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# Immediate Reattachment of Fractured Tooth Segment : A Case Report

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**ABSTRACT :**
Coronal fractures of the anterior teeth are common form of dental trauma. Reattachment of the tooth fragment is one of the options for managing coronal tooth fractures when the tooth fragment is available and there is minimal violation of the biological width.
***Keywords :*** *Crown fracture, Fiber post, Reattachment, Restoration, Trauma.*

## INTRODUCTION :

Crown fractures have been documented to account for up to 92% of all traumatic injuries to the permanent dentition.[1] Dental trauma often has a severe impact on the social and psychological well-being of a patient. Coronal fractures of permanent incisors represent 18-22% of all trauma to dental hard tissues, 28-44% being simple (enamel and dentin) and 11-15% complex (enamel, dentin and pulp). Of these 96% involve maxillary central incisors.[2] Traumatized anterior teeth require quick functional and aesthetic repair.[3]

The treatment modalities vary from simple reattachment of fracture fragment to complex interdisciplinary approach. Re-attachment of a tooth fragment should be preferable to restoring fractured teeth. There are several advantages in this treatment such as obtaining esthetic in a single appointment, being more conservative procedure, obtaining healthy periodontal attachment and it maintains the original tooth contours and translucence as the patient's own.[4,5] The present case report describes the reattachment of an original tooth fragment using splinting and fiber post.

## CASE REPORT :

A 24 year old male patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Nadiad with the chief complaint of fractured teeth associated with pain in the upper front region of jaw. Patient presented with history of trauma due to a road traffic accident one week back.

Intraoral examination revealed; a fracture line with pulp exposure on the labial surface of left maxillary central and lateral incisor. Left maxillary central and lateral incisor showed horizontal crown fracture whereas the right maxillary central showed mesio-incisal edge fracture with laceration on the lower and upper lip. Extraoral examination was not significant. (Illustration-1)

**Illustration-1** Preoperative showing horizontally fractured 21,22 & Mesio-incisal edge fracture of 11

On Clinical examination, the following findings were noted :

- Ellis Class III fracture in 21, 22 Grade I mobility in 11, 12, 21, 22
- Soft tissue lacerations on upper and lower lip were noticed

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# Furcation Perforation Repair by Mineral Trioxide Aggregate : A case report

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**ABSTRACT :**
Perforations are defined as mechanical or pathological communications between the root canal system and the external tooth surface.Previous studies have demonstrated the efficacy of mineral trioxide aggregate (MTA) in repair of furcation perforation. In this article, the use of MTA in treating a case of furcation perforation (caries-related) is described.
***Keywords:*** *Furcation perforation repair, MTA, Root canal treatment*

## INTRODUCTION L

Perforations are undesirable complications and unfortunate incidents that can occur during pulp space therapy.[1] Several materials have been used to repair perforations like amalgam, zinc oxide-eugenol cements (IRM and Super-EBA), glass ionomer cement, composite resins, resin-glass ionomer hybrids.[2] An ideal orthograde or retrograde filling material should seal the pathways of communication between the root canal system and its surrounding tissues. It should be nontoxic, should have antibacterial properties, excellent biocompatibility, non carcinogenic, insoluble in tissue fluids, dimensionally stable and should promote the growth of cementum, formation of bone, and non genotoxic.[3] Mineral Trioxide Aggregate has fulfilled the requirement of an ideal material when compared to Amalgam, IRM and Super EBA. The Mineral Trioxide Aggregate was developed by Dr. Torbinejad at Loma Linda University in the year 1993.[3]

MTA has been used successfully in several clinical applications such as root end filling material, pulp capping as well as pulpotomy.[4] This article presents a case report of furcation perforation repaired by MTA (Angelus, Londrina, PR, Brazil) with six months follow up.

## CASE REPORT :

A 29 year old female patient reported to Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Dharamsinh Desai University with chief complain of food lodgement and intermittent pain in the right lower mandibular posterior region. On clinical examination a deep carious lesion was found in relation to tooth number 46. Patient had no history of systemic illness and no relevant medical history. Preoperative radiograph (Illustration: 1) showed extensive occlusal caries involving pulp and furcation area. Vitality test showed negative response with both thermal tests and electric pulp tester. The radiographic examination revealed involvement of furcation area. The tooth was diagnosed as a case of necrosis of the tooth with periradicular changes and furcation perforation in tooth number 46 as seen in radiograph. Treatment chosen was furcation perforation repair with mineral trioxide aggregate in furcation area and root canal treatment.

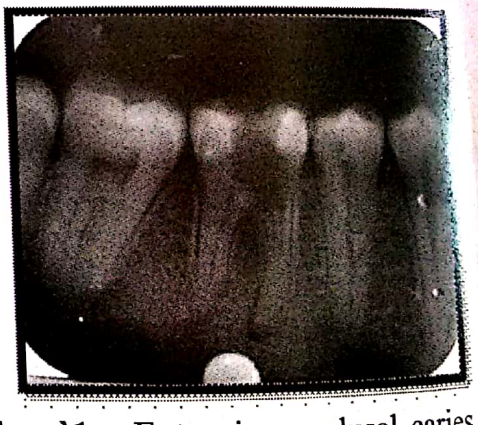

**Illustration `1 :** Extensive occlusal caries involving pulp and furcation area

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# Ultrasonics in Endodontics : A Review

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**ABSTRACT :**
During the past few decades endodontic treatment has benefited from the development of new techniques and equipment, which have improved outcome and predictability. Important attributes such as the ultrasonics have found indispensable applications in a number of dental procedures in Periodontology, to a much lesser extent in restorative dentistry, while being very prominently used in Endodontics. Ultrasonics in Endodontics has enhanced quality of clinical procedures and represents an important adjunct in the treatment of difficult cases. Since its introduction, ultrasonics has become more useful in applications such as gaining access to canal openings, cleaning and shaping, increased action of irrigating solution, ultrasonic condensation of gutta-percha, removal of intracanal materials and obstructions, distribution of sealer around root canal wall and endodontic surgery. This comprehensive review of the literature aims at presenting the numerous uses of ultrasonics in clinical Endodontics and emphasizes the broad applications in a modern-day endodontic practice.
**Keywords:** *Endodontics, Ultrasonics, Root-End Filling*

## INTRODUCTION :

The use of ultrasonics was introduced in 1955, when Zinner reported on the use of an ultrasonic instrument to remove deposits from the tooth surface. This was improved by Johnson and Wilson, and the ultrasonic scaler became an established tool in the removal of dental calculus and plaque. The concept of using ultrasonics in Endodontics was first introduced by Richman in 1957.[1] However, it took almost 20 years before a commercial system to instrument and clean root canals ultrasonically was developed in 1976 by Howard Martin, under the name 'endosonics'.[2]

Ultrasound is sound energy with a frequency above the range of human hearing, which is 20 kHz. The range of frequencies employed in the original ultrasonic units was between 25 and 40 kHz. There are two basic methods of producing ultrasound.[3] The first is magnetostriction, which converts electromagnetic energy into mechanical energy. The second method is based on the piezoelectric principle, in which a crystal is used that changes dimension when an electrical charge is applied. Deformation of this crystal is converted into mechanical oscillation without producing heat.[4]

## APPLICATIONS OF ULTRASONICS IN ENDODONTICS :

In the last decade, there has been renewed interest in the application of ultrasound in Endodontics. Further development of special equipment expanded the areas where it can be applied. The following is a list of the most frequent applications of ultrasonics in Endodontics, which will be reviewed in detail:[1]

Improving root canal access (e.g. removal of pulp stones)

- Activation of root canal irrigating solution
- Removal of posts, broken instruments and other obstructions from the root canal
- Distribution of sealer around the root canal walls
- Condensing gutta-percha root fillings
- Placement of mineral trioxide aggregate (MTA)
- Surgical Endodontics: Root-end cavity preparation and placement of root-end obturation material ration and placement of root-end obturation material.

### Improving Root Canal Access

One of the challenges in Endodontics is to locate canals, particularly in cases in which the orifice ha

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Case Report

# One Visit Apexification And Intra-Radicular Rehabilitation In Maxillary Right Central Incisor : A Case Report.

AUTHORS: NIRAV PARMAR[1], DIPTI CHOKSI[2], BARKHA IDANANI[3]

## ABSTRACT :

This case report explains the management of structurally compromised fractured maxillary right central incisor. Treatment of nonvital immature permanent teeth with calcium-hydroxide are often associated with some difficulties such as weakened tooth structure, root canal reinfection and long treatment time. Mineral trioxide aggregate (MTA) apical plug method is an alternative treatment option for open apices, and has gained popularity in the recent times. Many anterior teeth requiring restoration are severely weakened, having wide flared canal spaces and thin dentinal walls, and are at a high risk of getting fractured. But now recent advancements in dentistry, the canal is reinforced intra-radicularly with flowable composite, resin cement and light transmitting glass fiber post, rendering the endodontically treated root capable of supporting the post and core and thereby ensuring continued function of the badly damaged tooth. This case report describes the intra-radicular rehabilitation and one visit apexification in maxillary right central incisor.

Key words : Intra-radicular rehabilitation, Mineral trioxide aggregate (MTA), Glass fiber post, Flowable composite, Resin cement.

## Introduction :

Trauma to dentition is most common in the age group of 9-10 years [1]. During this period, the roots are still in the process of maturing hence there is less intra-radicular dentinal thickness and the tooth and root are more prone to fracture. The flared canal arising as a result of carious extension, trauma to immature tooth, pulpal pathosis, iatrogenic or endodontic misadventure or idiopathic causes, can present a difficult restorative problem to the practicing dentist [2].

Complete formation of the root and closure of the apical foramen continues for up to 3 years following eruption of the tooth [3]. If the pulp of young permanent teeth is damaged before the closure of the apical foramen, pulp necrosis may occur. The biggest problem in endodontic treatment of these teeth is obtaining an apical seal. The purpose of the apexification therapy used in nonvital immature teeth is to induce the formation of a hard tissue barrier at the root apex or the completion of apical development [3]. Mineral trioxide aggregate (MTA) is the most popular material for this aim. MTA has been suggested to create an apical plug at the root-end and helps to prevent the extrusion of the filling materials [4].

Factors such as location and quantity of the remaining healthy dentinal structure and the internal configuration and morphology of the root, affect the choice of post system. Also, the principals for retention of the posts such as length, diameter and surface configuration should be considered [5], [6], [7]. The primary objective of post endodontic rehabilitation by post and core is to replace the missing coronal tooth structure sufficiently to provide the required retention and resistance for the final restoration. It should also be esthetically compatible, cost effective and minimize chair side time.

For many years, cast posts were most commonly used for the treatment of endodontically treated teeth with wide canals. Their disadvantages include catastrophic root fractures in teeth with reduced remaining dentinal thickness, shadowing and graying of the root and discoloration at the tooth's gingival margins, which will adversely affect the esthetic results required for bonded resin and ceramic restorations in the anterior region.

In the last several years there have been significant advances in the development of bondable, fiber-reinforced, esthetic posts to reinforce endodontically treated teeth [8]. In clinical situations, where the post does not allow light transmission, the resin can be polymerised within the intra-radicular space to a maximum depth of 2-3 mm, due to the limited effect of trans-illumination within the composite resin. However, introduction of commercially available light transmitting posts allow light polymerization by transillumination, that effectively polymerises the composite along the entire length of the radicular preparation [7]. Glass fiber post has modulus of elasticity and biomechanical behaviour which is nearly identical to that of dentin [9].

The objective of this case report is to describe a step by step multidisciplinary conservative approach of rehabilitating a fractured maxillary right central incisor with a immature root apex using flowable composite resin, resin cement and Glass fiber post.

## Case Report :

A 19 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Dharmsinh Desai University, Nadiad, Gujarat with a complaint of fractured maxillary right central incisor with history of trauma 9-10 years back. Patient had complaint of mild pain, with no incidence of intra or extra oral swelling. On clinical examination, there was Ellis class II fracture on maxillary left central incisor and Ellis class III fracture on maxillary right central incisor (Fig. 1).

Fig. 1 PRE-OPERATIVE PHOTOGRAPH

CASE REPORT

AODMR

# Clinical Applications of Mineral Trioxide Aggregate: Report of Three Cases

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**ABSTRACT:**

The greatest threats to teeth are dental caries and traumatic injuries. The primary goal of all restorative treatment is to maintain vitality of pulp. If pulpal exposure occurs, then vital pulp procedure should be done to preserve pulp vitality. Historically, calcium hydroxide has been the material of choice for vital pulp procedures. As of late, an option material called mineral trioxide total (MTA) has exhibited the capacity to prompt hard-tissue development in pulpal tissue. This article portrays the clinical and radiographic result of cases including the utilization of MTA in furcal perforation repair, closure of open apex and direct pulp capping.

**Keywords:** Closure of open apex, Direct pulp capping, MTA**,** Perforation repair.

## INTRODUCTION

A perfect endodontic repair material should seal the pathways of correspondence between the the root canal system and its surrounding tissues. It should be noncarcinogenic, nontoxic, biocompatible, insoluble in tissue fluids, and dimensionally stable.[1] Because any previous materials did not have these all characteristics, MTA is being used in a wide range of clinical treatments such as a perforation repair material, as a root-end filling material and as a pulp capping agent during vital pulp therapy and[2] MTA showed excellent sealing ability and promoted osteoblast activity[3]. It is less cytotoxic had an antimicrobial effect.[4,5]

In this article three cases of furcal perforation repair, closure of open apex and direct pulp capping by using MTA are shown.

## CASE REPORT

### CASE 1 :- Furcal Perforation repair using MTA

A 34-yr-old female patient reported to the Department, with the chief complain of pain in her lower right back region of the jaw since one month. On clinical examination a deep carious lesion was found in relation to 46. Radiographic examination reveled extensive occlusal caries involving pulp and furcal area.(Figure 1)

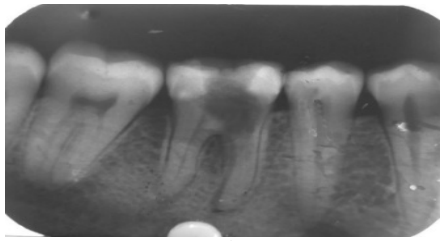

Figure 1: Radiograph showing furcation involvement in 46

Vitality test showed negative response with both thermal tests and Electric pulp tester. The diagnosis was necrosis of the tooth and involvement of furcal area because of deep carious lesion. On first appointment tooth was isolated with rubber dam. The caries was removed, and Perforation was confirmed clinically with probe. Canals were cleaned and shaped with ProTaper files up to the F1-ProTaper and patient was recalled after three days. On second appointment tooth was asymptomatic canals were obturated & on same day the perforation was sealed with

# Treatment of Internal Root Resorption in Maxillary Lateral Incisor: A Case Report

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## ABSTRACT:

A clinician encounters a variety of pulpo-pathologic conditions. Resoprtion is one such condition. By definition it is a condition associated with either a physiologic or a pathologic process resulting in loss of dentin, cementum or bone. Internal as well as external resorption signifies a very complex pathological interaction of the cells of pulp, periradicular and periodontal tissues. An insidious process that is generally found in teeth with a long standing chronic inflammation of the pulp, caries related pulpits, traumatic injuries, and iatrogenic causes. Generally a tooth with internal root resorption is asymptomatic and this condition is diagnosed on routine radiographic examination. Accurate diagnosis and immediate institution of treatment in this condition is important to improve the prognosis of such teeth.

This case report having resorptive defect in the middle 1/3rd of maxillary left lateral incisor which was treated non-surgically with endodontic treatment. The step back technique for bio-mechanical preparation was used and obturation was carried out with hybrid technique where apical 1/3rd till resorptive defect was obturated and the defect was backfilled with thermoplastized guttapercha. A six-month follow up demonstrated clinically asymptomatic and adequately functional tooth, with radiographic signs of healing.

**Keywords:** Gutta-Percha, Resorption Lacunae, Thermoplastized.

## INTRODUCTION

Internal root resorption is a rare finding, usually asymptomatic, slowly progressing, and detectable upon routine radiographic examination.[1] An oval enlargement of the root canal space in radiograph is seen in affected tooth. The resorption lacuna, a continuation of the distorted outer borders of the root canal is confirmed by different angulations techniques of radiographs.[2] A deviation from the standard procedure is required for diagnosis and management of internal resorption. The key to success in arresting the process of internal resorption is total removal of pulp horn. The cause of internal resorption is not fully understood.[3] Suggested contributing factors are trauma, persistent chronic pulpitis as well as orthodontic treatment.[4] Late diagnosis is because the tooth is asymptomatic.

Chronic inflammatory process in the pulp tissue combined with the loss of the protective layer of odontoblasts and predentin is assumed to cause dentinal resorption. Activated multinucleated giant cells that are adjacent to the granulation tissue in the inflamed pulp resorb internal aspect of root canal.[5] Teeth in which the resorptive process reaches the cervical area of the crown may have a pinkish color, known as 'pink tooth' resulting from granulation tissue ingrowths.[6]

Radicular portion it often goes unnoticed until it has perforated the external surface. Stage at which the process is detected & treated affects the prognosis. Extirpation of entire pulpal tissue is the main motive of its treatment. The

REVIEW ARTICLE

AODMR

# Recent Advances in Endodontics- A Review

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**ABSTRACT:**

Contemporary endodontics has seen an extraordinary progress in innovation and materials. This article is aimed to review some of challenges and advances in the following sections: (1) Diagnosis of pulp vitality, (2) endodontic imaging, (3) root canal disinfection, (4) root canal preparation, (5) root canal filling and (6) visualization. The above mentioned advances aims to improve the art and science of root canal treatment.

**Keywords:** Canal preparation, Disinfection, Imaging, Orascope.

## INTRODUCTION

Diagnosis in dentistry may be defined as " the process whereby the data obtained from questioning, examining and testing are combined by dentist to identify deviations from the normal".[1] Past couple of decades have witnessed a cascade of most rapid and extensive technological evolution in field of dentistry. Era of diagnosing vitality of pulp and fractures have evolved from conventional technique to modern method, root canal preparation from stainless steel to Ni-Ti files and root canal filling materials in field of endodontics. The scenario in radiographic assessment, which is indispensable adjunct to clinical examination in endodontics has also seen progression from traditional radiology to an advanced and more accurate imaging techniques.

Development of visualization in field of endodontics with the usage of loupes and microscopes have offered a break through. This helped in overcoming the limitations faced with naked eyes in detection of missed canals, incipient caries, fractured tooth, etc. This articles shows a review of recent advances in endodontics.

## ADVANCES IN DIAGNOSTIC VITALITY OF PULP

### Laser Doppler flowmetry

This is a non-invasive, objective, painless, semi-quantitative method that is more reliable in measuring blood pressure to pulp. Laser light is transmitted to pulp by means of fibro optic probe.[2] Fibro optic probe transmits laser light to pulp. This method uses Helium Neon (HeNe) and Gallium Aluminium (Ga-Al) as semiconductor diode lasers at power of 1 to 2 mW. HeNe has wavelength of 632.8nm and wavelength of semiconductor diode laser is 780 to 820 nm.[3] The ideal position to place the probe is 2 to 3 mm from the gingival margin.[4] The scattered light from moving red blood cells in the circulation will be frequency shifted while those from static tissues remains unshifted.Doppler's shifted and unshifted reflected light is returned via afferent fibres and a signal is produced. Vitality of pulp in both adults and children can be estimated successfully by this technique.[5](Figure 1)

### Pulse Oximetry

The determination of percentage of oxygen saturation of the circulating arterial blood is defined as "Oximetry".[6] It is a relatively

CASE REPORT

# Anterior Esthetic Rehabilitation: Harmonizing the White and Pink

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## ABSTRACT

Esthetics is the science of beauty, re-establishing dental esthetics is one of the most gratifying services that a dental professional can provide. When the complaint is associated with both hard and soft tissues, it becomes even more challenging to harmonize these structures. A multi-disciplinary approach is the preferred protocol for such cases. This article discusses a case report of successful rehabilitation of anterior esthetics involving both white and pink esthetics.


**Keywords:** Discolored tooth, Calcium hydroxide, Depigmentation, Gingivoplasty, Composite veneers

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## INTRODUCTION

A beautiful smile is one of the biggest aspirations for many and often sought after treatment from dentists. Frequently, when treating esthetic concerns for the patients, clinician focusses on the teeth (white), and the gingiva (pink) are often ignored. This can have catastrophic effects on overall treatment outcome despite delivering the best white esthetics.[1,2]

Thus, an optimal balance of both the white and pink oral tissues must be considered while planning any esthetic corrective procedure. It is not unusual to restore maxillary anterior teeth which are naturally out of form and esthetics or due to some pathology with direct or indirect veneers. However, assessment of smile must be done to gain information about the relationship of teeth with surrounding soft tissues.[3] This forms the key element to proper diagnosis, treatment planning and providing the best possible treatment outcome to the patient.

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The current case report discusses one such interdisciplinary approach to harmoniously restore the white and pink esthetics to patient's utmost satisfaction.

## CASE REPORT

A female patient of age 18 years reported to the Department of Conservative Dentistry and Endodontics, with the chief complaint of pain and swelling in upper front teeth since few days, discolored gums, and compromising smile [Figure 1].

Clinical examination revealed Ellis Class II fracture involving 11 and 12. There was intraoral sinus tract in relation to these teeth. The teeth were tender on percussion. All teeth were hypoplastic, and there was the presence of midline diastema.

There was an irregular grayish black discoloration involving the anterior attached gingiva that presented with an esthetic concern for the patient. The gingival margins and zenith were nonuniform for all teeth [Figure 2].

The patient gave a history of trauma before 6 years but did not seek any dental intervention at that time. Past dental history and medical history was non contributory.

Pulp sensibility tests were performed. Tooth 11 and 12 had no response in electric and thermal (heat) test whereas 13, 21, 22, and 23 gave normal response to these tests.

Radiographic examination revealed diffuse periapical radiolucency of size 2 cm × 2 cm around apices of 11 and 12. Open apex was present in relation to 11. Remaining anterior teeth showed no periapical changes [Figure 3].

A final diagnosis of the chronic periapical abscess was made for 11 and 12. There was associated idiopathic melanin hyperpigmentation of gingiva.

The patient presented with a complaint of both hard and soft tissues. Hence, an elaborate interdisciplinary treatment was planned to restore the tooth form n function along with esthetic rehabilitation of white and pink structure of the oral cavity.

Phase I therapy involved management of pain and associated complaint in teeth 11 and 12. This involved non-surgical endodontic therapy. Under local anesthesia and rubber dam isolation, access cavities were prepared in 11 and 12. Working length was determined

# APEXIFICATION : CREATING OBSTRUCTION FOR CONSTRUCTION

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**ABSTRACT :**
Open apices with necrotic pulp and periapical lesion present a special challenge in this regard as they are arduous to treat via conventional endodontic therapy. Apexification using an apical plug of novel biomaterial like Mineral Trioxide Aggregate (MTA) has emerged as an alternative to long-term intracanal use of calcium hydroxide. This case report attempts to discuss the treatment protocol and successful management for such a challenge- traumatized immature tooth with open apex and radicular cyst.

***Keywords*: Open apex, immature necrotic permanent tooth, MTA, calcium hydroxide, apexification, radicular cyst**

## Introduction

The immature root with a necrotic pulp and large periapical lesion presents multiple challenges to successful treatment.

i. The infected root canal space cannot be disinfected with the standard root canal protocol with the aggressive use of endodontic files.
ii. Once the microbial phase of the treatment is complete, filling the root canal is difficult because the open apex provides no barrier for stopping the root filling material before impinging on the periodontal tissues.
iii. Even when the challenges described earlier are overcome, the roots of these teeth are thin with a higher susceptibility to fracture.[1]

These problems are overcome by using a disinfection protocol that does not include root canal instrumentation, stimulating the formation of a hard tissue barrier or providing an artificial apical barrier to allow for optimal filling of the canal, and reinforcing the weakened root against fracture during and after an apical stop is provided.

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# BROKEN INSTRUMENT RETRIEVAL FROM MAXILLARY 2ND MOLAR- A CASE REPORT

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## Abstract :

One of the most common mishaps occurs during routine endodontic treatment is the fracture of instrument inside the root canal. The separated instrument leads to metallic obstruction and prevents thorough cleaning and shaping procedures. Factors should take into the consideration are tooth type and canal curvature, instrument position and type before attempting instrument retrieval. This case report illustrates instrument retrieval from 27 using small artery forceps and re root canal treatment of same tooth.

**Keywords:** *H file, instrument separation, instrument retrieval, stieglitz pliers, artery forceps*

## Introduction

Separation of endodontic instruments within the root canal is an unfortunate occurrence that may hinder root canal procedure and affect the outcome. This instrument is usually some type of file or reamer but can include gates-Glidden or peeso reamers, lentulo spiral paste fillers, thermo mechanical gutta percha compactors, tips of hand instruments such as explorers or gutta percha spreaders. The separated instrument leads to metallic obstruction in the root canal and prevents thorough cleaning and shaping procedures.[1]The retrieval of separated instruments is usually very difficult and often ineffective. Different methods have been proposed for retrieving objects separated into the root canal.In the past, chemicals such as hydrochloric acid, sulfuric acid, and concentrated iodine potassium iodide were used in an attempt to dissolve the metal obstruction, which is now irrelevant because of the metals used today, as well as the obvious safety issues. Recently, specialized devices and techniques have been introduced specifically to remove separated instruments such as ultrasonic devices, Instrument Retrieval System (IRS) and Masserann kit.

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# A HOLISTIC APPROACH TO AESTHETIC ENHANCEMENT USING DIRECT COMPOSITE RESTORATION- A CASE REPORT

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## Abstract:

Aesthetic dentistry has evolved since the last many years with the advent of composite resin. The use of direct composite restoration to redesign and recontour anterior teeth has evolved and also played a very important role in not only developing the patients functional requirements but also helped majorly to build the overall confidence and well being of the patient.

***Keywords:*** *Aesthetics, composite resin, smile design ,recontouring.*

## Introduction

Anterior crown fractures are common form of injury that mainly affects children and adolescents. Uncomplicated crown fracture to the permanent teeth has an intense effect not only on the patient's appearance, but also on function and speech.[1,2]

The predictable esthetic restoration of broken incisal edge of maxillary central incisors is a demanding and technique sensitive procedure. Its success is dependent on operator's skills and knowledge and also on adhering to a systematic and problem solving approach.[1,2]

A logical method is used to build up morphologically correct composite restorations by careful selection of composite shades, tints and opaquers. In accurate combinations, an illusion of varying translucencies and opacities become visible over natural tooth structure.[3]
Fracture during and after an apical stop is provided.

The dental composite has emerged as a top ranked material over other direct restorative counterparts. Their evolution since their introduction in dentistry has resulted in better bonding, optical and handling properties. Their performance has also been supported by many longevity studies.[4]

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# Cone Beam Volumetric Tomography- An Overview

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**Abstract**

Radiographic examination is essential in diagnosis and treatment planning in dentistry. The interpretation of an image can be confounded by the anatomy of both the teeth and surrounding structures. The ability to assess an area of interest in 3-Dimension is beneficial for both novice and experienced clinicians.

Cone Beam Volumetric Tomography also known as cone beam computed tomography, captures a cylindrical volume of data in one acquisition. The volume acquired by a CBVT is composed of voxels. A voxel is a 3-D pixel. As the data are captured in a volume, all the voxels are isotropic, which enables objects within the volume to be accurately measured in different directions. CBVT offers distinct advantages over conventional CT. These advantages include increased accuracy, higher resolution, scan-time reduction, and dose reduction.

CBVT allows the clinician to view the tooth and pulpal structures in thin slices in all three anatomic planes: axial, sagittal, and coronal. This capability alone allows visualization of periapical pathology and root morphology previously impossible.

This presentation will be containing its use for assessment of implants, for third molar extraction and orthodontic analysis. Along with its use in endodontics for Apical morphology and suspected lesions of endodontic origin, Root canal system morphology, Presurgical visualization, Suspected root fractures and trauma, Internal and external root resorption.

**Keywords:** CBVT (Cone Beam , Volumetric Tomography, 3D imaging , Maladies

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## Introduction

Imaging is an important diagnostic adjunct to the clinical assessment of the dental patient. Intraoral and extraoral procedures, used individually or in combination, suffer from the inherent limitations of all planar two-dimensional (2D) projections: magnification, distortion, superimposition, and misrepresentation of structures. The introduction of cone-beam volumetric tomography (CBVT) heralds a true paradigm shift from a 2D to a 3D approach to data acquisition and image reconstruction.[1]

Fig. 1 Cone-Beam 3D volumetric imaging

Cone-Beam 3D volumetric imaging was invented by Willi Kalender in the 1980s.

Cone beam technology was first introduced in the European market in 1998 and into the US market in 2001.[2]

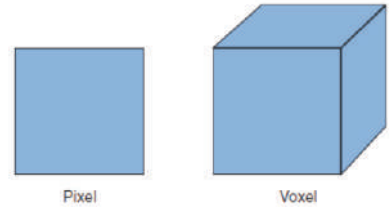
Imaging is accomplished by using a rotating gantry to which an x-ray source and detector are fixed. A divergent pyramidal- or cone-shaped source of ionizing radiation is directed through the middle of the area of interest ontoan area x-ray detector on the opposite side. The x-ray source and detector rotate around a rotation fulcrum fixed within the center of the region of interest.

During the rotation, multiple, sequential planar projection images of the field of view (FOV) are acquired in a complete, or sometimes partial, arc.[1]

This procedure varies from a traditional medical CT, which uses a fan-shaped x-ray beam in a helical progression to acquire individual image slices of the FOV and then stacks the slices to obtain a 3D representation. Each slice requires a separate scan and separate 2D reconstruction. Because CBVT exposure incorporates the entire FOV, only one rotational sequence of the gantry is necessary to acquire enough data for image reconstruction.

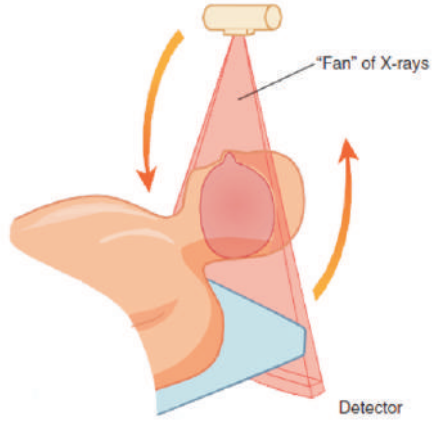
Just as a digital picture is subdivided into pixels, the volume acquired by a CBVT is composed of voxels. Essentially, a voxel is a 3-D pixel. Because the data are captured in a volume as opposed to slices, all the voxels are isotropic, which enables objects within the volume to be accurately measured in different directions.[3] The axial height of a medical CT voxel, however, is determined by the slice thickness or pitch Fig 2 (1–2mm thick) and results in an anisotropic voxel.[4]

Fig 2 (1–2mm thick) and results in an anisotropic voxel.




In other words, unlike the CBVT voxel, a medical CT voxel is not a perfect cube, and measurements made in multiple planes are not accurate. In addition to increased accuracy and higher resolution, CBVT offers significant scan-time reduction, radiation dose reduction, and reduced cost for the patient(4-6). With the help of viewer software7, the clinician is able to scroll through the entire volume and simultaneously view axial, coronal, and sagittal 2-D sections that range from 0.125–2.0 mm thick. The axial and proximal (sagittal in the anterior, coronal in the posterior) views are of particular value, because they are generally not seen with conventional periapical radiography. The ability to reduce or eliminate superimposition of the surrounding structures makes CBVT superior to conventional periapical radiography8. In addition to the 2-D slices, Fig : 3 3-D reconstruction enables further assessment of the area of interest.

Fig 3 3-D reconstruction enables further assessment of the area of interest.




CBVT technology allows the dental practitioner to virtually immediately, evaluate patients for a wide variety of maladies.

- Ranging from dental and jaw trauma and infections.
- Edentulism (quantitative and qualitative osseous evaluation for dental implants).
- Temporomandibular joint osseous pathology.
- Impacted and supernumerary teeth.
- Developmental and congenital jaw deformities.
- Dental endodontic lesions.
- Oral and maxillofacial pathology.[9]

## Implant Site Assessment[10]

Greatest impact of CBVT has been on planning of dental implant placements. It provides cross sectional images of the alveolar bone height, width, and angulation and accurately depicts vital structures such as the inferior alveolar dental nerve canal in the mandible or Sinus in the maxilla.

Fig 4.(A) Typical implant planning image set shows a "generic" implant fixture orientation in relation to the inferior alveolar nerve. (B) A close-up image of the case above

Case Report

# Heal and Seal: Management of an Open Apex with Mineral Trioxide Aggregate Apexification

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## Abstract

The use of mineral trioxide aggregate (MTA) as an alternative material to calcium hydroxide for apexification has gained popularity over reasons such as good sealing ability and biocompatibility and to avoid longer periodic appointments. The case report presents use of MTA as an apical plug for an open apex central incisor which gives a favorable outcome with periapical lesion.

**Keywords:** Apexification, mineral trioxide aggregate, periapical lesion

## Introduction

The immature root with a necrotic pulp and an open apex lesion presents challenges to successful treatment such as that the infected root canal space cannot be disinfected with the standard root canal protocol with the advent use of endodontic files. Once the microbial phase of the treatment is complete, obturating the root canal is difficult as the open apex does not provide any barrier for stopping the root filling material before impinging on the periodontal tissues.[1]

Even when the challenges described earlier are overcome, the roots of these teeth are structurally thin, with a higher susceptibility to fracture. These problems are overcome by disinfecting without any instrument usage, stimulating the formation of a hard tissue barrier or providing an artificial apical barrier to allow for optimal filling of the canal, and reinforcing the weakened root against fracture during and after an apical stop is provided.[2,3]

## Case Report

A 20-year-old female patient was referred to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Dharmsinh Desai University, with a chief complaint of pain in the upper right front tooth region. The patient's dental history revealed that she had suffered a trauma to the right maxillary central incisior 9 years back, for which she did not undergo any treatment. The right maxillary central incisor was discolored and was tender on percussion. On doing the pulp vitality test, there was a negative response to heat and electric pulp testing. On radiographic examination of the associated tooth, a large canal with associated peripaical lesion was noticed in relation to right maxillary central incisor.

With the evident clinical and radiographic findings, final diagnosis of necrotic pulp with an open apex in relation to upper right central incisor was established [Figure 1]. Treatment plan of root canal therapy with single-step mineral trioxide aggregate (MTA) apexification was decided.

On the first appointment access, opening was done using round bur No. 2 and endoaccess bur. Working length was determined using hand K file radiographically [Figure 2]. Biomechanical preparation was completed with copious irrigation of 2.5% sodium hypochlorite and a final flush of 2% chlorhexidine digluconate for 5 min. The patient was then recalled for the next visit.

On the second appointment the length of the hand plugger that was to be used for MTA plug was confirmed radiographically [Figure 3]. Thereafter, MTA was mixed and loaded into the canal in increments with MTA carrier and condensed with the

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# SONIC AND ULTRASONIC IRRIGATION: A REVIEW

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**ABSTRACT**

Complete debridement of root canal system is a critical component of endodontic therapy. Ultrasonic and sonic activation of endodontic instruments have been suggested as a means to enhance canal debridement. When a file is ultrasonically activated and placed passively in canal, a phenomenon called acoustic streaming produced. It may produce shear stresses that are capable of disrupting biological cells and removing debris. Several studies have shown that ultrasonically or sonically prepared teeth have significantly debris free canals. This may be due to the fact that, when power driven files are used to instrument a canal, they can bind or contact the canal walls in a way that restricts their vibratory motion and cleaning efficacy. This may be particularly true for the fine and/or curved canals. Perhaps a more effective method for canal debridement would be to passively activate a file, sonically or ultrasonically, inside the canal as a final step in root canal preparation. Passive activation suggests that no attempt is made to instrument, plane, or contact the canal walls with the file. This should enable maximum benefits from acoustic streaming. The purpose of this review is to evaluate the cleaning efficacy of passive ultrasonic activation and passive sonic activation.

***Keywords:*** *Ultrasonic irrigation, sonic irrigation, root canal, smear layer, irrigation, activation.*

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# NANODENTISTRY: BIOACTIVE GLASS AND NANOPARTICLES AS INTRACANAL MEDICAMENTS: A REVIEW

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**ABSTRACT**

The primary goal of endodontic therapy is thorough disinfection of the root canal system through thermomechanical debridement. Intracanal medicaments have been widely used for multipurpose like disinfection, regeneration, trauma, pain control. Newer research has been focused to combat the drawbacks like antimicrobial resistance, dentin discoloration, alteration in microhardness of dentin. Nanotechnology been the upcoming future scope focuses on development of new such materials like bioactive glass and nanoparticles. These materials not only are biocompatible but are target specific in their mode of action.

***Keywords:*** *intracanal medicaments, bioactive glass, nanoparticles, future scope.*

## INTRODUCTION

Several root canal irrigants have been used to eradicate the root canal microbiota, however there exists no particular literature stating its complete efficacy. Bacterial resistance, complex root canal anatomy, leads to incomplete efficiency of the root canal irrigant. Also, the protective layer formed by necrotic tissue, debris, inhibit the penetration of the irrigant, thereby inhibiting the antibacterial activity of the irrigant.[1]

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# HEMISECTION AS A TREATMENT OPTION: A CASE REPORT

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## ABSTRACT

Hemisection (i.e. tooth resection) procedures are useful solutions for a variety of clinical problems. These procedures are often indicated in the treatment of periodontally involved molars in which significant bone loss exists around a root or in the furcation. Occasionally, teeth with pathosis of apparaent endodontic origin actually have a lesion of periodontal cause.

*Key Words: Hemisection, Mandibular molar*

## INTRODUCTION

Hemisection implies that the tooth is cut in half. In practical usage, one of the halves is usually removed, but this is not essential if the most common indication for these techniques is the treatment of periodontal defects, they are useful for a variety of problems encountered in endodontic practice. Perhaps the most common endodontic indication is the removal of a root with a vertical fracture or a long lateral strip perforation. Creative endodontic treatment planning, however, can make root removal a useful approach in the treatment of a tooth with deep localized caries, an irretrievable separated instrument, a severe coronal fracture, or a strip perforation that might include periodontal bone loss. For the purpose of this discussion, both root amputation and hemisection will be referred to as root resection, because the principles of diagnosis and technique apply equally to both types of outcome.[10]

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# A CASE REPORT ON MANAGEMENT OF RADIX ENTOMOLARIS WITH POST-ENDODONTIC RESTORATION WITH ENDOCROWN

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## ABSTRACT

Mandibular molars may have an additional root located either buccally or lingually. Thus, an accurate diagnosis and thorough understanding of variation in root canal anatomy is essential for treatment success. Endodontically Treated Teeth (ETT) are at higher risk of biomechanical failure than vital teeth. With the development of adhesive systems, endocrowns have been used as an alternative to the conventional post-core and fixed partial dentures.

***Key words**: Permanent mandibular first molar, Radix entomolaris, Additional third root, Root canal anatomy, Endo-crown*

## INTRODUCTION

Clinicians must have an in-depth knowledge of the morphology of root canal systems and its variations that may complicate the procedure. The majority of mandibular first molars have two roots, mesial and distal with two mesial and one distal canal[1,2]. *(Fabra-Campos) (1985-1989)* reported the presence of three mesial canals while *Stroner* reported three distal canals (1984)[3,4]. A major variant is the presence of three roots in mandibular first molar, first mentioned in the literature by *Carabelli* (1844) known as Radix entomolaris (RE) located in distolingual position[5]. When located on mesiobuccal surface, the anomaly is known as Radix paramolaris. RE has a frequency of less than 5% in white Caucasian, African, Eurasian and Indian populations while it appears to be commonly present in races of Mongoloid traits such as the Chinese, Eskimos, and Native American populations with a frequency of 5-30%.[5] Radiographic diagnosis plays a pivotal role in successful endodontic treatment of tooth. One of the main reasons for failure of endodontic treatment is incomplete removal of pulp tissue and microorganisms from all the root canals.[6]

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# MANAGEMENT OF SEPARATED INSTRUMENT BY FILE BY-PASS TECHNIQUE

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**Abstract:** Instrument separation is one of the most common procedural errors that may occur during endodontic treatment. A separated instrument can create an obstruction in the root canal which can hinder the cleaning and shaping procedures. Removal of the separated instrument is often advised but factors like poor access and visibility to the separated instrument makes it difficult and also the amount of dentin to be removed is more. As an alternative to removal, bypassing technique is very effective and conservative. This case report describes management of separated instrument in lower right first molar.

***Keywords****: Separated instrument, by-passing, Neoendo hand file, lateral condensation, obturation.*

## INTRODUCTION

There are several unwanted procedural errors that clinicians may face during endodonticpractice.[1] These include strip perforations, ledging of the root canal walls, and separation of various endodontic instruments. The separation of instruments during endodontic therapy is a troublesome incident. Its incidence range varied from 2 to 6% of the casesinvestigated.[2] The most common causes for file separation are improper use, limitations in physical properties, inadequate access, root canal anatomy, and possibly manufacturing defects.[3]

The presence of a separated instrument in the root canal leads to failure of root canal treatment. Instrument separation commonly occurs at the middle or apical third of the mesial canals of mandibular molars, and at the same location in the mesiobuccal roots of maxillary molars due to their root curvatures.[4]

The prognosis depends on the degree of contamination of canal at the moment of instrument separation. Proper assessment should be made whether the canal can be instrumented even in the presence of fracturedinstrument.[5,6]If the canal cannot be instrumented decision should be made to remove the separated instrument.

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# MANAGEMENTOF C-SHAPED CANAL CONFIGURATIONINMANDIBULARSECOND MOLAR: A CASE REPORT

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## ABSTRACT

One of the most challenging root canal configurations is the C-shaped root canal, commonly present in mandibular second molar. These canals are most challenging to treat because transverse anastomosis, lateral and accessary canal sand apical deltas. This case report presents successful management of c-shaped canal in mandibular second molar.

***Keywords**: C-shaped canal, Mandibular second molar, Thermoplasticized guttapercha.*

## INTRODUCTION:

A thorough knowledge of the root canal anatomy and its variants is required for achieving success in root canal therapy along with diagnosis, treatment planning and clinical expertise. One such variation of the root canal system is C-shaped canal configuration. The C-shaped canal was first documented in endodontic literature by *Cooke and Cox* in 1979.[1] The C-shaped canals are mostly present in the mandibular second molar and especially in Asian population this type of configuration is seen.[2-5]The C-shaped canal configuration results from the failure of the Hertwig's epithelial sheath to fuse or its inadequate development during the root embryologic stage.[6] Failure of the Hertwig's epithelial root sheath to fuse on the lingual or buccal root surface is the main cause of C-shaped roots, which always contain a C-shaped canal.[7]This results in a conical or prism shaped root with a thin interradicular ribbon-shaped isthmus connecting them.[8-10] *Manning* attributed the formation of C-shaped roots to age changes like deposition of cementum.[9] This theory was however contested since separate canals in roots with C-shaped anatomy were observed even in patients under 40 years of age.[9]

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# LASERS IN ENDODONTICS: A PUBMED RESEARCH BASED REVIEW

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## ABSTRACT

Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of papers on potential applications for lasers in endodontics have been published. The purpose of this paper is to summarize laser applications in endodontics, including their use in pulp diagnosis, dentinal hypersensitivity, pulp capping and pulpotomy, sterilization of root canals, root canal shaping and obturation and apicectomy. The effects of laser on root canal walls and periodontal tissues are also reviewed. The essential question is whether a laser can provide equal or improved treatment over conventional care. Secondary issues include treatment duration and cost/benefit ratio. This article reviews the role of lasers in endodontics since the early 1970s, summarizes many research reports from the last decade, and surmises what the future may hold for lasers in endodontics. With the potential availability of many new laser wavelengths and modes, much interest is developing in this promising field.

***Key words**: Laser, Pulpal diagnosis, Pulp capping and Pulpotomy, Cleaning and Shaping, Endodontic Surgeries.*

## INTRODUCTION

The use of lasers in dentistry has increased over the past few years. The first laser was introduced into the fields of medicine and dentistry during the 1960s (*Goldman et al., 1964*). Since then, this science has progressed rapidly. Because of their many advantages, lasers are indicated for a wide variety of procedures (*Frentzen and Koort, 1990; Aoki et al., 1994; Pelagalli et al., 1997; Walsh, 2003*). Conventional methods of cavity preparation with low- and high-speed handpieces involve noise, uncomfortable vibrations and stress for patients. Although pain may be reduced by local anesthesia, fear of the needle and of noise and vibration of mechanical preparation remains causes of discomfort. These disadvantages have led to a search for new techniques as potential alternatives for dental hard tissue removal. The aim of this review is to describe the application of lasers in dental hard tissue procedures.[1, 2]

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# Biodentine A Bandage to Dentine: A Review

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**ABSTRACT**: The ideal material for dental rehabilitation should have certain unique properties such as adhesion strength, insolubility, dimensional stability, biocompatibility, bioactivity, etc. In order to optimize the care of dental patients, new materials that demand improved efficiency are constantly put in the market. Recently launched, Biodentine has become the "first all-in-one, bioactive and biocompatible dentin replacement material." It eliminates the disadvantages of calcium hydroxide and mineral trioxide aggregate.

Biodentine is a material basically made up of calcium silicate, which has attracted attention in recent years. Biodentine is recommended to be used in different clinical applications and for various procedures like as root perforations repair, apexification procedure, resorptions, retrograde fillings, pulp capping procedures and dentine replacement. Since its launch, considerable research has been carried out on this material, but few reviews contain details and data obtained from the studies. This analysis paper is therefore prepared to give the reader an overview of the results of different content characteristics. The review initially focuses on various parts of material.

**KEYWORDS**:Biodentine, Pulp Capping, Dentine Bridge, MTA, Pulp Protection, Pulp Vitality

## I. INTRODUCTION

Over the last few decades, there has been a surge of interest in restorative materials. Direct composite restorations were used to replace amalgams in small anterior restorations and medium-sized posterior restorations. In contrast to amalgams, resin composites can achieve micromechanical retention through the use of different adhesives. Although, a few disadvantages have been reported with resin-based materials such as wear resistance under high load, shrinkage due to polymerization leading to microleakage and toxic monomers release.[1;2]


Calcium hydroxide-based materials have been commonly used in direct pulp capping procedures to shield the pulp from the harmful components of resin-based materials. Despite the material's highly alkaline pH, a dentin bridge may develop within 3 months, protecting the underlying pulp from mild to moderate inflammation. However, several tests have shown that this bridge has partial dissolution and tunnel defects. Mineral trioxide aggregate (MTA) was developed as a root-end filling material and direct pulp capping as a result of the recent emphasis on biocompatible materials such as Portland. Tricalcium and dicalcium silicates make up the majority of this material.[5]When used for pulp capping, it stimulates the development of reparative dentin, resulting in the formation of a normal tubular dentin bridge in two months with no signs of inflammation. When used for pulp capping, it stimulates the development of reparative dentin, resulting in the formation of a normal tubular dentin bridge in two months with no signs of inflammation.[4] However, this content has been

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# Resin infiltration: a micro-invasive approach to white spot lesions

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## Introduction

With the advancement in preventive and adhesive techniques in dentistry, newer methods are applied for inhibiting the carious process aiming to preserve the tooth structure. Thus introducing the concept 'Minimally Invasive Dentistry' for preservation of healthy dental structures. It is a systematic respect for the original tissue by replacing and removing with little tissue loss.[1]

Enamel demineralization and remineralization are considered as a continuous process. Cavitated lesions occur as a result of demineralization of the hard tissues and destruction of the organic matter of the tooth by production of acid by hydrolysis of carbohydrates in the plaque.[2] Non cavitated caries lesions show increased porosity within the lesion due to loss of inorganic substance beneath an intact surface layer. When compared with the refractive index of sound enamel (RI 1.65), incipient enamel caries lesions are porous and are filled with air (RI 1.0) and water (RI 1.33). Consequently, due to scattering of reflected light, the lesion looks opaque.[3]

Recent minimally invasive concepts in Operative Dentistry are focused on the control of the etiological factors using noninvasive and microinvasive strategies. The current modalities for the treatment of early lesions are either invasive or non-invasive in nature. Noninvasive strategies target at arresting or reverting noncavitated enamel caries lesions, microinvasive strategies include barriers that prevent further dissolution of enamel by the acidic challenge from cariogenic bacteria. Two microinvasive procedures are used: (a) pit-and-fissure

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# 3D Printing In Endodontics

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**Conflicts of Interest:** Nil

## Introduction

In endodontics, radiographic imaging is a primary and essential step in the diagnosis, treatment planning and follow up of all the cases. Diagnostic imaging is an important adjunct in clinical assessment of the patient. Radiology has played a crucial role in dentistry. An intraoral radiography system is based on the transmission, attenuation and recording of x-rays on a film or digital receptor and the images produced by a conventional periapical radiograph are a two dimensional (2D) representation of a three dimensional (3D) area of interest that possess inherent limitations of magnification, distortion and superimposition.[1] These constraints paved way for the advanced techniques of cross sectional imaging which revolutionised the concept of diagnosis and treatment planning in dentistry.[2,3]

3D printing has been used increasingly since the 1980s. In 1983, for the first time, a three-dimensional object was printed by Charles Hull, in which the technique of stereo lithography is used, as well as the first program for virtualization. It can be used in areas that require millimetric precision. So, it has drawn the attention of specialists in general medicine, which started to implement it since the 1990s. [4]

## Methods of 3d Printing

Dental applications of 3D printing adopt one or more of the following common technical type classifications:

1. Stereo lithography apparatus (SLA),
2. Fused deposition modelling (FDM),

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# Immediate Reattachment of Fractured Tooth Segment : A Case Report

★ Dr. Ajaz Goplani
★★ Dr. Dipti Choksi
★★★ Dr. Barkha Idnani

**ABSTRACT :**
Coronal fractures of the anterior teeth are common form of dental trauma. Reattachment of the tooth fragment is one of the options for managing coronal tooth fractures when the tooth fragment is available and there is minimal violation of the biological width.
***Keywords :*** *Crown fracture, Fiber post, Reattachment, Restoration, Trauma.*

## INTRODUCTION :

Crown fractures have been documented to account for up to 92% of all traumatic injuries to the permanent dentition.[1] Dental trauma often has a severe impact on the social and psychological well-being of a patient. Coronal fractures of permanent incisors represent 18-22% of all trauma to dental hard tissues, 28-44% being simple (enamel and dentin) and 11-15% complex (enamel, dentin and pulp). Of these 96% involve maxillary central incisors.[2] Traumatized anterior teeth require quick functional and aesthetic repair.[3]

The treatment modalities vary from simple reattachment of fracture fragment to complex interdisciplinary approach. Re-attachment of a tooth fragment should be preferable to restoring fractured teeth. There are several advantages in this treatment such as obtaining esthetic in a single appointment, being more conservative procedure, obtaining healthy periodontal attachment and it maintains the original tooth contours and translucence as the patient's own.[4,5] The present case report describes the reattachment of an original tooth fragment using splinting and fiber post.

## CASE REPORT :

A 24 year old male patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Nadiad with the chief complaint of fractured teeth associated with pain in the upper front region of jaw. Patient presented with history of trauma due to a road traffic accident one week back.

Intraoral examination revealed; a fracture line with pulp exposure on the labial surface of left maxillary central and lateral incisor. Left maxillary central and lateral incisor showed horizontal crown fracture whereas the right maxillary central showed mesio-incisal edge fracture with laceration on the lower and upper lip. Extraoral examination was not significant. (Illustration-1)

**Illustration-1** Preoperative showing horizontally fractured 21,22 & Mesio-incisal edge fracture of 11

On Clinical examination, the following findings were noted :

- Ellis Class III fracture in 21, 22 Grade I mobility in 11, 12, 21, 22
- Soft tissue lacerations on upper and lower lip were noticed

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# Furcation Perforation Repair by Mineral Trioxide Aggregate : A case report

★ Dr. Ghanshyam Patel
★★ Dr. Dipti Choksi
★★★ Dr. Barkha Idnani

**ABSTRACT :**
Perforations are defined as mechanical or pathological communications between the root canal system and the external tooth surface.Previous studies have demonstrated the efficacy of mineral trioxide aggregate (MTA) in repair of furcation perforation. In this article, the use of MTA in treating a case of furcation perforation (caries-related) is described.
***Keywords:*** *Furcation perforation repair, MTA, Root canal treatment*

## INTRODUCTION L

Perforations are undesirable complications and unfortunate incidents that can occur during pulp space therapy.[1] Several materials have been used to repair perforations like amalgam, zinc oxide-eugenol cements (IRM and Super-EBA), glass ionomer cement, composite resins, resin-glass ionomer hybrids.[2] An ideal orthograde or retrograde filling material should seal the pathways of communication between the root canal system and its surrounding tissues. It should be nontoxic, should have antibacterial properties, excellent biocompatibility, non carcinogenic, insoluble in tissue fluids, dimensionally stable and should promote the growth of cementum, formation of bone, and non genotoxic.[3] Mineral Trioxide Aggregate has fulfilled the requirement of an ideal material when compared to Amalgam, IRM and Super EBA. The Mineral Trioxide Aggregate was developed by Dr. Torbinejad at Loma Linda University in the year 1993.[3]

MTA has been used successfully in several clinical applications such as root end filling material, pulp capping as well as pulpotomy.[4] This article presents a case report of furcation perforation repaired by MTA (Angelus, Londrina, PR, Brazil) with six months follow up.

## CASE REPORT :

A 29 year old female patient reported to Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Dharamsinh Desai University with chief complain of food lodgement and intermittent pain in the right lower mandibular posterior region. On clinical examination a deep carious lesion was found in relation to tooth number 46. Patient had no history of systemic illness and no relevant medical history. Preoperative radiograph (Illustration: 1) showed extensive occlusal caries involving pulp and furcation area. Vitality test showed negative response with both thermal tests and electric pulp tester. The radiographic examination revealed involvement of furcation area. The tooth was diagnosed as a case of necrosis of the tooth with periradicular changes and furcation perforation in tooth number 46 as seen in radiograph. Treatment chosen was furcation perforation repair with mineral trioxide aggregate in furcation area and root canal treatment.

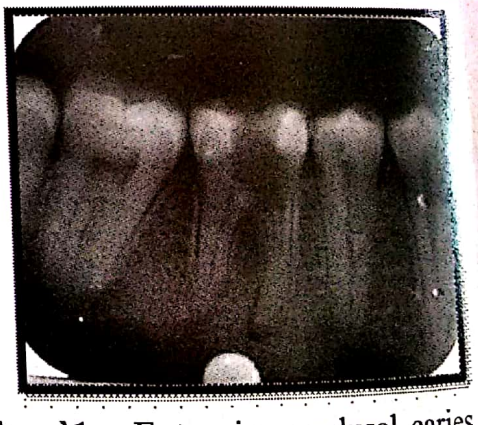

**Illustration `1 :** Extensive occlusal caries involving pulp and furcation area

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# Ultrasonics in Endodontics : A Review

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**ABSTRACT :**
During the past few decades endodontic treatment has benefited from the development of new techniques and equipment, which have improved outcome and predictability. Important attributes such as the ultrasonics have found indispensable applications in a number of dental procedures in Periodontology, to a much lesser extent in restorative dentistry, while being very prominently used in Endodontics. Ultrasonics in Endodontics has enhanced quality of clinical procedures and represents an important adjunct in the treatment of difficult cases. Since its introduction, ultrasonics has become more useful in applications such as gaining access to canal openings, cleaning and shaping, increased action of irrigating solution, ultrasonic condensation of gutta-percha, removal of intracanal materials and obstructions, distribution of sealer around root canal wall and endodontic surgery. This comprehensive review of the literature aims at presenting the numerous uses of ultrasonics in clinical Endodontics and emphasizes the broad applications in a modern-day endodontic practice.
**Keywords:** *Endodontics, Ultrasonics, Root-End Filling*

## INTRODUCTION :

The use of ultrasonics was introduced in 1955, when Zinner reported on the use of an ultrasonic instrument to remove deposits from the tooth surface. This was improved by Johnson and Wilson, and the ultrasonic scaler became an established tool in the removal of dental calculus and plaque. The concept of using ultrasonics in Endodontics was first introduced by Richman in 1957.[1] However, it took almost 20 years before a commercial system to instrument and clean root canals ultrasonically was developed in 1976 by Howard Martin, under the name 'endosonics'.[2]

Ultrasound is sound energy with a frequency above the range of human hearing, which is 20 kHz. The range of frequencies employed in the original ultrasonic units was between 25 and 40 kHz. There are two basic methods of producing ultrasound.[3] The first is magnetostriction, which converts electromagnetic energy into mechanical energy. The second method is based on the piezoelectric principle, in which a crystal is used that changes dimension when an electrical charge is applied. Deformation of this crystal is converted into mechanical oscillation without producing heat.[4]

## APPLICATIONS OF ULTRASONICS IN ENDODONTICS :

In the last decade, there has been renewed interest in the application of ultrasound in Endodontics. Further development of special equipment expanded the areas where it can be applied. The following is a list of the most frequent applications of ultrasonics in Endodontics, which will be reviewed in detail:[1]

Improving root canal access (e.g. removal of pulp stones)

- Activation of root canal irrigating solution
- Removal of posts, broken instruments and other obstructions from the root canal
- Distribution of sealer around the root canal walls
- Condensing gutta-percha root fillings
- Placement of mineral trioxide aggregate (MTA)
- Surgical Endodontics: Root-end cavity preparation and placement of root-end obturation material ration and placement of root-end obturation material.

### Improving Root Canal Access

One of the challenges in Endodontics is to locate canals, particularly in cases in which the orifice ha

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Case Report

# One Visit Apexification And Intra-Radicular Rehabilitation In Maxillary Right Central Incisor : A Case Report.

AUTHORS: NIRAV PARMAR[1], DIPTI CHOKSI[2], BARKHA IDANANI[3]

## ABSTRACT :

This case report explains the management of structurally compromised fractured maxillary right central incisor. Treatment of nonvital immature permanent teeth with calcium-hydroxide are often associated with some difficulties such as weakened tooth structure, root canal reinfection and long treatment time. Mineral trioxide aggregate (MTA) apical plug method is an alternative treatment option for open apices, and has gained popularity in the recent times. Many anterior teeth requiring restoration are severely weakened, having wide flared canal spaces and thin dentinal walls, and are at a high risk of getting fractured. But now recent advancements in dentistry, the canal is reinforced intra-radicularly with flowable composite, resin cement and light transmitting glass fiber post, rendering the endodontically treated root capable of supporting the post and core and thereby ensuring continued function of the badly damaged tooth. This case report describes the intra-radicular rehabilitation and one visit apexification in maxillary right central incisor.

Key words : Intra-radicular rehabilitation, Mineral trioxide aggregate (MTA), Glass fiber post, Flowable composite, Resin cement.

## Introduction :

Trauma to dentition is most common in the age group of 9-10 years [1]. During this period, the roots are still in the process of maturing hence there is less intra-radicular dentinal thickness and the tooth and root are more prone to fracture. The flared canal arising as a result of carious extension, trauma to immature tooth, pulpal pathosis, iatrogenic or endodontic misadventure or idiopathic causes, can present a difficult restorative problem to the practicing dentist [2].

Complete formation of the root and closure of the apical foramen continues for up to 3 years following eruption of the tooth [3]. If the pulp of young permanent teeth is damaged before the closure of the apical foramen, pulp necrosis may occur. The biggest problem in endodontic treatment of these teeth is obtaining an apical seal. The purpose of the apexification therapy used in nonvital immature teeth is to induce the formation of a hard tissue barrier at the root apex or the completion of apical development [3]. Mineral trioxide aggregate (MTA) is the most popular material for this aim. MTA has been suggested to create an apical plug at the root-end and helps to prevent the extrusion of the filling materials [4].

Factors such as location and quantity of the remaining healthy dentinal structure and the internal configuration and morphology of the root, affect the choice of post system. Also, the principals for retention of the posts such as length, diameter and surface configuration should be considered [5], [6], [7]. The primary objective of post endodontic rehabilitation by post and core is to replace the missing coronal tooth structure sufficiently to provide the required retention and resistance for the final restoration. It should also be esthetically compatible, cost effective and minimize chair side time.

For many years, cast posts were most commonly used for the treatment of endodontically treated teeth with wide canals. Their disadvantages include catastrophic root fractures in teeth with reduced remaining dentinal thickness, shadowing and graying of the root and discoloration at the tooth's gingival margins, which will adversely affect the esthetic results required for bonded resin and ceramic restorations in the anterior region.

In the last several years there have been significant advances in the development of bondable, fiber-reinforced, esthetic posts to reinforce endodontically treated teeth [8]. In clinical situations, where the post does not allow light transmission, the resin can be polymerised within the intra-radicular space to a maximum depth of 2-3 mm, due to the limited effect of trans-illumination within the composite resin. However, introduction of commercially available light transmitting posts allow light polymerization by transillumination, that effectively polymerises the composite along the entire length of the radicular preparation [7]. Glass fiber post has modulus of elasticity and biomechanical behaviour which is nearly identical to that of dentin [9].

The objective of this case report is to describe a step by step multidisciplinary conservative approach of rehabilitating a fractured maxillary right central incisor with a immature root apex using flowable composite resin, resin cement and Glass fiber post.

## Case Report :

A 19 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Dharmsinh Desai University, Nadiad, Gujarat with a complaint of fractured maxillary right central incisor with history of trauma 9-10 years back. Patient had complaint of mild pain, with no incidence of intra or extra oral swelling. On clinical examination, there was Ellis class II fracture on maxillary left central incisor and Ellis class III fracture on maxillary right central incisor (Fig. 1).

Fig. 1 PRE-OPERATIVE PHOTOGRAPH

CASE REPORT

AODMR

# Clinical Applications of Mineral Trioxide Aggregate: Report of Three Cases

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**ABSTRACT:**

The greatest threats to teeth are dental caries and traumatic injuries. The primary goal of all restorative treatment is to maintain vitality of pulp. If pulpal exposure occurs, then vital pulp procedure should be done to preserve pulp vitality. Historically, calcium hydroxide has been the material of choice for vital pulp procedures. As of late, an option material called mineral trioxide total (MTA) has exhibited the capacity to prompt hard-tissue development in pulpal tissue. This article portrays the clinical and radiographic result of cases including the utilization of MTA in furcal perforation repair, closure of open apex and direct pulp capping.

**Keywords:** Closure of open apex, Direct pulp capping, MTA**,** Perforation repair.

## INTRODUCTION

A perfect endodontic repair material should seal the pathways of correspondence between the the root canal system and its surrounding tissues. It should be noncarcinogenic, nontoxic, biocompatible, insoluble in tissue fluids, and dimensionally stable.[1] Because any previous materials did not have these all characteristics, MTA is being used in a wide range of clinical treatments such as a perforation repair material, as a root-end filling material and as a pulp capping agent during vital pulp therapy and[2] MTA showed excellent sealing ability and promoted osteoblast activity[3]. It is less cytotoxic had an antimicrobial effect.[4,5]

In this article three cases of furcal perforation repair, closure of open apex and direct pulp capping by using MTA are shown.

## CASE REPORT

### CASE 1 :- Furcal Perforation repair using MTA

A 34-yr-old female patient reported to the Department, with the chief complain of pain in her lower right back region of the jaw since one month. On clinical examination a deep carious lesion was found in relation to 46. Radiographic examination reveled extensive occlusal caries involving pulp and furcal area.(Figure 1)

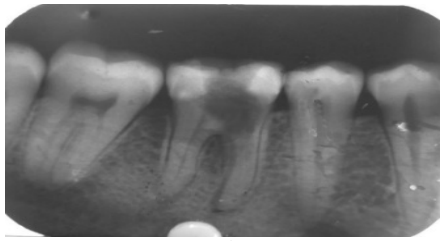

Figure 1: Radiograph showing furcation involvement in 46

Vitality test showed negative response with both thermal tests and Electric pulp tester. The diagnosis was necrosis of the tooth and involvement of furcal area because of deep carious lesion. On first appointment tooth was isolated with rubber dam. The caries was removed, and Perforation was confirmed clinically with probe. Canals were cleaned and shaped with ProTaper files up to the F1-ProTaper and patient was recalled after three days. On second appointment tooth was asymptomatic canals were obturated & on same day the perforation was sealed with

# Treatment of Internal Root Resorption in Maxillary Lateral Incisor: A Case Report

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## ABSTRACT:

A clinician encounters a variety of pulpo-pathologic conditions. Resoprtion is one such condition. By definition it is a condition associated with either a physiologic or a pathologic process resulting in loss of dentin, cementum or bone. Internal as well as external resorption signifies a very complex pathological interaction of the cells of pulp, periradicular and periodontal tissues. An insidious process that is generally found in teeth with a long standing chronic inflammation of the pulp, caries related pulpits, traumatic injuries, and iatrogenic causes. Generally a tooth with internal root resorption is asymptomatic and this condition is diagnosed on routine radiographic examination. Accurate diagnosis and immediate institution of treatment in this condition is important to improve the prognosis of such teeth.

This case report having resorptive defect in the middle 1/3rd of maxillary left lateral incisor which was treated non-surgically with endodontic treatment. The step back technique for bio-mechanical preparation was used and obturation was carried out with hybrid technique where apical 1/3rd till resorptive defect was obturated and the defect was backfilled with thermoplastized guttapercha. A six-month follow up demonstrated clinically asymptomatic and adequately functional tooth, with radiographic signs of healing.

**Keywords:** Gutta-Percha, Resorption Lacunae, Thermoplastized.

## INTRODUCTION

Internal root resorption is a rare finding, usually asymptomatic, slowly progressing, and detectable upon routine radiographic examination.[1] An oval enlargement of the root canal space in radiograph is seen in affected tooth. The resorption lacuna, a continuation of the distorted outer borders of the root canal is confirmed by different angulations techniques of radiographs.[2] A deviation from the standard procedure is required for diagnosis and management of internal resorption. The key to success in arresting the process of internal resorption is total removal of pulp horn. The cause of internal resorption is not fully understood.[3] Suggested contributing factors are trauma, persistent chronic pulpitis as well as orthodontic treatment.[4] Late diagnosis is because the tooth is asymptomatic.

Chronic inflammatory process in the pulp tissue combined with the loss of the protective layer of odontoblasts and predentin is assumed to cause dentinal resorption. Activated multinucleated giant cells that are adjacent to the granulation tissue in the inflamed pulp resorb internal aspect of root canal.[5] Teeth in which the resorptive process reaches the cervical area of the crown may have a pinkish color, known as 'pink tooth' resulting from granulation tissue ingrowths.[6]

Radicular portion it often goes unnoticed until it has perforated the external surface. Stage at which the process is detected & treated affects the prognosis. Extirpation of entire pulpal tissue is the main motive of its treatment. The

REVIEW ARTICLE

AODMR

# Recent Advances in Endodontics- A Review

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**ABSTRACT:**

Contemporary endodontics has seen an extraordinary progress in innovation and materials. This article is aimed to review some of challenges and advances in the following sections: (1) Diagnosis of pulp vitality, (2) endodontic imaging, (3) root canal disinfection, (4) root canal preparation, (5) root canal filling and (6) visualization. The above mentioned advances aims to improve the art and science of root canal treatment.

**Keywords:** Canal preparation, Disinfection, Imaging, Orascope.

## INTRODUCTION

Diagnosis in dentistry may be defined as " the process whereby the data obtained from questioning, examining and testing are combined by dentist to identify deviations from the normal".[1] Past couple of decades have witnessed a cascade of most rapid and extensive technological evolution in field of dentistry. Era of diagnosing vitality of pulp and fractures have evolved from conventional technique to modern method, root canal preparation from stainless steel to Ni-Ti files and root canal filling materials in field of endodontics. The scenario in radiographic assessment, which is indispensable adjunct to clinical examination in endodontics has also seen progression from traditional radiology to an advanced and more accurate imaging techniques.

Development of visualization in field of endodontics with the usage of loupes and microscopes have offered a break through. This helped in overcoming the limitations faced with naked eyes in detection of missed canals, incipient caries, fractured tooth, etc. This articles shows a review of recent advances in endodontics.

## ADVANCES IN DIAGNOSTIC VITALITY OF PULP

### Laser Doppler flowmetry

This is a non-invasive, objective, painless, semi-quantitative method that is more reliable in measuring blood pressure to pulp. Laser light is transmitted to pulp by means of fibro optic probe.[2] Fibro optic probe transmits laser light to pulp. This method uses Helium Neon (HeNe) and Gallium Aluminium (Ga-Al) as semiconductor diode lasers at power of 1 to 2 mW. HeNe has wavelength of 632.8nm and wavelength of semiconductor diode laser is 780 to 820 nm.[3] The ideal position to place the probe is 2 to 3 mm from the gingival margin.[4] The scattered light from moving red blood cells in the circulation will be frequency shifted while those from static tissues remains unshifted.Doppler's shifted and unshifted reflected light is returned via afferent fibres and a signal is produced. Vitality of pulp in both adults and children can be estimated successfully by this technique.[5](Figure 1)

### Pulse Oximetry

The determination of percentage of oxygen saturation of the circulating arterial blood is defined as "Oximetry".[6] It is a relatively

CASE REPORT

# Anterior Esthetic Rehabilitation: Harmonizing the White and Pink

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## ABSTRACT

Esthetics is the science of beauty, re-establishing dental esthetics is one of the most gratifying services that a dental professional can provide. When the complaint is associated with both hard and soft tissues, it becomes even more challenging to harmonize these structures. A multi-disciplinary approach is the preferred protocol for such cases. This article discusses a case report of successful rehabilitation of anterior esthetics involving both white and pink esthetics.


**Keywords:** Discolored tooth, Calcium hydroxide, Depigmentation, Gingivoplasty, Composite veneers

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## INTRODUCTION

A beautiful smile is one of the biggest aspirations for many and often sought after treatment from dentists. Frequently, when treating esthetic concerns for the patients, clinician focusses on the teeth (white), and the gingiva (pink) are often ignored. This can have catastrophic effects on overall treatment outcome despite delivering the best white esthetics.[1,2]

Thus, an optimal balance of both the white and pink oral tissues must be considered while planning any esthetic corrective procedure. It is not unusual to restore maxillary anterior teeth which are naturally out of form and esthetics or due to some pathology with direct or indirect veneers. However, assessment of smile must be done to gain information about the relationship of teeth with surrounding soft tissues.[3] This forms the key element to proper diagnosis, treatment planning and providing the best possible treatment outcome to the patient.

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The current case report discusses one such interdisciplinary approach to harmoniously restore the white and pink esthetics to patient's utmost satisfaction.

## CASE REPORT

A female patient of age 18 years reported to the Department of Conservative Dentistry and Endodontics, with the chief complaint of pain and swelling in upper front teeth since few days, discolored gums, and compromising smile [Figure 1].

Clinical examination revealed Ellis Class II fracture involving 11 and 12. There was intraoral sinus tract in relation to these teeth. The teeth were tender on percussion. All teeth were hypoplastic, and there was the presence of midline diastema.

There was an irregular grayish black discoloration involving the anterior attached gingiva that presented with an esthetic concern for the patient. The gingival margins and zenith were nonuniform for all teeth [Figure 2].

The patient gave a history of trauma before 6 years but did not seek any dental intervention at that time. Past dental history and medical history was non contributory.

Pulp sensibility tests were performed. Tooth 11 and 12 had no response in electric and thermal (heat) test whereas 13, 21, 22, and 23 gave normal response to these tests.

Radiographic examination revealed diffuse periapical radiolucency of size 2 cm × 2 cm around apices of 11 and 12. Open apex was present in relation to 11. Remaining anterior teeth showed no periapical changes [Figure 3].

A final diagnosis of the chronic periapical abscess was made for 11 and 12. There was associated idiopathic melanin hyperpigmentation of gingiva.

The patient presented with a complaint of both hard and soft tissues. Hence, an elaborate interdisciplinary treatment was planned to restore the tooth form n function along with esthetic rehabilitation of white and pink structure of the oral cavity.

Phase I therapy involved management of pain and associated complaint in teeth 11 and 12. This involved non-surgical endodontic therapy. Under local anesthesia and rubber dam isolation, access cavities were prepared in 11 and 12. Working length was determined

# APEXIFICATION : CREATING OBSTRUCTION FOR CONSTRUCTION

*Dr. Amee Patel **Dr. Dipti Choksi ***Dr. Barkha Idnani

**ABSTRACT :**
Open apices with necrotic pulp and periapical lesion present a special challenge in this regard as they are arduous to treat via conventional endodontic therapy. Apexification using an apical plug of novel biomaterial like Mineral Trioxide Aggregate (MTA) has emerged as an alternative to long-term intracanal use of calcium hydroxide. This case report attempts to discuss the treatment protocol and successful management for such a challenge- traumatized immature tooth with open apex and radicular cyst.

***Keywords*: Open apex, immature necrotic permanent tooth, MTA, calcium hydroxide, apexification, radicular cyst**

## Introduction

The immature root with a necrotic pulp and large periapical lesion presents multiple challenges to successful treatment.

i. The infected root canal space cannot be disinfected with the standard root canal protocol with the aggressive use of endodontic files.
ii. Once the microbial phase of the treatment is complete, filling the root canal is difficult because the open apex provides no barrier for stopping the root filling material before impinging on the periodontal tissues.
iii. Even when the challenges described earlier are overcome, the roots of these teeth are thin with a higher susceptibility to fracture.[1]

These problems are overcome by using a disinfection protocol that does not include root canal instrumentation, stimulating the formation of a hard tissue barrier or providing an artificial apical barrier to allow for optimal filling of the canal, and reinforcing the weakened root against fracture during and after an apical stop is provided.

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# BROKEN INSTRUMENT RETRIEVAL FROM MAXILLARY 2ND MOLAR- A CASE REPORT

*Dr. Rutu Doshi **Dr Dipti Choksi ***Dr. Barkha Idnani

## Abstract :

One of the most common mishaps occurs during routine endodontic treatment is the fracture of instrument inside the root canal. The separated instrument leads to metallic obstruction and prevents thorough cleaning and shaping procedures. Factors should take into the consideration are tooth type and canal curvature, instrument position and type before attempting instrument retrieval. This case report illustrates instrument retrieval from 27 using small artery forceps and re root canal treatment of same tooth.

**Keywords:** *H file, instrument separation, instrument retrieval, stieglitz pliers, artery forceps*

## Introduction

Separation of endodontic instruments within the root canal is an unfortunate occurrence that may hinder root canal procedure and affect the outcome. This instrument is usually some type of file or reamer but can include gates-Glidden or peeso reamers, lentulo spiral paste fillers, thermo mechanical gutta percha compactors, tips of hand instruments such as explorers or gutta percha spreaders. The separated instrument leads to metallic obstruction in the root canal and prevents thorough cleaning and shaping procedures.[1]The retrieval of separated instruments is usually very difficult and often ineffective. Different methods have been proposed for retrieving objects separated into the root canal.In the past, chemicals such as hydrochloric acid, sulfuric acid, and concentrated iodine potassium iodide were used in an attempt to dissolve the metal obstruction, which is now irrelevant because of the metals used today, as well as the obvious safety issues. Recently, specialized devices and techniques have been introduced specifically to remove separated instruments such as ultrasonic devices, Instrument Retrieval System (IRS) and Masserann kit.

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# A HOLISTIC APPROACH TO AESTHETIC ENHANCEMENT USING DIRECT COMPOSITE RESTORATION- A CASE REPORT

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## Abstract:

Aesthetic dentistry has evolved since the last many years with the advent of composite resin. The use of direct composite restoration to redesign and recontour anterior teeth has evolved and also played a very important role in not only developing the patients functional requirements but also helped majorly to build the overall confidence and well being of the patient.

***Keywords:*** *Aesthetics, composite resin, smile design ,recontouring.*

## Introduction

Anterior crown fractures are common form of injury that mainly affects children and adolescents. Uncomplicated crown fracture to the permanent teeth has an intense effect not only on the patient's appearance, but also on function and speech.[1,2]

The predictable esthetic restoration of broken incisal edge of maxillary central incisors is a demanding and technique sensitive procedure. Its success is dependent on operator's skills and knowledge and also on adhering to a systematic and problem solving approach.[1,2]

A logical method is used to build up morphologically correct composite restorations by careful selection of composite shades, tints and opaquers. In accurate combinations, an illusion of varying translucencies and opacities become visible over natural tooth structure.[3]
Fracture during and after an apical stop is provided.

The dental composite has emerged as a top ranked material over other direct restorative counterparts. Their evolution since their introduction in dentistry has resulted in better bonding, optical and handling properties. Their performance has also been supported by many longevity studies.[4]

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# Cone Beam Volumetric Tomography- An Overview

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**Abstract**

Radiographic examination is essential in diagnosis and treatment planning in dentistry. The interpretation of an image can be confounded by the anatomy of both the teeth and surrounding structures. The ability to assess an area of interest in 3-Dimension is beneficial for both novice and experienced clinicians.

Cone Beam Volumetric Tomography also known as cone beam computed tomography, captures a cylindrical volume of data in one acquisition. The volume acquired by a CBVT is composed of voxels. A voxel is a 3-D pixel. As the data are captured in a volume, all the voxels are isotropic, which enables objects within the volume to be accurately measured in different directions. CBVT offers distinct advantages over conventional CT. These advantages include increased accuracy, higher resolution, scan-time reduction, and dose reduction.

CBVT allows the clinician to view the tooth and pulpal structures in thin slices in all three anatomic planes: axial, sagittal, and coronal. This capability alone allows visualization of periapical pathology and root morphology previously impossible.

This presentation will be containing its use for assessment of implants, for third molar extraction and orthodontic analysis. Along with its use in endodontics for Apical morphology and suspected lesions of endodontic origin, Root canal system morphology, Presurgical visualization, Suspected root fractures and trauma, Internal and external root resorption.

**Keywords:** CBVT (Cone Beam , Volumetric Tomography, 3D imaging , Maladies

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## Introduction

Imaging is an important diagnostic adjunct to the clinical assessment of the dental patient. Intraoral and extraoral procedures, used individually or in combination, suffer from the inherent limitations of all planar two-dimensional (2D) projections: magnification, distortion, superimposition, and misrepresentation of structures. The introduction of cone-beam volumetric tomography (CBVT) heralds a true paradigm shift from a 2D to a 3D approach to data acquisition and image reconstruction.[1]

Fig. 1 Cone-Beam 3D volumetric imaging

Cone-Beam 3D volumetric imaging was invented by Willi Kalender in the 1980s.

Cone beam technology was first introduced in the European market in 1998 and into the US market in 2001.[2]

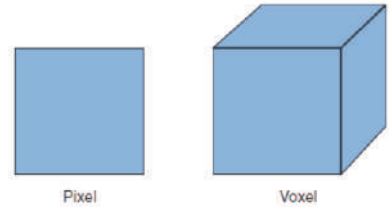
Imaging is accomplished by using a rotating gantry to which an x-ray source and detector are fixed. A divergent pyramidal- or cone-shaped source of ionizing radiation is directed through the middle of the area of interest ontoan area x-ray detector on the opposite side. The x-ray source and detector rotate around a rotation fulcrum fixed within the center of the region of interest.

During the rotation, multiple, sequential planar projection images of the field of view (FOV) are acquired in a complete, or sometimes partial, arc.[1]

This procedure varies from a traditional medical CT, which uses a fan-shaped x-ray beam in a helical progression to acquire individual image slices of the FOV and then stacks the slices to obtain a 3D representation. Each slice requires a separate scan and separate 2D reconstruction. Because CBVT exposure incorporates the entire FOV, only one rotational sequence of the gantry is necessary to acquire enough data for image reconstruction.

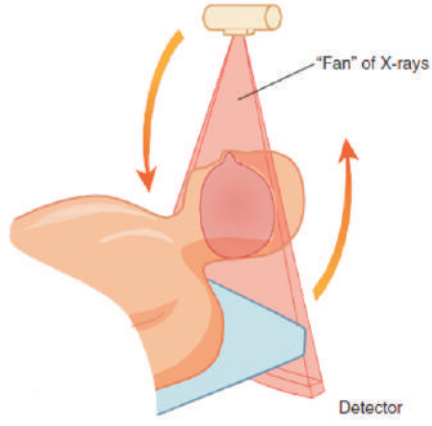
Just as a digital picture is subdivided into pixels, the volume acquired by a CBVT is composed of voxels. Essentially, a voxel is a 3-D pixel. Because the data are captured in a volume as opposed to slices, all the voxels are isotropic, which enables objects within the volume to be accurately measured in different directions.[3] The axial height of a medical CT voxel, however, is determined by the slice thickness or pitch Fig 2 (1–2mm thick) and results in an anisotropic voxel.[4]

Fig 2 (1–2mm thick) and results in an anisotropic voxel.




In other words, unlike the CBVT voxel, a medical CT voxel is not a perfect cube, and measurements made in multiple planes are not accurate. In addition to increased accuracy and higher resolution, CBVT offers significant scan-time reduction, radiation dose reduction, and reduced cost for the patient(4-6). With the help of viewer software7, the clinician is able to scroll through the entire volume and simultaneously view axial, coronal, and sagittal 2-D sections that range from 0.125–2.0 mm thick. The axial and proximal (sagittal in the anterior, coronal in the posterior) views are of particular value, because they are generally not seen with conventional periapical radiography. The ability to reduce or eliminate superimposition of the surrounding structures makes CBVT superior to conventional periapical radiography8. In addition to the 2-D slices, Fig : 3 3-D reconstruction enables further assessment of the area of interest.

Fig 3 3-D reconstruction enables further assessment of the area of interest.




CBVT technology allows the dental practitioner to virtually immediately, evaluate patients for a wide variety of maladies.

- Ranging from dental and jaw trauma and infections.
- Edentulism (quantitative and qualitative osseous evaluation for dental implants).
- Temporomandibular joint osseous pathology.
- Impacted and supernumerary teeth.
- Developmental and congenital jaw deformities.
- Dental endodontic lesions.
- Oral and maxillofacial pathology.[9]

## Implant Site Assessment[10]

Greatest impact of CBVT has been on planning of dental implant placements. It provides cross sectional images of the alveolar bone height, width, and angulation and accurately depicts vital structures such as the inferior alveolar dental nerve canal in the mandible or Sinus in the maxilla.

Fig 4.(A) Typical implant planning image set shows a "generic" implant fixture orientation in relation to the inferior alveolar nerve. (B) A close-up image of the case above

Case Report

# Heal and Seal: Management of an Open Apex with Mineral Trioxide Aggregate Apexification

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## Abstract

The use of mineral trioxide aggregate (MTA) as an alternative material to calcium hydroxide for apexification has gained popularity over reasons such as good sealing ability and biocompatibility and to avoid longer periodic appointments. The case report presents use of MTA as an apical plug for an open apex central incisor which gives a favorable outcome with periapical lesion.

**Keywords:** Apexification, mineral trioxide aggregate, periapical lesion

## Introduction

The immature root with a necrotic pulp and an open apex lesion presents challenges to successful treatment such as that the infected root canal space cannot be disinfected with the standard root canal protocol with the advent use of endodontic files. Once the microbial phase of the treatment is complete, obturating the root canal is difficult as the open apex does not provide any barrier for stopping the root filling material before impinging on the periodontal tissues.[1]

Even when the challenges described earlier are overcome, the roots of these teeth are structurally thin, with a higher susceptibility to fracture. These problems are overcome by disinfecting without any instrument usage, stimulating the formation of a hard tissue barrier or providing an artificial apical barrier to allow for optimal filling of the canal, and reinforcing the weakened root against fracture during and after an apical stop is provided.[2,3]

## Case Report

A 20-year-old female patient was referred to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Dharmsinh Desai University, with a chief complaint of pain in the upper right front tooth region. The patient's dental history revealed that she had suffered a trauma to the right maxillary central incisior 9 years back, for which she did not undergo any treatment. The right maxillary central incisor was discolored and was tender on percussion. On doing the pulp vitality test, there was a negative response to heat and electric pulp testing. On radiographic examination of the associated tooth, a large canal with associated peripaical lesion was noticed in relation to right maxillary central incisor.

With the evident clinical and radiographic findings, final diagnosis of necrotic pulp with an open apex in relation to upper right central incisor was established [Figure 1]. Treatment plan of root canal therapy with single-step mineral trioxide aggregate (MTA) apexification was decided.

On the first appointment access, opening was done using round bur No. 2 and endoaccess bur. Working length was determined using hand K file radiographically [Figure 2]. Biomechanical preparation was completed with copious irrigation of 2.5% sodium hypochlorite and a final flush of 2% chlorhexidine digluconate for 5 min. The patient was then recalled for the next visit.

On the second appointment the length of the hand plugger that was to be used for MTA plug was confirmed radiographically [Figure 3]. Thereafter, MTA was mixed and loaded into the canal in increments with MTA carrier and condensed with the

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# SONIC AND ULTRASONIC IRRIGATION: A REVIEW

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**ABSTRACT**

Complete debridement of root canal system is a critical component of endodontic therapy. Ultrasonic and sonic activation of endodontic instruments have been suggested as a means to enhance canal debridement. When a file is ultrasonically activated and placed passively in canal, a phenomenon called acoustic streaming produced. It may produce shear stresses that are capable of disrupting biological cells and removing debris. Several studies have shown that ultrasonically or sonically prepared teeth have significantly debris free canals. This may be due to the fact that, when power driven files are used to instrument a canal, they can bind or contact the canal walls in a way that restricts their vibratory motion and cleaning efficacy. This may be particularly true for the fine and/or curved canals. Perhaps a more effective method for canal debridement would be to passively activate a file, sonically or ultrasonically, inside the canal as a final step in root canal preparation. Passive activation suggests that no attempt is made to instrument, plane, or contact the canal walls with the file. This should enable maximum benefits from acoustic streaming. The purpose of this review is to evaluate the cleaning efficacy of passive ultrasonic activation and passive sonic activation.

***Keywords:*** *Ultrasonic irrigation, sonic irrigation, root canal, smear layer, irrigation, activation.*

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# NANODENTISTRY: BIOACTIVE GLASS AND NANOPARTICLES AS INTRACANAL MEDICAMENTS: A REVIEW

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**ABSTRACT**

The primary goal of endodontic therapy is thorough disinfection of the root canal system through thermomechanical debridement. Intracanal medicaments have been widely used for multipurpose like disinfection, regeneration, trauma, pain control. Newer research has been focused to combat the drawbacks like antimicrobial resistance, dentin discoloration, alteration in microhardness of dentin. Nanotechnology been the upcoming future scope focuses on development of new such materials like bioactive glass and nanoparticles. These materials not only are biocompatible but are target specific in their mode of action.

***Keywords:*** *intracanal medicaments, bioactive glass, nanoparticles, future scope.*

## INTRODUCTION

Several root canal irrigants have been used to eradicate the root canal microbiota, however there exists no particular literature stating its complete efficacy. Bacterial resistance, complex root canal anatomy, leads to incomplete efficiency of the root canal irrigant. Also, the protective layer formed by necrotic tissue, debris, inhibit the penetration of the irrigant, thereby inhibiting the antibacterial activity of the irrigant.[1]

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# HEMISECTION AS A TREATMENT OPTION: A CASE REPORT

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## ABSTRACT

Hemisection (i.e. tooth resection) procedures are useful solutions for a variety of clinical problems. These procedures are often indicated in the treatment of periodontally involved molars in which significant bone loss exists around a root or in the furcation. Occasionally, teeth with pathosis of apparaent endodontic origin actually have a lesion of periodontal cause.

*Key Words: Hemisection, Mandibular molar*

## INTRODUCTION

Hemisection implies that the tooth is cut in half. In practical usage, one of the halves is usually removed, but this is not essential if the most common indication for these techniques is the treatment of periodontal defects, they are useful for a variety of problems encountered in endodontic practice. Perhaps the most common endodontic indication is the removal of a root with a vertical fracture or a long lateral strip perforation. Creative endodontic treatment planning, however, can make root removal a useful approach in the treatment of a tooth with deep localized caries, an irretrievable separated instrument, a severe coronal fracture, or a strip perforation that might include periodontal bone loss. For the purpose of this discussion, both root amputation and hemisection will be referred to as root resection, because the principles of diagnosis and technique apply equally to both types of outcome.[10]

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# A CASE REPORT ON MANAGEMENT OF RADIX ENTOMOLARIS WITH POST-ENDODONTIC RESTORATION WITH ENDOCROWN

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## ABSTRACT

Mandibular molars may have an additional root located either buccally or lingually. Thus, an accurate diagnosis and thorough understanding of variation in root canal anatomy is essential for treatment success. Endodontically Treated Teeth (ETT) are at higher risk of biomechanical failure than vital teeth. With the development of adhesive systems, endocrowns have been used as an alternative to the conventional post-core and fixed partial dentures.

***Key words**: Permanent mandibular first molar, Radix entomolaris, Additional third root, Root canal anatomy, Endo-crown*

## INTRODUCTION

Clinicians must have an in-depth knowledge of the morphology of root canal systems and its variations that may complicate the procedure. The majority of mandibular first molars have two roots, mesial and distal with two mesial and one distal canal[1,2]. *(Fabra-Campos) (1985-1989)* reported the presence of three mesial canals while *Stroner* reported three distal canals (1984)[3,4]. A major variant is the presence of three roots in mandibular first molar, first mentioned in the literature by *Carabelli* (1844) known as Radix entomolaris (RE) located in distolingual position[5]. When located on mesiobuccal surface, the anomaly is known as Radix paramolaris. RE has a frequency of less than 5% in white Caucasian, African, Eurasian and Indian populations while it appears to be commonly present in races of Mongoloid traits such as the Chinese, Eskimos, and Native American populations with a frequency of 5-30%.[5] Radiographic diagnosis plays a pivotal role in successful endodontic treatment of tooth. One of the main reasons for failure of endodontic treatment is incomplete removal of pulp tissue and microorganisms from all the root canals.[6]

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# MANAGEMENT OF SEPARATED INSTRUMENT BY FILE BY-PASS TECHNIQUE

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**Abstract:** Instrument separation is one of the most common procedural errors that may occur during endodontic treatment. A separated instrument can create an obstruction in the root canal which can hinder the cleaning and shaping procedures. Removal of the separated instrument is often advised but factors like poor access and visibility to the separated instrument makes it difficult and also the amount of dentin to be removed is more. As an alternative to removal, bypassing technique is very effective and conservative. This case report describes management of separated instrument in lower right first molar.

***Keywords****: Separated instrument, by-passing, Neoendo hand file, lateral condensation, obturation.*

## INTRODUCTION

There are several unwanted procedural errors that clinicians may face during endodonticpractice.[1] These include strip perforations, ledging of the root canal walls, and separation of various endodontic instruments. The separation of instruments during endodontic therapy is a troublesome incident. Its incidence range varied from 2 to 6% of the casesinvestigated.[2] The most common causes for file separation are improper use, limitations in physical properties, inadequate access, root canal anatomy, and possibly manufacturing defects.[3]

The presence of a separated instrument in the root canal leads to failure of root canal treatment. Instrument separation commonly occurs at the middle or apical third of the mesial canals of mandibular molars, and at the same location in the mesiobuccal roots of maxillary molars due to their root curvatures.[4]

The prognosis depends on the degree of contamination of canal at the moment of instrument separation. Proper assessment should be made whether the canal can be instrumented even in the presence of fracturedinstrument.[5,6]If the canal cannot be instrumented decision should be made to remove the separated instrument.

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# MANAGEMENTOF C-SHAPED CANAL CONFIGURATIONINMANDIBULARSECOND MOLAR: A CASE REPORT

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## ABSTRACT

One of the most challenging root canal configurations is the C-shaped root canal, commonly present in mandibular second molar. These canals are most challenging to treat because transverse anastomosis, lateral and accessary canal sand apical deltas. This case report presents successful management of c-shaped canal in mandibular second molar.

***Keywords**: C-shaped canal, Mandibular second molar, Thermoplasticized guttapercha.*

## INTRODUCTION:

A thorough knowledge of the root canal anatomy and its variants is required for achieving success in root canal therapy along with diagnosis, treatment planning and clinical expertise. One such variation of the root canal system is C-shaped canal configuration. The C-shaped canal was first documented in endodontic literature by *Cooke and Cox* in 1979.[1] The C-shaped canals are mostly present in the mandibular second molar and especially in Asian population this type of configuration is seen.[2-5]The C-shaped canal configuration results from the failure of the Hertwig's epithelial sheath to fuse or its inadequate development during the root embryologic stage.[6] Failure of the Hertwig's epithelial root sheath to fuse on the lingual or buccal root surface is the main cause of C-shaped roots, which always contain a C-shaped canal.[7]This results in a conical or prism shaped root with a thin interradicular ribbon-shaped isthmus connecting them.[8-10] *Manning* attributed the formation of C-shaped roots to age changes like deposition of cementum.[9] This theory was however contested since separate canals in roots with C-shaped anatomy were observed even in patients under 40 years of age.[9]

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# LASERS IN ENDODONTICS: A PUBMED RESEARCH BASED REVIEW

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## ABSTRACT

Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of papers on potential applications for lasers in endodontics have been published. The purpose of this paper is to summarize laser applications in endodontics, including their use in pulp diagnosis, dentinal hypersensitivity, pulp capping and pulpotomy, sterilization of root canals, root canal shaping and obturation and apicectomy. The effects of laser on root canal walls and periodontal tissues are also reviewed. The essential question is whether a laser can provide equal or improved treatment over conventional care. Secondary issues include treatment duration and cost/benefit ratio. This article reviews the role of lasers in endodontics since the early 1970s, summarizes many research reports from the last decade, and surmises what the future may hold for lasers in endodontics. With the potential availability of many new laser wavelengths and modes, much interest is developing in this promising field.

***Key words**: Laser, Pulpal diagnosis, Pulp capping and Pulpotomy, Cleaning and Shaping, Endodontic Surgeries.*

## INTRODUCTION

The use of lasers in dentistry has increased over the past few years. The first laser was introduced into the fields of medicine and dentistry during the 1960s (*Goldman et al., 1964*). Since then, this science has progressed rapidly. Because of their many advantages, lasers are indicated for a wide variety of procedures (*Frentzen and Koort, 1990; Aoki et al., 1994; Pelagalli et al., 1997; Walsh, 2003*). Conventional methods of cavity preparation with low- and high-speed handpieces involve noise, uncomfortable vibrations and stress for patients. Although pain may be reduced by local anesthesia, fear of the needle and of noise and vibration of mechanical preparation remains causes of discomfort. These disadvantages have led to a search for new techniques as potential alternatives for dental hard tissue removal. The aim of this review is to describe the application of lasers in dental hard tissue procedures.[1, 2]

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# Biodentine A Bandage to Dentine: A Review

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**ABSTRACT**: The ideal material for dental rehabilitation should have certain unique properties such as adhesion strength, insolubility, dimensional stability, biocompatibility, bioactivity, etc. In order to optimize the care of dental patients, new materials that demand improved efficiency are constantly put in the market. Recently launched, Biodentine has become the "first all-in-one, bioactive and biocompatible dentin replacement material." It eliminates the disadvantages of calcium hydroxide and mineral trioxide aggregate.

Biodentine is a material basically made up of calcium silicate, which has attracted attention in recent years. Biodentine is recommended to be used in different clinical applications and for various procedures like as root perforations repair, apexification procedure, resorptions, retrograde fillings, pulp capping procedures and dentine replacement. Since its launch, considerable research has been carried out on this material, but few reviews contain details and data obtained from the studies. This analysis paper is therefore prepared to give the reader an overview of the results of different content characteristics. The review initially focuses on various parts of material.

**KEYWORDS**:Biodentine, Pulp Capping, Dentine Bridge, MTA, Pulp Protection, Pulp Vitality

## I. INTRODUCTION

Over the last few decades, there has been a surge of interest in restorative materials. Direct composite restorations were used to replace amalgams in small anterior restorations and medium-sized posterior restorations. In contrast to amalgams, resin composites can achieve micromechanical retention through the use of different adhesives. Although, a few disadvantages have been reported with resin-based materials such as wear resistance under high load, shrinkage due to polymerization leading to microleakage and toxic monomers release.[1;2]


Calcium hydroxide-based materials have been commonly used in direct pulp capping procedures to shield the pulp from the harmful components of resin-based materials. Despite the material's highly alkaline pH, a dentin bridge may develop within 3 months, protecting the underlying pulp from mild to moderate inflammation. However, several tests have shown that this bridge has partial dissolution and tunnel defects. Mineral trioxide aggregate (MTA) was developed as a root-end filling material and direct pulp capping as a result of the recent emphasis on biocompatible materials such as Portland. Tricalcium and dicalcium silicates make up the majority of this material.[5]When used for pulp capping, it stimulates the development of reparative dentin, resulting in the formation of a normal tubular dentin bridge in two months with no signs of inflammation. When used for pulp capping, it stimulates the development of reparative dentin, resulting in the formation of a normal tubular dentin bridge in two months with no signs of inflammation.[4] However, this content has been

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# Resin infiltration: a micro-invasive approach to white spot lesions

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**Conflicts of Interest:** Nil

## Introduction

With the advancement in preventive and adhesive techniques in dentistry, newer methods are applied for inhibiting the carious process aiming to preserve the tooth structure. Thus introducing the concept 'Minimally Invasive Dentistry' for preservation of healthy dental structures. It is a systematic respect for the original tissue by replacing and removing with little tissue loss.[1]

Enamel demineralization and remineralization are considered as a continuous process. Cavitated lesions occur as a result of demineralization of the hard tissues and destruction of the organic matter of the tooth by production of acid by hydrolysis of carbohydrates in the plaque.[2] Non cavitated caries lesions show increased porosity within the lesion due to loss of inorganic substance beneath an intact surface layer. When compared with the refractive index of sound enamel (RI 1.65), incipient enamel caries lesions are porous and are filled with air (RI 1.0) and water (RI 1.33). Consequently, due to scattering of reflected light, the lesion looks opaque.[3]

Recent minimally invasive concepts in Operative Dentistry are focused on the control of the etiological factors using noninvasive and microinvasive strategies. The current modalities for the treatment of early lesions are either invasive or non-invasive in nature. Noninvasive strategies target at arresting or reverting noncavitated enamel caries lesions, microinvasive strategies include barriers that prevent further dissolution of enamel by the acidic challenge from cariogenic bacteria. Two microinvasive procedures are used: (a) pit-and-fissure

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# 3D Printing In Endodontics

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**Type of Publication:** Review Article

**Conflicts of Interest:** Nil

## Introduction

In endodontics, radiographic imaging is a primary and essential step in the diagnosis, treatment planning and follow up of all the cases. Diagnostic imaging is an important adjunct in clinical assessment of the patient. Radiology has played a crucial role in dentistry. An intraoral radiography system is based on the transmission, attenuation and recording of x-rays on a film or digital receptor and the images produced by a conventional periapical radiograph are a two dimensional (2D) representation of a three dimensional (3D) area of interest that possess inherent limitations of magnification, distortion and superimposition.[1] These constraints paved way for the advanced techniques of cross sectional imaging which revolutionised the concept of diagnosis and treatment planning in dentistry.[2,3]

3D printing has been used increasingly since the 1980s. In 1983, for the first time, a three-dimensional object was printed by Charles Hull, in which the technique of stereo lithography is used, as well as the first program for virtualization. It can be used in areas that require millimetric precision. So, it has drawn the attention of specialists in general medicine, which started to implement it since the 1990s. [4]

## Methods of 3d Printing

Dental applications of 3D printing adopt one or more of the following common technical type classifications:

1. Stereo lithography apparatus (SLA),
2. Fused deposition modelling (FDM),

Original Article

# Comparative evaluation of antimicrobial activity of herbal extracts with 5.25% sodium hypochlorite against multispecies dentinal biofilm

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**Key words:**

Antimicrobial activity, herbal extracts, multispecies dentinal biofilm

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## ABSTRACT

**Aims:** To check the antimicrobial activity of *Tinospora cordifolia* (TC) (Giloy), *Ocimum sanctum* (Tulsi), and 5.25% sodium hypochlorite (NaOCl) against 21-day-old multispecies biofilm formed on tooth substrate of extracted human teeth. **Settings and Design:** *In vitro* dentin disinfection model used to check the antimicrobial efficacy of herbal extracts. **Materials and Methods:** The *in vitro* dentin disinfection model was used to check the antimicrobial activity of the methanolic extracts of medicinal plants along with NaOCl. The polymicrobial biofilm was allowed to grow on extracted teeth sections for a period of 21 days. Remaining microbial load in the form of CFU/ml after the antimicrobial treatment was tabulated and data were statistically analyzed using ANOVA and Bonferroni *post-hoc* tests. **Statistical Analysis Used:** SPSS version 17 one-way ANOVA, Bonferroni *post-hoc* test. **Results:** Both the plant extracts showed considerable antimicrobial efficacy as compared to negative control. About 5.25% NaOCl was the most effective antimicrobial agent having statistically significant difference against plant extracts and negative control (saline). **Conclusions:** The methanolic extract of TC (Giloy), *O. sanctum* (Tulsi), and 5.25% NaOCl has considerable antimicrobial activity against polymicrobial dentinal biofilm of *Streptococcus mutans*, *Enterococcus faecalis*, *Staphylococcus aureus*, *and Candida albicans*.

## INTRODUCTION

A potential role of microorganisms in the initiation and perpetuation of endodontic infections has long been established.[1,2] A combined chemo-mechanical approach is followed in an attempt to clear off the microorganisms from the pulp space. Microcomputed tomography images of the canal walls have brought into light the fact that mechanical instrumentation alone is not sufficient enough to touch all areas of the canal wall.[3,4] This makes the use of irrigation solutions and intracanal medicament mandatory in conjunction with mechanical instrumentation to achieve disinfection and healing. Keeping into

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Original Article

# The antimicrobial activity of *Azadirachta indica, Mimusops elengi, Tinospora cardifolia, Ocimum sanctum* and 2% chlorhexidine gluconate on common endodontic pathogens: An *in vitro* study

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## ABSTRACT

**Objective:** To check the antimicrobial activity of *Azadirachta indica* (Neem), *Ocimum sanctum* (Tulsi), *Mimusops elelngi* (Bakul), Tinospora cardifolia (Giloy) and Chlorhexidine Gluconate (CHX) on common endodontic pathogens like *Streptococcus mutans*, Enterococcus faecalis and *staphylococcus aureus*. **Materials and Methods:** The agar diffusion test was used to check the antimicrobial activity of the Methanolic extracts of the medicinal plants along with CHX. Six different concentrations of the tested agents were used for the study. The values of Zone of Inhibition were tabulated according to the concentration of the tested agent and data was statistically analyzed using ANOVA and Bonferroni *post- hoc* tests. The Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal *Concentrations* (MBC) values were also recorded. **Results:** All the plants extracts showed considerable antimicrobial activity against selected endodontic pathogens. At 3mg. concentration, *O.sanctum* was the most effective against *S. mutans, M. elengi* showed highest zone of inhibition against *E.faecalis*, whereas CHX was the most effective agent against *S.aureus*. CHX was also the most consistent of all the medicaments testes, showing inhibitory effect against all the tree pathogens at all the selected concentrations. **Conclusions:** The Methanolic extract of *A.Indica, O.sanctum, M. Elengi, T.cardifolia* and Chlorhexidine Gluconate has considerable antimicrobial activity against *S. mutans, E. faecalis and S. aureus*.

**Key words:** Antimicrobial activity, chlorhexidine gluconate, endodontic pathogens, medicinal plant extracts

## INTRODUCTION

Microorganisms are primary etiological factor in the development of pulpal and periapical diseases.[1] Endodontic treatment is aimed at complete elimination of microbes form the pulp space. This goal is achieved by thorough chemo mechanical preparation followed by three dimensional obturation of the root canal system. Although mechanical instrumentation can remove a significant number of bacteria from the root canal system,[2] the bacteria remaining in the intricacies of the canal can cause or sustain periradicular tissue inflammation.[3] Therefore, mechanical instrumentation of the pulp space is accompanied by use of different types of irrigation solutions. According to current literature, sodium hypochlorite and 2% chlorhexidine remains to be the most preferred irrigating solutions.[4]

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 **DOI:** 10.4103/1305-7456.130591

Case Report

# C-SHAPED ROOT CANAL SYSTEM IN MANDIBULAR SECOND MOLARS

Authors: Kunjal S. Mistry*, Zarna Sanghvi**, Rupal Vaidya ***, Pallav Chokshi****, Shraddha Chokshi*****

Abstract:

A case report is presented here of mandibular second molar requiring root canal treatment that has C-shaped canal configuration. This case demonstrates an uncommon anatomical condition and supplements previous reports of such cases affecting mandibular second molars. The case report underlines the importance of complete knowledge about root canal morphology and possible variations, coupled with full clinical and radiographic examination, in order to increase the ability of clinicians to treat difficult cases.

## Introduction

A thorough knowledge of the root canal morphology is required for successful endodontic therapy. It is important to be familiar with variations in tooth anatomy and internal root morphology because such knowledge can aid location and negotiation of canals as well as their subsequent management.

One of the most important and confusing anatomic variations is the "C" configuration of the canal system. The "C" shaped canal was first documented in endodontic literature by Cooke and Cox in 1979[1]. It is so named for the cross sectional morphology of the root and root canal. Instead of having several discrete orifices, the pulp chamber of the C-shaped canal is a single ribbon-shaped orifice with 180 degree arc or more, which in mandibular molars, starts at the mesiolingual line angle and sweeps around the buccal to the end at the distal aspect of the pulp chamber. Below the orifice level, the root structure can harbor a wide range of anatomic variation. Once encountered, C-shaped canals present major challenges with respect to their diagnosis, debridement and obturation. This is especially true when it is uncertain that whether a C-shaped orifice found on the floor of the pulp chamber may continue to the apical third of the root. Irregular areas in a C-shaped canal that may house soft tissue remnants or infected debris may escape thorough cleaning or filling and may be a source of bleeding and severe pain.

The C-shaped canal system presents a significant challenge to the clinician and this anatomic variant is seen mostly in mandibular second molars, although it can also appear in other maxillary and mandibular molars and premolars.[2,3,4] The main anatomic feature of C-shaped canals is the presence of fins or webs connecting individual mesial and distal canals. Roots containing C-shaped canal often have a conical or square configuration.

This paper presents a case report on endodontic management of a mandibular second molar with C-shaped root canal system. Some of the guidelines on diagnosis, radiographic interpretation and method of pulp space preparation and obturation are also discussed.

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ORIGINAL ARTICLE

# Comparative Evaluation of Antibacterial Efficacy of 5% Sodium Hypochlorite, 940 nm Diode Laser, and Gaseous Ozone against *Enterococcus faecalis* Biofilm formed on Tooth Substrate: A Scanning Electron Microscope Study

[1]Disha Mehta, [2]Pallav Choksi, [3]Rupal Vaidya, [4]Kunjal Mistry, [5]Zarna Sanghvi, [6]Pruthvi Patel


## ABSTRACT

**Aim:** To comparatively assess the antibacterial effectiveness of 5% sodium hypochlorite, 940 nm diode laser, and gaseous ozone against *Enterococcus faecalis* biofilm produced on the substrate.

**Materials and methods:** Freshly extracted maxillary central incisor teeth of human source were decoronated and vertically sectioned after biomechanical preparation.

The samples were then, after sterilization, placed in Eppendorf tubes filled with 1 mL of bacterial solution containing 1.5 × $10^5$ colony-forming units (CFUs)/mL of *E. faecalis*. Then, these adulterated samples were divided into four groups (n = 8) depending upon the method of disinfection used: group I, 5% sodium hypochlorite (positive control); group II, normal saline (negative control); group III, gaseous ozone; and group IV, 940 nm diode laser.

At the conclusion of 3 weeks, all the samples were disinfected according to their groups and were analyzed qualitatively and quantitatively.

**Results:** The positive control group (5% sodium hypochlorite) showed statistically significant results in comparison with the other three groups ($p < 0.05$). Statistically, there was no significant difference found between the experimental groups, i.e., ozone group and diode laser group ($p > 0.05$).

**Conclusion:** A 5% sodium hypochlorite showed the highest antibacterial effect against *E. faecalis* biofilm formed on substrate, i.e., tooth. Both diode laser and gaseous ozone groups have a statistically significant antibacterial action on the infected root canals.


**Keywords:** Biofilm, Diode laser, *Enterococcus faecalis*, Ozone, Root canal disinfection.

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**Conflict of interest:** None

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## INTRODUCTION

In nature, microorganisms play a pivotal role in pulpal death and periapical infections.[1]

The ability of the microorganisms to colonize in the root canal system plays the primary etiologic factor in pulpal and periradicular diseases.[2] The primary aim of an endodontic treatment is to eliminate or substantially decrease the microbial load in the root canal system, which is conventionally achieved by chemomechanical instrumentation, using various mixtures of canal irrigants and files, followed by canal obturation, thereby preventing recolonization of bacteria.

The anatomical complexity of the root canal system acts as a reservoir for numerous bacterial species, which might result in biofilms. Biofilm is defined as a sessile and multicellular microbial community characterized by cells that are firmly attached to a surface and enmeshed in a self-produced matrix of extracellular polymeric substance.[3] Oral bacteria grow exclusively (or almost) in biofilms.

Thus, the main goal of oral disinfection is mainly biofilm eradication, along with the destruction of the remaining active bacteria.[4] The *E. faecalis* is a Gram-positive facultative anaerobe that is the most commonly isolated and persistent bacteria in root canals. It survives endodontic treatment procedures, shows strong adhesion to collagen, attaches to the dentin, and infests the dentinal tubules.[5]

It also resists high concentrations of drugs and wide variations in pH and shows high bacterial resistance to several irrigation solutions and medications used in endodontic therapy. And more importantly, these bacteria have the ability to produce biofilms. Therefore, *E. faecalis* can survive for a long time in the root canals.[6,7] The studies related to the eradication of root canal infections

Original Article

# Comparative evaluation of antimicrobial activity of herbal extracts with 5.25% sodium hypochlorite against multispecies dentinal biofilm

**Kunjal S. Mistry, Zarna Sanghvi[1], Girish Parmar[2], Samir Shah[3]**

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**Key words:**

Antimicrobial activity, herbal extracts, multispecies dentinal biofilm

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## ABSTRACT

**Aims:** To check the antimicrobial activity of *Tinospora cordifolia* (TC) (Giloy), *Ocimum sanctum* (Tulsi), and 5.25% sodium hypochlorite (NaOCl) against 21-day-old multispecies biofilm formed on tooth substrate of extracted human teeth. **Settings and Design:** *In vitro* dentin disinfection model used to check the antimicrobial efficacy of herbal extracts. **Materials and Methods:** The *in vitro* dentin disinfection model was used to check the antimicrobial activity of the methanolic extracts of medicinal plants along with NaOCl. The polymicrobial biofilm was allowed to grow on extracted teeth sections for a period of 21 days. Remaining microbial load in the form of CFU/ml after the antimicrobial treatment was tabulated and data were statistically analyzed using ANOVA and Bonferroni *post-hoc* tests. **Statistical Analysis Used:** SPSS version 17 one-way ANOVA, Bonferroni *post-hoc* test. **Results:** Both the plant extracts showed considerable antimicrobial efficacy as compared to negative control. About 5.25% NaOCl was the most effective antimicrobial agent having statistically significant difference against plant extracts and negative control (saline). **Conclusions:** The methanolic extract of TC (Giloy), *O. sanctum* (Tulsi), and 5.25% NaOCl has considerable antimicrobial activity against polymicrobial dentinal biofilm of *Streptococcus mutans*, *Enterococcus faecalis*, *Staphylococcus aureus*, *and Candida albicans*.

## INTRODUCTION

A potential role of microorganisms in the initiation and perpetuation of endodontic infections has long been established.[1,2] A combined chemo-mechanical approach is followed in an attempt to clear off the microorganisms from the pulp space. Microcomputed tomography images of the canal walls have brought into light the fact that mechanical instrumentation alone is not sufficient enough to touch all areas of the canal wall.[3,4] This makes the use of irrigation solutions and intracanal medicament mandatory in conjunction with mechanical instrumentation to achieve disinfection and healing. Keeping into

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# DESIGN FEATURES OF ROTARY INSTRUMENTS IN ENDODONTICS

Review Article

*ZARNA SANGHVI* , KUNJAL MISTRY***

ABSTRACT

The last decade has been witness to phenomenal growth in endodontic technology. The introduction of these new technologies has resulted in endodontics becoming easier, faster and most importantly, better. Principal among these is Nickel Titanium (NiTi) rotary instrumentation that results in consistent, predictable, and reproducible shaping. The purpose of this article is to review the design features of different rotary instruments used for pulp space preparation. Individual design features affect the performance of NiTi rotary instruments. Important mechanical features include the variability of taper, rake angle, cross-sectional geometry, tip configuration, design of blades, helical angle and pitch. These design features influence flexibility, cutting efficiency and safety. In this review design features of commonly used NiTi rotary systems are summarized.

**Key Words**: Rotary Instruments, NiTi Files, Taper, Rake Angle, Radial Land.

## INTRODUCTION

The fundamental aim of endodontic treatment is to prevent or cure apical periodontitis. One of the main objectives of root canal preparation is to shape and clean the root canal system effectively whilst maintaining the original configuration without creating any iatrogenic events such as instrument fracture, external transportation, ledge, or perforation. Preparation of the root canal system is recognized as being one of the most important stages in root canal treatment which includes both enlargement and shaping of the complex endodontic space together with its disinfection[1,2]. A variety of instruments and techniques have been developed and described for this critical stage of root canal treatment.

Over the last few years, endodontics has undergone a complete revolution with the introduction of the Nickel Titanium alloy for the manufacture of manual instruments initially and then rotary endodontic instruments[3]. The extraordinary characteristics of super-elasticity and strength of the NiTi alloy have made it possible to manufacture rotary instruments with double, triple and quadruplet taper compared to the traditional standard .02 taper of the stainless steel hand manual instruments[4,5,6]. This has made it possible to achieve perfect shaping with the use of very few instruments in a short period of time and without the need for above average skills on the part of the operator. The super-elasticity has furthermore made it possible to carry out extremely conservative shapes, better centered, with less canal transportation and therefore with more respect of the original anatomy. In order to improve working safety, shorten preparation time and create a continuously tapered, conical flare of preparations advanced instrument designs with non-cutting tips, radial lands, different cross-sections, superior resistance to torsional fracture and varying tapers have been developed[7,8,9]. Truly, NiTi rotary instrumentation has been one of the most significant changes in dentistry in the past 25 years[10]. All endodontic companies are trying to produce files that will work more efficiently and safely. Some of the areas though, where file design

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JOURNAL OF DENTAL SCIENCES Volume 2 Issue 2

# REVIEW ON COMMON ROOT CANAL IRRIGANTS

• Dr. Kunjal S. Mistry M.D.S.
• Dr. Shashin Shah M.D.S.

**Abstract:**

The triad of biomechanical preparation, pulp space sterilization and three-dimensional obturation is the hallmark of endodontic success. Complete disinfection of the pulp space cannot be achieved with most sophisticated instrumentation techniques. The role of irrigants in obtaining this goal cannot be underestimated. There is no single irrigating solution that alone sufficiently covers all of the functions required from an irrigant. Optimal irrigation is based on the combined use of 2 or several irrigating solutions, in a specific sequence. This article highlights the mechanism of action, safety and biocompatibility of currently used irrigation solutions.

***Key Words :*** *Root Canal Irrigation, Mechanism of Actions, Chelators, Cytotoxicity*

**Introduction**

Successful endodontic treatment requires combination of variety of factors such as an accurate diagnosis, thorough cleaning and shaping of the pulp space, a predictable disinfection protocol achieved with the help of various intracanal medicaments and irrigation solutions. This is followed by three dimensional obturation of the pulp space and adequate final restoration. Mechanical preparation of the root canal achieved with the use of either hand instruments or rotary nickel-titanium instruments helps in removal of vital and necrotic remnants of pulp tissue, microorganisms and microbial toxins to a certain extent. However, with the use of recent imaging techniques, it is certain that some part of the pulp space remains uninstrumented.[1] These areas might harbor necrotic tissues, microorganisms and their byproducts resulting in persistent periradicular inflammation. Therefore, irrigation is an essential part of debridement because it allows for cleaning beyond what might be achieved by root canal instrumentation alone.

**Endodontic microbiology:**

The role of microorganisms in infection of dental pulp and periapical lesion formation has been elegantly demonstrated in the classic studies of Kakehashi et. Al.[2] Primary intraradicular infection is caused by microorganisms that invade and colonize necrotic pulp tissue. The microflora of untreated teeth with necrotic pulp is usually found to be mixed, comprising of Gram-positive and Gram-Negative organisms, dominated by anaerobic bacteria.[3] The microorganisms associated with endodontic treatment failure mainly comprised one or two species, these are predominantly Gram-positive bacteria with *Enterococcus faecalis* as the most prevalent organism.[4] Fungi, specifically *Candida albicans* can also be found at a significantly higher rate than in primary infection.[5]. The choice of irrigant solution and irrigation protocol should be aimed at removal of all forms of microorganisms including their presence in biofilm.

**Desirable properties of Root Canal Irrigant as suggested by Zehnder[6] :**

1. Broad antimicrobial spectrum
2. High efficiency against anaerobic and facultative microorganisms organized in biofilm
3. Ability to dissolve necrotic pulp tissue remnants
4. Ability to inactivate endotoxins
5. Prevent formation of smear layer during instrumentation or to dissolve the latter once it has formed.
6. Should be non toxic when they come in contact with vital tissues, non caustic to periodontal tissues, and with little potential to cause anaphylactic reactions.

The irrigating solutions that are currently used during cleaning and shaping can be broadly categorized into antibacterial and decalcifying agents or their combinations. They include Sodium Hypochlorite (Here after Known as NaOCl), Chlorhexidine Gluconate (Here after Known as CHX), ethylenediaminetetraacitic acid (Here after Known as EDTA), and a mixture of tetracycline, an acid and a detergent (Here after Known as MTAD).

**Sodium Hypochlorite (NaOCl):**

Sodium hypochlorite (house hold bleach) is the most frequently and dominantly used agent for root canal irrigation. It has been known in medical fields since the beginning of 20th century and was introduced as a part of endodontic treatment in 1936 by Walker. During the world war I the chemist Henry Drysdale Dakin and surgeon Alexis Carrel extended the use of buffered 0.5% NaOCl solution to the irrigation of infected wound.[7]

**Mechanism of Action:[8]**

Two unique properties of NaOCl- antimicrobial activity and organic tissue dissolution can be explained by following reactions that takes place when it comes in contact with the organic tissues or microorganisms.

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# Endodontic Pathogens - Revisited

Kunjal Mistry,[1] Zarna Sanghvi,[2] Girish Parmar[3]

## ABSTRACT

Most of the diseases of the dental pulp and periradicular tissues are caused by microorganisms. From past to present different studies have been carried out to establish the role of microorganisms in endodontic pathology. Successful endodontic treatment depends on complete elimination or reduction in the number of these organisms. Currently the focus of research is to find out and identify specific genera and species of the pathogens involved. Culture based methods have been used for a long time to isolate and identify the specific group of bacteria associated with the disease process. However, the endodontic microflora has remained restricted for a long time, because of the limitations of culture methods and fastidious nature of some of the organisms. With the introduction of Polymerase Chain Reaction based methods in endodontic microbiology, the endodontic microbiota has expanded and new endodontic pathogens are continuously added to the list. Results of studies have clearly defined the microbial difference between primary, persistent and secondary endodontic infections. The purpose of this review paper is to revisit the microflora associated with primary and secondary endodontic infections. Moreover several of the bacterial species recently identified and added in the microflora have been reviewed. Organisms other than bacteria such as archaea and fungi have also been listed.

**Key Words:** Endodontic Mircro-flora, Primary and secondary endodontic infection, Traditional methods, Molecular diagnostic methods

## Introduction

The bacterial flora of the healthy oral cavity is highly diverse and more than 700 bacterial species belonging to 11 divisions (or phylotypes) of the domain bacteria have been detected [1, 2]. The pulp and root canal system within the teeth are usually sterile as they are not exposed to the micro flora. If the normal flora is provided with the right conditions and gains access to this sterile environment i.e. the pulp or periradicular tissues, they become an opportunistic pathogens and cause damage to these tissues. The microbial invasion of the pulp tissue is sufficient to provoke the host's response in the form of non-specific inflammation and or specific immunological reactions. Microbes may reach the pulp either through carious exposure, traumatic injury, cracks in the tooth, through coronal leakage and faulty restorations, periodontal pathways or anachoresis.

In essence, endodontic infection is the infection of the root canal of the tooth and is the primary etiologic agent of the different forms of periradicular inflammatory diseases. The relationship between bacterial infection of dental pulp and periapical lesion formation has been elegantly demonstrated in the classic studies of kakehashi et al [3]. Now the issue of concern is to find out which specific microbial species are involved in pathogenesis of periradicular diseases.

The development of effective strategies for root canal therapy is dependent upon understanding the composition of the pathogenic flora of the root canal system. Therefore, the composition of the micro flora of the root canal system has been the focus of considerable research over the years. Traditionally endodontic microbes have been identified by culture dependent methods. However, culture based methods rely on isolation, growth, transport media and laboratory identification by bacterial morphology, and biochemical tests. Other group of methods includes direct microscopy, immunological assays and antibiotic susceptibility.

In the last decade there has been spectacular development in the application of molecular technologies in endodontic microbiology research. The purpose of this paper is to review the diversity of endodontic microbiota established with the use of recent molecular biological techniques.

**Traditional vs. Molecular methods:**

For more than a century, culture based methods have been used to study endodontic infections. Based on these studies, a definite group of species have been established which are thought to play an important role in the pathogenesis of periradicular pathology.

Original Article

# Antibacterial efficacy of *Azadirachta indica, Mimusops elengi* and 2% CHX on multispecies dentinal biofilm

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## Abstract

**Aims**: To check the antimicrobial activity of *Azadirachta indica* (Neem), *Mimusops elengi* (Bakul), and Chlorhexidine gluconate (CHX) on multispecies biofilm of common endodontic pathogens such as *Streptococcus mutans*, *Enterococcus faecalis*, *Staphylococcus aureus* and *Candida albicans*.

**Settings and Design**: *In vitro* dentin disinfection model used to check the antimicrobial efficacy of herbal extracts.

**Materials and Methods**: The *in vitro* dentin disinfection model was used to check the antimicrobial activity of the methanolic extracts of the medicinal plants along with Chlorhexidine gluconate. The polymicrobial biofilm was allowed to grow on extracted teeth sections for a period of 21 days. Remaining microbial load in the form of CFU/ml after the antimicrobial treatment was tabulated, and data were statistically analyzed using ANOVA and Bonferroni *post-hoc* tests.

**Statistical Analysis Used**: SPSS version 17, one-way ANOVA, Bonferroni *post-hoc* test.

**Results**: Both the plant extracts showed considerable antimicrobial efficacy as compared to negative control. 2% CHX was the most effective antimicrobial agent having statistically significant difference against plant extracts and negative control (saline).

**Conclusion**: The methanolic extract of *A. Indica, M. elengi*, and Chlorhexidine Gluconate has considerable antimicrobial activity against polymicrobial dentinal biofilm of *S. mutans*, *E. faecalis, S. aureus* and *C. albicans*.

**Keywords:** Antimicrobial activity; Chlorhexidine gluconate; medicinal plant extracts; multispecies dentinal biofilm

## INTRODUCTION

Microorganisms are the primary etiological factor in the development of pulpal and periapical diseases.[1,2] Endodontic treatment is aimed at complete elimination of microbes form the pulp space. This goal is achieved by thorough chemo-mechanical preparation followed by three dimensional obturation of the root canal system. While mechanical instrumentation can remove a significant number of bacteria from the root canal system,[3] the bacteria remaining in the intricacies of the pulp space can cause or sustain periradicular tissue inflammation.[4] Therefore, mechanical instrumentation of the pulp space is accompanied by the use of different types of irrigation solutions. According to current literature, sodium hypochlorite and 2% chlorhexidine remains to be the most preferred irrigating solutions.[5] Chlorhexidine gluconate has a wide antimicrobial spectrum. However,

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Case Report

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2020;10:4:55-60.

# Management of Class-III External Invasive Cervical Resorption Using Biodentin: A Case Report

**Kunjal Mistry[1*] Aanjan Parikh[2] Zarna Sanghvi Mistry[3] Pruthvi Patel[4]**

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## ABSTRACT

**Background**: Tooth Resorption is the loss of hard dental tissue (i.e. cementum, dentin and/or enamel) as a result of odontoclastic action. External Invasive Cervical Resorption (EICR) is an aggressive form of external root resorption which may occur in any tooth in the permanent dentition. This condition is defined as a localized resorptive process that involves the surface of root below epithelial attachment and coronal aspect of the supporting alveolar process, namely the zone of connective tissue attachment. Among the etiologic factors that have been suggested include traumatic injury, orthodontic treatment, intracoronal bleaching, periodontal therapy and idiopathic etiology. Once diagnosed, clinical management is challenging and depends on the degree of involvement of the tissues. This paper presents a case describing the successful surgical management of an aggressive form of EICR in the upper right central incisor using Dental Operating Microscope and Biodentin™ in an attempt to repair the defect. A systematic treatment plan that is executed with the use of modern equipment like Dental Operating Microscope, use of biocompatible materials like Biodentine and operator skill are helpful to achieve a predictable outcome of the treatment.

**Keywords:** External Invasive Cervical Resorption (EICR), Biodentin, DOM.

## INTRODUCTION

Tooth Resorption is the loss of hard dental tissue (i.e. cementum, dentin and/or enamel) as a result of odontoclastic action. Root resorption is desirable in deciduous teeth as it is necessary for their exfoliation. However, it is undesirable in adult teeth as it leads to irreversible damage**.** It is broadly categorized into External Resorption or Internal Resorption depending on the surface of the tooth where it occurs. External Root Resorption may be further sub-classified into surface resorption, external inflammatory resorption, external cervical resorption, external replacement resorption and transient apical resorption.[1] External Invasive Cervical Resorption (EICR) is an aggressive form of external root resorption which may occur in any tooth in the permanent dentition.[2, 3, 4] However, it is most commonly detected in maxillary central incisor teeth. This condition is defined as a localized resorptive process that involves the surface of root below epithelial attachment and coronal aspect of the supporting alveolar process, namely the zone of connective tissue attachment.[2] Damage to the cementum in that area exposes the dentin to osteoclasts, which, in turn, start to resorb it, creating a space filled with granulation tissue.[5,6] It is a dynamic process that involves periodontal, dental and in later stages pulpal tissues.[3] Among the etiologic factors that have been suggested include traumatic injury, orthodontic treatment, intracoronal bleaching, periodontal therapy and idiopathic etiology.[7,8,9,10,11,12] Once diagnosed, clinical management is challenging and depends on the degree of involvement of the tissues. This paper presents a case describing the successful surgical

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A Case Report

# MANDIBULAR SECOND PREMOLAR WITH TWO ROOTS AND TWO CANALS

Authors: Shashin Shah*, Kunjal Mistry**, Dipti Chokshi***, Barkha Idnani****, Nirav Parmar*****, Aastha Buch******

ABSTRACT

Recognition of unusual variations in the canal configuration is critical as it has been established that a root with a tapering canal and single foramen is an exception rather than the rule. Mandibular premolars are one of the most difficult teeth to treat endodontically because of the variations on root canal anatomy .There are only a few endodontic publication citing an incidence of mandibular 2nd premolar with two root canals. This article describes the successful endodontic treatment of mandibular 2nd premolar with two roots and two canals apically(1-2).

Key words: canal configuration, anatomy of pulp chamber, mandibular 2nd premolar

INTRODUCTIONSuccessful endodontic therapy of a tooth demands that the dentist should have a thorough knowledge of the root canal morphology, making it mandatory towards thorough radiographic evaluation and diagnosis of the status of the pulp canals as well as the periapical areas. Improper diagnostic protocol may lead to the failure of endodontic treatment.

For a successful endodontic treatment, it is not only important to know the normal anatomy of tooth's interior but one must also know different morphologic variations. A wide morphological divergence of the root canal system is known to exist. Varying the number of the root canal different teeth, their anatomy and interconnections have been studied and reported by several authors [1].

Brescia (1961) reported that the mandibular premolar teeth had the most variable canal pattern (Ingle and Taintor 1985). It is well known fact that the root canal system varies with race and gender [Trope et al 1986, Sert and Bayirli (2004), Ahmed et al (2007)] [2].

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The anatomy of the pulp space decides the parameter with which root canal therapy will be carried out and its success. Root canal variations pose a challenge for the clinician. According to Weine(1995) [3], the major cause of endodontic failure are incorrect canal instrumentation, incomplete obturation and untreated major canals. According to Cohen and Brown (2002) [4] failure to recognize the presence of an additional canal may result in unsuccessful treatment and may be the origin of acute flare ups during and after treatment. Anatomical variations of mandibular premolars have been documented in endodontic literature. A single canal have been from 65.7 to 100% (Pineda and Kutler 1972, Vertucci 1978, 1984) and Zillich and Dowson 1973) [5-8]. The highest reported frequency of a second canal and second premolar was reported as 1.2 to 11.7% Yang Et al (1988) [9]. Tzanetakis et al [10] in the mandibular second premolar can range from 1.2 to 34%.

CASE REPORT

A 22 year old patient reported to the Department of Conservative and Endodontia, Faculty of Dental Science, Dharmsinh Desai University with chief complain of continuous pain and food lodgement in lower left mandibular region. Clinical examination revealed mandibular left second premolar with distal carious lesion with possible pulp

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Published online: 24.09.2019

Original Article

# The antimicrobial activity of *Azadirachta indica, Mimusops elengi, Tinospora cardifolia, Ocimum sanctum* and 2% chlorhexidine gluconate on common endodontic pathogens: An *in vitro* study

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## ABSTRACT

**Objective:** To check the antimicrobial activity of *Azadirachta indica* (Neem), *Ocimum sanctum* (Tulsi), *Mimusops elelngi* (Bakul), Tinospora cardifolia (Giloy) and Chlorhexidine Gluconate (CHX) on common endodontic pathogens like *Streptococcus mutans*, Enterococcus faecalis and *staphylococcus aureus*. **Materials and Methods:** The agar diffusion test was used to check the antimicrobial activity of the Methanolic extracts of the medicinal plants along with CHX. Six different concentrations of the tested agents were used for the study. The values of Zone of Inhibition were tabulated according to the concentration of the tested agent and data was statistically analyzed using ANOVA and Bonferroni *post- hoc* tests. The Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal *Concentrations* (MBC) values were also recorded. **Results:** All the plants extracts showed considerable antimicrobial activity against selected endodontic pathogens. At 3mg. concentration, *O.sanctum* was the most effective against *S. mutans, M. elengi* showed highest zone of inhibition against *E.faecalis*, whereas CHX was the most effective agent against *S.aureus*. CHX was also the most consistent of all the medicaments testes, showing inhibitory effect against all the tree pathogens at all the selected concentrations. **Conclusions:** The Methanolic extract of *A.Indica, O.sanctum, M. Elengi, T.cardifolia* and Chlorhexidine Gluconate has considerable antimicrobial activity against *S. mutans, E. faecalis and S. aureus*.

**Key words:** Antimicrobial activity, chlorhexidine gluconate, endodontic pathogens, medicinal plant extracts

## INTRODUCTION

Microorganisms are primary etiological factor in the development of pulpal and periapical diseases.[1] Endodontic treatment is aimed at complete elimination of microbes form the pulp space. This goal is achieved by thorough chemo mechanical preparation followed by three dimensional obturation of the root canal system. Although mechanical instrumentation can remove a significant number of bacteria from the root canal system,[2] the bacteria remaining in the intricacies of the canal can cause or sustain periradicular tissue inflammation.[3] Therefore, mechanical instrumentation of the pulp space is accompanied by use of different types of irrigation solutions. According to current literature, sodium hypochlorite and 2% chlorhexidine remains to be the most preferred irrigating solutions.[4]

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# Antimicrobial Activity of Azadirachta indica (Neem) Leave Extract Against Some Clinical Isolates

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Case Report

# One Visit Apexification And Intra-Radicular Rehabilitation In Maxillary Right Central Incisor : A Case Report.

AUTHORS: NIRAV PARMAR[1], DIPTI CHOKSI[2], BARKHA IDANANI[3]

## ABSTRACT :

This case report explains the management of structurally compromised fractured maxillary right central incisor. Treatment of nonvital immature permanent teeth with calcium-hydroxide are often associated with some difficulties such as weakened tooth structure, root canal reinfection and long treatment time. Mineral trioxide aggregate (MTA) apical plug method is an alternative treatment option for open apices, and has gained popularity in the recent times. Many anterior teeth requiring restoration are severely weakened, having wide flared canal spaces and thin dentinal walls, and are at a high risk of getting fractured. But now recent advancements in dentistry, the canal is reinforced intra-radicularly with flowable composite, resin cement and light transmitting glass fiber post, rendering the endodontically treated root capable of supporting the post and core and thereby ensuring continued function of the badly damaged tooth. This case report describes the intra-radicular rehabilitation and one visit apexification in maxillary right central incisor.

Key words : Intra-radicular rehabilitation, Mineral trioxide aggregate (MTA), Glass fiber post, Flowable composite, Resin cement.

## Introduction :

Trauma to dentition is most common in the age group of 9-10 years [1]. During this period, the roots are still in the process of maturing hence there is less intra-radicular dentinal thickness and the tooth and root are more prone to fracture. The flared canal arising as a result of carious extension, trauma to immature tooth, pulpal pathosis, iatrogenic or endodontic misadventure or idiopathic causes, can present a difficult restorative problem to the practicing dentist [2].

Complete formation of the root and closure of the apical foramen continues for up to 3 years following eruption of the tooth [3]. If the pulp of young permanent teeth is damaged before the closure of the apical foramen, pulp necrosis may occur. The biggest problem in endodontic treatment of these teeth is obtaining an apical seal. The purpose of the apexification therapy used in nonvital immature teeth is to induce the formation of a hard tissue barrier at the root apex or the completion of apical development [3]. Mineral trioxide aggregate (MTA) is the most popular material for this aim. MTA has been suggested to create an apical plug at the root-end and helps to prevent the extrusion of the filling materials [4].

Factors such as location and quantity of the remaining healthy dentinal structure and the internal configuration and morphology of the root, affect the choice of post system. Also, the principals for retention of the posts such as length, diameter and surface configuration should be considered [5], [6], [7]. The primary objective of post endodontic rehabilitation by post and core is to replace the missing coronal tooth structure sufficiently to provide the required retention and resistance for the final restoration. It should also be esthetically compatible, cost effective and minimize chair side time.

For many years, cast posts were most commonly used for the treatment of endodontically treated teeth with wide canals. Their disadvantages include catastrophic root fractures in teeth with reduced remaining dentinal thickness, shadowing and graying of the root and discoloration at the tooth's gingival margins, which will adversely affect the esthetic results required for bonded resin and ceramic restorations in the anterior region.

In the last several years there have been significant advances in the development of bondable, fiber-reinforced, esthetic posts to reinforce endodontically treated teeth [8]. In clinical situations, where the post does not allow light transmission, the resin can be polymerised within the intra-radicular space to a maximum depth of 2-3 mm, due to the limited effect of trans-illumination within the composite resin. However, introduction of commercially available light transmitting posts allow light polymerization by transillumination, that effectively polymerises the composite along the entire length of the radicular preparation [7]. Glass fiber post has modulus of elasticity and biomechanical behaviour which is nearly identical to that of dentin [9].

The objective of this case report is to describe a step by step multidisciplinary conservative approach of rehabilitating a fractured maxillary right central incisor with a immature root apex using flowable composite resin, resin cement and Glass fiber post.

## Case Report :

A 19 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Dharmsinh Desai University, Nadiad, Gujarat with a complaint of fractured maxillary right central incisor with history of trauma 9-10 years back. Patient had complaint of mild pain, with no incidence of intra or extra oral swelling. On clinical examination, there was Ellis class II fracture on maxillary left central incisor and Ellis class III fracture on maxillary right central incisor (Fig. 1).

Fig. 1 PRE-OPERATIVE PHOTOGRAPH

# A CASE REPORT ON MANAGEMENT OF RADIX ENTOMOLARIS WITH POST-ENDODONTIC RESTORATION WITH ENDOCROWN

*Dr. Barkha Idnani **Dr. Dipti Choksi ***Dr. Tulsi Sujal Patel

## ABSTRACT

Mandibular molars may have an additional root located either buccally or lingually. Thus, an accurate diagnosis and thorough understanding of variation in root canal anatomy is essential for treatment success. Endodontically Treated Teeth (ETT) are at higher risk of biomechanical failure than vital teeth. With the development of adhesive systems, endocrowns have been used as an alternative to the conventional post-core and fixed partial dentures.

***Key words**: Permanent mandibular first molar, Radix entomolaris, Additional third root, Root canal anatomy, Endo-crown*

## INTRODUCTION

Clinicians must have an in-depth knowledge of the morphology of root canal systems and its variations that may complicate the procedure. The majority of mandibular first molars have two roots, mesial and distal with two mesial and one distal canal[1,2]. *(Fabra-Campos) (1985-1989)* reported the presence of three mesial canals while *Stroner* reported three distal canals (1984)[3,4]. A major variant is the presence of three roots in mandibular first molar, first mentioned in the literature by *Carabelli*(1844) known as Radix entomolaris (RE) located in distolingual position[5]. When located on mesiobuccal surface, the anomaly is known as Radix paramolaris. RE has a frequency of less than 5% in white Caucasian, African, Eurasian and Indian populations while it appears to be commonly present in races of Mongoloid traits such as the Chinese, Eskimos, and Native American populations with a frequency of 5-30%.[5] Radiographic diagnosis plays a pivotal role in successful endodontic treatment of tooth. One of the main reasons for failure of endodontic treatment is incomplete removal of pulp tissue and microorganisms from all the root canals.[6]

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# MANAGEMENT OF SEPARATED INSTRUMENT BY FILE BY-PASS TECHNIQUE

*Dr. Dipti Choksi, **Dr. Barkha Idnani, ***Dr. Huma Shaikh

**Abstract:** Instrument separation is one of the most common procedural errors that may occur during endodontic treatment. A separated instrument can create an obstruction in the root canal which can hinder the cleaning and shaping procedures. Removal of the separated instrument is often advised but factors like poor access and visibility to the separated instrument makes it difficult and also the amount of dentin to be removed is more. As an alternative to removal, bypassing technique is very effective and conservative. This case report describes management of separated instrument in lower right first molar.

***Keywords**: Separated instrument, by-passing, Neoendo hand file, lateral condensation, obturation.*

## INTRODUCTION

There are several unwanted procedural errors that clinicians may face during endodonticpractice.[1] These include strip perforations, ledging of the root canal walls, and separation of various endodontic instruments. The separation of instruments during endodontic therapy is a troublesome incident. Its incidence range varied from 2 to 6% of the casesinvestigated.[2] The most common causes for file separation are improper use, limitations in physical properties, inadequate access, root canal anatomy, and possibly manufacturing defects.[3]

The presence of a separated instrument in the root canal leads to failure of root canal treatment. Instrument separation commonly occurs at the middle or apical third of the mesial canals of mandibular molars, and at the same location in the mesiobuccal roots of maxillary molars due to their root curvatures.[4]

The prognosis depends on the degree of contamination of canal at the moment of instrument separation. Proper assessment should be made whether the canal can be instrumented even in the presence of fracturedinstrument.[5,6]If the canal cannot be instrumented decision should be made to remove the separated instrument.

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# MANAGEMENTOF C-SHAPED CANAL CONFIGURATIONINMANDIBULARSECOND MOLAR: A CASE REPORT

*Dr. Dipti Choksi, **Dr. Barkha Idnani, ***Dr. Priyanka Patel

## ABSTRACT

One of the most challenging root canal configurations is the C-shaped root canal, commonly present in mandibular second molar. These canals are most challenging to treat because transverse anastomosis, lateral and accessary canal sand apical deltas. This case report presents successful management of c-shaped canal in mandibular second molar.

***Keywords**: C-shaped canal, Mandibular second molar, Thermoplasticized guttapercha.*

## INTRODUCTION:

A thorough knowledge of the root canal anatomy and its variants is required for achieving success in root canal therapy along with diagnosis, treatment planning and clinical expertise. One such variation of the root canal system is C-shaped canal configuration. The C-shaped canal was first documented in endodontic literature by *Cooke and Cox* in 1979.[1] The C-shaped canals are mostly present in the mandibular second molar and especially in Asian population this type of configuration is seen.[2-5]The C-shaped canal configuration results from the failure of the Hertwig's epithelial sheath to fuse or its inadequate development during the root embryologic stage.[6] Failure of the Hertwig's epithelial root sheath to fuse on the lingual or buccal root surface is the main cause of C-shaped roots, which always contain a C-shaped canal.[7]This results in a conical or prism shaped root with a thin interradicular ribbon-shaped isthmus connecting them.[8-10] *Manning* attributed the formation of C-shaped roots to age changes like deposition of cementum.[9] This theory was however contested since separate canals in roots with C-shaped anatomy were observed even in patients under 40 years of age.[9]

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# LASERS IN ENDODONTICS: A PUBMED RESEARCH BASED REVIEW

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****Dr. Nirav Parmar *****Dr. Kunjal Mistry

## ABSTRACT

Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of papers on potential applications for lasers in endodontics have been published. The purpose of this paper is to summarize laser applications in endodontics, including their use in pulp diagnosis, dentinal hypersensitivity, pulp capping and pulpotomy, sterilization of root canals, root canal shaping and obturation and apicectomy. The effects of laser on root canal walls and periodontal tissues are also reviewed. The essential question is whether a laser can provide equal or improved treatment over conventional care. Secondary issues include treatment duration and cost/benefit ratio. This article reviews the role of lasers in endodontics since the early 1970s, summarizes many research reports from the last decade, and surmises what the future may hold for lasers in endodontics. With the potential availability of many new laser wavelengths and modes, much interest is developing in this promising field.

***Key words**: Laser, Pulpal diagnosis, Pulp capping and Pulpotomy, Cleaning and Shaping, Endodontic Surgeries.*

## INTRODUCTION

The use of lasers in dentistry has increased over the past few years. The first laser was introduced into the fields of medicine and dentistry during the 1960s (*Goldman et al., 1964*). Since then, this science has progressed rapidly. Because of their many advantages, lasers are indicated for a wide variety of procedures (*Frentzen and Koort, 1990; Aoki et al., 1994; Pelagalli et al., 1997; Walsh, 2003*). Conventional methods of cavity preparation with low- and high-speed handpieces involve noise, uncomfortable vibrations and stress for patients. Although pain may be reduced by local anesthesia, fear of the needle and of noise and vibration of mechanical preparation remains causes of discomfort. These disadvantages have led to a search for new techniques as potential alternatives for dental hard tissue removal. The aim of this review is to describe the application of lasers in dental hard tissue procedures.[1, 2]

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# HEMISECTION AS A TREATMENT OPTION: A CASE REPORT

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## ABSTRACT

Hemisection (i.e. tooth resection) procedures are useful solutions for a variety of clinical problems. These procedures are often indicated in the treatment of periodontally involved molars in which significant bone loss exists around a root or in the furcation. Occasionally, teeth with pathosis of apparaent endodontic origin actually have a lesion of periodontal cause.

*Key Words: Hemisection, Mandibular molar*

## INTRODUCTION

Hemisection implies that the tooth is cut in half. In practical usage, one of the halves is usually removed, but this is not essential if the most common indication for these techniques is the treatment of periodontal defects, they are useful for a variety of problems encountered in endodontic practice. Perhaps the most common endodontic indication is the removal of a root with a vertical fracture or a long lateral strip perforation. Creative endodontic treatment planning, however, can make root removal a useful approach in the treatment of a tooth with deep localized caries, an irretrievable separated instrument, a severe coronal fracture, or a strip perforation that might include periodontal bone loss. For the purpose of this discussion, both root amputation and hemisection will be referred to as root resection, because the principles of diagnosis and technique apply equally to both types of outcome.[10]

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REVIEW ARTICLE

AODMR

# Recent Advances in Endodontics- A Review

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**ABSTRACT:**

Contemporary endodontics has seen an extraordinary progress in innovation and materials. This article is aimed to review some of challenges and advances in the following sections: (1) Diagnosis of pulp vitality, (2) endodontic imaging, (3) root canal disinfection, (4) root canal preparation, (5) root canal filling and (6) visualization. The above mentioned advances aims to improve the art and science of root canal treatment.

**Keywords:** Canal preparation, Disinfection, Imaging, Orascope.

## INTRODUCTION

Diagnosis in dentistry may be defined as " the process whereby the data obtained from questioning, examining and testing are combined by dentist to identify deviations from the normal".[1] Past couple of decades have witnessed a cascade of most rapid and extensive technological evolution in field of dentistry. Era of diagnosing vitality of pulp and fractures have evolved from conventional technique to modern method, root canal preparation from stainless steel to Ni-Ti files and root canal filling materials in field of endodontics. The scenario in radiographic assessment, which is indispensable adjunct to clinical examination in endodontics has also seen progression from traditional radiology to an advanced and more accurate imaging techniques.

Development of visualization in field of endodontics with the usage of loupes and microscopes have offered a break through. This helped in overcoming the limitations faced with naked eyes in detection of missed canals, incipient caries, fractured tooth, etc. This articles shows a review of recent advances in endodontics.

## ADVANCES IN DIAGNOSTIC VITALITY OF PULP

### Laser Doppler flowmetry

This is a non-invasive, objective, painless, semi-quantitative method that is more reliable in measuring blood pressure to pulp. Laser light is transmitted to pulp by means of fibro optic probe.[2] Fibro optic probe transmits laser light to pulp. This method uses Helium Neon (HeNe) and Gallium Aluminium (Ga-Al) as semiconductor diode lasers at power of 1 to 2 mW. HeNe has wavelength of 632.8nm and wavelength of semiconductor diode laser is 780 to 820 nm.[3] The ideal position to place the probe is 2 to 3 mm from the gingival margin.[4] The scattered light from moving red blood cells in the circulation will be frequency shifted while those from static tissues remains unshifted.Doppler's shifted and unshifted reflected light is returned via afferent fibres and a signal is produced. Vitality of pulp in both adults and children can be estimated successfully by this technique.[5](Figure 1)

### Pulse Oximetry

The determination of percentage of oxygen saturation of the circulating arterial blood is defined as "Oximetry".[6] It is a relatively

CASE REPORT

AODMR

# Clinical Applications of Mineral Trioxide Aggregate: Report of Three Cases

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**ABSTRACT:**

The greatest threats to teeth are dental caries and traumatic injuries. The primary goal of all restorative treatment is to maintain vitality of pulp. If pulpal exposure occurs, then vital pulp procedure should be done to preserve pulp vitality. Historically, calcium hydroxide has been the material of choice for vital pulp procedures. As of late, an option material called mineral trioxide total (MTA) has exhibited the capacity to prompt hard-tissue development in pulpal tissue. This article portrays the clinical and radiographic result of cases including the utilization of MTA in furcal perforation repair, closure of open apex and direct pulp capping.

**Keywords:** Closure of open apex, Direct pulp capping, MTA**,** Perforation repair.

## INTRODUCTION

A perfect endodontic repair material should seal the pathways of correspondence between the the root canal system and its surrounding tissues. It should be noncarcinogenic, nontoxic, biocompatible, insoluble in tissue fluids, and dimensionally stable.[1] Because any previous materials did not have these all characteristics, MTA is being used in a wide range of clinical treatments such as a perforation repair material, as a root-end filling material and as a pulp capping agent during vital pulp therapy and[2] MTA showed excellent sealing ability and promoted osteoblast activity[3]. It is less cytotoxic had an antimicrobial effect.[4,5]

In this article three cases of furcal perforation repair, closure of open apex and direct pulp capping by using MTA are shown.

## CASE REPORT

### CASE 1 :- Furcal Perforation repair using MTA

A 34-yr-old female patient reported to the Department, with the chief complain of pain in her lower right back region of the jaw since one month. On clinical examination a deep carious lesion was found in relation to 46. Radiographic examination reveled extensive occlusal caries involving pulp and furcal area.(Figure 1)

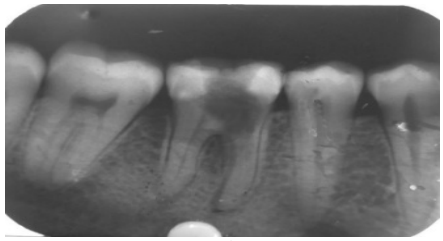

Figure 1: Radiograph showing furcation involvement in 46

Vitality test showed negative response with both thermal tests and Electric pulp tester. The diagnosis was necrosis of the tooth and involvement of furcal area because of deep carious lesion. On first appointment tooth was isolated with rubber dam. The caries was removed, and Perforation was confirmed clinically with probe. Canals were cleaned and shaped with ProTaper files up to the F1-ProTaper and patient was recalled after three days. On second appointment tooth was asymptomatic canals were obturated & on same day the perforation was sealed with

Research Article

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# Prevalence and Severity of Dental Fluorosis in Nadiad Taluka, Gujarat, India

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## ABSTRACT

**Background**: A cross-sectional survey was carried out in schools of Nadiad taluka for the incidence and severity of dental fluorosis. Five different schools were randomly selected from the rural areas of Nadiad taluka for the study. Total 1065 students were examined during the study period.Out of total examined students, approximately 10% of children were affected with dental fluorosis.

**Keywords:** Dental fluorosis, Fluoride, School children, Dean's Fluorosis Index.

## INTRODUCTION

Fluoride helps in the development of teeth, bones and maintaining the health. It has great significance in preventive dentistry due to its cariostatic properties. However, excessive intake of fluoride leads to dental and skeletal fluorosis. Its abundance in the continental crust is about 626µg/g. [1] Endemic fluorosis resulting from high fluoride concentration of ground water is major health concern in Gujarat.Fluorosis is caused by ingestion of excess fluoride mainly through drinking water contamination. Due to its strong electro negativity, fluoride is attracted by positively charged calcium in teeth and bones causing dental fluorosis. [2]

The clinical appearance of dental fluorosis is characterized by lusterless opaque white patches in enamel which may become striated, mottled and/or pitted. The opaque area may become stained yellow to dark brown. The incidence and severity of dental fluorosis is significantly influenced by fluoride intake. This study was aimed to find out prevalence and severity of dental fluorosis.

## MATERIAL AND METHODS

A cross-sectional survey was conducted among the children attending free dental check-up camps held by the department of Public Health Dentistry, Faculty of Dental Science, Dharmsinh Desai University. In the first stage, five public schools were randomly selected from the rural areas in Nadiad taluka to record dental fluorosis in children, residing in the villages since childhood and consuming the groundwater. Official permission was obtained from the concerned authorities to conduct this study. In the second stage, the students

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Review Article

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# Radix Entomolaris: Literature Review

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## ABSTRACT

**Background**: Most commonly permanent mandibular first molars have two roots, one mesial, and the other distal root. In permanent mandibular first molars, anatomical variations like the number of root canals configuration and presence of a number of roots and their morphology are most common. Most complex morphological variation is the presence of supernumerary root either lingually or buccally. When the supernumerary root is located distolingually to the main distal root is known as "Radix Entomolaris (RE)". Adequate knowledge of root canal morphology and its variations are helpful for proper diagnosis, identification and treatment planning of this complexity, which leads to the successful outcome of endodontic treatment. The main goal of this article is to discuss the prevalence, morphology, classification, clinical and radiographic diagnosis and clinical significance of radix entomolaris in a permanent mandibular first molar.

**Keywords:** Distolingual root, radix entomolaris, mandibular molars, supernumerary root, additional root, extra root, root canal morphology.

## INTRODUCTION

The primary goal of the endodontic procedure is the elimination of bacteria and their toxins from the infected root canal system and the prevention of subsequent reinfection. This is achieved by a thorough chemico-mechanical preparation of the root canal space, followed by a three-dimensional hermetic seal.

According to Swartz, Skidmore and Griffen, reported that endodontic outcome of permanent mandibular first molars has a lower success rate compared with other teeth.[1] For this reason, clinicians must have adequate knowledge of root canal morphology and its variations, for prevention of failure of the endodontic treatment. Normal anatomy of permanent mandibular first molars has mesial and distal roots with three root canals, two mesial and one distal [2,3]. Many authors have been described the variations of root canal configurations in permanent mandibular first molars. In the study of anatomical variations, Fabra-Campos documented the presence of three mesial canals, whereas Stronger reported three distal canals [4,5].

Carabelli was first reported Radix entomolaris, an anatomical variant found in a permanent mandibular molar.[6] It is characterized by the presence of supernumerary root, which is typically present disto-lingually. Radix entomolaris can be found in the first, second, and third mandibular molars, but the least frequently seen in the second molar.[7-9] Prevalence of Radix entomolaris has been found less than 5% in white Caucasian, African, Eurasian and Indian populations while it

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# Treatment of Internal Root Resorption in Maxillary Lateral Incisor: A Case Report

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## ABSTRACT:

A clinician encounters a variety of pulpo-pathologic conditions. Resoprtion is one such condition. By definition it is a condition associated with either a physiologic or a pathologic process resulting in loss of dentin, cementum or bone. Internal as well as external resorption signifies a very complex pathological interaction of the cells of pulp, periradicular and periodontal tissues. An insidious process that is generally found in teeth with a long standing chronic inflammation of the pulp, caries related pulpits, traumatic injuries, and iatrogenic causes. Generally a tooth with internal root resorption is asymptomatic and this condition is diagnosed on routine radiographic examination. Accurate diagnosis and immediate institution of treatment in this condition is important to improve the prognosis of such teeth.

This case report having resorptive defect in the middle 1/3rd of maxillary left lateral incisor which was treated non-surgically with endodontic treatment. The step back technique for bio-mechanical preparation was used and obturation was carried out with hybrid technique where apical 1/3rd till resorptive defect was obturated and the defect was backfilled with thermoplastized guttapercha. A six-month follow up demonstrated clinically asymptomatic and adequately functional tooth, with radiographic signs of healing.

**Keywords:** Gutta-Percha, Resorption Lacunae, Thermoplastized.

## INTRODUCTION

Internal root resorption is a rare finding, usually asymptomatic, slowly progressing, and detectable upon routine radiographic examination.[1] An oval enlargement of the root canal space in radiograph is seen in affected tooth. The resorption lacuna, a continuation of the distorted outer borders of the root canal is confirmed by different angulations techniques of radiographs.[2] A deviation from the standard procedure is required for diagnosis and management of internal resorption. The key to success in arresting the process of internal resorption is total removal of pulp horn. The cause of internal resorption is not fully understood.[3] Suggested contributing factors are trauma, persistent chronic pulpitis as well as orthodontic treatment.[4] Late diagnosis is because the tooth is asymptomatic.

Chronic inflammatory process in the pulp tissue combined with the loss of the protective layer of odontoblasts and predentin is assumed to cause dentinal resorption. Activated multinucleated giant cells that are adjacent to the granulation tissue in the inflamed pulp resorb internal aspect of root canal.[5] Teeth in which the resorptive process reaches the cervical area of the crown may have a pinkish color, known as 'pink tooth' resulting from granulation tissue ingrowths.[6]

Radicular portion it often goes unnoticed until it has perforated the external surface. Stage at which the process is detected & treated affects the prognosis. Extirpation of entire pulpal tissue is the main motive of its treatment. The

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*Case Report*

# Mental Nerve Paraesthesia: A Report of Two Cases Associated with Endodontic Etiology

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Paraesthesia of the mental nerve can occur due to various etiological factors. Rarely, dental infections can cause paraesthesia. However, this article discusses two cases of endodontic etiology in the mental nerve region as a causative factor for paraesthesia. In the first case, the patient had severe pain localized to his right mandible, with numbness of his lower lip. Endodontic treatment led to quick regression and resolution of paraesthesia. In the second case, a patient who was referred for retreatment of a mandibular second premolar infection developed profound paraesthesia in the region of the mental nerve distribution following prior therapy. Possible mechanisms responsible for periapical infection-related paraesthesia are discussed here. CBCT imaging may be useful in the diagnosis and management of such conditions.

## 1. Introduction

Paraesthesia is a feeling that is rare, provocative, or spontaneous and is commonly described by patients as a burning, tickling, or tingling sensation [1]. According to the taxonomy of the International Association of Study of Pain (IASP), paraesthesia, although abnormal, is not unpleasant [2]. Patients have often described it as warmth, cold, burning, aching, prickling, tingling, pin and needle sensation, or numbness.

The mental foramen in dentistry is an essential anatomical feature on the lateral surface of the mandible. This marks the culmination of the mandibular canal that opens in an oblique direction to the surface. The mental nerve bundle passes through the mental foramen and supplies the soft tissues of the chin, lower lip, and gingiva on the ipsilateral side of the mandible with sensory innervation and nutrition [3].

Radiographically, the mental foramen may result in misdiagnosis of a radiolucent lesion in the apical area of the mandibular premolar teeth. For diagnostic and clinical procedures, accurately locating the mental foramen is important [4]. The intimate anatomical proximity between the root apices of the mandibular premolars and the mental nervous bundle should also be meticulously examined. Periapical infection before and after endodontic therapy leading to mental and inferior alveolar nerve paraesthesia is also well documented [5]. The mechanism of induction of paraesthesia due to periapical infection may be threefold.

(1) The inflammatory process causes purulent exudate to accumulate in the mandibular bone, causing local mechanical pressure on the mental nerve [6, 7]

(2) Toxic or inflammatory bacterial products [6–8]

(3) Adequate subsequent hematoma pressure [6, 7]

# A CASE REPORT ON MANAGEMENT OF RADIX ENTOMOLARIS WITH POST-ENDODONTIC RESTORATION WITH ENDOCROWN

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## ABSTRACT

Mandibular molars may have an additional root located either buccally or lingually. Thus, an accurate diagnosis and thorough understanding of variation in root canal anatomy is essential for treatment success. Endodontically Treated Teeth (ETT) are at higher risk of biomechanical failure than vital teeth. With the development of adhesive systems, endocrowns have been used as an alternative to the conventional post-core and fixed partial dentures.

***Key words**: Permanent mandibular first molar, Radix entomolaris, Additional third root, Root canal anatomy, Endo-crown*

## INTRODUCTION

Clinicians must have an in-depth knowledge of the morphology of root canal systems and its variations that may complicate the procedure. The majority of mandibular first molars have two roots, mesial and distal with two mesial and one distal canal[1,2]. *(Fabra-Campos) (1985-1989)* reported the presence of three mesial canals while *Stroner* reported three distal canals (1984)[3,4]. A major variant is the presence of three roots in mandibular first molar, first mentioned in the literature by *Carabelli* (1844) known as Radix entomolaris (RE) located in distolingual position[5]. When located on mesiobuccal surface, the anomaly is known as Radix paramolaris. RE has a frequency of less than 5% in white Caucasian, African, Eurasian and Indian populations while it appears to be commonly present in races of Mongoloid traits such as the Chinese, Eskimos, and Native American populations with a frequency of 5-30%.[5] Radiographic diagnosis plays a pivotal role in successful endodontic treatment of tooth. One of the main reasons for failure of endodontic treatment is incomplete removal of pulp tissue and microorganisms from all the root canals.[6]

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# MANAGEMENT OF SEPARATED INSTRUMENT BY FILE BY-PASS TECHNIQUE

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**Abstract:** Instrument separation is one of the most common procedural errors that may occur during endodontic treatment. A separated instrument can create an obstruction in the root canal which can hinder the cleaning and shaping procedures. Removal of the separated instrument is often advised but factors like poor access and visibility to the separated instrument makes it difficult and also the amount of dentin to be removed is more. As an alternative to removal, bypassing technique is very effective and conservative. This case report describes management of separated instrument in lower right first molar.

***Keywords****: Separated instrument, by-passing, Neoendo hand file, lateral condensation, obturation.*

## INTRODUCTION

There are several unwanted procedural errors that clinicians may face during endodonticpractice.[1] These include strip perforations, ledging of the root canal walls, and separation of various endodontic instruments. The separation of instruments during endodontic therapy is a troublesome incident. Its incidence range varied from 2 to 6% of the casesinvestigated.[2] The most common causes for file separation are improper use, limitations in physical properties, inadequate access, root canal anatomy, and possibly manufacturing defects.[3]

The presence of a separated instrument in the root canal leads to failure of root canal treatment. Instrument separation commonly occurs at the middle or apical third of the mesial canals of mandibular molars, and at the same location in the mesiobuccal roots of maxillary molars due to their root curvatures.[4]

The prognosis depends on the degree of contamination of canal at the moment of instrument separation. Proper assessment should be made whether the canal can be instrumented even in the presence of fracturedinstrument.[5,6]If the canal cannot be instrumented decision should be made to remove the separated instrument.

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# MANAGEMENTOF C-SHAPED CANAL CONFIGURATIONINMANDIBULARSECOND MOLAR: A CASE REPORT

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## ABSTRACT

One of the most challenging root canal configurations is the C-shaped root canal, commonly present in mandibular second molar. These canals are most challenging to treat because transverse anastomosis, lateral and accessary canal sand apical deltas. This case report presents successful management of c-shaped canal in mandibular second molar.

***Keywords**: C-shaped canal, Mandibular second molar, Thermoplasticized guttapercha.*

## INTRODUCTION:

A thorough knowledge of the root canal anatomy and its variants is required for achieving success in root canal therapy along with diagnosis, treatment planning and clinical expertise. One such variation of the root canal system is C-shaped canal configuration. The C-shaped canal was first documented in endodontic literature by *Cooke and Cox* in 1979.[1] The C-shaped canals are mostly present in the mandibular second molar and especially in Asian population this type of configuration is seen.[2-5]The C-shaped canal configuration results from the failure of the Hertwig's epithelial sheath to fuse or its inadequate development during the root embryologic stage.[6] Failure of the Hertwig's epithelial root sheath to fuse on the lingual or buccal root surface is the main cause of C-shaped roots, which always contain a C-shaped canal.[7]This results in a conical or prism shaped root with a thin interradicular ribbon-shaped isthmus connecting them.[8-10] *Manning* attributed the formation of C-shaped roots to age changes like deposition of cementum.[9] This theory was however contested since separate canals in roots with C-shaped anatomy were observed even in patients under 40 years of age.[9]

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# LASERS IN ENDODONTICS: A PUBMED RESEARCH BASED REVIEW

*Dr. Dipti Choksi **Dr. Barkha Idnani ***Dr. Kunjal Mistry
****Dr. Nirav Parmar *****Dr. Aditi Choksi ****Dr. Ronak Patel

## ABSTRACT

Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of papers on potential applications for lasers in endodontics have been published. The purpose of this paper is to summarize laser applications in endodontics, including their use in pulp diagnosis, dentinal hypersensitivity, pulp capping and pulpotomy, sterilization of root canals, root canal shaping and obturation and apicectomy. The effects of laser on root canal walls and periodontal tissues are also reviewed. The essential question is whether a laser can provide equal or improved treatment over conventional care. Secondary issues include treatment duration and cost/benefit ratio. This article reviews the role of lasers in endodontics since the early 1970s, summarizes many research reports from the last decade, and surmises what the future may hold for lasers in endodontics. With the potential availability of many new laser wavelengths and modes, much interest is developing in this promising field.

***Key words**: Laser, Pulpal diagnosis, Pulp capping and Pulpotomy, Cleaning and Shaping, Endodontic Surgeries.*

## INTRODUCTION

The use of lasers in dentistry has increased over the past few years. The first laser was introduced into the fields of medicine and dentistry during the 1960s (*Goldman et al., 1964*). Since then, this science has progressed rapidly. Because of their many advantages, lasers are indicated for a wide variety of procedures (*Frentzen and Koort, 1990; Aoki et al., 1994; Pelagalli et al., 1997; Walsh, 2003*). Conventional methods of cavity preparation with low- and high-speed handpieces involve noise, uncomfortable vibrations and stress for patients. Although pain may be reduced by local anesthesia, fear of the needle and of noise and vibration of mechanical preparation remains causes of discomfort. These disadvantages have led to a search for new techniques as potential alternatives for dental hard tissue removal. The aim of this review is to describe the application of lasers in dental hard tissue procedures.[1, 2]

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# HEMISECTION AS A TREATMENT OPTION: A CASE REPORT

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****Dr. Nirav Parmar *****Dr. Aditi Choksi ****Dr. Ronak Patel

## ABSTRACT

Hemisection (i.e. tooth resection) procedures are useful solutions for a variety of clinical problems. These procedures are often indicated in the treatment of periodontally involved molars in which significant bone loss exists around a root or in the furcation. Occasionally, teeth with pathosis of apparaent endodontic origin actually have a lesion of periodontal cause.

*Key Words: Hemisection, Mandibular molar*

## INTRODUCTION

Hemisection implies that the tooth is cut in half. In practical usage, one of the halves is usually removed, but this is not essential if the most common indication for these techniques is the treatment of periodontal defects, they are useful for a variety of problems encountered in endodontic practice. Perhaps the most common endodontic indication is the removal of a root with a vertical fracture or a long lateral strip perforation. Creative endodontic treatment planning, however, can make root removal a useful approach in the treatment of a tooth with deep localized caries, an irretrievable separated instrument, a severe coronal fracture, or a strip perforation that might include periodontal bone loss. For the purpose of this discussion, both root amputation and hemisection will be referred to as root resection, because the principles of diagnosis and technique apply equally to both types of outcome.[10]

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Research Article

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# Prevalence and Severity of Dental Fluorosis in Nadiad Taluka, Gujarat, India

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## ABSTRACT

**Background**: A cross-sectional survey was carried out in schools of Nadiad taluka for the incidence and severity of dental fluorosis. Five different schools were randomly selected from the rural areas of Nadiad taluka for the study. Total 1065 students were examined during the study period.Out of total examined students, approximately 10% of children were affected with dental fluorosis.

**Keywords:** Dental fluorosis, Fluoride, School children, Dean's Fluorosis Index.

## INTRODUCTION

Fluoride helps in the development of teeth, bones and maintaining the health. It has great significance in preventive dentistry due to its cariostatic properties. However, excessive intake of fluoride leads to dental and skeletal fluorosis. Its abundance in the continental crust is about 626µg/g. [1] Endemic fluorosis resulting from high fluoride concentration of ground water is major health concern in Gujarat.Fluorosis is caused by ingestion of excess fluoride mainly through drinking water contamination. Due to its strong electro negativity, fluoride is attracted by positively charged calcium in teeth and bones causing dental fluorosis. [2]

The clinical appearance of dental fluorosis is characterized by lusterless opaque white patches in enamel which may become striated, mottled and/or pitted. The opaque area may become stained yellow to dark brown. The incidence and severity of dental fluorosis is significantly influenced by fluoride intake. This study was aimed to find out prevalence and severity of dental fluorosis.

## MATERIAL AND METHODS

A cross-sectional survey was conducted among the children attending free dental check-up camps held by the department of Public Health Dentistry, Faculty of Dental Science, Dharmsinh Desai University. In the first stage, five public schools were randomly selected from the rural areas in Nadiad taluka to record dental fluorosis in children, residing in the villages since childhood and consuming the groundwater. Official permission was obtained from the concerned authorities to conduct this study. In the second stage, the students

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Review Article

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# Radix Entomolaris: Literature Review

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## ABSTRACT

**Background**: Most commonly permanent mandibular first molars have two roots, one mesial, and the other distal root. In permanent mandibular first molars, anatomical variations like the number of root canals configuration and presence of a number of roots and their morphology are most common. Most complex morphological variation is the presence of supernumerary root either lingually or buccally. When the supernumerary root is located distolingually to the main distal root is known as "Radix Entomolaris (RE)". Adequate knowledge of root canal morphology and its variations are helpful for proper diagnosis, identification and treatment planning of this complexity, which leads to the successful outcome of endodontic treatment. The main goal of this article is to discuss the prevalence, morphology, classification, clinical and radiographic diagnosis and clinical significance of radix entomolaris in a permanent mandibular first molar.

**Keywords:** Distolingual root, radix entomolaris, mandibular molars, supernumerary root, additional root, extra root, root canal morphology.

## INTRODUCTION

The primary goal of the endodontic procedure is the elimination of bacteria and their toxins from the infected root canal system and the prevention of subsequent reinfection. This is achieved by a thorough chemico-mechanical preparation of the root canal space, followed by a three-dimensional hermetic seal.

According to Swartz, Skidmore and Griffen, reported that endodontic outcome of permanent mandibular first molars has a lower success rate compared with other teeth.[1] For this reason, clinicians must have adequate knowledge of root canal morphology and its variations, for prevention of failure of the endodontic treatment. Normal anatomy of permanent mandibular first molars has mesial and distal roots with three root canals, two mesial and one distal [2,3]. Many authors have been described the variations of root canal configurations in permanent mandibular first molars. In the study of anatomical variations, Fabra-Campos documented the presence of three mesial canals, whereas Stronger reported three distal canals [4,5].

Carabelli was first reported Radix entomolaris, an anatomical variant found in a permanent mandibular molar.[6] It is characterized by the presence of supernumerary root, which is typically present disto-lingually. Radix entomolaris can be found in the first, second, and third mandibular molars, but the least frequently seen in the second molar.[7-9] Prevalence of Radix entomolaris has been found less than 5% in white Caucasian, African, Eurasian and Indian populations while it

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**Keywords:** Dental fluorosis, Fluoride, School children, Dean's Fluorosis Index.

## INTRODUCTION

Fluoride helps in the development of teeth, bones and maintaining the health. It has great significance in preventive dentistry due to its cariostatic properties. However, excessive intake of fluoride leads to dental and skeletal fluorosis. Its abundance in the continental crust is about 626µg/g. [1] Endemic fluorosis resulting from high fluoride concentration of ground water is major health concern in Gujarat.Fluorosis is caused by ingestion of excess fluoride mainly through drinking water contamination. Due to its strong electro negativity, fluoride is attracted by positively charged calcium in teeth and bones causing dental fluorosis. [2]

The clinical appearance of dental fluorosis is characterized by lusterless opaque white patches in enamel which may become striated, mottled and/or pitted. The opaque area may become stained yellow to dark brown. The incidence and severity of dental fluorosis is significantly influenced by fluoride intake. This study was aimed to find out prevalence and severity of dental fluorosis.

## MATERIAL AND METHODS

A cross-sectional survey was conducted among the children attending free dental check-up camps held by the department of Public Health Dentistry, Faculty of Dental Science, Dharmsinh Desai University. In the first stage, five public schools were randomly selected from the rural areas in Nadiad taluka to record dental fluorosis in children, residing in the villages since childhood and consuming the groundwater. Official permission was obtained from the concerned authorities to conduct this study. In the second stage, the students

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# EFFECT OF FOUR COMMERCIAL MOUTHRINSES ON THE MICROHARDNESS OF NANOHYBRID COMPOSITE RESTORATIVE MATERIAL- AN IN VITRO STUDY.

Original Article

Yash Shah*, Krutika Chudasama**, Kushani Shah ***, Shraddha Chokshi****, Zarana Sanghvi*****, Pruthvi Patel******

## ABSTRACT

**Aim:** To evaluate the effect of four commercial mouthrinses on the microhardness of nanohybrid composite restorative material. **Materials and Method:** Forty specimens of nano-hybrid composite material (Tetric-N- Ceram Ivoclar Vivadent) with 3mm diameter and 3mm height were prepared using Teflon moulds. The baseline microhardness of the specimens were recorded using Vickers Microhardness Tester. The specimen were randomly divided into four groups according to mouth rinses used, each containing ten specimens as follows: **GROUP A:** LISTERINE (Alcohol based) **GROUP B:** PERIOGARD (Alcohol based) **GROUP C:** FRESHCLOR (Alcohol Free) **GROUP D:** HIORA (Alcohol Free). The pH of all mouth rinses were recorded. Then the specimens were immersed in 20 ml of respective mouthrinses and kept in incubator at 37°C for 24 hr. The post immersion microhardness values of the specimens were recorded using Vickers Microhardness Tester and results were subjected to statistical analysis which was done by one-way ANOVA and Post Hoc analysis **Result:** The decrease of microhardness was seen highest in GROUP A followed by Group B and least in GROUP C and GROUP D. **Conclusion:** All the mouth rinses showed reduction in surface hardness of the esthetic restorative material. Highest reduction of surface hardness was seen with use of Listerine®mouth rinse followed by Periogard®. There was no statistically significant difference between Freshclor® and Hiora® mouth rinses.

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## INTRODUCTION:

In the recent years, there is a great research and development in the field of esthetic dentistry as esthetics is the main concern for an individual. There is a marked increase in the use of composite resin as it is a tooth colored restorative material[1].

Various internal and external factors influence the longevity, durability, and degradation of dental composite resins[2,3]. Failure of resin restoration may occur due to change in the mechanical and chemical properties of the composite resin material. Both of them are inter-dependent on each other. Mechanical properties may be altered as the resin is exposed to unwanted compressive and tensile forces while chemical properties of resin is altered by the internal environment of oral cavity, food or other materials used; which further affects the mechanical properties.[4,5]

The wear resistance of a resin composite is affected when there is reduction in surface hardness. Due to decrease in wear resistance there may be increase in surface roughness which is favourable for plaque accumulation, staining of resin composite and finally early loss of restoration, requiring re-restoration.[6,7]

To overcome plaque accumulation and periodontal problems there is increase in prescription of mouth rinse by the dentist also there is increased purchase of over-the-counter mouthrinses by the patients.

Mouthrinses contain water, antimicrobial agents, salts, preservatives and in some cases alcohol. The variation in the concentration of these substances affects the pH of the mouthrinses. Although mouthwashes are effective in reducing periodontal disease and dental caries, there are some risks associated with them when used daily. The risks include dry mouth, pigmentation of tongue and change in the physical properties of composite resin restorations[8].

Alcohol containing mouthrinses such as LISTERINE and PERIOGARD are most frequently used mouthrinses; The alcohol in the mouthwashes influences the degradationof composite resins[8,9] and this effect is found to be directlyrelated to the concentration of alcohol[9]. Furthermore, lowpH affects sorption; solubility and surface degradation of there storative material. Therefore, alcohol-free mouth washes have been introduced into the market[9]. However, studies have reported the fact that both alcohol and alcohol-freemouth rinses can reduce the hardness of the restorative materials[9].

Recently, manufacturers have introduced a new nano hybrid restorative composite material (IVOCLAR TETRIC-N-CERAM ®), which they

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# A Comparative Evaluation of Different Irrigating System for Removal of Modified Triple Antibiotic Pastefrom Root Canal- An In Vitro Study.

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***Abstract:*** *Aim of this study is to compare the efficacy of different irrigation systems for removal of Modified Triple Antibiotic Paste from Root Canal.90 human extracted single rooted teeth were decoronatedand prepared using K files(Mani) up to size 40# and filled with modified Triple Antibiotic Paste. After preservation for 21 days in the normal saline, roots were divided randomly into 6 groupsPositive control (n=15), 30 gauge Side Vented Needle(n=15), EndoVac (Apical negative pressure) (n=15), EndoActivator (Sonic irrigation system) (n=15), Passive ultrasonic irrigation (n=15) & Negative control group (n=15). The root halveswere evaluated with stereomicroscope with 40x magnification. The study is stastically analysed by Kruskal-Wallis test.The result showed that EndoVac, EndoActivator groups were effective for apical third,Sidevented needle group was effective for coronal third whereas PUI group was effective for apical third as well as coronal third.* ***Conclusion****Passive ultrasonic irrigation system significantly removes the mTAP coronal as well as apical third from the root canal.*

***Key Words:*** *EndoActivator; EndoVac; Modified Triple Antibiotic Paste;Passive ultrasonic; Side Vented Needle;*

## I. Introduction

Regenerative endodontic therapy has been introduced for immaturenecrosed tooth for complete restoration of pulpal function and subsequent completion of root development[1]. Endodontic regeneration needs highly bacteria free/steriledenvironment through the use ofintracanal medicament. The most widely used intracanalmedicament in endodontic regeneration is triple antibiotic paste (TAP) described by Hoshino et al[2] in 1996, which is a mixture of metronidazole, ciprofloxacin, and minocycline. Minocycline has been discarded from TAP because of its discoloration effect[3].Cefaclor has been its replacement and it is described as modified triple antibiotic paste (mTAP)[4].This paste should be removed completely from the root canals to avoid an effect on sealer penetration and tooth discoloration[5], cytotoxic effects to the stem cells.

Conventional syringes are used for irrigation to remove TAP by using Sodium hypochlorite(NaOCl) as an irrigant[5,7] but in case of curved root canals where irrigating solution cannot be reached sufficiently[8]upto apex. So, different devices have been recommended to deliverirrigants, to increase their flow and distribution within the root canal system[9].

The SideVented needle (Canal Clean) 30 gauge, the EndoVac System (Discus Dental, Culver City, CA), the EndoActivator System (EA) (Dentsply, Tulsa, OK), Passive ultrasonic irrigation (PUI) (Acteon Group Ltd, Merignac, France) systems were used.

The Sideventedneedle30 gauge is inserted until resistance was felt and then reducing 1mm to prevent obliteration of the root canal lumen[12,13].

The EndoVac is an irrigation system which is works on apical negative pressure, to deliver the irrigantsat the apical third of the root canal and to remove debris via a negative pressure mechanism[10].

The EndoActivator is a sonically activated irrigation system to produce vigorous intracanal fluid agitation that has been shown to increase the efficacy of irrigation compare to conventional syringe irrigation[11].

Passive ultrasonic irrigation activates a small size file or smooth wire in the presence of irrigant solutions and by using principles of acoustic streaming,it disrupts the endodontic biofilm, facilitating better penetration of irrigants throughout the endodontic dentinal walls[9,11].

## II. Materials & Methodology

***Inclusion Criteria****:-*
The single rooted teeth with single canal were included.
The root of the teeth werestraight.





***Exclsion Criteria****:-*
The curved rootedteeth were excluded.
The single rooted teeth with double canal teeth were excluded.

The teeth were decoronated with diamond disc under water coolant to obtain standardized root length of 12mm. The root canals were instrumented with Hand K file (Mani) up to size 40#. At every instrument change, the root canals were irrigated with 2 ml 3% NaOCl (Eusol) solution. Final irrigation was performed using 5mL 3% NaOCl followed by 5ml of normal saline.

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# Effect of Pretreatment Paracetamol & Aceclofenac Postendodontic Pain: An In Vivo Study

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***Abstract:Aim**: The aim of thisin vivostudy is to compare the effect of pretreatment paracetamol & aceclofenac on postendodontic pain. **Materials & Methodology**: 90 patients were divided into three groups of 30 patients and were given medication 30 minutes before the beginning of the procedure. Preoperative medication includes Paracetamol, Aceclofenac, and Placebo tablets. When instrumentation was completed, the canals were dried using paper points & intracanal medicament placed. The access cavity was closed withprovisional restorative material. Patients were instructed to maintain a pain diary at 6, 12, and 24 hours. The data was statistically analyzed by one way ANOVA followed by Tukey's post-hoc test. **Results:** The result showed that postoperative pain reduction by aceclofenac is better at 6 hours and 12 hours followed by paracetamol and placebo. **Conclusion:**It can be concluded that aceclofenac was better in postoperative pain reduction when administered preoperatively 30 minutes before the beginning of the procedure. Aceclofenac was associated with the lowest level of postendodontic pain followed by paracetamol.*

***Key Words:**Non-Steroidal Anti-Inflammatory Agents, Root Canal Therapy, Pain control, Inflammation Mediators, Post-endodontic Pain*

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## I. Introduction

Patients visit dentists and seek dental treatment for various reasons. These include routine dental checkups, appointed visits for definitive dental treatment, for information about a problem, and because the patient is experiencing pain or other warning signs that affect them. The occurrence of pain is perhaps the most frequent reason for an unplanned visit to the dentist and most general dentists would probably see at least one or two patients with pain almost every working day.[1]

Dental pain (35.3%) is the most common reason for visiting a dental clinic followed by decay of teeth (27%).Dental pain undesirably affects quality of life and normal functioning and daily living of people, and most dental visits are intended at immediate relief of pain. Patients often turn up for dental care at the later stages of the dental disease when blatant symptoms such as pain and extreme uneasiness appear, rather than earlier. In other words, patients opt for a problem-oriented visit rather than a prevention-oriented one.[2] Pain following root canal treatment (RCT) is unpleasant scenario for both the patient and the dental practitioner as the number of patients experiencing pain following RCT range from 2.53% to 58% .[3]

Although the use of local anesthetic will reduce and lower the threshold of pain, the post-operative pain is common in some procedures, especially in patients who have experienced pain prior to treatment.[4] The pain relief afforded by endodontic treatment is effective but rarely immediate and complete. Post-endodontic pain is usually mild in nature and rarely lasts longer than 72 hours and is usually well managed with non-steroidal anti-inflammatory agents (NSAID) or acetaminophen. Some patients will continue to have pain at moderate to severe levels that stays for several days even after suitable endodontic treatment.[5]

In Endodontics, an important facet of pain control and pain prevention includes anxiety reduction and control of pre/trans-operative pain through local anesthetic techniques and use of pharmacological drugs like steroidal and non-steroidal anti-inflammatory drugs.[6]A preoperative single oral dose of anti-inflammatory drugs can regulate the release of inflammatory mediators and reduce the amount of side effects compared with repeated doses during the postoperative period.[7]The number of studies performed for evaluation of the use of nonsteroidal anti-inflammatory drugs (NSAIDs) for the purpose of postendodontic pain management after root canal instrumentation are few. Hence, the aim of this study is to evaluate, clinically, the effectiveness of single oral dose of aceclofenac and paracetamol administered 30 minutes prior to initiation of root canal treatment in comparison with placebo and to check the effectiveness of same on postendodontic pain reduction.





## II. Material And Methods

A total of 90 subjects who reported to the Department of Conservative Dentistry & Endodontics were selected for the study. Ethical clearance was obtained from Karnavati School of Dentistry Ethics Committee (KSDEC). All patients received a detailed description of the proposed treatment and gave informed written consent.

Case report

# Retrieval of a Separated Instrument from the Root Canal using Ultrasonics -A Case Report

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## ABSTRACT

Every endodontist may have encountered a variety of emotions associated with instrument separation during root canal treatment. The traditional methods to recover such obstructions often require removal of greater amounts of tooth structure, potentially leading to perforation or eventual vertical root fracture. Today, these dangers can be minimized with innovative headways in vision, ultrasonics and microtube retrieval methods. In particular, the dental operating microscope permits clinicians to imagine most broken instruments and satisfies the age old saying "If you can see it, you can probably do it". This case reports on successful retrieval of separated instruments by ultrasonic techniques under magnification.

**Key words**: Ultrasonics, Instrument Retrieval System, Dental operating microscope.

## INTRODUCTION

Clinicians included in endodontic practice may confront different undesirable procedural errors at any phase of routine endodontic treatment. Among the different procedural mishaps, fracture of endodontic instruments within root canals is one of the most troublesome incidents [1]. Fractured root canal instruments may include endodontic files, sectioned silver points, a segment of lentulo spirals, gates glidden drills, a portion of carrier-based obturators, finger spreaders, and paste fillers, or any other instrument left inside the canal[2].

The clinical outcome of cases with fractured instruments depends on several factors, such as root canal anatomy, the type of instrument material, the location of the fragment in the canal, the plane in which the canal curves, the length of the separated fragment and the diameter of the canal itself.During root canal preparation procedures, the potential for instrument breakage is always present. There are three possible outcomes that may be encountered when treating these cases: (i) Retrieval, (ii) Bypass and sealing the fragment within the root canal space, (iii) True blockage[3]. The use of both nickel-titanium (NiTi) hand files and rotary instruments has become popular andas of now they are the backbone of root canal instrumentation. This is mainly because of the much greater flexibility of NiTi files compared to their stainless steel counterparts, which offers particular clinical favourable circumstances in curved root canals [4-6].However, regardless of their certainly good qualities, there is a potential risk of 'unexpected' fracture with NiTi instruments. With the increased use of NiTi instruments there has been an unfortunate increase in the occurrence of broken instruments[7]. Instrument breakage during treatment leads to considerable anxiety, and then all attempts are made to non-surgically liberate the instrument from the canal[8].

The removal of separated instruments from root canals is very difficult and at times can be impossible, with a reported success rate ranging from 55 to 79%[7, 8]. A few techniques and devices for removal of the separated instrument have been described in the literature with most successful method being the use of ultrasonics along with a dental operating microscope [9, 10]. In this report, we demonstrate a case with separated instrument in which a combined technique of ultrasonic method along with dental operating microscope was used to retrieve the separated instrument fragment from the root canal.

## CASE REPORT

A 45 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Karnavati school of Dentistry, Gandhinagar with the chief complaint of pain in upper left back tooth region since last 2months. On clinical examination involved tooth showed deep carious lesion. Tooth was tender on percussion. There was no associated swelling in relation to the involved tooth region. Surrounding gingival tissue appeared inflamed but the pocket depths were within the normal limits. According to clinical



Hathila NB et al: Root canal and Ultrasonic www.jrmds.in

findings we gave the provisional diagnosis of apical periodontitis in tooth #26. Pre-operative intra oral periapicalradiograph(IOPA)revealed radiolucency involving enamel, dentine and pulp with periodontal

Review Article

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# Radix Entomolaris: Literature Review

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## ABSTRACT

**Background**: Most commonly permanent mandibular first molars have two roots, one mesial, and the other distal root. In permanent mandibular first molars, anatomical variations like the number of root canals configuration and presence of a number of roots and their morphology are most common. Most complex morphological variation is the presence of supernumerary root either lingually or buccally. When the supernumerary root is located distolingually to the main distal root is known as "Radix Entomolaris (RE)". Adequate knowledge of root canal morphology and its variations are helpful for proper diagnosis, identification and treatment planning of this complexity, which leads to the successful outcome of endodontic treatment. The main goal of this article is to discuss the prevalence, morphology, classification, clinical and radiographic diagnosis and clinical significance of radix entomolaris in a permanent mandibular first molar.

**Keywords:** Distolingual root, radix entomolaris, mandibular molars, supernumerary root, additional root, extra root, root canal morphology.

## INTRODUCTION

The primary goal of the endodontic procedure is the elimination of bacteria and their toxins from the infected root canal system and the prevention of subsequent reinfection. This is achieved by a thorough chemico-mechanical preparation of the root canal space, followed by a three-dimensional hermetic seal.

According to Swartz, Skidmore and Griffen, reported that endodontic outcome of permanent mandibular first molars has a lower success rate compared with other teeth.[1] For this reason, clinicians must have adequate knowledge of root canal morphology and its variations, for prevention of failure of the endodontic treatment. Normal anatomy of permanent mandibular first molars has mesial and distal roots with three root canals, two mesial and one distal [2,3]. Many authors have been described the variations of root canal configurations in permanent mandibular first molars. In the study of anatomical variations, Fabra-Campos documented the presence of three mesial canals, whereas Stronger reported three distal canals [4,5].

Carabelli was first reported Radix entomolaris, an anatomical variant found in a permanent mandibular molar.[6] It is characterized by the presence of supernumerary root, which is typically present disto-lingually. Radix entomolaris can be found in the first, second, and third mandibular molars, but the least frequently seen in the second molar.[7-9] Prevalence of Radix entomolaris has been found less than 5% in white Caucasian, African, Eurasian and Indian populations while it

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seems to be appeared in races of Mongoloid traits such as the Chinese, Eskimos, and Native American populations with a frequency of 5-30% [10-13]. Success of endodontic treatment also depends on careful clinical and radiographic diagnosis. Different angulations of radiographs are indicated for the

considered to be Eumorphic root morphology. I Eurasian and Indian populations, it is less than 5% and in African populations less than 3%.[21] I Caucasians, low prevalence of 3.4–4.2% has bee found and considered to be unusual or dysmorphi root morphology[21,20] RE has been reporte

# A CASE REPORT ON MANAGEMENT OF RADIX ENTOMOLARIS WITH POST-ENDODONTIC RESTORATION WITH ENDOCROWN

*Dr. Barkha Idnani **Dr. Dipti Choksi *** Dr. Kunjal Mistry
**** Dr. Nirav Parmar **** Dr. Aastha Buch ***** Dr. Tulsi Sujal Patel

## ABSTRACT

Mandibular molars may have an additional root located either buccally or lingually. Thus, an accurate diagnosis and thorough understanding of variation in root canal anatomy is essential for treatment success. Endodontically Treated Teeth (ETT) are at higher risk of biomechanical failure than vital teeth. With the development of adhesive systems, endocrowns have been used as an alternative to the conventional post-core and fixed partial dentures.

***Key words**: Permanent mandibular first molar, Radix entomolaris, Additional third root, Root canal anatomy, Endo-crown*

## INTRODUCTION

Clinicians must have an in-depth knowledge of the morphology of root canal systems and its variations that may complicate the procedure. The majority of mandibular first molars have two roots, mesial and distal with two mesial and one distal canal[1,2]. *(Fabra-Campos) (1985-1989)* reported the presence of three mesial canals while *Stroner* reported three distal canals (1984)[3,4]. A major variant is the presence of three roots in mandibular first molar, first mentioned in the literature by *Carabelli* (1844) known as Radix entomolaris (RE) located in distolingual position[5]. When located on mesiobuccal surface, the anomaly is known as Radix paramolaris. RE has a frequency of less than 5% in white Caucasian, African, Eurasian and Indian populations while it appears to be commonly present in races of Mongoloid traits such as the Chinese, Eskimos, and Native American populations with a frequency of 5-30%.[5] Radiographic diagnosis plays a pivotal role in successful endodontic treatment of tooth. One of the main reasons for failure of endodontic treatment is incomplete removal of pulp tissue and microorganisms from all the root canals.[6]

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Case Report

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# Endodontic Management of C Shaped Root Canal System Using Three Dimensional Obturation Techniques: Case Reports

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## ABSTRACT

**Background**: Unusual root canal anatomy always poses a diagnostic and treatment challenge. Identification of such variation is important for the success of the root canal treatment outcome. The C- shaped root canal configuration is one of the aberrant morphologies of molar teeth, commonly the mandibular second molar. In this configuration, the canals are connected by slit or web. The presence of fin, slit and web makes through debridement obstacle for the clinician. This two case reports present successful management of C-shaped mandibular second molar by using different obturation techniques.

**Keywords:** C- shaped canals, Thermoplasticised, Thermafill, Mandibular second molar.

## INTRODUCTION

The C-shaped configuration of root canal is one of the most important anatomical variations of the canal. It was first documented by Cooke and Cox in 1979.The failure of Hertwig's epithelial root sheath to fuse onto the buccal or lingual root surface may be the main cause of this configuration [1].Canal configuration has been shown to have a high prevalence in mandibular second molars with a percentage ranging between 2.7%-45.5%. [2] & also occur in mandibular premolars, maxillary molars, and mandibular third molars. The intricacies present in C shaped canal morphology can pose a challenge to the clinician during negotiation, debridement and obturation so knowledge of the C-shaped canal configuration is essential to achieve success in endodontic therapy. In particular, long and narrow isthmuses, which are generally found in C1 and C2 configurations, complicate the preparation and filling of root canals. [3] So it is important to select the proper obturation system. Many authors recommended thermoplasticised systems as it completely fills the canal irregularities. These two case reports present the management of C-shaped mandibular second molar.

## CASE REPORT 1

A 39-year-old female patient reported to Department of Conservative Dentistry and Endodontics with a complaint of pain in her lower right back tooth. The medical history was noncontributory. Intra oral examination revealed dental caries on tooth 47 with necrotic pulp and slight pain on percussion. The tooth was not responsive to the electric pulp test (EPT). Radiographically the tooth was conical in shape with fused mesial and distal root with a thin radiolucent line between them, with a suspected C-shaped canal with periapical lesion. The tooth was diagnosed with necrotic pulp with apical periodontitis. Root canal treatment (RCT) was

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Case Report

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# Taurodont: A Case Series

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## ABSTRACT

**Background**: Taurodontism is a rare embryologic anomaly of teeth, defined by an apical displacement of the furcation of roots and enlarged pulp chambers. Taurodontism has been classified as hypo-, meso- or hypertaurodontism according to the severity of the anomaly. The aim of this case report was to illustrate clinical cases of teeth with taurodontism. Three different cases of irreversible pulpitis in taurodont have been successfully treated.

**Keywords:** Dentistry, Multiple teeth, taurodontism.

## INTRODUCTION

The term taurdontism comes from the Latin term **tauros**, which means 'bull' and the Greek term **odus**, which means 'tooth' or 'bull tooth'; however, the term taurodontism was first introduced by Sir Arthur Keith in 1913.Taurodontism can be defined as a change in tooth shape caused by the failure of Hertwig's epithelial sheath diaphragm to invaginate at the proper horizontal level[1]. This abnormality is a developmental disturbance of a tooth that lacks constriction at the level of the cemento-enamel junction (CEJ) and is characterized by vertically elongated pulp chambers, apical displacement of the pulpal floor, and bifurcation or trifurcation of the roots[2]. Although permanent molar teeth are most commonly affected, this change can also be seen in both the permanent and deciduous dentition, unilaterally or bilaterally, and in any combination of teeth or quadrants. Whilst it appears most frequently as an isolated anomaly, its association with several syndromes and abnormalities has also been reported[3].

## CASE REPORT

**CASE 1**

A twenty-nine-year-old female patient reported to department of Conservative dentistry and Endodontics, with chief complain of spontaneous pain and food lodgement in upper left back region of jaw for 2 months. The patient's medical history was non-contributory. Intraoral examination revealed a normal shaped crown with deep occlusal carious lesion. The tooth was sensitive to percussion. The periodontal probing was within normal range (2-3mm). The preoperative periapical radiograph suggested the following possibilities, a deep occlusal carious lesion with endodontic involvement; elongated pulp chamber extending up to the trifurcation with no periapical changes. Based on the clinical and radiographic findings, a diagnosis of hypertaurodontism with symptomatic irreversible pulpitis was given to mandibular left first molar. Mandibular left second molar (37) was anesthetized with inferior alveolar block using 2%lignocaine with epinephrine 1:100000 and pulp chamber of 37

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Original Article

# Comparative Evaluation of the Influence of Different Sports/Energy Drinks and Alcoholic Beverages on the Surface Roughness of Three Different Flowable Esthetic Restorative Materials: An *In Vitro* Analysis

*Naman Vaidya[1], Pravin Kumar[2], Karishma Pathak[3], Sandhya K. Punia[1], Ashish Choudhary[2], Arun K. Patnana[2]*

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ABSTRACT

**Objective:** This study aimed to evaluate the surface roughness of three flowable esthetic restorative materials after exposure to sports/energy drinks and alcoholic beverages. **Materials and Methods:** A total of 210 specimens of dimension (2 cm diameter and 2 mm thickness) with giomer, compomer, and composite (70 samples with each esthetic material) were made with the help of plastic rings. The prepared samples were tested in six experimental sports/energy drinks (beer, whiskey, vodka, Gatorade, Red Bull, and Sting) and distilled water was considered as the control group. Profilometric analyses of all samples were recorded before immersing into the experimental and control solutions. Then, the samples were stored in the experimental and control group solutions for 5 min for 30 days. The profilometric analysis was repeated after 30 days and records were statistically analyzed. **Results:** Flowable composite showed the minimum surface roughness, whereas the flowable compomer showed the maximum surface roughness in the present test conditions. When the erosive potential of the test solutions was evaluated, surface roughness values were more for sports/energy drinks when compared to that of alcoholic beverages. **Conclusion:** All the sports/energy drinks and alcoholic beverages evaluated in this study altered the surface roughness of the tested restorative materials. The effects ranged from slight to a markedly negative impact on the surface roughness of the test restorative materials.

**KEYWORDS:** *Flowable compomer, flowable composite, flowable giomer, profilometry, sports drinks, surface roughness*

## INTRODUCTION

Greater health consciousness among the new generation along with greater permissibility in the society has seen an increase in the consumption of health drinks as well as alcoholic beverages. The consumption of sports/energy drinks has gained high popularity not only among the young population but also among senior citizens as well. There is a pressing need for tooth-colored restorative materials that possess comparable mechanical properties to that of natural dentition.[1] Among tooth-colored restorations, resin-based composites and glass ionomers have wide usage in the regular day-to-day clinical practices. The development of these materials had focused on modifying their biphasic compositions to improve chemical and mechanical properties.[2,3]

The surface degradation of resinous materials is dependent on the composition of the resin matrix, content, distribution of the fillers, and the effect of

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# BIOFILMS IN ENDODONTICS

Dr. Nikenlemla, Dr. Naman Vaidya, Dr. Rucha Shinde, Dr. Swati Bali

*"Biofilm can be defined as a sessile multicellular microbial community characterized by cells that are firmly attached to a surface and enmeshed in a self-produced matrix of extracellular polymeric substance (EPS), usually a polysaccharide."*[1]

The term biofilm was introduced to designate the thin layered condensations of microbes (e.g. bacteria, fungi, protozoa) that may occur on various surface structures in nature. Free-floating bacteria existing in an aqueous environment, so-called planktonic microorganisms, are a prerequisite for biofilm formation. In dental contexts, a well-known and extensively studied biofilm structure is established during the attachment of bacteria to teeth to form dental plaque. Here, bacteria free in saliva (planktonic organisms) serve as the primary source for the organization of this specific biofilm.[2]

Development of biofilm is influenced by physiochemical property of components involved in the biofilm. pH, temperature, surface energy of substrate, nutrient availability, and length of the time the bacteria is in contact with the surface and bacterial cell surface charge may play a key role in biofilms. Studies have shown that biofilm is made up of single cells and microcolonies, all embedded in a highly hydrated, predominantly anionic exopolymer matrix. [3]

Biofilm formation is a step-wise procedure its formation occurs in the presence of microorganisms, fluid and solid surface. Biofilm is considered as community as it possesses following criteria: Autopoiesis; Haemostasis; Synergy; Communality[4]

**Stages in the Development of Biofilm**

1. First step is the interaction and adsorption of inorganic and organic molecules to solid surface creating the conditioning layer
2. Once the conditioning layer is formed; finally, it undergoes adhesion of microbial cells to this layer.

In addition, the microbial adherence to substrate is also mediated by bacterial surface structure such as fimbriae, pili, flagella, and extra polymeric substances (EPS). The bacterial cell surface structures form bridges between the bacteria and conditioning layer. Initially, the bond between the bacteria and the substrate may not be strong. However with time, these bonds gains in strength, making the bacteria substrate attachment irreversible.[3]

**Ultrastructure of Biofilm**

A fully developed biofilm is described as a heterogeneous arrangement of microbial cells on a solid surface. Basic structural unit microcolonies or cell clusters formed be surface adherent bacterial cells. Microcolonies comprises a discrete unit of densely packed bacterial cells aggregates.

Three factors essential for biofilm are:
1. Microorganisms
2. Solid substrate
3. Fluid channels.

***Composition of biofilm***

Biofilm consists of matrix material 85% volume and 15% cells. A fresh biofilm is made up of biopolymers such as polysaccharides, proteins, nucleic acids, and salts. A glycocalyx matrix is made up of EPS, which surrounds the microcolonies and anchors the bacterial cells to the substrate. Tower or mushroom shaped structure is typically characteristic feature of a viable fully hydrated biofilm.

There is an important aspect when we see the composition of biofilm these are water-filled channels which act as a primitive circulatory system in a biofilm, intersect the structure of biofilm to establish connections between the microbial colonies. Biofilm community comprises efficient exchange between bacterial cells and fluid. Detachment has been understood to play an important role in shaping the morphological characteristics. It is also an "active dispersal mechanism" or "seeding dispersal" where a detached cell forms resistance traits which is the source of persistent infections.[3]

**Oral diseases as consequences of ecological changes in biofilms**

While seemingly a contradictory quality, dental biofilms are essential for maintenance of both oral health and oral disease conditions. Indeed, caries, gingivitis and chronic periodontitis are caused by commensal microorganisms and not by classical microbial pathogens. Currently their development is considered to be a consequence of ecologically driven imbalances in dental microbial biofilms . In the case of caries for example, a low pH environment caused by microbial fermentation of carbohydrates selects populations of acid-tolerant and acid-producing strains that in turn increase acid formation and may result in demineralization of the tooth structure. As far as endodontic infections are concerned the flare-up lesion could have a similar mechanism. Hence, acute exacerbations of endodontic lesions may be explained by a shift in the flow of nutrients to the root canal space, giving rise to ecological changes, which promote growth of proteolytic bacteria.

Example, following the initial instrumentation of a primary

Review Article

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# Radix Entomolaris: Literature Review

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## ABSTRACT

**Background**: Most commonly permanent mandibular first molars have two roots, one mesial, and the other distal root. In permanent mandibular first molars, anatomical variations like the number of root canals configuration and presence of a number of roots and their morphology are most common. Most complex morphological variation is the presence of supernumerary root either lingually or buccally. When the supernumerary root is located distolingually to the main distal root is known as "Radix Entomolaris (RE)". Adequate knowledge of root canal morphology and its variations are helpful for proper diagnosis, identification and treatment planning of this complexity, which leads to the successful outcome of endodontic treatment. The main goal of this article is to discuss the prevalence, morphology, classification, clinical and radiographic diagnosis and clinical significance of radix entomolaris in a permanent mandibular first molar.

**Keywords:** Distolingual root, radix entomolaris, mandibular molars, supernumerary root, additional root, extra root, root canal morphology.

## INTRODUCTION

The primary goal of the endodontic procedure is the elimination of bacteria and their toxins from the infected root canal system and the prevention of subsequent reinfection. This is achieved by a thorough chemico-mechanical preparation of the root canal space, followed by a three-dimensional hermetic seal.

According to Swartz, Skidmore and Griffen, reported that endodontic outcome of permanent mandibular first molars has a lower success rate compared with other teeth [1] For this reason, clinicians must have adequate knowledge of root canal morphology and its variations, for prevention of failure of the endodontic treatment. Normal anatomy of permanent mandibular first molars has mesial and distal roots with three root canals, two mesial and one distal [2,3]. Many authors have been described the variations of root canal configurations in permanent mandibular first molars. In the study of anatomical variations, Fabra-Campos documented the presence of three mesial canals, whereas Stronger reported three distal canals [4,5].

Carabelli was first reported Radix entomolaris, an anatomical variant found in a permanent mandibular molar [6] It is characterized by the presence of supernumerary root, which is typically present disto-lingually. Radix entomolaris can be found in the first, second, and third mandibular molars, but the least frequently seen in the second molar [7-9] Prevalence of Radix entomolaris has been found less than 5% in white Caucasian, African, Eurasian and Indian populations while it

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seems to be appeared in races of Mongoloid traits considered to be Eumorphic root morphology. In

# TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION THERAPY IN TEMPOROMANDIBULAR JOINT DISORDER –OVERVIEW

*Dr. Priti P Shah **Dr. Hetul J Patel ***Dr. Mona J Shah ***Dr. Kevin Parikh

**Abstract:**

Temporomandibular joint disorder (TMD) is a term to describe a group of diseases functionally affecting the masticatory system, especially masticatory muscles and the temporomandibular joint (TMJ). It has different etiologies and specific treatments, including transcutaneous electrical nerve stimulation (TENS). Hence the purpose of this article is to overview its applications in dentistry for method of pain alleviation. Tens offers a modest, safe and noninvasive technique, which has minimal or no side effect. It can be concluded that to achieve better response in patients, combination of conventional (medication, soft diet and hot fomentations,) and TENS therapy should be given

***Keywords:*** *TENS, TMJ, orofacial pain, TMJ disorder*

## Introduction

Temporomandibular joint disorder (TMD) is a generic term to describe a group of disorders or diseases affecting masticatory muscles, the temporomandibular joint (TMJ) and associated structures[1] TMD can be divided into two broad categories as myogenous or muscle related TMD and arthrogenous or joint related TMD[2] They are the most common orofacial pain conditions of non-dental origin. That frequently encountered in clinical practice, and them prevalence in the general population has been reported as being as high as 12%[3] It worsens with stress or may intensify with cold. It may be associated with bruxism, trauma from occlusion, and/or with jaw manipulation in any form.[4] Skeletal muscles are major sources of undiagnosed pain. There may be areas of hyperirritability called myofascial trigger points which are sensitive sites in muscle bands, tendons or ligaments which may generate local or referred pain with atypical pattern.

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Review Article

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# Fortuitous Tale of Progeria & Oral Manifestations by Dentists

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ABSTRACT

**Background:** Progeria is a rare, fatal genetic condition & an autosomal recessive disorder which comprises one in four million and one in eight million children of both sexes equally and described as premature and accelerated aging. The appearance and physiology of affected children be similar to elderly people but they typically have short life span i.e. mid-teens. Hutchinson Gilford syndrome & Progeria syndrome are synonymous which was described by Jonathan Hutchinson in 1886 and further reported by Hastings Gilford in 1904. Hutchinson-Gilford Progeria Syndrome (HGPS) is a rare genetic disorder in which the individual exhibits a phenotype expression similar to that of an aged individual. Involved individuals suffer from numerous complaints generally seen in the elderly. HGPS individuals displayed many oral manifestations as well as a multitude of abnormal craniofacial manifestations of the disorder.

**Keywords:** Progeria, Hutchinson-Gilford syndrome, Genetic mutation, Growth failure

## INTRODUCTION

The word "Ageing" does not give a good perceptions to most of us due to complaints & diseases accompanying with ageing. Many individuals take large doses of vitamins & proteins etc., all in the optimism of discovering the "fountain of youth". According to social, behavioral, physiological, morphological, cellular and molecular changes, ageing can be reflected in numerous ways. Ageing stories, principally anti-ageing therapies having a huge attraction in newspapers and magazines. Although etiology of aging is vital to understand, but it is equally significant to distinguish the normal physiological changes from those associated with diseases [1]. Aging can be described, according to Holland and Rogers, as an inevitable consequence of being a multicellular organism, accompanying with a random, passive deterioration in function, indicating in a universal loss of homeostasis over time and mortality enhancing with age [2]. Progeria is a subordinate, multisystem but devastating disorder involving various tissues and organs like bone, muscle, skin, adipose tissue, vessels and heart that mimic premature aging [3].

There are two types of progeria namely

**1) Hutchinson-Gilford Progeria Syndrome**
**2) Werner Syndrome (adult progeria)**

**1) Hutchinson-Gilford Progeria Syndrome**

Progeria was first reported in 1886 by Jonathan Hutchinson. It was also explained independently in 1897 by Hasting Gilford. The

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Review Article

JRAD

# Illuminating the Facts on Oral Manifestations of Psychiatric Disorders: An Accomplishing Review

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**Background:** Mental illnesses comprise a wide group of psychiatric disorders. Patients with psychological disorders have a number of special features that may be the origin of hard and / or soft tissue damage of the oral cavity. Many people affected by these disorders cannot carry out oral hygiene satisfactorily. Diseases of the oral cavity influencing these patients are the same as in the general population (caries, periodontal disease, malocclusion), but generally occur more frequently [dental treatment consists of addressing the problems of poor oral hygiene and resultant dental caries and periodontal disease. However motivating the patient to improve oral hygiene procedures is often difficult. The issue of dry mouth (xerostomia) accompanying many psychotropic medications should also be addressed.

**Keywords:** Psychiatric disorders, Oral health, Dental hygiene, Improvement in Oral health.

## INTRODUCTION

Oral health is a vital part of general health. It contributes and significantly improves the quality of life. There is evidence that patients suffering from psychological illness are more vulnerable to dental neglect and poor oral health [1]. It was reported that physical health problems are more common in psychiatric patients [2]. They seem to be poorly diagnosed & treated by psychiatrists and oral health is an exception. Psychiatric disorders affect the general behaviour of a person, their level of functioning and impair perception towards oral health. Living and changing patterns take precedence over personal hygiene making them susceptible to many oral diseases. Alternatively, oral symptoms may be the first or only manifestation of a mental health problem e.g. facial pain, preoccupation with dentures, excessive palatal erosion or soft inflicted sores. The two diseases which have a major influence on the oral cavity are dental caries and periodontal disease. Dentists spend a considerable amount of time treating patients who present with either psychiatric disorders like depression and anxiety or with physical manifestations of underlying emotional disturbances. Common manifestations of covert emotional disturbances in patients in dental practice include oral dysaesthesia, atypical facial pain and other atypical syndromes [3]. Increasing attention needs to be given to identify and appropriately treat emotional disorders more so as these constitute one third to one half of referrals to any liaison psychiatry service [4]. Somatoform disorders apart from posing management problems also cause significant functional impairment and mental disability for the patient [5]. Rees et al [6] recognized somatoform disorders as

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ORIGINAL RESEARCH

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IJoMfD

# PATTERN OF NON SYNDROMIC HYPODONTIA IN PATIENTS VISITING DENTAL COLLEGE IN CENTRAL GUJARAT – A STUDY

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**Abstract**

**Introduction:** Congenitally missing tooth (CMT) is the condition of having genetically one or more missing teeth which cannot be observed clinically or in radiographic images.[1] This anomaly occurs in three categories:[2] Hypodontia(Agenesis of less than 6 teeth without syndrome), Oligodontia (six or more teeth are missing) and Anodontia (absence of all teeth).[3,4] This study was carried out to evaluate specific missing teeth and pattern of distribution in maxillary and mandibular arches and on right & left sides.

**Materials and method:** This study was conducted on patients having age between 10 to 34 years, not having any history of tooth extraction, coming to the Department of Oral Medicine and Radiology, Faculty of Dental Science, DDU, Nadiad during two years period from May 2013 to April 2015. Those with cleft lip and palate or systemic syndromes and third molars were also excluded.The patients with missing teeth were observed during routine intraoral examination and panoramic radiographs were taken to confirm anodontia. **Results:** Excluding third molars, 288 congenitally missing permanent teeth were observed in 96 patients, 40 males (41.67%) and 56 females (58.33%).The rate of missing teeth was higher in females, 168 teeth(58.34%) than in males,120 teeth (41.68%)(Table I). mandible 175 teeth (60.76%) than in maxilla 113 teeth (39.24%) and slightly higher on right side 147 teeth (48.96%) as compare to left side 141 teeth (48.96%)(Table III & IV). Most commonly missing teeth were mandibular central incisors (10.07%) followed by maxillary lateral incisors (8.33%), mandibular second premolar (7.64%), mandibular lateral incisors (7.6%) followed by maxillary second premolars (5.38%),maxillary and mandibular first premolars.

**Key words:** Hypodontia, Congenitally Missing Teeth, Partial Anodontia, Oligodontia

## Introduction

The most common developmental and congenital dental anomaly is tooth agenesis.[1]Congenitally missing tooth (CMT) is the condition of having genetically one or more missing teeth which cannot be observed clinically or in radiographic images.[2]This anomaly occurs in three categories: Hypodontia(Agenesis of less than 6 teeth without syndrome) ,Oligodontia( six or more teeth are missing) and Anodontia (absence of all teeth).[3,4]

Dhyanrajani [5] classified hypodontia according to the severity of the condition. The term mild to moderate hypodontia is used to denote agenesis of two to five teeth while absence of six or more teeth excluding third molars indicate severe hypodontia.[5,6]According to Moyers, there are five principal known causes of congenital absence of teeth- Heredity, Ectodermal dysplasia, conditions such as rickets, syphilis and expression of evolutionary changes in dentition.[7]However CMT commonly are encountered in healthy apparently normal people.

Variation in the literature is seen as to which tooth types are commonly missing, that is due to ethnic variation. The most frequently missing teeth excluding the third molars are mandibular second premolars, maxillary lateral incisors, maxillary second premolars and mandibular incisors.[8] Most studies have found higher prevalence in girls than in boys.[9]

Hypodontia causes a disturbance in developing occlusion, masticatory dysfunction as well as affects asthetics.[10,11] Hypodontia creates significant challenges to the clinicians in both diagnosis and management. Comprehensive management often requires a multidisciplinary approach.[12] Precise and on-time diagnosis of hypodontia would be essential in preventing complications including periodontal damage, malocclusion and lack of alveolar growth.[13,14] This study was carried out in DDU, Faculty of Dental Science in the Department of Oral Medicine and Radiology Nadiad.The occurrence was evaluated in relation to gender, specific missing teeth and pattern of distribution in maxillary and mandibular arches and on right & left sides

Original Article

# Prevalence of Habit-related Oral Lesions in Patients Visiting Dental College in Central Gujarat

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## Abstract

**Background:** Oral cancer is the sixth most common cancer around the globe and one of the largest groups of cancer in the Indian subcontinent. The incidence and prevalence of oral precancerous lesions are rising due to an increase in number of people consuming tobacco and related products. This study aims to find the prevalence of use of tobacco, areca nut, and related products and associated oral mucosal lesions. **Materials and Methods:** It is a hospital-based prevalence study conducted at dental college in Central Gujarat. The study population were 1143 subjects having tobacco, areca nut, and related products associated oral mucosal lesions. A standardized extraoral and intraoral examination was performed by trained dental surgeons. All the details were entered into the specially designed pretested "Pro forma." The unpaired "*t*" tests, Chi-square tests, and Fisher's exact test were applied as required. $P < 0.01$ was considered statistically significant. **Results:** A total of 44,681 subjects (with a male-to-female ratio of 1.2:1) of above 15 years were examined. Among them, s total of 4667 (10.45%) subjects were having adverse habits in which a total of 1143 (24.5%) subjects were having oral habit-related lesions. Bidi smoking was a most prevalent habit (29.83%) followed by gutkha chewing (25.10%). Maximum patients were having habit of smoking from 11 to 15 years with frequency of 11 to 20 times/day, while in case of chewing, most of the patients were having habit for <5 years with frequency <10 times/day still more incidence of precancerous lesions were developed because of tobacco chewing. **Conclusion:** Prevalence rate of our study does not reflect the whole population but may prove valuable in planning future oral health studies. Increase in prevalence of oral submucous fibrosis, especially in lower age group in our study, is alarming.

**Keywords:** Prevalence study, Oral precancerous lesions, Oral cancer, Tobacco, Areca nut.

## Introduction

Oral cancer is a global health problem with rising prevalence and mortality rates. It constitutes one of the largest groups of cancer in the Indian subcontinent with an incidence rate as high as 30–40%.[1] The tobacco and areca nut habit have a major social and cultural role in communities throughout the Indian subcontinent, Southeast Asia, and parts of the Western Pacific.[2] Mortality attributable to tobacco has been estimated to be 1 million every year in India, projected to be 1.5 million by 2020.[3] India is the third largest producer and consumer of tobacco.[4] Kheda district is one of the leading tobacco growing areas of India.[5]

The adverse health effects associated with tobacco and areca (betel) nut use include addiction, oral and oropharyngeal cancer, and oral precancerous lesions and conditions.[6,7] The early diagnosis and treatment of such lesions would go a long way in improving the overall health status of the population and preventing the otherwise irreversible condition.[8]

Lack of adequate information to form a basis of effective preventive strategies prompted us to conduct this study with the objective of finding prevalence of use of tobacco and areca nut, their commercial preparations and different oral mucosal lesions associated with their use among the patients visiting OPD of Faculty of Dental Science, DDU, Nadiad, in Kheda district, Gujarat. Furthermore, their association with age, duration, and frequency of habits was studied.

## Materials and Methods

The present study was carried out in the Department of Oral Medicine and Radiology, Faculty of Dental Science, Dharmsinh Desai University, Nadiad, Gujarat. All the cases

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# Oral Pathology Publications

2016-2021

2018-2019

Rare disease
CASE REPORT

# Idiopathic macrocheilia

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## Summary

A 13-year-boy presented with painless swelling of upper and lower lips accompanied with gingival enlargement. The aetiology for these symptoms included vast pathological varieties but none of them could fit in. Clinical features were similar to orofacial graulomatosis but histopathological examination revealed chronic non-specific infection. Therefore, the final diagnosis was made as idiopathic macrocheilia through exclusion criteria. Management with intralesional triamcinolone acetonide 40 mg, twice a week for 3 weeks, resulted in significant remission in lip swelling without recurrence after a 6-month follow-up.

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## Footnotes

**Contributors:** The authors certify that they have participated sufficiently in the intellectual content, conception and design of this work or the analysis and interpretation of the data (when applicable), as well as the writing of the manuscript, to take public responsibility for it and have agreed to have their name listed as a contributor. They believe the case report represents valid work. Neither this case report nor one with substantially similar content under their authorship has been published or is being considered for publication elsewhere, except as described in the covering letter. They certify that all the data collected during the study are presented in this case report and no data from the study have been or will be published separately. They attest that, if requested by the editors, they will provide the data/information or will cooperate fully in obtaining and providing the data/information on which the case report is based, for examination by the editors or their assignees. Financial interests, direct or indirect, that exist or may be perceived to exist for individual contributors in connection with the content of this paper have been disclosed in the cover letter. The authors give the rights to the corresponding author to make necessary changes as per the

Review Article

JRAD Journal of Research and Advancement in Dentistry

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# Oral Manifestations and Dental Management Strategies in Maintenance Haemodialysis Patients

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## ABSTRACT

**Background**: Chronic renal Failure (CRF) is the progressive and irreversible deterioration of renal function. Patients with CRF requiring maintenance haemodialysis (HD) exhibit increased prevalence of oral lesions. Since worldwide increasing number of patients with this disease have been documented and majority of them show oral signs and symptoms related to disease or treatment, dental management of such patients require clinician to be aware of oral manifestations related to disease and understand patients' special condition such as bleeding tendency, hypertension, anaemia, drug intolerance, altered bone mineralization and increased susceptibility to infection. The purpose of this article is to aware dental practitioners regarding oral manifestations of CRF patients on maintenance haemodialysis and to summarize management strategies that can be put in to practice in dental office to treat these patients.

**Keywords:** Hemodialysis, xerostomia, oral manifestations.

## INTRODUCTION

Chronic renal failure (CRF) is a progressive and irreversible decline in renal function that causes metabolic derangements, bone disease, chronic inflammation, accelerated atherosclerosis and cardio vascular disease(1).Various causes for CRF include hypertension, diabetes, glomerular nephritis, interstitial nephritis, pyelonephritis etc. Worldwide prevalence and incidence of patients with CRF appears to be increasing and alteration in bone metabolism and in immune status can be significant to the dental practitioner as these patients have related oral lesions(1,2).

Maintenance hemodialysis or kidney transplantation are alternatives for the removal of metabolic waste products in CRF patients.(3)Patients on maintenance hemodialysis can be considered as a potential candidate for transplant. But due to lack of awareness about organ donation makes availability of transplant unpredictable. In India ,there are around 130,000 patients are on maintenance and the number is increasing by about 232 per million population.(4)From this view point to study oral lesions among these patients and to find possible link between different subjective symptoms and objective clinical findings becomes interesting for oral health practitioners.

### Oral Manifestations

Oral cavity exhibits manifestations of underlying systemic illness and serve as indicator of overall health. Up to 90% of patients with CRF show oral signs and symptoms in soft and hard tissues, some of them being a cause of disease itself and others deriving from the treatment of pathology.(5) The oral manifestations observed in CRF and maintenance hemodialysis patients are mainly unpleasant taste, burning sensation, xerostomia, dry fissured lips, uremic fetor, enamel hypoplasia, renal osteo dystrophy, coated tongue, pale mucosa, atrophic tongue and petechie etc.(3)

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Review Article

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# A Spectacular Visionary of a Human: At the Viral Terrorism on the Messenger Molecules Soldiers, Hormones

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## ABSTRACT

Tremendous progress in study of hormones' functions has raised the knowledge about their relationship between normal physiology and disease conditions of the living body. Human cells sensitive to viruses are susceptible to cause an infection. Disease severity is reflected by the number and the nature of cells infected, viral reproduction, inflammation and an immune response of an individuals. Hormones may alter a course of viral infection may be beneficial or detrimental to the host is a study scope as a natural or an experimental challenge for researchers. Hormonal balance is effective to prevent viral infection. Shaping of an immunity is depends on the kinetics of host immune response to virus (initial phase) and an extent of virus induced pathology (T-cell mediated lethality) by the role of HPA (Hypothalamus-Pituitary-Adrenal) Axis, cytokines and glucocorticoids. Hormonal administration after viral infection does not prove to protect the host from disease condition, only supportive to reduce progress and severity of disease status. Efforts by this review is to focus on prevention as a priority rather than curative measures against viruses for human existence.

**Keywords:** Hormones, Viruses, HPA Axis, Glucocorticoids, Immune –regulating signals.

## INTRODUCTION

Hormones are chemical molecular messengers in the human body secreted by an endocrine glands, circulate in the body through the blood and activate target cells (with receptors which correspond to the hormones). About 50 hormones, of nine specialized glands (pituitary, thyroid, four parathyroids, two adrenals and thymus), hypothalamus (nerve center) and number of organs (pancreas, heart, kidney

virus allows faster evolution with mutation even with smaller genome.[4] From $10^{13}$ bacteria and $10^{14}$ viruses of gut, about 1200 types of Intestinal commensal viruses, maintain intraepithelial lymphocytes numbers to form firm "great wall" against pathogen invasion to protect the host.[5] Some enteroviruses benefit the host via immune –

regulating signals and design to treat infection

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Case Report

Dentistry Section

# An Uncommon Occurrence of Pleomorphic Adenoma of Submandibular Gland in a 14-Year-Old Child: A Case Report

HIMANI TIWARI CHATURVEDI[1], CHANDRASHEKHER CHATURVEDI[2]



## ABSTRACT

Neoplastic disorders of salivary gland are rare in children and adolescents as compare to salivary gland inflammatory diseases. When salivary gland tumour occur in children, they are approximately 10 times more likely to occur in parotid gland than submandibular gland. Pleomorphic Adenomas (PA) of submandibular glands mostly occurs in third to fifth decade of life but rarely occur in children and adolescents. Patients usually present with a painless mass without any other associated symptoms and with female predominance. Radiologic studies are usually unable to differentiate benign from malignant neoplasm in most cases. Surgical removal of the submandibular gland along with tumour is the best treatment option for PA in children and adolescents. PA consists of epithelial and myoepithelial cells which forms various patterns along with different types of stromal formation and sometimes play challenges for diagnosis. Recurrences are rare in submandibular gland PA and the prognosis is excellent. Here, a case of a 14-year-old male patient who presented with a painless left submandibular mass that developed over the period of four months and was not associated with fever, erythema, oedema has been reported. Preoperative imaging revealed a submandibular mass contiguous with the left submandibular gland. The mass and left submandibular gland were completely excised. The histopathology confirmed the diagnosis of PA arising from left submandibular gland without any malignant changes. The postoperative period was uneventful. Patient follow-up was done till nine months and no recurrence was noted. Early diagnosis and strict follow-up pivots the management of PA in children.

**Keywords:** Benign neoplasm, Children, Salivary gland

## CASE REPORT

A 14-year-old male came to the Surgery department with a four months history of a slowly progressing lump in left submandibular region. On examination, a painless, firm, partially mobile, slow growing lump was present in left submandibular area with ill-defined margins and normal overlying skin [Table/Fig-1]. There was no history of fever, cough, redness, weight loss and anorexia. It was not associated with any relevant past history of medical, dental and surgical illness and family history also being insignificant. On general physical examination, patient was thin built, adequately nourished, well oriented to time, place and person with vitals being normal and all biochemical reports and chest radiograph were in normal limits. On palpation, mass was non tender and firm and no cervical lymphadenopathy was evident. The Ultrasonography (USG) neck showed a hypoechoic lesion of size 3.0x2.6x2.2 cm with well defined margins involving left submandibular gland. There was no obvious involvement or inflammatory changes of the surrounding tissues. Clinical differential diagnosis of sialadenitis and benign and malignant salivary gland tumour was made and provisional diagnosis of tumour of left submandibular gland was made based on clinical and radiological findings. Patient was posted for surgery. The surgery was proceeded with standard submandibular incision and complete excision of mass along with submandibular gland done under general anaesthesia. Closure was done after adequate hemostasis and specimen was sent for histopathologic examination [Table/Fig-2].

[Table/Fig-1]: Clinical picture having lump in left submandibular area.

[Table/Fig-2]: Per operative image of the lesion.

On gross examination, the specimen was 3.2x2.8x2.4 cm in size with tumour mass within the submandibular gland. Postoperative course was uneventful. The histopathologic examination revealed a partially encapsulated tissue comprising of both epithelial and mesenchymal components. Epithelial cells were arranged in solid sheets, tubules, acini and rods along with fibromyxoid and chondromyxoid stroma. Most of the tubular structures were composed of inner ductal epithelial and outer myoepithelial cell layer [Table/Fig-3-6]. No areas of malignant transformation were visualised. PA, myoepithelioma

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# Histopathological Study of Pericoronal Tissue and Radiological Evaluation of Various Position of Impacted Mandibular Third Molar

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**Abstract:**

**Background:** Removal of impacted mandibular third molar is a common procedure performed in oral surgery. Indications for removal of the third molar have generated much discussion in dentistry. The presence of pericoronal pathosis is generally accepted reason for the extraction of impacted mandibular third molars. Radiographic pathology is usually defined as a pericoronal radiolucency measuring about 2.5 mm or larger in any dimension.

**Purpose:** This study aims to evaluate the histopathologic changes in radiographically normal dental follicles associated with various types of impacted mandibular third molars.

**Methods:** After extraction of 50 impacted mandibular third molars, dental follicle associated with extracted teeth was placed in 10% formalin solution. Histopathologic examination was done. The type of pathological changes was recorded based on histopahological reports.

**Results and conclusion:** 46% patients with impacted third molar had vertical position and 58% patients with impacted teeth showed 0.5 to 1.5mm pericoronal radiolucency. Enamel organ epithelium (EOE) and squamous lining, epithelial rest in connective tissue and epithelial rest in connective tissue were higher in mesioagnular tooth position. Maximum percentage of myxomatous change was recorded in mesioagnular tooth followed by horizontal tooth position. Epithelial hyperplasia and severe inflammation were more common in distoangular teeth. Epithelial lining was absent maximum in vertical impacted teeth.

**Keywords:** Dental follicle, impacted lower third molar, pericoronal pathology, pericoronal radiolucency

## Introduction

Most of the uperupted molars are covered by an pericoronal tissue composed of soft tissue. During extraction this pericoronal tissueis removed surgically and the location of this tissue into tooth bearing area of the jaw indicates probable with both ectodermal and mesodermal components. [1] Deliberate retention of the impacted third molar, however caries a risk of squeal such as cyst formation, resoprtion of the root of second molar and tumour formaton[2]

# PLEOMORPHIC ADENOMA OF PAROTID GLAND: A CASE REPORT AND REVIEW OF LITERATURE

*Dr. Himani Tiwari **Dr. Bhupesh Patel ***Dr. Jigar Purani
****Dr. Grishma Doria ***** Dr. Rina Mehta

## ABSTRACT

Pleomorphic adenoma, the most common salivary gland tumor, also known as benign mixed tumor, because of its dual origin from epithelial and myoepithelial components along with mesenchymal stroma. Parotid gland is affected from 80 to 90% of cases. The tumor has female predilection between 30-50 years of age. Here we describe a case report of pleomorphic adenoma of parotid gland in 45 years old male patient.

*Keywords: Pleomorphic adenoma, parotid gland, myoepithelial cells*

## INTRODUCTION

Salivary gland tumors are uncommon and comprise only 1-4% of head and neck tumors. Majority of the salivary gland tumors occur in parotid gland with more than 70% of cases.[1] Pleomorphic adenoma or benign mixed tumor is the most common salivary gland neoplasm and involve 53-77% of parotid tumors.[2] The histopathologic features of pleomorphic adenoma is pathognomic. The term pleomorphic adenoma is because of its morphologic diversity exists among the tumor between individuals and glands and even within the same tumor. [3]

## CASE REPORT

A 45year old male reported the hospital with the complaint of slow growing swelling of right side of face, for 4 months. Swelling was initially small then reached to present size. On examination, 2x3 cm solitary, oval swelling was present in the preauricular area ***(Illustration 1)***.

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2020-2021

Case Report

# Oral condyloma acuminatum with changes in excretory duct of minor salivary gland: An unusual case report and review of literature

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**Abstract** Condyloma acuminatum (CA) is human papilloma virus-induced disease, rarely involving oral cavity, usually sexually transmitted and frequently occurs in anogenital areas. Oral lesions are being present predominantly on the tongue, lip mucosa, buccal mucosa, palate and floor of the mouth. The disease is more common in teenagers and appears as solitary or multiple, sessile or pedunculated masses. Here, we report the unique case of CA on the lower lip in a 45-year-old man, showing changes in the excretory duct of the minor salivary gland, which is relatively unusual.

**Keywords:** Condyloma acuminatum, human papillomavirus, oral

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## INTRODUCTION

Condyloma acuminatum (CA) caused by human papillomavirus (HPV), is often considered to be a sexually transmitted disease and frequently occurs in anogenital areas.[1] Oral CA is an increasingly common but frequently undiagnosed disease. CA generally appears 1–3 months after exposure to an infected partner and presents in multiple forms in the oral cavity.[2] Oral CA was first published by Knapp and Uohara in 1967.[1,3] CA is usually diagnosed in teenagers and young adults, but all ages are susceptible. Oral lesions often involve labial mucosa, lingual CA may involve the excretory ducts of the minor salivary gland.[7] Here, we present a case of oral CA on lower lip with changes in the excretory duct of the minor salivary gland which is relatively unusual and not much described.

## CASE REPORT

A 45-year-old man presented to our hospital with a 6-month history of a growth on his right side lower lip. On examination, three sessile nonulcerated grayish-white, soft, nontender raised circumscribed lesions were present on the right side lower lip, extending up to the

Emerging Hot Topics - Original Article

# Importance and correlation of sudden onset, presence and recovery of olfactory and gustatory dysfunctions in COVID-19 patients: A cross-sectional study

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## Abstract

**Background:** Coronavirus disease-2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), may be associated with acute onset of smell and taste dysfunction along with other common presenting symptoms such as cough, fever and myalgia. Our study aims to analyze the presence of olfactory and gustatory dysfunctions Olfactory and gustatory dysfunctions (OGDs) in patients with COVID-19 and to assess their onset and recovery.

**Materials and Methods:** The cross-sectional study was conducted in March 2021 retrospectively at Care Multispecialty Hospital, Vadodara. A total 301 patients were admitted, among those 280 qualify according to inclusion criteria and 3 patients denied to participate in the study. All patients presenting with laboratory-confirmed real-time reverse transcriptase polymerase chain reaction test for SARS-CoV-2 were included in the study. All 277 patients were undergone a diagnostic questionnaire through telephonic conversation which include patient main symptoms and self-assessment of loss of smell and taste and their onset and recovery.

**Results:** Two hundred and seventy-seven patients were included in this study. One hundred and fifty-three patients (55%) reported olfactory and gustatory disorders. Loss of taste and smell were more frequently reported in female patients (72.8%) than male patients (48%). Onset of these symptoms concomitant with other typical symptoms of COVID-19 is in 58.2% of cases. Recovery of symptoms in most patients was in 5–10 days and faster in younger patients.

**Conclusion:** Olfactory and gustatory disorders (OGDs) related to COVID-19 are frequently reported and more common in female patients. Rapid recovery was observed in most cases. Altogether OGDs can possibly act pivot screening or diagnostic tool for COVID-19 pandemic.

**Keywords:** Anosmia, COVID-19, gustatory, loss, olfactory, SARS-CoV-2, smell, taste

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Research Article

# Comparison of Distribution of Mast Cells in Leukoplakia and Oral Squamous Cell Carcinoma - A Retrospective Study

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## Abstract

Oral leukoplakia and oral squamous cell carcinoma (OSCC) are the commonly occurring oral diseases, with characteristic clinical and histological features. These diseases at some stages are associated with chronic inflammation in adjacent connective tissue. Mast cells are granule-containing secretory cells which are local residents of the connective, scattered along the capillaries of oral mucosa. They are proinflammatory and expressed the serine proteases, tryptase and chymase along with cytokines and may play a significant role in the pathogenesis of oral diseases. The aim of the study was to histologically evaluate and compare the presence of mast cells in Normal mucosa, Leukoplakia and Well differentiated oral squamous cell carcinoma. Thirty cases each of normal oral mucosa, oral leukoplakia, and oral squamous cell carcinoma (OSCC) were studied for mast cell number using 1% Toluidine blue. There was a linear increase in mast cell numbers were seen in leukoplakia and OSCC as compared to normal mucosa. Mast cell hyperplasia in oral leukoplakia and OSCC suggests their probable role in the pathogenesis of these diseases.

**Keywords:** Mast Cells; Oral Submucous Fibrosis; Oral Leukoplakia; Oral Squamous Cell Carcinoma

## Abbreviations

LT: Leukotriene; TNF: Tumor Necrosis Factor; IL: Interleukin; MMP: Matrix Metalloproteinases

## Introduction

Mast cell was discovered by Paul Ehrlich (1877), who termed it Mast Zellen i.e. fattened or well-fed cells [1]. Mast cells are key effector cell in allergic diseases, but it has become apparent that they also contribute to other pathologies, including autoimmune diseases and cancer. Mast cells secrete a wide range of proangiogenic, proinflammatory, immune-modulatory and mitogenic cytokines. Mast cells are large connective tissue cells (diameter-10 - 15 microns), with a life span of weeks to months, scattered along the capillaries, containing numerous basophilic granules in their cytoplasm. Mast cells release preformed secretory mediators like histamine, heparin, tryptase; lipid derived mediators like leukotrienes B4 (LTB4), LTC4, LTD4 and LTE4; pro-inflammatory cytokines like TNF-alpha, IL-1; mitogenic cytokines: IL-3, IL-5 and immunomodulatory cytokines like IL-4, IL-10 [2,3]. The commonly occurring oral diseases like oral leukoplakia, submucous fibrosis, lichen planus, squamous cell carcinoma have chronic inflammation in common it is probable that mast cells play key role in mediating the cross talks

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# Primary tuberculosis of submandibular salivary gland- A rare case report and diagnostic dilemma

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**ABSTRACT:**

Tuberculosis of submandibular gland is a rare condition and only few cases have been reported in literature. A rare case of primary tuberculosis of the submandibular gland is reported here which required surgical excision for definitive diagnosis. Polymerase chain reaction for tuberculosis is a reliable diagnostic tool, and if available, it should be performed before surgical intervention to enable differential diagnosis of a salivary gland tumor.

**Keywords-** tuberculosis, salivary gland

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# Battle between Human and Viruses: An Antidisease Visual Approach on Viruses' Aduptive Nature to Concentrate as an *Endurance Endeavors*

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**Abstract:- Humans were battling for survival before evolution till our modern lifestyle. Amongst all, viruses are such tiny organisms keep infecting a humans a decades ago and spreading in universe by many routes/pathways. Animal to human transmission is triggered outbreaks claiming thousands of lives, in a period of time by different species of viruses. RNA genome viruses are assumed to more virulent than DNA genome one due to its complex structural instability , environmental adoptability, mutational properties. Study of its entry in human body, attachment and replication into host cells, response of host defence cells by innate and adaptive immunity is helpful to know virus' mild to lethal pathogenic nature. Marburg, Ebola, HIV,influenza, SARS-COV, and 2019 –nCoV( COVID 19 /SARS-COV2) are few deadly threats of a battle. Study by lab investigation, vaccines, antiviral drugs need to focus on antidisease approach then anti pathology visionary to eradicate and protect human from viruses' bioweapon use.**

***Keywords:-*** *Viruses, immunity , 2019-n COVID, antidisease approach.*

## I. INRRODUCTION

Marburg, Ebola, Rabies , HIV,Herpes simplex, Smallpox, Hanta, influenza, Dengue, Rota, SARS-CoV -2( 2019-nCoV) are few deadliest viruses had put nature and lives in danger through endemic, epidemic or pandemic spread. Pathogenicity and existance of each one are depend on their diverse aduptive ecology/nature with different environs. Cure of infection , possible immunization at community level and / or global eradication are a challenge for medical profession which necessitate to explore virus with time.

## II. DISCUSSION

➢ *MARBURG VIRUS:*

Marburg virus is a filamentous negative sense, non segmented RNA virus from filoviridae family which encodes seven genes.[1] It was first found in1967, germany, continued outbreak till 2017 uganda, with 4th number of infection with upto 90% fatality.[2] Virus infected bats infects humans through abraded skin and mucosa, low aerosol transmission and fatal parenteral exposure.[3] Incubation period 2-21days. Accurate disease progression begins with flu-like symptoms chills, sore throat, headache, painful muscles and joints, alveolar congestion. Other symptoms include bleeding from mucosa, fever, bloody vomitus and watery diarrhea.[3] Diffuse skin rashes with

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# A review
# Trace elements: The unique chemical substances with fascinating biological influences on morphology and disease status of oro-dental tissues

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**ABSTRACT**:
Trace elements with its unique chemical properties, adequate amounts of availability in the environment and its easily accessible forms are essential for better survival of life. Nutritional value of trace elements can be analysed by various approaches. Significant role of these elements in humans is an immense field of study for structural and functional changes by its normal, deficient or excess amount exposure at particular stage of cell. Traces like Fluoride(Fl) zinc(Zn), Iron(Fe) copper(Cu) etc. are important for oral tissues health and severe changes in them can lead to discoloration, cracks, mottling of enamel, dental caries, fluorosis, glossitis, lichen planus and squamous cell carcinoma.
Any fluctuation in trace elements will reflect first functional activities of cells. Trace elements, (only 0.02% total body wt) fluoride(F-) zinc(Zn), Iron(Fe) copper(Cu), selenium(Se), chromium(Cr), cobalt(Co), Iodine(I), Manganese(Mn), Molybdenum(Mo) and Strontium(Sr)etc. from dietary source,[6] coordinate with other elements for cellular activities i.e. physiological and metabolic activity,[7] regeneration, repair and immunization.[7,8] Some of them like lead(Pb), nickel(Ni), Aluminium(Al), Boron(B) are known for toxic effects on the tissues.

Equanimity of trace elements does not show any major effects during short period of its deficiency or excess. Truancy or surpluses of elements at any stage of cell biology and along with duration of time during existence show an abnormal state of a particular tissue. Oral hard and

Tzu Chi Medical Journal 2021; XX (XX): XX-XX

Review Article

# Sudden onset of olfactory and gustatory dysfunctions in coronavirus disease 2019 (COVID-19) is momentous marker

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## Abstract

Coronavirus disease 2019 (COVID-19) presenting as global pandemic left no boundaries untouched worldwide. There are conglomerates of clinical and pathological presentation depending on population and geographic distribution. However amidst of such variable presentations, the sudden onset of olfactory and gustatory dysfunctions, if present, remains the most consistent and reliable symptoms of severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) infection. Olfactory and gustatory dysfunctions can be present either isolated or as a part of the spectrum of common symptoms such as fever, cough, dyspnea, and fatigue in COVID-19. The pathophysiology of olfactory and gustatory loss is thought to be due to the neural and cytopathic effect of SARS CoV-2 on nasal and tongue mucosa and olfactory neuroepithelium. This review intends to provide a concise description of recent evidence for structure, pathophysiology, prognosis, and treatment for smell and taste dysfunction in SARS CoV-2-infected patients, subjected to further studies and research. Vigilant screening of anosmia and ageusia could probably be an important tool in the fight against the COVID-19 pandemic.

**Keywords:** *Ageusia, Anosmia, Coronavirus disease 2019, Olfactory and gustatory dysfunction, Severe acute respiratory syndrome coronavirus 2*

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## Introduction

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) was first discovered in China in late 2019 has rapidly transformed as global pandemic worldwide [1]. SARS CoV-2 belongs to coronaviridae family and has a single-stranded RNA genome, enveloped virus. Based on early reports, bat is a natural origin of SARS CoV-2 [2,3]. Common clinical manifestations of COVID-19 infection include headache, fever, dry cough, fatigue, mfyalgia, anorexia, shortness of breath, sore throat, nasal congestion and less common are nausea, vomiting, and diarrhea [2-5]. Recently, several surveys and reviews proposed that acute taste and smell dysfunction in COVID-19 infection is a noteworthy finding [6-15]. This review summarizes the evidence regarding the association of anosmia and ageusia with SARS-CoV-2 infection.

## Structure of virus and mechanism of action

SARS CoV-2 has four structural proteins: spike (S) protein, nuclear capsid (N) protein, membrane matrix (M) protein, and envelope (E) protein, gathering of these proteins into infectious virion leads to distinct toxicity of coronavirus. The coronavirus invasion of the target cells is mediated by trimeric S protein with two domains, S1 for binding to the host cell receptors and S2 for the fusion process with the host cell membrane. The S1 upper lobular domain contains an angiotensin-converting enzyme 2 (ACE 2) receptors binding feature that engages the host cells to initiate entry into the cell. S2 domain contains the machinery required for the virus to fuse with the host cell mffembrane. S proteins are the main target for neutralizing antibodies and for new developing therapies because of their peripheral positioning [16,17].

SARS CoV-2 uses the ACE2 as receptor, which has ubiquitous distribution into the human body. ACE 2 receptors display the highest expression on type II alveolar cells, upper and stratified epithelial cells, absorptive enterocytes from ileum and colon, myocardial cells proximal tubule cells of kidney, bladder uroepithelial cells, glial cells and

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Original Article

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Effect of Micro-osteoperforations on the Rate of Orthodontic Tooth Movement: A Randomized Controlled Trial

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# Effect of Micro-osteoperforations on the Rate of Orthodontic Tooth Movement: A Randomized Controlled Trial

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## ABSTRACT

***Objectives*:** To evaluate the efficacy of Micro-osteoperforations(MOPs) on the rate of tooth movement, levels of Pain and Discomfort associated with MOPs as well as differences in anchorage loss between tooth movement with and without MOPs.

***Methods*:** Ten patients with Bidentoalveolar Protrusions, who were treated with Extraction of Upper First Premolars; divided into control and experimental groups. MOPs were performed on experimental side and control side did not receive MOPs. Canines on both sides were completely retracted till second premolar contact and time taken was recorded. Pain and discomfort were monitored with a numeric rating as well as visual analog scale. Anchor loss, if any was measured using study models and cephalometric method.

***Results*:** Micro-osteoperforations significantly increased the rate of tooth movement by 1.64-fold. The patients did not report to have experienced significant pain or discomfort during or after the procedure. No other complication was reported. And anchorage loss was not encountered.

***Conclusions*:** Micro-osteoperforations can be used as an effective, comfortable, and safe procedure to accelerate tooth movement without taxing anchorage and with minimal pain or discomfort. Mops tend to reduce the duration of orthodontic treatment.

***Keywords*:** Orthodontic tooth movement, Accelerated orthodontics, Micro-osteoperforations, Canine retraction, Anchorage.

## INTRODUCTION

Altering the biology of tooth movement since the turn of the century, has become an exciting focus of research to pursue treatment proficiency. Patients may elect to forego orthodontic treatment due to the cost and/or duration of treatment, with most cases, traditionally taking 24 to 30 months, or due to the visibility of orthodontic appliances. A multitude of potential benefits of accelerating orthodontic tooth movement has been reported in the literature. [1-6]

It is imperative to understand the biological principles and molecular mechanisms that govern tooth movement, based on which, the existing proposed acceleration techniques can be categorized into two types: a) indirect (acts on cytokines) and b) direct (acts on the target cells). Direct techniques include vibration, laser, and ultrasound and indirect techniques include Micro-osteoperforations(MOPs), Piezocision and Corticotomy etc. The biological mechanism of indirect techniques are based on a physiological healing process known as *Regional Acceleratory Phenomenon(RAP)*.

Many studies have reported that by increasing expressions of inflammatory markers like chemokines and cytokines, tooth movement can be accelerated via prostaglandin E2and RANK/RANKL pathway. [7-9]

Currently, various modalities have been suggested by the literature to accelerate the rate of orthodontic tooth movement. Corticotomy and Low Level Laser Therapy(LLLT) are most commonly used and researched. However, these methods have their own merits and demerits. Corticotomy being an invasive, time consuming and technique sensitive procedure; is difficult to incorporate into routine practice. Lately, *Micro-osteoperforations*(**Alveocentesis™**) have gained momentum and have succeeded in raising inquisitiveness amongst orthodontists to perform studies for research in determining the efficacy of MOPs to accelerate the rate of tooth movement.

Previous animal studies have shown that performing MOPs during orthodontic tooth movement can stimulate the expression of inflammatory markers, leading to increased osteoclastic activity and the rate of tooth movement.[10] Recent human

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# Paradigm shift in Orthodontics- A Review

★ Dr. Mudrika Patel
★★ Dr. Aakash Shah
★★★ Dr. Amish Mehta

**Abstract :**
The rapidly expanding field of Orthodontics is an intellectual challenge for every practitioner. Several fundamental conceptual changes are taking place in our profession. These trends signify alteration of traditional emphasis and have emerged gradually over the past 100 years. The integration of progress in material sciences, basic clinical sciences and technological advances has changed the treatment protocols and treatment time. This article describes the paradigm shifts in orthodontics including angle's paradigm versus soft tissue paradigm, extraction treatment versus non-extraction treatment, one phase versus two phase therapy, surgery first approach, paradigm shift in anchorage devices-Temporary Anchorage Devices and paradigm shift in diagnosis and management of dentofacial deformities.
**Keywords :** *Paradigm shift, Orthodontics*

## INTRODUCTION

Usually, science advances incrementally by the cumulative effort of investigators, each adding units of knowledge to the currently accepted model or paradigm.[1] Scientific progress proceeds in this appositional fashion, until a new way of looking at things arises, and a new paradigm is proposed and accepted. A new paradigm replaces old one, today's "truths" becomes tomorrow's "myths". There is generally great resistance on the part of practitioners of a scientific discipline to acceptance of a new paradigm. Once a paradigm shift has occurred, there is explosion of new ideas and information, leading to rapid advances in the field.[1]

In Orthodontics, we are on the threshold of paradigm shift that changes the concept of orthodontics.[1] Near the end of the first century of organized Orthodontics, several concepts are emerging, some of which may become state of the art, while others need validation or further development.[3] These include Angle's paradigm versus soft tissue paradigm, extraction treatment versus non- extraction treatment, one phase versus two phase therapy, surgery-first approach, paradigm shift in anchorage device-The Temporary Anchorage Devices and paradigm shift in diagnosis and management of dentofacial deformities.

## ANGLE'S PARADIGM VERSUS SOFT TISSUE PARADIGM

In early 1900s, Orthodontic diagnosis and treatment was based on hard tissue relationships and on the Angle paradigm that considers the ideal dental occlusion 'nature's intended ideal arch form'.[1] He solved the problem of dental and facial appearance by simply postulating that best esthetics always were achieved when patient had ideal occlusion. As time passed, it became clear that even an excellent occlusion was unsatisfactory, if it was achieved at the expense of proper facial proportions.[4] The changes in goals of treatment, which are focused on facial proportions and the impact of the dentition on facial appearance, have been developed in 1990s in the form of the soft tissue paradigm.[2] The soft tissue paradigm states that both the goals and limitations of modern Orthodontic and orthognathic treatment are determined by soft tissue of face, not by the teeth and bones.[2] The differences between Angle's paradigm and soft tissue paradigm are tabulated as below:

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# Orthodontic space closure in carious 1st molar extraction case- a preferred treatment option in young patients

*Dr. Aakash Shah **Dr. Amit Mendiratta
**Dr. Harsh Mandan

**ABSTRACT**

Orthodontic treatments involving missing or compromised first permanent molars are often challenging cases to treat considering the loss of potential anchor tooth. The case presents orthodontic treatment in a patient with mutilated dentition & carious first permanent molar. The treatment goals were to be accomplished by extraction of compromised tooth and retention of healthy dentition. The diagnosis and problem list needed extractions to accomplish the treatment goals. The possibility of extracting compromised first permanent molars instead of other healthy teeth was considered. Fixed appliances were used with simple mechanics without any additional anchorage devices. Case-based retention protocols were followed. The patient achieved the predetermined treatment objectives of improved esthetics and healthy and stable functional occlusion. This kind of treatment approach in young patients has triple advantage- avoidance of an artificial prosthesis at a young age, preserving healthy dentition as against a carious tooth and allowing more room for the eruption of third molar.

***Keywords:*** *Space closure, Prosthetic replacement, Asymmetric extractions, Mutilated, Molar extractions, Friction mechanics.*

## INTRODUCTION

Due to increased intake of processed, soft & sugary[1] diet in the young population, incidence of caries has increased. The 6-year molars are the early permanent teeth to erupt and they have high prevalence of caries. If unattended, this may lead to eventual loss of the tooth & consequent prosthetic replacement of the natural tooth. After the loss of tooth, if lot of time is elapsed, it may lead to supra-eruption of antagonist & tipping of adjacent teeth into edentulous area. Prosthetic replacement of this mutilated condition is one treatment alternative; & orthodontic ally correcting supraeruption, tipping of teeth & closing the space without any artificial teeth is another treatment alternative.

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Original Research

# Orthodontic-Periodontic : Inter-Relationship

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**ABSTRACT**

Orthodontic treatment aims at providing acceptable functional and aesthetic occlusions using appropriate tooth movements. These movements are specifically related to interactions of the teeth with their supportive periodontal tissues. Periodontic and orthodontic interactions usually deal with the establishment of an appropriate diagnosis and the treatment planning needed to enable coordinated periodontic-orthodontic therapy. A harmonious cooperation of the periodontist and the orthodontist offers great possibilities for the treatment of various orthodontic-periodontal problems. The present discussion focused on the effects of a combined periodontal and orthodontic treatment on the periodontal health and dentofacial aesthetics, and the mode that each field can contribute to optimize treatment of combined orthodontic-periodontal clinical problems.

**KEY WORDS :**

## INTRODUCTION

The relationship between periodontology and orthodontics consists of a highly complex, bidirectional and close interaction that is nowadays characterized by controversial scientific opinions and clinical approaches. The term synergy refers to two or more distinct influences or agents acting together to create an effect greater than that predicted by knowing only the separate effects of the individual agents. This definition is applicable to the classic relationship between orthodontic and periodontics specialties in treating patients. Understanding the biologic basis of periodontal surgical procedures, recent advancements in tissue engineering and research development can yield more productive clinical endpoints than ever before. Making the most of what these two specialties offer each other begins with the identification of periodontal problems that could become more complicated during orthodontic therapy and, conversely those that could benefit from orthodontic therapy.

The biologic basis of orthodontic treatment is that bone remodels and tooth moves on application of prolonged pressure to the tooth. Removal of bone occurs in some areas and addition in others, in a selective manner. In essence, the tooth socket migrates and the tooth moves through the bone carrying its attachment apparatus, i.e., periodontal ligament with it. This response occurs through mediation by the periodontal ligament; therefore, orthodontic tooth movement is basically a periodontal ligament phenomenon.

A multidisciplinary approach including an orthodontist and a periodontist is done in patients with periodontal disease. Both specialists should be involved in the treatment planning of such patients, and care should be taken in evaluation of progress of the treatment undertaken. Since orthodontic tooth movements are strongly associated with interactions of teeth and their supporting periodontal structures, we can say every orthodontic intervention has some kind of periodontal dimension. Adult patients opting for orthodontic treatment has increased recently and also the patients with periodontal problems faced by the orthodontists. Orthodontics may be an option in case of repositioning of periodontally compromised teeth. There are osteogenic changes seen in bone during orthodontic tooth movement, and there will be alteration of bone deformities and contours. The topography of the underlying bone and other intraosseous deformities influences the prognosis of periodontal therapy and pockets elimination[1].

### Timing of ortho-perio treatment

While establishing the treatment plan, it is important to define the treatment to be performed by the periodontist prior to starting orthodontic treatment as well as during and after orthodontic treatment. This should be done both to be able to perform tooth movement in a healthy environment and to optimize the function of the existing periodontal support and to enhance the final aesthetic result.[1]

**Procedure performed prior to orthodontic treatment**

- Oral hygiene motivation
- Prophylaxis or therapy to control inflammation
- Surgery to eliminate deep pockets
- Augmentation of attached gingiva
- Frenulectomy (frenectomy) and frenulotomy (frenotomy)
- Elimination of gingival clefts

**Procedures performed during orthodontic treatment**

- Prophylaxis to control inflammation
- Surgical exposure of impacted teeth according to periodontal concepts
- Fibrotomy and curettage during forced eruption and rotation correction

**Procedures performed during and/or post orthodontic treatment**

- Prophylaxis to control inflammation
- Clinical crown lengthening
- Gingivoplasty

**Procedures performed post orthodontic treatment**

Supportive therapy. The above outline is only indicative, as all decisions depend on the individual diagnosis and tailoring the timing of treatment to each patient's unique situation to achieve both the functional and aesthetic therapeutic goals. When labial orthodontic movement is planned, if needed a periodontal surgical procedure to increase the thickness of the attached gingiva prior to initiating orthodontic treatment can serve to optimize the final result. The same holds true for cases where tooth migrations have resulted in spaces opening and loss of the papilla and eventually a reduction or total lack of attached gingiva. In these cases surgery is

# CHANGES IN SOFT TISSUE MORPHOLOGY FOUND IN GUJARATI POPULATION FROM 8 TO 20 YEARS, HAVING CLASS-I DENTO-SKELETAL RELATIONSHIP-(A CEPHALOMETRIC STUDY)

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****Dr. Amish Mehta *****Dr. Vishal Patel ******Dr. Kinal Shah

**ABSTRACT**
Aim of present study was early diagnosis of varying areas of the dento facial skeleton between age 8-10 years to 18-20 years in Gujarati children for their timely management to give the individual better aesthetics. Study was conducted on 100 patients 25 male and 25 females from age group between 8-10 and 25 male and 25 females from age group between 18-20.
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***KEYWORDS -*** *Dentofacial skeleton, nasolabial fold, S line, H line*

## INTRODUCTION

The fact highlighted as early as 1834 reveals that the position of teeth and supporting jaws have a significant effect on an individual's facial appearance. It is also well known that the supporting jaws undergo great variation in their size and position during the growing phase particularly between the age 8 years to 20 years which have great influence on individual's facial form and acceptance. Any kind of abnormality in form of any part of dento-facial skeleton will have adverse effect on facial aesthetics of an individual. Different areas of the dento

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# SURGICAL MANAGEMENT OF SKELETAL CLASS III MALOCCLUSION: A CASE REPORT

*Dr. Vishal D Patel **Dr. Mable V Patel ***Dr. N. Raghunath
****Dr. Aakash Shah ******Dr. Amish Mehta ******Dr. Pratik Pandya

## ABSTRACT

This case report describes a successful orthognathic treatment of a skeletal Class III malocclusion with maxillary retrognathism and mandibular prognathism in an adult individual. The patient with Class III malocclusion, having maxillary deficiency and mandibular excess in sagittal plane was treated with orthodontics, Le fort 1 osteotomy advancement and bilateral sagittal split osteotomy.

The surgical-orthodontic combination therapy has resulted in near-normal skeletal, dental and soft tissue relationship, with marked improvement in the facial esthetics which in turn, has helped the patient to improve the self-confidence level. The interdisciplinary approach is the treatment of choice in most of the skeletal malocclusions.

**Keywords**: *Class III malocclusion, Decompensation, Orthognathic Surgery, Le Fort1 osteotomy advancement, Bilateral sagittal split osteotomy, Retrognathism, Prognathism, surgical orthodontic treatment.*

## INTRODUCTION

The Skeletal Class III malocclusion is characterized by mandibular prognathism, maxillary deficiency or both. Clinically, these patients exhibit a concave facial profile, a retrusive nasomaxillary area and a prominent lower third of the face. The lower lip is often protruded relative to the upper lip. The upper arch is usually narrower than the lower, and the over jet and overbite can range from reduced to reverse.

The effect of environmental factors and oral function on the etiological factors of a Class III malocclusion is not completely understood. However, there is a definite familial and racial tendency to mandibular prognathism. For many Class III malocclusions, surgical treatment can be the best alternative. Depending on the amount of skeletal discrepancy, surgical correction may consist of mandibular setback, maxillary advancement or a combination of mandibular and maxillary procedures.

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# Effect of Micro-osteoperforations on the Rate of Orthodontic Tooth Movement: A Randomized Controlled Trial

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## ABSTRACT

***Objectives*:** To evaluate the efficacy of Micro-osteoperforations(MOPs) on the rate of tooth movement, levels of Pain and Discomfort associated with MOPs as well as differences in anchorage loss between tooth movement with and without MOPs.

***Methods*:** Ten patients with Bidentoalveolar Protrusions, who were treated with Extraction of Upper First Premolars; divided into control and experimental groups. MOPs were performed on experimental side and control side did not receive MOPs. Canines on both sides were completely retracted till second premolar contact and time taken was recorded. Pain and discomfort were monitored with a numeric rating as well as visual analog scale. Anchor loss, if any was measured using study models and cephalometric method.

***Results*:** Micro-osteoperforations significantly increased the rate of tooth movement by 1.64-fold. The patients did not report to have experienced significant pain or discomfort during or after the procedure. No other complication was reported. And anchorage loss was not encountered.

***Conclusions*:** Micro-osteoperforations can be used as an effective, comfortable, and safe procedure to accelerate tooth movement without taxing anchorage and with minimal pain or discomfort. Mops tend to reduce the duration of orthodontic treatment.

***Keywords*:** Orthodontic tooth movement, Accelerated orthodontics, Micro-osteoperforations, Canine retraction, Anchorage.

## INTRODUCTION

Altering the biology of tooth movement since the turn of the century, has become an exciting focus of research to pursue treatment proficiency. Patients may elect to forego orthodontic treatment due to the cost and/or duration of treatment, with most cases, traditionally taking 24 to 30 months, or due to the visibility of orthodontic appliances. A multitude of potential benefits of accelerating orthodontic tooth movement has been reported in the literature. [1-6]

It is imperative to understand the biological principles and molecular mechanisms that govern tooth movement, based on which, the existing proposed acceleration techniques can be categorized into two types: a) indirect (acts on cytokines) and b) direct (acts on the target cells). Direct techniques include vibration, laser, and ultrasound and indirect techniques include Micro-osteoperforations(MOPs), Piezocision and Corticotomy etc. The biological mechanism of indirect techniques are based on a physiological healing process known as *Regional Acceleratory Phenomenon(RAP)*.

Many studies have reported that by increasing expressions of inflammatory markers like chemokines and cytokines, tooth movement can be accelerated via prostaglandin E2and RANK/RANKL pathway. [7-9]

Currently, various modalities have been suggested by the literature to accelerate the rate of orthodontic tooth movement. Corticotomy and Low Level Laser Therapy(LLLT) are most commonly used and researched. However, these methods have their own merits and demerits. Corticotomy being an invasive, time consuming and technique sensitive procedure; is difficult to incorporate into routine practice. Lately, *Micro-osteoperforations*(**Alveocentesis™**) have gained momentum and have succeeded in raising inquisitiveness amongst orthodontists to perform studies for research in determining the efficacy of MOPs to accelerate the rate of tooth movement.

Previous animal studies have shown that performing MOPs during orthodontic tooth movement can stimulate the expression of inflammatory markers, leading to increased osteoclastic activity and the rate of tooth movement.[10] Recent human

# ORTHODONTIC PERCEPTION OF SMILE ESTHETICS

Dr. Ahuti Shah, Dr. Vishva Bhalani, Dr. Amish Mehta, Dr. Vishal Patel and Dr. Ravina Patel

**ABSTRACT**

Introduction: Esthetics has become a major concern among patients and orthodontists. It has become the main reason why patients seek orthodontic treatment. The present survey evaluates the differential perception of smile esthetics among clinicians, orthodontists and laypeople. Material and method: The sample consisted of 300 selected to evaluate the orthodontic perception on smile esthetics from the Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dental Sciences, Dharmsinh Desai University. Subjects in divided into three group to evaluate the orthodontic perception on smile esthetics. The survey form with frontal smile photograph and a visual analogue scale was given for scoring to all three study groups. The data was collected and complied and statistical analysis was done using one-way analysis of variance (ANOVA) test. Results: 300 sample were divided equally in three groups namely orthodontists, layperson and general dentist, out of which Layperson showed maximum of score between 7 and 8, dentist showed maximum score between of 5 and 6 and orthodontist showed maximum score of between 3 and 4. Present study showed statistically significant results that the smile used for survey purpose was esthetically pleasant and all the three groups were found to be highly critical, the group comprising of orthodontists being the most critical about smile esthetics as they rated accordingly. Conclusion: The present study demonstrated the differences and similarities to how Orthodontists, Dental Professionals and Lay persons evaluated the smile esthetics. There wasn't any significant difference in the ratings because all the three groups showed similar tendencies in rating the preferences of gummy smile and midline shift. The group conducting most strict smile assessment were orthodontists, followed by clinicians and laypersons. However, no statistical differences were found amongst groups.

**Keyword:** orthodontics, smile esthetics, visual perception

## Introduction

From ancient societies and cultures to our modern society, a great emphasis has been placed on facial esthetics and physical attractiveness. The concept of esthetics is subjective, so it is very hard to determine objective criteria for defining the concept of beauty. The word esthetics is derived from a Greek word `aesthesis` which means perception[1]. Every person has its own parameters of defining beauty of a Subject. Appearance of a personality plays a major key role in social dealings. It has a great effect on the personality development, getting employment, showing performance, self-belief and being victorious. Smile, defined as a facial expression characterized by upward curving of the corners of the mouth, is often used to indicate pleasure, amusement, or derision[2]. The smile, which is essential to express friendliness, agreement, and appreciation, and to convey compassion and understanding, should not be ignored in diagnosis and treatment planning. Assessing beauty is a highly subjective matter. Meanwhile, assessing patient's smile allows the clinician to see what needs to be done, what can be done and what should be accepted[3]. Furthermore, perception of esthetics varies considerably among individuals and is influenced by personal experiences as well as by the social environment. Thus, in addition to assessing patient's smile in geometrical and objective terms, it is also necessary to scientifically understand smile pleasantness from the point of view of laypeople, orthodontists and clinicians[4]. Orthodontic treatment is based on occlusal relationships, but with the changing paradigm, facial esthetics and smile have gained importance. The purpose of this study is to compare the perception of smile esthetics by three panel groups include Orthodontists, Dental professionals and Lay persons.

## Aim

To evaluate the differential perception of smile esthetics amongst clinicians, orthodontists and laypeople.

## Material and Methodology

The sample consisted of 300 selected to evaluate the orthodontic perception on smile esthetics from the Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, Dharmsinh Desai University.

## Description of sample

Total of 300 subjects selected to evaluate the orthodontic perception on smile esthetics. Subjects are divided into three group.

Group -1: 100 Orthodontists to evaluate photograph of orthodontic perception on smile esthetics. Group-2: 100 Dentists to evaluate photograph of orthodontic perception on smile esthetics. Group-3: 100 Layperson to evaluate photograph of orthodontic perception on smile esthetics.

The photographic set-up consisted of a tripod (Harison Mega Mx-2100) that held camera (Nikon, Coolpix P5100) with a built-in flash. The camera was used in its Automatic Focus

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The surgical-orthodontic combination therapy has resulted in near-normal skeletal, dental and soft tissue relationship, with marked improvement in the facial esthetics which in turn, has helped the patient to improve the self-confidence level. The interdisciplinary approach is the treatment of choice in most of the skeletal malocclusions.

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Research Article

JRAD Journal of Research and Advancement in Dentistry

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# Prevalence and Severity of Dental Fluorosis in Nadiad Taluka, Gujarat, India

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## ABSTRACT

**Background**: A cross-sectional survey was carried out in schools of Nadiad taluka for the incidence and severity of dental fluorosis. Five different schools were randomly selected from the rural areas of Nadiad taluka for the study. Total 1065 students were examined during the study period.Out of total examined students, approximately 10% of children were affected with dental fluorosis.

**Keywords:** Dental fluorosis, Fluoride, School children, Dean's Fluorosis Index.

## INTRODUCTION

Fluoride helps in the development of teeth, bones and maintaining the health. It has great significance in preventive dentistry due to its cariostatic properties. However, excessive intake of fluoride leads to dental and skeletal fluorosis. Its abundance in the continental crust is about 626µg/g. [1] Endemic fluorosis resulting from high fluoride concentration of ground water is major health concern in Gujarat.Fluorosis is caused by ingestion of excess fluoride mainly through drinking water contamination. Due to its strong electro negativity, fluoride is attracted by positively charged calcium in teeth and bones causing dental fluorosis. [2]

The clinical appearance of dental fluorosis is characterized by lusterless opaque white patches in enamel which may become striated, mottled and/or pitted. The opaque area may become stained yellow to dark brown. The incidence and severity of dental fluorosis is significantly influenced by fluoride intake. This study was aimed to find out prevalence and severity of dental fluorosis.

## MATERIAL AND METHODS

A cross-sectional survey was conducted among the children attending free dental check-up camps held by the department of Public Health Dentistry, Faculty of Dental Science, Dharmsinh Desai University. In the first stage, five public schools were randomly selected from the rural areas in Nadiad taluka to record dental fluorosis in children, residing in the villages since childhood and consuming the groundwater. Official permission was obtained from the concerned authorities to conduct this study. In the second stage, the students

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Review Article

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# Radix Entomolaris: Literature Review

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## ABSTRACT

**Background**: Most commonly permanent mandibular first molars have two roots, one mesial, and the other distal root. In permanent mandibular first molars, anatomical variations like the number of root canals configuration and presence of a number of roots and their morphology are most common. Most complex morphological variation is the presence of supernumerary root either lingually or buccally. When the supernumerary root is located distolingually to the main distal root is known as "Radix Entomolaris (RE)". Adequate knowledge of root canal morphology and its variations are helpful for proper diagnosis, identification and treatment planning of this complexity, which leads to the successful outcome of endodontic treatment. The main goal of this article is to discuss the prevalence, morphology, classification, clinical and radiographic diagnosis and clinical significance of radix entomolaris in a permanent mandibular first molar.

**Keywords:** Distolingual root, radix entomolaris, mandibular molars, supernumerary root, additional root, extra root, root canal morphology.

## INTRODUCTION

The primary goal of the endodontic procedure is the elimination of bacteria and their toxins from the infected root canal system and the prevention of subsequent reinfection. This is achieved by a thorough chemico-mechanical preparation of the root canal space, followed by a three-dimensional hermetic seal.

According to Swartz, Skidmore and Griffen, reported that endodontic outcome of permanent mandibular first molars has a lower success rate compared with other teeth.[1] For this reason, clinicians must have adequate knowledge of root canal morphology and its variations, for prevention of failure of the endodontic treatment. Normal anatomy of permanent mandibular first molars has mesial and distal roots with three root canals, two mesial and one distal [2,3]. Many authors have been described the variations of root canal configurations in permanent mandibular first molars. In the study of anatomical variations, Fabra-Campos documented the presence of three mesial canals, whereas Stronger reported three distal canals [4,5].

Carabelli was first reported Radix entomolaris, an anatomical variant found in a permanent mandibular molar.[6] It is characterized by the presence of supernumerary root, which is typically present disto-lingually. Radix entomolaris can be found in the first, second, and third mandibular molars, but the least frequently seen in the second molar.[7-9] Prevalence of Radix entomolaris has been found less than 5% in white Caucasian, African, Eurasian and Indian populations while it

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Review Article

# Diabetes mellitus, a myth in orthodontics?

**ABSTRACT**

Diabetes mellitus (DM) is a chronic disorder of carbohydrate, fat, and protein metabolism. Conventionally, orthodontic treatment was considered to be a treatment modality for healthy young people. However, with increasing patient awareness, the trend has changed with adults now seeking orthodontic treatment. Approximately, half of the patients with diabetes are not diagnosed and an oral examination may provide the first diagnosis of the disease, So that treating doctor must have a basic knowledge of the oral features of DM. Here, we will see clinical aspects of DM, its oral manifestations, and orthodontic treatment considerations.

**Keywords:** Bone resorption, diabetes mellitus, hyperglycemia

## INTRODUCTION

Conventionally, orthodontic treatment was considered as a treatment modality for healthy young people. However, with increasing patient awareness, the trend has changed with adults now seeking orthodontic treatment. Considering the current lifestyle and habits, many adults are suffering from chronic diseases, one such disease is diabetes mellitus (DM). The clinician should, therefore, understand the consequences of DM in relation to dental and/or orthodontic treatment and should have a basic knowledge and understanding of this disease and its impact on the oral cavity. This article briefly deals with the medical aspects of DM, its oral manifestations and orthodontic treatment considerations.

## DIABETES MELLITUS: A GENERAL POINT OF VIEW

DM is a chronic disorder of carbohydrate, fat, and protein metabolism. A defective or deficient insulin secretory response, which translates into impaired carbohydrate use, is a characteristic feature of DM, as is the resultant hyperglycemia.[1] A persistently raised blood glucose level (hyperglycemia) is also a characteristic feature, resulting from deficiency in insulin secretion, insulin action, or both. The classic symptoms of marked hyperglycemia include polyuria, polydipsia, weight loss, and susceptibility to infections. Long-term complications include retinopathy, nephropathy, peripheral and autonomic neuropathy, cardiovascular disease, and in addition, increased tendency for periodontal disease is often found.[2]

## CLASSIFICATION OF DIABETES MELLITUS

The two broad categories of DM are designated Type 1 and Type 2. In Type 1 diabetes, the cause is an absolute deficiency of insulin secretion. It is often diagnosed in adolescence and therefore was called "juvenile-onset diabetes."[3] Type 2 DM is a heterogeneous group of disorders. Distinct genetic and

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# SURGICAL MANAGEMENT OF SKELETAL CLASS III MALOCCLUSION: A CASE REPORT

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## ABSTRACT

This case report describes a successful orthognathic treatment of a skeletal Class III malocclusion with maxillary retrognathism and mandibular prognathism in an adult individual. The patient with Class III malocclusion, having maxillary deficiency and mandibular excess in sagittal plane was treated with orthodontics, Le fort 1 osteotomy advancement and bilateral sagittal split osteotomy.

The surgical-orthodontic combination therapy has resulted in near-normal skeletal, dental and soft tissue relationship, with marked improvement in the facial esthetics which in turn, has helped the patient to improve the self-confidence level. The interdisciplinary approach is the treatment of choice in most of the skeletal malocclusions.

**Keywords**: *Class III malocclusion, Decompensation, Orthognathic Surgery, Le Fort1 osteotomy advancement, Bilateral sagittal split osteotomy, Retrognathism, Prognathism, surgical orthodontic treatment.*

## INTRODUCTION

The Skeletal Class III malocclusion is characterized by mandibular prognathism, maxillary deficiency or both. Clinically, these patients exhibit a concave facial profile, a retrusive nasomaxillary area and a prominent lower third of the face. The lower lip is often protruded relative to the upper lip. The upper arch is usually narrower than the lower, and the over jet and overbite can range from reduced to reverse.

The effect of environmental factors and oral function on the etiological factors of a Class III malocclusion is not completely understood. However, there is a definite familial and racial tendency to mandibular prognathism. For many Class III malocclusions, surgical treatment can be the best alternative. Depending on the amount of skeletal discrepancy, surgical correction may consist of mandibular setback, maxillary advancement or a combination of mandibular and maxillary procedures.

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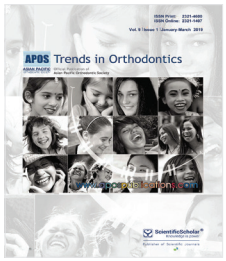

*Case Report*

# Correction of severe facial asymmetry: A case with fractured condyle

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## ABSTRACT

The current paper depicts the challenges faced during the treatment of a complicated case of mandibular condylar head fracture, facial asymmetry, and centric relation-centric occlusion (CR-CO) discrepancy along with Class III malocclusion. A 20-year-old female reported with the chief complaint of difficulty in chewing and concern with her appearance due to deviated jaw and had a history of trauma over chin region. The clinical and radiographic examination revealed significant facial asymmetry with long face, right-sided deviation of the mandible, fractured condyle, CR-CO discrepancy, cross-bite with Class III malocclusion, and a missing mandibular single incisor along with non-vital 21 and 22. She was treated with 0.022 MBT appliance along with guiding plane for CR-CO correction followed by asymmetric bilateral sagittal split osteotomy and differential set back on the right and left sides and finally rigid fixation. A good facial profile and functional occlusion were achieved and non-vital 21 and 22 were esthetically rehabilitated with PFM crowns. The stability of surgical as well as orthodontic corrections was excellent and appreciable in the records obtained 2-year post-treatment. When faced with mutilated malocclusion, with multiple problems, sequential correction of functional malocclusion with dental decompensation followed by skeletal correction with surgical approach has yielded a appreciable facial correction with good stability showing 2-year post-treatment follow-up.

**Keywords:** Angle's class iii malocclusion, Condylar fracture, Facial asymmetry, Orthognathic surgery.

## INTRODUCTION

Symmetry is considered as a hallmark of facial attractiveness.[1] Perfect bilateral face and body symmetry are largely a theoretical concept that seldom exists in living organisms.[2] The cause of asymmetry can be multivariate, dental, functional, skeletal, muscular, or combination of any of the above. The problem may originate from abnormal dental eruption, premature loss of primary or permanent teeth, trauma, or asymmetrical maxilla or mandible. According to Severt and Proffit,[3] the frequencies of facial laterality are 5%, 36%, and 74% in the upper, middle, and lower thirds of the face, respectively.

The prevalence of asymmetry is common, and its nature and cause might differ in various populations. The total facial structures were found to be larger on the right side than on the left. The attributing cause could be unilateral chewing.[4,5]

Diagnosis of transverse discrepancy should be accomplished by a thorough clinical examination and analysis of records including patients' age[6] so as to determine the dental, skeletal, functional, or soft-tissue component. The first step should be checking of centric relation (CR) with centric occlusion (CO). Keeping these factors as well as the nature and severity of the transverse problems in mind, surgical approach along with fixed mechanotherapy can be used to address the skeletal problems to fine tune the

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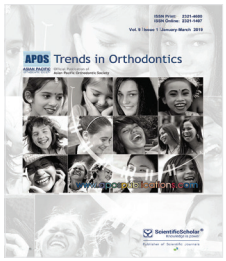

*Case Report*

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**Keywords:** Angle's class iii malocclusion, Condylar fracture, Facial asymmetry, Orthognathic surgery.

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Diagnosis of transverse discrepancy should be accomplished by a thorough clinical examination and analysis of records including patients' age[6] so as to determine the dental, skeletal, functional, or soft-tissue component. The first step should be checking of centric relation (CR) with centric occlusion (CO). Keeping these factors as well as the nature and severity of the transverse problems in mind, surgical approach along with fixed mechanotherapy can be used to address the skeletal problems to fine tune the

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# Effect of Micro-osteoperforations on the Rate of Orthodontic Tooth Movement: A Randomized Controlled Trial

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## ABSTRACT

***Objectives*:** To evaluate the efficacy of Micro-osteoperforations(MOPs) on the rate of tooth movement, levels of Pain and Discomfort associated with MOPs as well as differences in anchorage loss between tooth movement with and without MOPs.

***Methods*:** Ten patients with Bidentoalveolar Protrusions, who were treated with Extraction of Upper First Premolars; divided into control and experimental groups. MOPs were performed on experimental side and control side did not receive MOPs. Canines on both sides were completely retracted till second premolar contact and time taken was recorded. Pain and discomfort were monitored with a numeric rating as well as visual analog scale. Anchor loss, if any was measured using study models and cephalometric method.

***Results*:** Micro-osteoperforations significantly increased the rate of tooth movement by 1.64-fold. The patients did not report to have experienced significant pain or discomfort during or after the procedure. No other complication was reported. And anchorage loss was not encountered.

***Conclusions*:** Micro-osteoperforations can be used as an effective, comfortable, and safe procedure to accelerate tooth movement without taxing anchorage and with minimal pain or discomfort. Mops tend to reduce the duration of orthodontic treatment.

***Keywords*:** Orthodontic tooth movement, Accelerated orthodontics, Micro-osteoperforations, Canine retraction, Anchorage.

## INTRODUCTION

Altering the biology of tooth movement since the turn of the century, has become an exciting focus of research to pursue treatment proficiency. Patients may elect to forego orthodontic treatment due to the cost and/or duration of treatment, with most cases, traditionally taking 24 to 30 months, or due to the visibility of orthodontic appliances. A multitude of potential benefits of accelerating orthodontic tooth movement has been reported in the literature. [1-6]

It is imperative to understand the biological principles and molecular mechanisms that govern tooth movement, based on which, the existing proposed acceleration techniques can be categorized into two types: a) indirect (acts on cytokines) and b) direct (acts on the target cells). Direct techniques include vibration, laser, and ultrasound and indirect techniques include Micro-osteoperforations(MOPs), Piezocision and Corticotomy etc. The biological mechanism of indirect techniques are based on a physiological healing process known as *Regional Acceleratory Phenomenon(RAP)*.

Many studies have reported that by increasing expressions of inflammatory markers like chemokines and cytokines, tooth movement can be accelerated via prostaglandin E2and RANK/RANKL pathway. [7-9]

Currently, various modalities have been suggested by the literature to accelerate the rate of orthodontic tooth movement. Corticotomy and Low Level Laser Therapy(LLLT) are most commonly used and researched. However, these methods have their own merits and demerits. Corticotomy being an invasive, time consuming and technique sensitive procedure; is difficult to incorporate into routine practice. Lately, *Micro-osteoperforations*(**Alveocentesis™**) have gained momentum and have succeeded in raising inquisitiveness amongst orthodontists to perform studies for research in determining the efficacy of MOPs to accelerate the rate of tooth movement.

Previous animal studies have shown that performing MOPs during orthodontic tooth movement can stimulate the expression of inflammatory markers, leading to increased osteoclastic activity and the rate of tooth movement.[10] Recent human

Original Article

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# Correlating causative factors in cleft lip and palate patients: An epidemiological study

**Bhagyashree B. Desai, Dolly P. Patel, Surina V. Sinha, Mahesh Jain, Roopal N. Patel, Sheron T. Bhanat**

## ABSTRACT

**Aims:** The primary aim of this study was to correlate the incidence of cleft lip and palate (CLP) with possible etiological factors such as consanguinity, history of abortions or miscarriages, type of delivery, oral destructive habits, and family history.**Materials and Methods:** This retrospective study was completed using a standardized questionnaire which was prepared to investigate the information of 166 patients referred to/undergoing orthodontic rehabilitation treatment of CLP at the hospital. The variables assessed were consanguinity, affected members in family and relatives, gestational history, past abortions and/or miscarriages, medications taken by mother during pregnancy, and parental habits of tobacco chewing and/or smoking. **Statistical Analysis Used:** Correlation of the above-mentioned variables as well as any mutual effects of gender and cleft type was assessed statistically by Pearson's Chi-square test and Fisher's exact test. **Results:**The results of the present study provide demographic details of cleft patients in Gujarat, which show that cleft deformity is seen more in male patients ($n$ = 98; 59%). Unilateral CL and palate of left side (CL + PUL) occurs most frequently ($n$ = 62; 37.3%) both in male ($n$ = 40; 40.8%) and female ($n$ = 22; 32.4%) patients. Occurrence of CL + PUL is followed by bilateral CL and palate (CL + PB) ($n$ = 45; 27.1%) and unilateral CL and palate of right side ($n$ = 27; 16.3%). The oral destructive habits of parents ($n$ = 82; 49.4%), past abortions and miscarriage ($n$ = 47; 28.3%), family history ($n$ = 26; 15.7%), and consanguinity ($n$ = 24; 14.5%) could be correlated with the occurrence of CLP. **Conclusion:** This can serve as a guide for future reference to health workers so that they can take measures to create awareness among the people to avoid consanguineous marriages, use of tobacco, abortions, and create awareness about a family history. The outcome could also help government/public health sector workers to develop strategies for awareness, identification, and treatment of cleft deformities.

**Key words:** Cleft lip, cleft palate, consanguinity, tobacco consumption

## INTRODUCTION

Cleft lip (CL), with or without cleft palate (CL/+P), is the most common congenital deformity of the face and mouth which exhibits variable phenotypes.[1] The affected individuals may have CL, cleft palate (CP), or both (CL + P) and their prevalence varies by ethnic group and geographic location.

Global surveys have shown that the frequency of CLP varies greatly from country to country. Africans have the lowest prevalence rates (1/2500) and North American-Indians and Orientals have the highest prevalence rates (1/500). The frequency of cleft is higher in Asian people than that in other races.[2,3] In India alone, the number of infants born every year with CL + P is 28,600, which means 78 affected infants are born every day or 3 infants with clefts born every hour.[4] Approximately 70% of the CLP cases are of nonsyndromic variety and occur as an isolated condition, but 30% of oral clefts are syndromic and are associated with some anomalies.[5]

The etiology and mode of transmission of CLP is very complex because of the congenital anomalies that

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Vertical, Sagittal and Transverse Effects of Semi Rapid Maxillary Expansion Protocol Using a Removable Expansion Appliance: A Cephalometric and Model Based Study

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# Vertical, Sagittal and Transverse Effects of Semi Rapid Maxillary Expansion Protocol Using a Removable Expansion Appliance: A Cephalometric and Model Based Study

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## ABSTRACT

***Introduction:*** The aim of this study was to evaluate the vertical, sagittal and transverse effects of semi rapid maxillary expansion (SRME) in patients with transverse maxillary discrepancies using a modified removable expansion appliance assessed by lateral cephalograms and dental models.

***Materials and Methods:*** The lateral cephalograms and dental models of 50 treated patients group were compared with those of 29 untreated control group at 3 different times: pretreatment ($T_0$), after expansion ($T_1$) and after fixed appliance therapy ($T_2$). The mean age for treated group was 13.8yrs (32 females; 18 males) and control group was 13.2yrs (15 males; 14 females). A total of 18 measurements (8 angular; 10 linear) were measured in vertical, sagittal and transverse planes at $T_0$, $T_1$ and $T_2$ stages. The $T_0$-$T_1$, $T_1$-$T_2$ and $T_0$-$T_2$ changes were compared statistically in treated group with respect to the corresponding untreated control group. The intra-group and inter-group comparisons were statistically analyzed using Wilcoxon signed rank test.

***Results:*** In comparison to controlled group the following parameters in treated group showed a statistically significant change from $T_0$ to $T_2$. In vertical plane increase in ANS–Me and in sagittal plane decrease in angle ANB and OJ; increase in SNB and U1-SN was seen. In the transverse plane ICW, IPW, IMW, PMW showed net gain of 3.27, 5.06, 3.7 and 2.82mm respectively.

***Conclusion:*** The results of present study suggest that the design and protocol followed in using SRME is effective for the correction of maxillary transverse discrepancies with acceptable vertical and sagittal control.

**Key words**: Semi Rapid Maxillary Expansion, Transverse Maxillary Deficiency, Sagittal and Vertical Effect, Lateral Cephalogram, Model study.

## INTRODUCTION

Maxillary transverse deficiency is one of the most common conditions seen in the orthodontic office. The concept of maxillary expansion by opening of the mid palatal suture was introduced in the orthodontic literature by Angell in 1860. [1] Nearly 100 years after its introduction; the rapid maxillary expansion(RME) was popularized by the landmark works of Hass and became a routine procedure for the management of transverse deficiency in orthodontic offices. [2] On the basis of frequency of the activations, magnitude of the applied force, duration of the treatment, and patient age; maxillary expansion can either be rapid, semi rapid or slow maxillary expansion .[3-5] RME therapy is one of the most common orthopedic treatments for transverse maxillary deficiency. The rate of expansion in RME generally varies from 0.5mm and more per day over a period of 2-3 weeks. Twice-daily activation is usually recommended and the force of ~100N is generated at the mid-palatine suture. [6] RME not only produces expansion force at inter-maxillary sutures but also exerts greater force on various structures in the craniofacial complex. [7, 8] The long term evaluation of RME has also shown a tendency for relapse [8]. Slow Maxillary Expansion (SME) uses relatively lower orthopedic forces (5-20N) for longer time to accomplish similar amount of expansion. Half turn activation per week is usually recommended and this causes relatively lesser tissue resistance at the naso-maxillary complex. However the palatal expansion in SME is achieved after months instead of several weeks and also SME is said to have more of dental changes.[9] Hence to overcome the disadvantages of both RME and SME, a new method combining the effects of both namely, 'Semi Rapid Maxillary Expansion' (SRME) was recommended. [10] Several

# Long-Term Results of a Modified Removable Expansion Plate to Increase Arch Length: A Series of 10 Cases

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**Alka M. Banker[1], Rahul P. Muchhadia[1], Bhagyashree B. Desai[2], and Priyanka A. Shah[2]**

**Abstract**

Crowding, protrusion, and class II or end-on occlusion are malocclusions frequently associated with a narrow transverse dimension. The goal of expansion is to reduce the need for extractions in permanent dentition through elimination of arch length discrepancies as well as correction of bony base imbalances. Gaining arch length makes the subsequent fixed appliance treatment easier and shorter. Palatal expansion is usually achieved by using fixed rapid maxillary expansion, but because of the complexity, cost, and increased laboratory steps, this step is sometimes omitted. We have modified the design and screw activation protocol of the removable Schwarz plate in such a way that it gives efficient and stable expansion as well as arch perimeter gain with simpler mechanics. We present the long-term results of 10 such cases treated with this modified expander followed by fixed appliances.

**Keywords**

Removable, expansion, arch form, semi-rapid, Schwarz plate, transverse

## Introduction

This article shows how maxillary transverse discrepancies can be corrected by using a modified removable screw plate to increase the arch perimeter and gain space. Most of the cases with crowding are treated with extraction therapy or other approaches like rapid maxillary expansion (RME). A modified butterfly expander to increase anterior arch length has also been mentioned in the literature.[1] To the best of our knowledge, there is no literature that shows how the expansion is managed 2–3 years after retention with semi-rapid expansion protocol using a removable appliance. Modification of conventional Schwarz plates as well as screw activation protocol can bring about a lot of difference in end results. This appliance is simple and easy to use, does not cause pain or trauma, and gives long-term stable results. We present 10 cases of maxillary arch length discrepancies treated by such a modified expansion plate, which makes this approach of treating patients unique.

## Case Report

### *Diagnosis and Treatment Plan*

Ten patients in the age group of 12 to 15 years who presented with the chief complaint of crowded teeth were selected. The clinical evaluation showed relatively normal profile and Class 1 molar relationships. Using our earlier hypothesis,[2] it was found that all the patients had narrow maxillary arches with anterior crowding. None of the cases presented with a cross bite. The patients were given the modified screw plate and instructions on activation protocol were given. After 3 to 4 months, the patients were immediately put on fixed appliances (0.022 slot, pre-adjusted) without any retention protocols. Photographic records were taken at $T_0$ (pre treatment), $T_1$ (post expansion), $T_2$ (mid-fixed appliance treatment), $T_3$ (de bonding), and $T_4$ (post retention). The radiographic records were taken at $T_0$, $T_1$, and $T_3$ only.

### *Treatment Progress*

#### *Description of Appliance*

1. Appliance design: A simple removable plate was devised as the mode for expansion. An appliance

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**Case Report**

# CASE REPORT: HALLERMANN STREIFF SYNDROME

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**ABSTRACT**

The Hallermann Strieff syndrome (HSS) is a rare congenital disorder characterized by distinctive craniofacial malformations and significant orodental abnormalities. Very few such cases have been reported in the literature. Most cases of hallermann–strieff syndrome occur randomly, for unknown reason, may be the result of mutations, or changes in the genetic material. HSS is associated not only with developmental anomalies involving structures of ectodermal origin (face, skull, hair, skin, eyes and teeth) but also affects overall growth and development. One of such rare case of hallermann streiff syndrome reported at Department of Orthodontics, Government Dental College and Hospital, Ahmedabad with chief complaint of proclination of maxillary anterior is presented.



## INTRODUCTION

Hallermann-Streiff syndrome (HSS),an uncommon anomaly featuring oculo-mandibulo-cranial malformation. HSS was first incompletely described by Aubry in 1893 as oculomandibulodyscephaly syndrome, later described by Hallermann in 1948 and streiff in 1950, the term "bird face" was used because of the peculiar facial appearance[1].HSS results from a developmental disturbance that arises between the 5th and 7th week of embryonic life and affects the cephalic ventral extremity at themoment when development of facial bones and of lenses is at the highest degree, thus involving bothectoderm and mesoderm[2]. Hallermann-Streiff syndrome is considered to be a congenital disease characterized by dyscephalia, dental anomalies, proportionate nanism, hypotrichosis, atrophy of the skin, bilateral microopthalmia, and congenital cataract.[3]since the major symptom in all patients with this syndrome is cataract, most cases have been reported in the ophthalmologyliterature. Radiographic findings of the syndrome include hypoplasia of both the mandible and the maxilla and dysrhaphism ofthe suture[4].

The dental literature with respect to the Hallermann- Streiff syndrome has reported two additional radiographic signs,1: anterior displacement of the temporomandibular joint (TMJ), first reported by van Baleri,[5] and2: close proximity of the root apices of the molar teeth to the lower border of the mandible, reported only by Hutchinson[6]. Polymorphism of clinical signs is typical of HSS. Therefore, even if it is a rare disease, it requires an exact diagnosis in order to evaluate prognosis and implications of a probable genetic transmission.[7, 8, 9]

In 1958, Francois gave the diagnostic criteria of this syndrome. Around 150 cases have been reported in the literature. A case of 15 year old boy with classical signs and symptoms of Hallermann streiff syndrome is presented.

### *Case Report*

A 15 year old boy reported with the chief complaint of proclination of upper anterior teeth with no relevant dental history. As per the history, the patient was born after an uncomplicated full term pregnancy of a non-consanguineous marriage. His mother's obstetric history revealed no record of systemic disease or drug administration. His siblings were normal. His medical history revealed decreased vision and difficulty in breathing during sleep.

Physical examination of the patient's face revealed frontal bossing, small face, low set flared ears, small beaked nose, microopthalmia, opaciy of lens bilaterally, microstomia, retrognathia and convex profile . Skin of the face appears dry with hypotrichosis of scalp and eyelashes (fig 1). The patient has a propionate nanism. Intraoral examination revealedfull set of permanent teeth in maxillary arch and hypodontia of right central and lateral incisor and left lateral incisor in mandibular arch, scissor bite in right premolar region, unilateral chewing habit on left, fluoresced cervical margins of incisors, white

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patches on left buccal mucosa, large tongue with tongue tie, and small mandible.(fig 2)

Orthopantogram shows absence of lower right central incisor and both mandibular lateral incisors and impacted third molars in all quadrants. (fig 3 a). Lateral cephalogram reveals retrognathic, micro gnathic maxilla and mandible with skeletal class I relationship, vertical growth pattern, increased overjet and overbite. Upper incisors proclined and forwardly placed bodily, lower incisors retroclined (fig 3 b). Hand wrist radiograph indicates SMI stage III (Skeletal age estimate to be 12 ± 1years and chronological age 15 years). The radiographs of long bones and chest showed no significant findings. Chromosome analysis showed no evidence of structural or numerical abnormality in any of the chromosomes, except prominent satellite on chromosome 22, which is considered to be a normal variant. Thus a diagnosis of Hallermann streiff syndrome was made.

**FIG 3(a)** Orthopantogram

**FIG 3(b)** lateral cephalogram

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# Clinical Radiographic Analysis: Correlation Between Protrusive Interocclusal Record for Recording Condylar Guidance and Panoramic Radiographic Image: A Pilot Study

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## ABSTRACT

**Background**: The aim of this study was to compare the horizontal condylar angles set in the Hanau articulator by use of intraoral protrusive record to those angles found using a panoramic radiographic image.

**Materials and Methods**: Ten completely edentulous patients from either sex free of signs and symptoms of temporomandibular disorder were selected for in vivo study. For all patients, the protrusive records were obtained while doing extra oral gothic arch tracing and when the mandible moved forward by approximately 6 mm. The condylar guidance angles obtained were tabulated. A panoramic radiographic image of each patient was made and radiographically the angle was determined by cephalometric tracing

**Result**: The comparison of mean condylar guidance angles between the right side of the protrusive record method and the right side of the panoramic radiographic method and the left side of the protrusive record method and left side of the panoramic radiographic method ($p = 0.513$and $p = 0.118$, respectively) were not statistically significant ($p < 0.05$)

**Conclusion:** within the limit of this study, it was concluded that protrusive condylar guidance obtained by radiographic method can be used as an adjunct to protrusive method and error increases as if used independently to programme semi adjustable articulator.

**Keywords:** Cephalometric tracing, horizontal condylar guidance determination, protrusive records, panoramic radiograph, extra oral gothic arch tracing.

## INTRODUCTION

Three general classes of records are used for transferring maxillomandibular records from patients to articulator: interocclusal records, hinge axis records and graphic records. As complexity of articulator is increased it can accept all types of record. So, registration of accurate mandibular movement is important[5,7]. The inclination of the condylar path is thus a fundamental consideration in the prosthetic treatment. If condylar guidance is not recorded properly, this might lead to an increased chairside adjustment time due to arbitrary trimming which can be frustrating for both the patient as well as the dentist.

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Graphic writing apparatus needs to be firmly fixed to the jaws, in order to obtain accurate results. This becomes a concern for the clinician in edentulous patients where the attachment can be made only through occlusion rims. The graphic records are inaccurate as a result extra capability of an articulator that will reproduce curved movements is, therefore, of no use when designing complete dentures. Graphic method is sensitive, time consuming and messy and uncomfortable

The radiographic method of recording the horizontal condylar guidance (HCG) was introduced in the 1970s by authors such as Corbett *et al.*to overcome the disadvantages of clinical methods. The radiographic method is simpler, with the angles being read directly on the radiographs[1]. On lateral cephalogram and panoramic radiograph, various angles of temporomandibular joint (TMJ) are commonly believed to be related to the HCG angle. were made. A horizontal reference line was marked by joining the orbitale and porion. The most superior and the most inferior points of the curvatures were identified . These two lines were connected by a straight line representing the mean curvature line (Fig 3). Angles made by the intersection of the mean curvature line and the horizontal reference line were measured (Fig2). The data were subjected to statistical analysis by paired t-test

## RESULT

Table 1 shows the angles of the condylar guidance and standard deviations measured by the protrusive interocclusal record and panoramic radiographic method. The comparison of mean condylar guidance angles between the right side of the protrusive record method and the right side of the panoramic radiographic method and the left

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**Review Article**

# A COMPREHENSIVE REVIEW: MICRO-IMPLANTS IN ORTHODONTICS

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**ABSTRACT**

Anchorage has been a crucial topic since the origin of orthodontics. In the orthodontic process, gentle, constant pressure is applied to the teeth that need to be moved against the other teeth which serve as the anchoring unit. The anchoring teeth must be completely stable. Introduction of implants to orthodontic field have made this a possibility. Orthodontic implants also known as mini-implants have widened the horizon of orthodontic field. The mode of anchorage facilitated by these implant systems has a unique characteristic owing to their temporary use, which results in a transient, albeit absolute anchorage. The foregoing properties together with the recently achieved simple application of these screws have increased their popularity, establishing them as a necessary treatment option in complex cases that would have otherwise been impossible to treat. The aim of this comprehensive review is to present and discuss the development, clinical use, benefits, and drawbacks of the miniscrew implants used to obtain a temporary but absolute/skeletal anchorage for orthodontic applications. Topics to be discussed include classification, types and properties, types of, screw head, and thread, clinical applications, site and placement method selection, clinical procedures for implant insertion is presented.



## INTRODUCTION

Anchorage is defined as resistance to unwanted tooth movement. It is an essential prerequisite for the orthodontic treatment of dental and skeletal malocclusions. Prominent orthodontists namely, Gunnell, Desirabode, and Angle realized the limitations of moving teeth against other teeth used for anchorage thereby frontiering ideas such as the use of occipital, stationary, and occlusal anchorage.

From the far ages, orthodontists have used teeth, intraoral appliances, and extraoral appliances, to control anchorage thereby minimizing the movement of certain teeth, at the same time completing the desired movement of other teeth

Anchorage control helps to avoid undesirable tooth movements. However, even a small reactive force can cause undesirable movements. Therefore, it is important to have absolute anchorage to avoid them. Absolute or infinite anchorage is defined as no movement of the anchorage unit (zero anchorage loss) as a consequence to the reaction forces applied to move teeth. Such an anchorage can only be provided by using ankylosed teeth or dental implants as anchors, both relying on bone to inhibit movement. Anchorage provided by devices, such as implants or miniscrew implants fixed to bone, may be obtained by enhancing the support to the reactive unit (indirect anchorage) or by fixing the anchor units (direct anchorage), thus facilitating skeletal anchorage.

In 1945, Gainsforth and Higley used vitallium screws in mongrel dogs to create absolute anchorage for tooth movement. In 1983, Creekmore and Eklund were the first orthodontists to suggest that a small metal screw could withstand a constant force of sufficient magnitude and duration to reposition an entire anterior maxillary dentition without becoming loose, painful, infected, or pathologic, thus opening an entirely new area for managing orthodontic anchorage.

The aim of this comprehensive review is to present and discuss the development, clinical use, benefits, and drawbacks of the miniscrew implants used to obtain a temporary but absolute skeletal anchorage for orthodontic treatment applications.

### *Definition*

A temporary anchorage device (TAD) is a device that is temporarily fixed to bone for the purpose of enhancing orthodontic anchorage either by supporting the teeth of the reactive unit or by obviating the need for the reactive unit altogether, and which is subsequently removed after use. They can be located transosteally, subperiosteally, or endosteally;

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**Research Article**

# ASSESSMENT OF POSTERIOR TEETH ANGULATION IN PATIENTS WITH ANTERIOR OPEN BITE AND NORMAL OCCLUSION

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anterior openbite ,mesiodistal angulation of posterior teeth,vertical growth pattern

**ABSTRACT**

The aim of this study was to compare the posterior tooth angulations in patients with open-bite malocclusion and normal occlusion. Lateral cephalograms of 30 untreated open-bitesubjects were compared with the lateral cephalograms of 30 subjects with normal occlusion in the permanent dentition. The groups were matched for age and sex distribution and compared with t tests. The maxillary and mandibular premolars were more mesially angulated in relation to the bisected occlusal plane, and thefirst and second molars were significantly more distally angulated in the open-bite group in relation to the palataland mandibular planes.The maxillary and mandibular premolars were more mesially angulatedin relation to the bisected occlusal plane and therefore do not compensate for the divergence of the palatal and mandibular planes as the molars do.



## INTRODUCTION

Open bite malocclusion holds a challenging fascination in Orthodontics as it is not only difficult to treat but relapse tendencies are also strong. Numerous theories are proposed for cause of open bite mal occlusion including inherited facial form, unfavourable growth pattern, habits, nasopharyngeal airway obstruction, tongue posture and tongue function.Young Kim observed change in angulation in posterior teeth in subjects with open bite malocclusion as compared with normals. Increased mesial inclination of posterior teeth was significant finding in his study. According to him, last molars in the mouth are the only teeth that may occlude and this mesial inclination of molars block closure of the bite. Therefore efforts should be directed to upright the inclined molars thereby closing the bite.[1]

Extensive studies can be observed describing etiological factors for open bite. However fewer studies are observed which measures angulation of posterior teeth in open bite malocclusion. So the present study is carried out to compare angulation of posterior teeth in subjects with open bite compared to normal subjects.

## MATERIAL AND METHOD

The present study "Assessment of posterior teeth angulation in anterior open bite and normal occlusion" was carried out at the Department of Orthodontics and Dentofacial Orthopedics, Government Dental College & Hospital, Ahmedabad. The pre-treatment lateral cephalometric radiographs of 30 subjects with anterior open bite and 30 subjects with normal occlusion with the age range of 18 to 25 years who reported to the Department of Orthodontics, Government Dental College and Hospital, Ahmedabad were taken as sample for this study. Ethical clearance was obtained by institutional ethical committee.

Lateral cephalometric radiographs of 60 selected subjects were obtained and divided into two groups based on the amount of overbite.

**Group 1**: 30 untreated subjects with overbite ranging from 0.5mm-4mm with class I malocclusion (normal) and having pleasant facial profile.

**Group 2**: 30 untreated subjects with anterior open bite of 0.5 mm or more with class I skeletal maxillo mandibular base relationship irrespective of any other irregularities.

The lateral cephalograms were traced manually using 0.5 mm 3H micro tip pencil on matte acetate tracing paper.

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**Research Article**

# VIBRATION IN ORTHODONTICS: OVERVIEW

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Orthodontic tooth movement; Mechanical vibration; Root resorption; bone remodeling.

**ABSTRACT**

Orthodontic treatment being based wholly on the response of the bone and the tissue surrounding the bone takes an ample of time to achieve desired amount of tooth movement. This long treatment time burden the patient and the doctor with lack of patient cooperation, periodontal problems, improper oral hygiene, external root resorption, dental caries, and gingival recession, etc. Attempts to lessen the treatment duration by accelerating tooth movements created a major focus and became popularized as accelerated orthodontics that involves both invasive and noninvasive methods. The attempts become innovated focusing accelerated orthodontics with minimum drawbacks. The purpose of this article is to analyze and comprehend data of the studies developed on the mechanical vibration as a tool for accelerated orthodontic treatment.



## INTRODUCTION

The main concern of the patients and parents for seeking orthodontic treatment is its long duration. Orthodontic tooth movement (OTM) depends on the response of tissues around the root which involves remodeling of the alveolar bone which stands for the long duration of orthodontic treatment.[1,2,3,4] For shortening the duration of orthodontic treatment various surgical and non-surgical methods have been tried to accelerate orthodontic tooth movement. Surgical methods such as interseptal alveolar surgery, corticotomy, corticision, piezocision and microosteoperforations increase the speed of tooth movement. However surgical methods are expensive, needs patients' compliance and have post-surgical complications.[5,6,7]

Beside surgical method, mechanical stimulation can also increase the speed of orthodontic tooth movement. These modalities include low level laser therapy, direct electric current and cyclic vibrations. The purpose of this article is to review the role of cyclic vibration as a method to increase the velocity of tooth movement.

### *Evolution of Vibration in Orthodontics*[6,7,8]

As early as 1979, Shapiro and colleagues reported the use of pulsating force-induced piezoelectricity to stimulate tooth movement.

In 1982, Kurz received a patent for a vibrating headgear/ mouthpiece device.

In 1986, Kiev concluded that vibration at 50Hz for 60-360 seconds every two or three days reduced the time needed to move a tooth by a factor of 1.5-2 times.

Although academic interest in the orthodontic effects of vibration waned until the beginning of the 21st century, it persisted in orthopedic medicine.

In 2003, animal studies demonstrated an increased sutural response and more rapid tooth movement after vibratory stimulation.

In 2009 using a low-frequency pulse vibration prototype, Kau, reported accelerated tooth movement in both arches of 14 patients.

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# ORTHODONTIC PERCEPTION OF SMILE ESTHETICS

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**ABSTRACT**

Introduction: Esthetics has become a major concern among patients and orthodontists. It has become the main reason why patients seek orthodontic treatment. The present survey evaluates the differential perception of smile esthetics among clinicians, orthodontists and laypeople. Material and method: The sample consisted of 300 selected to evaluate the orthodontic perception on smile esthetics from the Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dental Sciences, Dharmsinh Desai University. Subjects in divided into three group to evaluate the orthodontic perception on smile esthetics. The survey form with frontal smile photograph and a visual analogue scale was given for scoring to all three study groups. The data was collected and complied and statistical analysis was done using one-way analysis of variance (ANOVA) test. Results: 300 sample were divided equally in three groups namely orthodontists, layperson and general dentist, out of which Layperson showed maximum of score between 7 and 8, dentist showed maximum score between of 5 and 6 and orthodontist showed maximum score of between 3 and 4. Present study showed statistically significant results that the smile used for survey purpose was esthetically pleasant and all the three groups were found to be highly critical, the group comprising of orthodontists being the most critical about smile esthetics as they rated accordingly. Conclusion: The present study demonstrated the differences and similarities to how Orthodontists, Dental Professionals and Lay persons evaluated the smile esthetics. There wasn't any significant difference in the ratings because all the three groups showed similar tendencies in rating the preferences of gummy smile and midline shift. The group conducting most strict smile assessment were orthodontists, followed by clinicians and laypersons. However, no statistical differences were found amongst groups.

**Keyword:** orthodontics, smile esthetics, visual perception

## Introduction

From ancient societies and cultures to our modern society, a great emphasis has been placed on facial esthetics and physical attractiveness. The concept of esthetics is subjective, so it is very hard to determine objective criteria for defining the concept of beauty. The word esthetics is derived from a Greek word `aesthesis` which means perception[1]. Every person has its own parameters of defining beauty of a Subject. Appearance of a personality plays a major key role in social dealings. It has a great effect on the personality development, getting employment, showing performance, self-belief and being victorious. Smile, defined as a facial expression characterized by upward curving of the corners of the mouth, is often used to indicate pleasure, amusement, or derision[2]. The smile, which is essential to express friendliness, agreement, and appreciation, and to convey compassion and understanding, should not be ignored in diagnosis and treatment planning. Assessing beauty is a highly subjective matter. Meanwhile, assessing patient's smile allows the clinician to see what needs to be done, what can be done and what should be accepted[3]. Furthermore, perception of esthetics varies considerably among individuals and is influenced by personal experiences as well as by the social environment. Thus, in addition to assessing patient's smile in geometrical and objective terms, it is also necessary to scientifically understand smile pleasantness from the point of view of laypeople, orthodontists and clinicians[4]. Orthodontic treatment is based on occlusal relationships, but with the changing paradigm, facial esthetics and smile have gained importance. The purpose of this study is to compare the perception of smile esthetics by three panel groups include Orthodontists, Dental professionals and Lay persons.

## Aim

To evaluate the differential perception of smile esthetics amongst clinicians, orthodontists and laypeople.

## Material and Methodology

The sample consisted of 300 selected to evaluate the orthodontic perception on smile esthetics from the Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, Dharmsinh Desai University.

## Description of sample

Total of 300 subjects selected to evaluate the orthodontic perception on smile esthetics. Subjects are divided into three group.

Group -1: 100 Orthodontists to evaluate photograph of orthodontic perception on smile esthetics. Group-2: 100 Dentists to evaluate photograph of orthodontic perception on smile esthetics. Group-3: 100 Layperson to evaluate photograph of orthodontic perception on smile esthetics.

The photographic set-up consisted of a tripod (Harison Mega Mx-2100) that held camera (Nikon, Coolpix P5100) with a built-in flash. The camera was used in its Automatic Focus

CASE REPORT

# Cemento-ossifying fibroma of mandible mimicking complex composite odontome

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## SUMMARY

Cemento-ossifying fibroma (COF) is a fibro-osseous lesion or non-odontogenic tumour that affects craniofacial bones. These lesions are included in the spectrum of fibro-osseous lesions arising from periodontal ligament cells, which can deposit combination of cementum and bone surrounded by fibrous tissue. It clinically, macroscopically and radiologically resembles complex composite odontome and can be differentiated only on the basis of histopathology. They usually occur solitarily as a painless and expansile spherical or ovoid jawbone mass that may displace the roots of adjacent teeth. They predominantly occur in females in third and fourth decades of life. We present a case report of a 20-year-old man, with a mildly painful swelling in the mandible which was successfully treated with enucleation and diagnosed as COF. Its resemblance to complex composite odontome and unique surgical approach are highlighted in this paper.

## BACKGROUND

Cemento-ossifying fibroma (COF) is a relatively rare osteogenic tumour, which is seen in the maxillofacial region. There are many fibro-osseous and odontogenic entities, especially complex composites odontomes, which mimic it clinically, macroscopically and radiologically. Although the line of treatment for both these lesions is similar, it is important to differentiate them histologically as they have distinct features. Further to add to its uniqueness, the lesion was more on lingual cortex below the level of mylohyoid muscle which warranted extraoral approach for excision.

## CASE PRESENTATION

A 20-year-old man presented with mild pain and swelling over left lower third region of face since 1 month. The pain was dull aching and referred to the temporal region. There was a history of toothache and extractions of multiple teeth in the left mandibular posterior region 5 months before. There was no associated paraesthesia of the inferior alveolar nerve, no pus discharge or no any trismus. Extraoral inspection and palpation (figure 1) revealed a small stony hard nodule-like growth on the left mandibular body region more on the lingual side. Intraoral inspection revealed no abnormal findings. Based on clinical findings and history of multiple teeth extractions, a provisional diagnosis was made as focal sclerosing osteitis. To further locate the position of the lesion, radiographic investigations were carried out in the form of orthopantomogram (OPG) (figure 2), various CT and cone-beam CT (CBCT) scan sections (figures 3–5). They revealed a solitary relatively defined high-density sclerotic lesion with hypodense borders seen in mandible on left side measuring 2×2 cm. Lesion was also causing expansion of the same along with breach noted in the lingual cortex. The findings suggested it as a benign lesion. All preoperative haematological investigations were within normal limits, and the patient was deemed to be fit for surgery. The patient was operated under general anaesthesia. As the lesion was below the level of mylohyoid muscle, it was exposed extraorally via submandibular approach (figure 6). Expansion and

**Figure 1** Extraoral photograph revealing slight bony enlargement on left junction of body and ramus of mandible.

**Figure 2** OPG reveals relatively defined heterogeneous radiopaque lesion, oval in shape with a surrounding radiolucent rim seen at the apical region of first and second molar edentulous area. OPG, orthopantomogram.

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# DENTAL MANAGEMENT OF PATIENTS ON ANTIPLATELET AND ANTICOAGULANT THERAPY: A REVIEW WITH CURRENT PERSPECTIVES

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## Abstract

There are a variety of discordant approaches for the management of patients on anticoagulant therapy undergoing dental or surgical procedures. As with all anticoagulants, bleeding, either spontaneous or provoked, is the most common complication so management protocols for the eventuality of bleeding is of utmost importance. Direct oral anticoagulants offer clinical advantages over warfarin, such as minimal drug interactions and fixed dosing without the need for routine monitoring of coagulation status. A thorough medical and dental history is critical to the identification of patients who may be on some type of hemostasis-altering medication. The dentist must be familiar with the types of diseases and conditions that necessitate the alteration of coagulation mechanisms and the different laboratory tests that are used to assess the coagulation status in these patients.

**Key words:** *anticoagulants, hemostasis, minor surgery*

## Introduction

Hemostasis is a defense mechanism which preserves vascular integrity and avoids blood losses,while ensuring optimum fluidity throughout the circulatory system. Anticoagulant drugs inhibit the enzyme vitamin K reductase, which mediates conversion of vitamin K epoxide to its active form.

As a result, the formation of coagulation factors dependent upon this active form is inhibited, and the coagulation process is blocked. So with this hemostatic alteration bleeding becomes difficult to control. As a result, some authors recommend suspending, reducing or replacing. Anticoagulation medication prior to invasive dental treatments, while others advise against such measures, due to the possibility of an increased risk of thromboembolic events.[1]

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# DENTAL MANAGEMENT IN PATIENTS WITH RENAL DISORDERS: A REVIEW WITH CURRENT CONCEPTS

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**Abstract**

Every dental professional is confronted regularly with patients suffering from single or multiple systemic disorders which necessitate modification in routine dental therapy. Renal disease, whether acute or chronic, constitute a large volume of patients who are suffering from underlying, untreated hypertension or diabetes ultimately leading to renal failure. Patients on dialysis or undergoing renal transplant therapy demand utmost care during dental treatment. This article aims at reviewing current perspectives in dental management of these patients.

**Keywords**: *renal disease, renal transplant, dental treatment*

## Introduction

With innovations in field of medicine and technology, the oral health care professionals have to apply a holistic approach for the management of patients with complex medical problems. Among the various systemic disorders, a major cause of morbidity and mortality worldwide is posed by renal diseases, as kidneys are the vital organs for maintaining a stable internal environment.[1] Multiple complex functions like excretion of metabolic waste, regulation of electrolyte concentration and blood volume, regulation of erythrocyte production in bone marrow and calcium homeostasis are performed by kidneys. Kidney diseases can be classified into developmental or inherited diseases and with respect to further course of illness, they can be sub-classified into chronic and acute renal diseases.

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CASE REPORT

# Idiopathic macrocheilia

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## SUMMARY

A 13-year-boy presented with painless swelling of upper and lower lips accompanied with gingival enlargement. The aetiology for these symptoms included vast pathological varieties but none of them could fit in. Clinical features were similar to orofacial graulomatosis but histopathological examination revealed chronic non-specific infection. Therefore, the final diagnosis was made as idiopathic macrocheilia through exclusion criteria. Management with intralesional triamcinolone acetonide 40 mg, twice a week for 3 weeks, resulted in significant remission in lip swelling without recurrence after a 6-month follow-up.

## BACKGROUND

Idiopathic macrocheilia is such a rare entity that there is no specific previous literature on it. Here, we have discussed all the possible associated disorders and excluded them scientifically as well as elaborated treatment for the same.

## CASE PRESENTATION

A 13-year-old male patient came to Department of Oral and Maxillofacial Surgery, Faculty of Dental Science, Dharmsinh Desai University, with a painless swelling of upper and lower lips, which has increased in size over a period of time with swelling on gums since last 2 years. There were no other associated symptoms but a sense of disfigurement. A detailed medical history, dental history, family history or history for allergy were unremarkable. There was neither history of trauma nor any insect bite. The systemic review of the respiratory and gastrointestinal tract was also non-significant.

**Figure 1** Preoperative facial profile showing upper and lower lip swelling.

**Figure 2** Preoperative lateral profile showing upper and lower lip swelling.

**Figure 3** Preoperative gingival enlargement.



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# PECTORALIS MAJOR MYOCUTANEOUS FLAP FOR MANDIBULAR RECONSTRUCTION IN ORAL SQUAMOUS CELL CARCINOMA: A CASE REPORT

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## Abstract

The pectoralis major myocutaneous (PMMC) flap can be used as either a pedicled or a free flap. The PMMC flap is still considered a workhorse flap for soft tissue reconstruction of the head and neck region. Although the increased use of free tissue transfers to reconstruct complex bony and soft tissue defects has overshadowed the PMMC flap to an extent, it remains a very useful, versatile, and reliable reconstructive option for many head and neck defects of the mucosa or skin, or both.Moreover, the proximity to the head and neck region larger arc of rotation and rich vascular supply are additional advantages of the PMMC flap. This article describes a case of oral squamous cell carcinoma of left lower alveolus reconstructed with PMMC flap afterhemimandibulectomy and modified neck dissection.

**Keywords:** *pectoralis major mayocutaneous flap, head and neck reconstruction, oral squamous cell carcinoma*

## Introduction

Carcinomas of the oral cavity form the second most common cancer in India. Patients usually present with advanced disease which requires extensive ablative surgery.

Modern head and neck surgery is characterized by its emphasis on three important objectives of reconstructive and rehabilitative procedures: esthetic, function and coverage of vital structures. Restoration of normal oral function following such extensive surgery-

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# EPULIS FISSURATUM OF MAXILLA: CONSEQUENCES OF ILL-FITTING PROSTHESIS: A CASE REPORT

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**ABSTRACT**

Epulis fissuratum, reactive fibrous hyperplasia/denture-induced fibrous hyperplasias are the various names attributed to reactive tissue response to chronic irritation and trauma caused by an ill-fitting prosthesis. Persistent trauma to oral mucosa may predispose the patient to carcinoma. Mucosal lesions related to the wearing of poorly adapted dentures are frequent. Chronic irritations with sharp or excessive edge lead to hyperplasic reaction. Epulis fissuratum represents 15% of benign tumour of the jaws, is a pseudo tumour growth located over the soft tissues of the vestibular sulcus. It has female predilection over males. Treatment indication for these lesions is surgical excision with appropriate prosthetic rehabilitation. We present a case of faulty denture and the resultant epulis fissuratum in a 62-year-old female patient.

***Keywords:*** *Epulis fissuratum, fibrous tissue, pre-cancerous, surgical excision, complete denture.*

## INTRODUCTION:

Denture-induced hyperplasia otherwise called epulis fissuratum is a hyperplastic condition of the oral mucosa caused by low-grade chronic trauma from ill-fitting dentures.[1] It is a reactive lesion of the oral mucosa to excessive mechanical pressure on the mucosa.[2]

Epulis fissuratum also known as Granuloma fissuratum is an oral pathologic condition thatappears in the mouth as an overgrowth of fibrous connective tissue. It is also known as inflammatory fibrous hyperplasia, denture epulis, and denture fibrous hyperplasia.

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# SIALOLITHIASIS – A CASE REPORT

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## ABSTRACT

Sialolithiasis accounts for the most common cause of diseases of salivary glands. The majority of sialoliths occur in the submandibular gland or the Wharton's duct. This article discusses the review of the literature, predisposing factors, signs and symptoms, diagnostic methods and various modalities available for the management of sialolithiasis. This case report presents a case of sialolith in the left Wharton's duct, which was explored and removed via an intra-oral approach.

***Keywords:*** *Sialolithiasis, Wharton's duct, Transoral sialolithotomy*

## INTRODUCTION

Salivary duct lithiasis refers to the formation of calcareous concretions or sialoliths in the salivary duct causing obstruction of salivary flow resulting in salivary ectasia, sometimes even dilatation of the salivary gland.[1]Sialolithiasis is the most common (50%) disease of salivary glands.[5] It is estimated to have a frequency of 0.15% in the adult population with a slight male predilection. [3] Sialolithiasis usually appears between the age of 30 and 60 years, and it is uncommon in children. [4]

Salivary calculi are generally unilateral, clinically they are round or ovoid, rough or smooth with yellow in color. [5] Bilateral or multiple gland sialolithiasis is occurring in less than 3% of patients. [6] Sialolith consists of mainly calcium phosphate with smaller amounts of carbonates in the form of hydroxyapatite, with minor amounts of magnesium, potassium, and ammonia. This mix is distributed evenly throughout. Submandibular stones are 82% inorganic and 18% organic material whereas parotid stones are composed of 49% inorganic and 51% organic material.

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# TUBERCULOUS LYMPHADENITIS-A REPORT OF AN UNUSUAL CASE

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## ABSTRACT

The neck is an anatomical site to which a variety of pathologic conditions of various origins can develop de novo or during the course of a systemic disease. Neck masses in general, can be divided into 3 major categories: of infectious origin, of neoplastic origin, and of congenital origin. Neck swellings are usually painful, and the patient's history reveals an episode of fever complemented with other signs and symptoms suspicious for an infectious condition either odontogenic or nonodontogenic in origin. In this article we report a case of a 47-year-old female patient with an intermittent painful swelling in her left submandibular region.

**Keywords**: *Lateral neck swellings, Submandibular, primary tuberculous lymphadenitis, tuberculosis, anti-tuberculosis therapy, giant cells.*

## INTRODUCTION

The neck is the site of occurrence for many diseases both benign and malignant in nature. From the benign group of tumors, lipomas are frequently encountered in the neck. [1]

Although superficial lipomas are easily diagnosed by palpation, deep seated lipomas are more difficult to assess clinically. Lymphangiomas are usually diagnosed and treated during infancy so very rarely is an undiagnosed lymphangioma seen during adulthood. Lymphangiomas or cystic hygromas present as diffuse, soft, multicystic compressible masses.[2]Hemangiomas and arteriovenous malformations of the neck are also mainly diagnosed during childhood. Clinical examination will reveal a pulsating tumorous mass, making tentative clinical diagnosis easier. Neurofibromas in the neck may occur as solitary tumors or as part of neurofibromatosis (von Recklinghausen's disease). The differentiation of schwannomas from solitary neurofibromas is clinically not feasible.[3]

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# MANAGEMENT OF BILATERAL PARASYMPHYSIS FRACTURE IN AN EPILEPTIC PATIENT: A CASE REPORT

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## ABSTRACT

The risk for skeletal fractures in patients with epilepsy is greater than general population. Many antiepileptic drugs increase the risk of bone fractures, minimal trauma may result in fractures during an epileptic seizure. The present case report describes the management of bilateral parasymphysis fracture in an epileptic patient.

***Key words:*** *antiepileptic drugs, parasymphysis, epilepsy, fracture*

## INTRODUCTION

Epilepsy is a neurological disorder characterized by repeated unprovoked seizures in the absence of a toxic metabolic or febrile condition.[1] A seizure is classified as "partial" when the electrical discharge responsible for it occurs in a specific area of the brain or "generalized" when the discharge affects the entire brain cortex. When there is loss of awareness, seizures are termed complex. Based on the cause, it can be symptomatic, idiopathic or cryptogenic.[2]Patients with epilepsy are at increased risk of accidental injuries, due to loss of muscle tone and self-protective reflexes to minimize the trauma during a fall. The most common examples are bone fractures and head injuries. Fractures are two to six times more prone to occur in epileptic patients than in the general population.[3]Muscular forces generated during a seizure may lead to fracture and dislocation of thejaw.[4] Therefore, the present case report describes the management of bilateral parasymphysis fracture in an epileptic patient.

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# ALVEOLAR RIDGE AUGMENTATION USING CHIN BLOCK GRAFT- A CASE REPORT

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## ABSTRACT

Severely resorbed alveolar ridge in esthetic zone of maxilla can compromise the successful implant placement and esthetic outcome. In clinical practice, though patients often demand osseointegrated implants to replace their missing teeth; the deficiency of bone volume is the primary reason for avoiding such treatment options. Despite recent advances in bone grafts and bone-substitute technology, the use of autogenous bone grafts continues to represent the "gold standard" in implant site reconstructive surgery. The mandibular symphysis (chin bone in interforaminal region) is a favorable donor site as it has an excellent risk-benefit ratio. This study reports a case of severely deficient maxillary alveolar ridge being only 2.45 mm of bone width and implant site requires a hard tissue base foundation: To fulfill this requirement, mandibular symphysis block bone is used to improve bone width.

*Keywords: Resorbed alveolar ridge, Chin block graft, Implant.*

## INTRODUCTION

The success of osseointegrated dental implants depends on whether there is sufficient volume of healthy bone at the recipient site at the time of implant placement. The placement of an implant at a site with a thin buccal crestal ridge (e.g., post-extraction ridge) mostly is followed by a significant buccal resorption.[1]

In addition to the biomechanical and functional needs of prosthesis, there are often esthetic considerations. Bone grafting is often necessary to place the implant in the proper location for an ideal esthetic result. The soft tissue covering often needs amplification in the esthetic zone. The bone foundation sets the base for the soft tissue drape.

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# Breaking the Chain in Therapy of Mucormycosis

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**Abstract:** ***Background: Mucormycosis is a life-threatening fungal disease that occurs in immunocompromised patients. However, treating the disease without reaching the depth of its pathogenesis wavers one from establishing the effectiveness of said treatment. We present two cases of patients with maxillary mucormycosis with diabetes mellitus as comorbidity, where we studied the role of iron as a benefactor to the progression of the disease and was treated with aggressive surgical management and antifungal drug. Method: In both cases, patients were put on empirical antibiotics. Incisional biopsy was performed. Glycemic Control was achieved and later Surgical intervention in form of sequestromy (Case 1) and partial maxillectomy (Case 2) was performed. Result: For both cases healing occurred with neovascularization. Conclusion: High mortality rates despite current regimen of mucormycosis remains unacceptable. Focusing on eliminating predisposing factors seems more feasible than the foreboding nephrotoxic effect of antifungal therapy with its added resistance. This article aims to highlight the fact that therapy to control ketoacids and iron chelating agents, along with antifungal, should be used to augment the results.***

**Keywords:** Mucormycosis, Diabetes mellitus, Iron, immunocompromised host

## 1. Introduction

Mucormycosis is a lethal infection caused by a saprophytic fungus that belongs to the order Mucorales, family Mucoraceae, and class Zygomycetes the genera of Mucorales that are Rhizopus oryzae (R.oryzae), Absidia, Rhizomucor, and Mucor. It manifests in a rhinocerebral, pulmonary, gastrointestinal, cutaneous, or disseminated form. It's association with comorbidities like uncontrolled diabetes mellitus, is acidotic, and occurs in patients with hematologic malignant disease like leukemia or patients receiving immunosuppressive therapy. Symptoms involving the oral and craniofacial tissues account for about 60% of all cases [1]. In uncontrolled diabetes mellitus commonest signs within the head and neck region are maxillary and orbital cellulitis [2].

Intraorally, the hard palate is mostly affected because of its proximity to the infection of the nasal fossa. If left untreated, this condition will cause severe comorbidity with craniofacial spread and death [1]. It poses a diagnostic and therapeutic dilemma for people who are not acquainted with its clinical presentations.

We describe our clinical experience with two cases of mucormycosis of the maxilla related to uncontrolled diabetes mellitus managed at our centre. The series of cases was reported with subsequent aims:

1) To highlight the clinical presentation of mucormycosis.
2) To emphasize the requirement for early diagnosis, prompt and aggressive surgical management.
3) To form awareness that reduction of the predisposing factors results in hampering the proliferation of fungus.

**Case 1**

A 50 years old female patient reported to Maxillofacial department with pain in upper right back teeth region for 2 months. Patient was unaware of her medical condition. The patient gave history of removal of faulty prosthesis and extraction of mobile teeth in upper arch before 3 months.

On clinical examination facial symmetry was present and paraesthesia was evident over right cheek. Whitish yellow exposed bone observed in right maxillary arch extending from 13 to 16 region of approximately 3X2 cm in size (figure 1). Palatal defect in midline along with exposed bone was seen. No sign of nasal regurgitation.

Halitosis present with absence of pus discharge. Alveolar segment irt 13 to 16, tender on palpation with no segmental mobility.

An orthopantomogram (OPG) showed atrophic maxilla and mandible. However, computated tomography scan showed diffuse heterogeneous and sclerotic appearance of right maxillary sinus. Bone lysis and erosion involving right lateral half of anterior portion of hard palate and alveolar arch. Routine biochemical investigations showed elevated random blood sugar (RBS) levels 377mg/dl and Hba1c-10.7.

The patient was hospitalized and treated by cefotaxim 2000mg per day, metronidazole 1500mg per day and insulin actrapid. A provisional diagnosis of maxillary osteomyelitis



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Case Report

JRAD Journal of Research and Advancement in Dentistry

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# Osteomyelitis of Maxilla

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## ABSTRACT

**Background:** Because of its structure osteomyelitis of the maxilla is rare. The maxilla is composed almost entirely of spongy bone with a very thin cortex. The maxillary blood supply is more extensive than in the mandible. Any infectious process of this bone can either remain localized or spread into the soft tissues and result in a cellulitis, fistula or sinusitis. Osteomyelitis has a variety of clinical presentations depending on the virulence of the infecting organisms, the resistance of the host, and the reaction of the bone and periosteum to the inflammation. We describe our clinical experience of maxillary osteomyelitis treated at our center having different type of causes. Etiology as well as management of osteomyelitis is discussed in this article.

**Keywords:** Infection, Maxilla, Mucormycosis, Osteomyelitis, Osteonecrosis.

## INTRODUCTION

Osteomyelitis is an inflammatory condition of the bone that begins as infection of the medullary cavity, rapidly involves the haversion system, and quickly extends to the periosteum of the affected area. The infection becomes established in the calcified portion of bone when pus in the medullary cavity and beneath the periosteum compromises or obstructs the blood supply. Following ischemia the infected bone becomes necrotic.[1]

Osteomyelitis in maxilla is rare, as the maxilla has a significant collateral blood flow, thin cortical bones, and bone marrow with struts which make it less prone to infection.[2] Thin cortical plate and a relatively rare paucity of medullary tissue in the maxilla preclude confinement of infection within bone and permit the dissipation of edema and pus into the soft tissue and paranasal sinuses.[3] Uncontrolled diabetes is the major cause of osteomyelitis along with bacterial infection, viral infection and fungal infection such as mucormycosis, aspergillosis etc.

## CASE REPORT 1

**History** - A 60year old male patient reported with Pain and mobility in upper left back teeth region since 20 days. Patient was Diabetic and under medication for the same since 10 days. Patient gave a history of extraction of 24, 25 & 26; 1 month previously. Following the extraction, the socket had not healed completely. On Extraoral examination a single diffuse swelling of size 1*1 cm was seen at the left side of face. On intraoral examination unhealed extraction socket with exposed bone & Pus discharge present in relation to 24, 25 & 26. Draining sinus tract present in relation to 22, 23. Mobility of fragment of left side of maxilla.

**Investigation** - CT revealed erosion of bone on left alveolar process of maxilla. Histopathological report revealed chronic osteomyelitis. (Figure 1)

**Management** - Extraction of all left maxillary teeth along with sequestrectomy and debridement done under general anesthesia. Pre fabricated template was given after closure. (Figure 2)

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Case Report

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# Ridge Augmentation Using Autogenous Block Bone Graft Harvested From Mandibular Symphysis Region Followed By Implant Placement: A Case Report

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## ABSTRACT

**Background:** Long term success of dental implant is primarily depend on the available bone.Severely resorbed alveolar ridge in aesthetic zone of maxilla can compromise the successful implant placement and aesthetic outcome. This study reports a case of severely deficient maxillary alveolar ridge being only 1.7 mm of bone width and implant site requires a hard tissue base foundation.To fulfill this requirement, mandibular symphysis block bone is used to improve bone width. After 6 months of the graft surgery 2.3 mm gain in bone width was noticed, implant was placed. Significant amounts of autogenous bone can be procured from symphysis region of the mandible. The cortical grafts of this area provide predictable increase in bone volume with a short healing time and yield a highly dense osseous architecture for implant placement. Block bone grafts harvested from the symphysis can be used for predictable bone augmentation up to 6 mm in horizontal and vertical dimensions. The range of this corticocancellous graft thickness is 3 to 11 mm with most sites providing 5 to 8 mm. Then density of the grafts is D-1 or D-2 and up to a three-tooth edentulous site can be grafted. This case report reveals the use and applicability of mandibular symphysis block bone to augment a horizontally deficient maxillary ridge for single dental implant placement.

**Keywords:** Bone, graft, atrophy, mandible, dental implant.

## INTRODUCTION

Resorption of alveolar ridge is a common sequelae of tooth loss[1].It becomes a challenge for the dentist to restore esthetic and function.various reconstruction techniques have been used (bone grafting, guided bone regeneration, orthognathic surgery or bone distraction) out of which autogenous block bone grafts are considered as gold standard in the repair of bone defects especially as a part of implant site development.Intraoral donor site for autogenous block bone graft are mandibular symphysis, ramus and residule ridge. Among the different available augmentation materials, only autologous bone combines osteoconductive, osteoinductive,and osteogenic characteristics compared to bone substitute and composite materials[2,3] .Because of its properties and absence of immunological reactions,autologous bone grafts have been considered as the "gold standard" and most effective material in bone regeneration procedures[4-7].Implant placement in augmented areas have reported high success rate[8].

This case report demonstrates the efficacy of using block bone graft harvested from symphysis region for dental implant placement in region of maxillary central incisor.

## CASE REPORT

A 17 year old healthy male patient reported to our department with the chief complain of missing

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Review Article

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# A Plunge into Pathogenesis and Management of Chronic Osteomyelitis of Jaws: A Retrospective Study

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## ABSTRACT

**Background:** Osteomyelitis is an inflammatory process of bone involving the medullary cavity that has a tendency to progress along the medullary space and involve the adjacent cortical bone, periosteum and surrounding soft tissues. Chronic Osteomyelitis (COM) of jaws is a relapsing and persistent infection that evolves over months to years which is characterized by low-grade inflammation, presence of dead bone (sequestrum), new bone apposition, and fistulous tracts. Possible reasons for the development of various clinical conditions are discussed along with the treatment. With the advances in surgical treatment today, the antibiotic therapy and current resources for accurate diagnosis and differentiated approaches of chronic osteomyelitis, better results are being obtained in its treatment outcome. To better understand the characteristics and treatment outcomes of this disease, this study retrospectively evaluates and reports the factors associated with the diagnosis and management of 22 patients with Chronic Osteomyelitis of the jaws seen at the Dharmsinh Desai University – Faculty of Dental science institution during the past ten years.

**Keywords:** Chronic Osteomyelitis, Mandible, Maxilla.

## INTRODUCTION

In spite of all the advancements in dental and medical care, osteomyelitis of the jaw is still a common disease [1]. Osteomyelitis has a variety of clinical presentations depending on the virulence of the infecting organisms, the resistance of the host, and the reaction of the bone and periosteum to the inflammation [2]. The introduction of antibiotics has decreased the threat of acute osteomyelitis of the jaw, but relapses and persistent chronic osteomyelitis of the jaw are still concerns for clinicians [3]. Chronic osteomyelitis (COM) of jaws is classified into various types on the basis of their clinical characteristics. According to the Zurich classification system [1], Chronic osteomyelitis of jaws can be divided into primary chronic osteomyelitis of jaws (PCO) and secondary chronic osteomyelitis of jaws. Secondary chronic osteomyelitis of jaws is further sub-classified into three major clinical types: suppurative chronic osteomyelitis (SUP), osteoradionecrosis of the jaw (ORN), and bisphosphonate-related osteonecrosis of the jaw (BRONJ). The name suppurative chronic osteomyelitis is derived from the major symptoms of this chronic osteomyelitis of jaws type; namely, abscess/pus formation, sequestration, and exposed bone [1]. The hypothesized major aetiology is deep bacterial invasion of the medullar and cortical bone by odontogenic infection and/or extraction wounds and bone fracture [1,4]. ORN is caused by head and neck radiation therapy, and BRONJ is thought to be

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Review Article

# Ameloblastomatous Calcifying Odontogenic Cyst: A Rare Entity

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## Abstract

**Introduction:** Ameloblastomatous calcifying odontogenic cyst (COC) is an extremely rare histopathologic variant of COC, an odontogenic cyst of the jaws. It needs to be differentiated from closely associated variant ameloblastoma ex COC that is entitled to a more aggressive form of surgical management. **Aim:** The aim of this paper is to present a case of ameloblastomatous COC of the right mandibular angle region with review of literature describing this rare entity. The paper also highlights the requirement of including this lesion in differential diagnosis of various jaw lesions. **Materials and Methods:** Google search, Wikipedia, ScienceDirect, MEDLINE, the Cochrane library, and PubMed were used extensively to search and collect all reported cases of ameloblastomatous COC using keywords such as ameloblastomatous COC, COC, maxilla, mandible, and gorlin cyst ameloblastic proliferation. **Results:** To the best of our knowledge, a total of twenty one cases of ameloblastomatous COC have been reported in the literature in the maxilla-mandibular region and we represent the twenty second case in a 20-year-old female patient along with the review. **Conclusion:** Ameloblastomatous COC – a subtype of COC needs to be differentiated from true ameloblastoma arising from COC as it warrants a conservative form of surgical management unlike other neoplastic variants of COC. Owing to scarcity of data of this lesion in literature, more reporting of such cases is required to shed light on its behavior.

**Keywords:** Ameloblastomatous calcifying odontogenic cyst, calcifying odontogenic cyst, ghost cell, gorlin cyst ameloblastic proliferation, mandible, maxilla

## Introduction

Since Gorlin's first discussion of calcifying epithelial odontogenic cyst in 1962,[1] the World Health Organization (WHO) in 2005 had classified calcifying odontogenic cyst (COC) in the group of odontogenic tumors having odontogenic epithelium with odontogenic ectomesenchyme with/without dental hard tissue formation which now in 2017 has been reclassified in the group of odontogenic cysts. It is well known that the lesion is often associated with the tumors of odontogenic origin such as odontoma, ameloblastoma, and adenomatoid odontogenic tumor.[2] Although the association of ameloblastoma with this lesion is important, only a few such cases with synchronous representation of more than one type have been reported so far. WHO classification by Kramer and Pindborg used the term COC and described its cystic or neoplastic variants in the jaw in 1992.[3] Even majority of authors have categorized it under two basic groups of cysts and tumors. Due to its variable histology, clinical behavior and association with dysregulated β-catenin signaling, there is confusion till date whether or not it is a reactive or developmental or neoplastic entity.[4] The cystic variant of COC is characterized by a unicystic lesion associated with or without odontoma and are in majority. They may also show ameloblastomatous proliferative activity intraluminally or intramurally.[4] The neoplastic variants of COC which show a solid growth pattern consisting of ameloblastoma such as strands and islands of odontogenic epithelium infiltrating into mature fibrous connective tissue, are further subclassified into ameloblastoma arising from COC (ameloblastoma ex COC) and odontogenic ghost cell tumors.[4] Malignant transformation of COC has been reported.[5]

Ameloblastomatous COC resembles unicystic ameloblastoma except for ghost cells and calcifications within the proliferative epithelium and the fact that it occurs only intraosseously.

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Original Article - Retrospective Study

# Efficacy of Platelet-Rich Plasma and Concentrated Growth Factor in Treating Androgenetic Alopecia - A Retrospective Study

**Enosh Nirmalkumar Steward, Hiren Patel, Haren Pandya, Hitesh Dewan, Bijal Bhavsar, Urvi Shah, Kartik Dholakia**
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## Abstract

**Introduction:** Plasma derivatives have been practiced a lot in orthopedics, burns, and sport medicine. Microneedling (MN) with platelet-rich plasma (PRP) therapy has been proven to improve the micro-circulation and thus improve hair growth. The role of concentrated growth factor (CGF) for hair growth has not been mentioned anywhere in the literature for hair growth which we tried to prove in our article by comparing it with various other studies. **Materials and Methods:** This is a retrospective randomized study involving 20 male patients whose ages ranged from 21 years to 56 years. PRP was prepared using the dual-spin method and injected after activation; post-MN, CGF gel was applied topically. Four sessions were performed, and a follow-up was done after 6 months. Statistical analysis was done using the Statistical Package for the Social Sciences software version 21 for Windows (SPSS, IBM Corp, Armonk, NY, USA). Paired *t*-test was used for the various comparisons. **Results:** Hair loss reduced by the end of the first month. At the end of 6 months, postfirst session, microscopic examination showed statistically significant difference in the hair count compared to those during the baseline. **Discussion:** PRP having platelet-derived growth factor and vascular endothelial growth factor acts on stem cells in the follicles, stimulating the development of new follicles and promoting neovascularization. CGF helps stimulating cell proliferation and matrix remodeling due to numerous growth factors in a concentrated form. Thus, this therapy combined helps to boost the hair growth in a very significant way. **Summary:** This study provides the preliminary evidence of efficacy of PRP along with MN and CGF in treating androgenetic alopecia by promoting angiogenesis along with vascularization and promotes hair follicles to enter and extend the anagen phase. Most of the results obtained show improved results with this therapy. A larger case study for the same can further be done for a stronger recommendation of the use of CGF for hair growth therapy further.

**Keywords:** 5-alpha-reductase inhibitors, androgenetic alopecia, growth factors, patterned hair loss, platelet-rich plasma

## Introduction

Androgenetic alopecia (AGA) is a nonscarring progressive miniaturization of the hair follicle with a usually characteristic pattern distribution of hair loss in genetically predisposed men and women.[1] The degree of hair loss becomes apparent with aging. Individuals with higher genetic predisposition to hair loss, start losing their hair earlier and to a greater degree than those with a lesser predisposition. By the age of 25, approximately 20% of men will shows the signs of hair loss which increases to 75% by the age of 60 years. Of the 75% of men, about half of these will show significant hair loss at frontal and vertex region. AGA affects up to 80% of men and 40% of women.[2] Hair loss in women occurs usually postmenopause, and they experience thinning of hair due to hair follicle's genetic programming.[3]

Minoxidil topical lotion and finasteride oral tablets are the Food and Drug Administration approved conservative treatment of hair loss.[4] Minoxidil appears to prolong the anagen while finasteride is 5-alpha reductase Type II inhibitor which reduces the conversion of testosterone to dihydrotestosterone (DHT).[4] Minoxidil originally was developed as an anti-hypertensive agent that attracted interest when its oral administration led to generalized hypertrichosis. It is available as an over-the-counter preparation, and it increases the anagen phase and promotes the survival of dermal papillary cells and

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# Chondrosarcoma of Maxilla - A Rare Case Report

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## Abstract

**Rationale:** Chondrosarcoma, although being a rare entity in jaws, may turn fatal if left untreated or inadequately excised. Prognosis in terms of 5-year survival rate ranges from 90% for Grade I, 81% for Grade II and 43% for Grade III respectively. **Patient Concerns:** A 35-year-old male patient reported with a gradually progressive hard painless growth over right maxillary molar region. His main concern was removal of pathology without long-term morbidity. **Diagnosis:** Computed tomography revealed ill-defined mass with internal calcification involving posterior half of upper right alveolus. **Treatment and Outcomes:** Mandatory biopsy suggested benign chondroma, however wide excision and infrastructural maxillectomy revealed Grade II chondrosarcoma. **Take-away Lessons:** Complex anatomy of maxilla renders surgical excision of chondrosarcomas with histological clear margins, a daunting task. Due to misdiagnosis of preoperative biopsy, suboptimal excision of malignant mass may lead to local recurrence and occasional distant metastasis. This necessitates further therapy and long term follow up, with occasional poor patient compliance.

**Keywords:** Biopsy, chondroma, chondrosarcoma, maxilla

## Introduction

Chondrosarcomas constitute a rarity in entire head and neck region accounting for 5.6% cases of malignant tumours.[1] Few cases have been reported in cervicofacial region in descending order-anterior maxilla, skull base, cervical vertebrae and nasal cavity.[2] They are malignant mesenchymal tumours which arise from remnants of embryonic cartilage precursors from nasal septum in anterior part of maxilla and from Meckel's cartilage in posterior aspect of mandible.[3]

Diagnosis of chondrosarcoma is amongst the trickiest in tumour pathology. Depending upon size of biopsy, diagnosis may vary. This discrepancy between biopsy and wide excision is highlighted in this paper, where a seemingly benign tumour of maxilla, upon infrastructural maxillectomy without neck dissection, revealed Grade II chondrosarcoma.

## Case Report

### Patient concerns

A 35-year-old male reported to Department of Oral Maxillofacial Surgery with a history of painless growth in right maxillary region since 6 months which later progressed slowly over a period of 2 months. His primary concern was removal of pathology, no external scar, preservation of facial contours and no long-term morbidity. There was no associated systemic illness, nor any destructive habits.

Extraoral examination revealed right malar disfigurement, nasolabial fold obliteration and intact visual acuity. Paraesthesia was present on right infraorbital region with no cervical lymphadenopathy. Intra-oral examination revealed lobulated growth of approximately 4 cm × 3 cm in size, involving right maxillary canine to molar region obliterating buccal vestibule. It was multinodular, fixed, nontender, firm in consistency and overlying mucosa appeared inflamed [Figure 1]. There was no pus discharge although root pieces of right maxillary molars were seen with marked mobility.

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Original Article - Evaluative Studies

# Efficacy of Collagen Membrane Graft in Intraoral Surgery - An Evaluative Study

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## Abstract

**Introduction:** Bovine-derived collagen membrane is usually and regularly used as a temporary cover or dressing for extraoral wounds and burns. It has wide applications because of its usefulness and biocompatibility. This has provoked us to do a study with the use of collagen membrane even for minor intraoral surgical defects. The aim of this evaluative study was to evaluate the clinical efficacy of collagen membrane in intraoral wounds created by removal of various soft tissue lesions. **Materials and Methods:** A total of 25 healthy patients (16 males and 9 females) were taken for this study. This study was confined to secondary defects of the oral mucosa, which occur after excision of premalignant lesions and other conditions, such as benign lesions, reactive proliferations, and incisional biopsy wounds. Only those lesions that were sufficiently large and could not be closed primarily were included in the study. **Results:** The results were evaluated on the day of surgery and in the postoperative period. The usefulness of collagen membrane as an intraoral temporary wound dressing material to promote haemostasis, relieve pain, induce granulation, and assist in rapid epithelialization at the wound site and prevent infection, contracture, scarring, and donor-site morbidity was evaluated, and finally, the efficacy of collagen membrane was tested by the use of Chi-square test and $P < 0.001$, which is a statistically and clinically significant value. **Discussion:** Collagen membrane was observed as both biological dressing material and drug carrier. It was found to be a suitable alternative to other graft materials mentioned for the repair of defects in the mucous membrane created by surgical excision of lesions. Therefore, when used judiciously in a controlled clinical situation, collagen membrane is biologically acceptable in nature. It is an alternative to autologous grafts rather than a replacement of other grafts used in the oral cavity.

**Keywords:** Collagen membrane, grafting, oral mucosa, wound healing

## Introduction

Oral and maxillofacial surgical procedures often result in open wounds. A dressing material should cover these wounds to prevent microbial infection, foreign material contamination, wound contracture and to improve healing. The existence of a variety of wound types with varied healing modes and phases led to the evolution of different types of wound dressings.[1-4] Wound dressings before the 1960s were considered passive products that had a minimum role in the healing process.[1]

Currently, a variety of approaches have been used including split and full-thickness skin grafts, oral mucosa free grafts, oral connective tissue grafts, and the tissue-engineered grafts.[1-4] One of these materials is collagen which is extensively used as temporary dressing material in a lot of surgical fields.[5-7]

Various uses of collagen in intraoral surgeries are as an interpositional graft material during palatoplasty, for guided bone regeneration during maxillary sinus lift for inducing bone formation along with/without certain medicaments, bone augmentation of posterior atrophic mandibular ridge for placement of dental implants. It can also be used as a reconstructive material for orbital floor fractures, in treatment of localized gingival recession, as a scaffold in tissue engineering to generate dental pulp, for coverage of small intraoral soft tissue defects of the oral cavity, and much more. Collagen is also used as a medium for culturing cells such as osteoblasts.[8,9]

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Original Article - Evaluative Studies

# Unilateral Condylar Fracture with Review of Treatment Modalities in 30 Cases - An Evaluative Study

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## Abstract

**Introduction:** The treatment of subcondylar mandible fractures is a topic of debate and can be variable even though these fractures are commonly seen. The present study aimed at evaluation of various treatment modalities for unilateral condylar fracture in adults. **Materials and Methods:** Thirty patients with unilateral condylar fractures between the age of 18 and 60 years were evaluated. Treatment protocol included closed reduction for 15 patients and open reduction for 15 patients. **Results:** Assessment was done functionally for maximum interincisal mouth opening, deviation on maximum interincisal mouth opening, occlusion and facial nerve function, and radiologically for ramus height shortening. In general, there were no statistically significant differences between closed and open methods. **Discussion:** Both the treatment options for condylar fractures of the mandible yielded acceptable results. Closed treatment appears to be a safe and appropriate modality for most unilateral condylar fractures. Although the open group, in general, showed similar outcomes, this treatment should be reserved for limited indications. The present study has confirmed that both treatment options can yield acceptable results. On clinical examination, there was no significant difference in mouth opening measures, the incidence of occlusal disturbances or in the degree of pain perception.

**Keywords:** Closed reduction, open reduction, unilateral mandibular condylar fracture

## Introduction

The mandible is the most prominent facial bone and a common site of trauma, constituting 12-56% of facial fractures.[1] Condylar fractures account for about 29-52% of all mandibular fractures.[1,2] Injury to the condylar region deserves special consideration apart from the rest of the mandible because of its unique anatomy and healing potential.[3]

Treatment of condylar fractures primarily aims at the re-establishment of undisturbed joint function with physiologic occlusion and recovery of the osseo-discoligamentary structures. Complications of trauma to the condylar region are far reaching in their effects and not always immediately apparent. Disturbance of occlusal function, deviation of the mandible, internal meniscal derangements of the temporomandibular joint (TMJ), ankylosis of the joint with a resultant inability to move the jaw, and growth disruption are all sequel of this injury.[4] Thus, proper assessment and choosing an appropriate treatment strategy is of paramount importance.

Broadly, the two main treatment modalities for fractured condyle are defined as conservative (closed reduction) or surgical (open reduction and direct fixation).[4] Although there are equal studies supporting both open and closed reductions, there is still a dilemma about clear guidelines for treatment and precise functional evaluation of surgical treatment of condylar fractures and long-term complications associated with closed reductions. For any given patient, fracture, or incident, advantages and disadvantages are specific to each potential treatment plan.

In this study, 30 patients of unilateral condylar fracture either alone or with associated other mandibular fractures have been included. Patients were treated either by closed or open reduction and the results were then evaluated.

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Case Report

JRAD Journal of Research and Advancement in Dentistry

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# Diagnostic Dilemma in Maxillary Osteomyelitis: A Case Report

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## ABSTRACT

**Background:** Maxillary osteomyelitis is rare compared to mandibular osteomyelitis owing to its extensive blood supply and unique structure. We present case report of maxillary osteomyelitis, where clinical, radiographical, histopathological features were perplexing, hence leading to dilemma in diagnosis. A 62-year-old male patient came with chief complain of painful swelling near his left maxillary molars along with pus discharge. His main concern was cessation of pus discharge and removal of the pathology without long-term morbidity. On examination, multiple draining sinuses were present with segmental mobility of left maxillary arch with unusual paper-thin bone texture. Incisional biopsy suggested tuberculous osteomyelitis. After initial biopsy Anti Koch therapy was initiated. Later surgical excision and debridement was performed which led to final diagnosis of fungal osteomyelitis. To establish definitive treatment plan, it is necessary to assess credibility of current methods of investigations.

**Keywords:** Maxilla; osteomyelitis; tuberculosis; case report.

## INTRODUCTION

Osteomyelitis" (OM) is inflammation of bone. In maxillofacial skeleton, it occurs when both medullary and cortical bone undergoes inflammatory process[1]. Thus, osteomyelitis is inflammation of basal and alveolar bone[2]. Mandible is more commonly invaded by infection[3]. However, OM of maxilla is a rare entity due to its rich vascularity[4].

## CASE REPORT

### Patient concerns

A 62-year-old male with complaint of swelling near upper left posterior teeth since one month came to our centre. The patient's history revealed pus discharge since eight days from the same region, forming multiple draining sinuses. Patient was known case of Type II Diabetes, on medication since two years [Tab Glynase MF (USV private limited) 1 BD]. Patient had fluctuating glycaemic control despite medication. Patient had no deleterious habit.

On clinical examination a tender swelling was present over his palate in relation to left maxillary molars approximately 1.5 x 1.5 cm in size. Multiple draining sinuses were present with active pus discharge in relation to 24, 25, 26 region (figure 1). On digital palpation, segmental mobility of the left posterior maxillary arch was noted which was unusual, the texture of bone was paper-thin bone.

### Diagnostic aids

Basic investigations revealed, Haemoglobin (Hb) 10.5gm/dl, high neutrophil count. Erythrocyte sedimentation rate (ESR) value was very high, 58

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Research Article

# Is Transition to E-Learning Effective amongst Dental Students during Covid-19 Era??

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## Abstract

**Background:** Dental education has more or less relied upon traditional classroom teaching where a face to face interaction exists amongst educators and students. However, emergence of worldwide pandemic due to covid-19 as declared by WHO in January 2020 has necessitated the need of social distancing. Consequently, all the education institutes have faced a dire situation of conducting the studies online via virtual classrooms, dentistry being no exemption.

**Material and Method:** To analyze the impact of e learning among dental students a survey was carried out amongst undergraduate students of various dental colleges. Structured questionnaire was prepared in Google form including 15 questions and circulated amongst them. The collected data was tabulated using Microsoft excel. After that relevant Chi-square test was performed and the results were analyzed. Some results are shown in absolute percentages.

**Results:** In our study 78.4% dental students found virtual classrooms helpful for study during this covid-19 era.

**Conclusion:** Practical knowledge is utmost important in dentistry though when everything was shut down and social distancing was of great necessity for the sake of survival of individuals virtual classrooms were found helpful. Well-structured implementation of virtual study is essential to be incorporated in dental curriculum for better synchronous format that is formulated keeping the best interest of students in mind.

**Keywords:** Transition; E-Learning; Dental Students; Covid-19

## Introduction

Commensurate with the advances in digital world, Pedagogical spectrum in dentistry has been implementing digital tools within its armamentarium depending upon their efficacy and availability. These applications range from web based knowledge transfer to using practical oriented trainings in terms of using digital radiography, use of 3D models, CAD-CAM based impression taking and so on. That being said, traditional classroom teaching is still the preferred mode of education delivery across the dental institutes in India, with little inclination to shift towards an online format [1].

However, the global crisis due to Covid 19 pandemic in 2020 (as declared by WHO) posed an unprecedented challenge to the education sector as it led to a shutdown of the campuses thus severing the physical connect between the faculty and students [2].

As per DCI advisory issued on 16th April 2020 all the professional educational institutes were asked to close completely or suspend classes and offer e-learning and work from home, maintain social distancing. The educators were instructed to continue dental education using various digital platforms as per availability [3].

Aiming to cope with this emergency, the dental institutes saw a sudden shift from traditional classroom learning to computer-based learning which might be one of the largest educational experiments to date [2].

# 4 ORAL SIGNS AS A DIAGNOSTIC TOOL FOR MORBID DISEASE

Author: Dr Bijal Bhavsar, Dr Hiren Patel, Dr Haren Pandya,
Dr Bhavinkumar D Masariya

## ABSTRACT:

**Introduction**

Many systemic diseases present with signs and symptoms related to oral cavity. Since these oral manifestations are detectable early in the progress of such diseases , they often contribute to the diagnosis of the corresponding systemic disease like leukemia[1]. Gingival and periodontal lesions are relatively frequent, often associated with mobility of the offending teeth and swelling. In such patients extraction sockets may not heal well and may lead to further progression of the infection and complications. The clinical manifestation of gingival enlargement differs based on its etiology.

REVIEW ARTICLE

# Caries risk assessment: A new horizon in preventive approach

*Dr.Heena Pandya **Ishani Thakkar ***Dr.Jitendra Akhani

**Abstract**
This review discusses the rationale for Caries Risk Assessment (CRA) and the role various risk indicators play in dental caries occurrence. The purpose of CRA is to find out caries risk level of each patient and encourage them to undertake measures that will move them from high/moderate risk category to low risk category. It also provides an overview of different CRA methods and preventive protocols for risk based clinical management of dental caries. Recognition, reduction and regeneration can lead to early determination of the lesion, minimizing caries risk thus leading to reversal of incipient lesion.
***Keywords:*** *Caries risk, caries risk assessment, management protocol*

## Introduction

Dental caries is the most common chronic disease worldwide. Until now, it was a norm to consider only cavitated lesions for the treatment of caries. But caries, as we know it, don't arise de nova, they are preceded by white spot lesion, which are a risk indicator for future caries development.

In Indian dental practice, a variety of patients can be observed. On one end, there are literate patients who come to the dentist being well aware about caries treatment protocols.

Unfortunately on the other end, there are many myths regarding dental treatment that lurk amongst mindset of patients. Factors like poor education and low socioeconomic status misguide the patient to have a casual attitude towards carious lesions, which leads to an increased proportion of complications. This lack of awareness is the chief reason behind caries associated morbidity.

Dental caries is an infective and transmissible disease. Carious lesion develops when cariogenic bacteria colonizes on the susceptible tooth surface in presence of dietary fermentable carbohydrates especially sucrose.

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Research Article

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# Prevalence and Severity of Dental Fluorosis in Nadiad Taluka, Gujarat, India

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## ABSTRACT

**Background:** A cross-sectional survey was carried out in schools of Nadiad taluka for the incidence and severity of dental fluorosis. Five different schools were randomly selected from the rural areas of Nadiad taluka for the study, Total 1065 students were examined during the study period,Out of total examined students, approximately 10% of children were affected with dental fluorosis.

**Keywords:** Dental fluorosis, Fluoride, School children, Dean's Fluorosis Index,

## INTRODUCTION

Fluoride helps in the development of teeth, bones and maintaining the health, It has great significance in preventive dentistry due to its cariostatic properties. However, excessive intake of fluoride leads to dental and skeletal fluorosis. Its abundance in the continental crust is about 626µg/g. [1] Endemic fluorosis resulting from high fluoride concentration of ground water is major health concern in Gujarat.Fluorosis is caused by ingestion of excess fluoride mainly through drinking water contamination. Due to its strong electro negativity, fluoride is attracted by positively charged calcium in teeth and bones causing dental fluorosis. [2]

The clinical appearance of dental fluorosis is characterized by lusterless opaque white patches in enamel which may become striated, mottled and/or pitted, The opaque area may become stained yellow to dark brown. The incidence and severity of dental fluorosis is significantly influenced by fluoride intake, This study was aimed to find out prevalence and severity of dental fluorosis.

## MATERIAL AND METHODS

A cross-sectional survey was conducted among the children attending free dental check-up camps held by the department of Public Health Dentistry, Faculty of Dental Science, Dharmsinh Desai University, In the first stage, five public schools were randomly selected from the rural areas in Nadiad taluka to record dental fluorosis in children, residing in the villages since childhood and consuming the groundwater. Official permission was obtained from the concerned authorities to conduct this study. In the second stage, the students

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# Guidelines and challenges for the clinical management of cleft lip and palate in newborns to adolescents : A review

★ Dr. Jyoti Mathur
★★ Dr. Shyam Shah

**ABSTRACT :**

Cleft lip and palate (CLP) is a disfigering congenital anomaly which results from failure of closure of lateral and median nasal processes (cleft lip) or of lateral palatal shelves (cleft palate) during the 6-8 week intra uterine period. Any kind of disturbance that can bring about cellular disruption during this period can result in failure of fusion of these processes causing either complete or partial clefts occurring either unilaterally or bilaterally. Although these are the most common forms of congenital birth defects, they are very challenging to treat because of various factors such as the requirement of multiple surgeries coupled with orthopedic/orthodontic correction requirements. Other social challenges such as ignorance and unavailability of comprehensive and long term treatment guidance makes the overall treatment of CLP patients a challenge in india. Whereas in the developed world, proper guidelines and auxiliary infrastructure is in place and in function for such patients from birth, in India often the auxiliary support such as nutritionists, infant feeding specialists, speech therapists etc. are not integrated into the treatment plan. Not only these but long term pediatric/orthodontic dental care may not be accessible or feasible for the patients.

## INTRODUCTION

Craniofacial anomalies, in particular cleft lip and palate are major human birth defects with a worldwide frequency of 1 in 700.[1] Two basic etiologic factors can be identified namely genetic and environmental. Genetic factors can be further subdivided as occurring in isolation or as part of a broad range of chromosomal, mendelian or teratogenic syndromes.[2] The detection can be based on ultrasonography or MRI prenatally or after birth in case of small isolated clefts of either hard or soft palate. Sometimes 'failure to thrive' and general negative weight gain in newborn may indicate the presence of cleft which may make the task of suckling very difficult for the infant. Types of cleft may range from unilateral, bilateral, complete clefts involving all the layers namely mucosal, sub-mucosal and bone or partial clefts involving just the soft tissues to various depths. Complete clefts of lip and palate can lead to growth impairments due to feeding difficulties.[3]

## GUIDELINES FOR TREATMENT :

Patients with craniofacial anomalies require dental care throughout life. It includes oral health examinations, caries control and preventive, restorative and prosthetic dental treatment, orthodontic treatment is also an integral part and takes place in phases. Such children may also require the help of speech and language pathologists.[4]

Other specialties that may be required are feeding specialists assist with managing the special feeding needs of cleft newborns. Geneticists serve to diagnose associated syndromes and can counsel families regarding genetic risks and future possibilities.[5] There is a vast variation in the surgical protocols being followed the world over. There can be a variation in surgical techniques and timings for surgery between surgeons in the same geographic location also. The following chart gives an outline of generally accepted guidelines for both surgical repair and orthodontic treatment.

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# Case report of the transposition of bilateral maxillary canines & first premolars

★ Nidhi Panchal
★ Parth Parekh
★★ Dr. Jyoti Mathur

**ABSTRACT :**

Apexification aims to induce apical closure of the open root apex with a hard-tissue barrier, against which a root filling can be compacted. Apexification with conventional calcium hydroxide therapy has some disadvantages including variability of treatment time, unpredictability of apical closure, difficulties with patient follow-up and delayed treatment. Mineral trioxide aggregate (MTA) is a potential alternative apical barrier material with good sealability and a high degree of biocompatibility overcoming almost all disadvantages of $Ca(OH)_2$. This paper demonstrates the placement of an apical barrier using MTA as an alternative to conventional long-term calcium hydroxide therapy.

**Keywords:** *Apexification, Mineral trioxide aggregate (MTA), Non-vital young permanent teeth, Apical plug, Open apex.*

## INTRODUCTION

Tooth transposition is an alteration initially reported in the 19th century,[1] and its terminology has been changing. Some publications have classified different degrees of ectopic eruption as pseudo transpositions or incomplete, partial, simple or coronal transposition.[3-4] Certainly, ectopic eruption is a wide category of any type of anomaly in which the teeth present an abnormal eruption pathway. Thus tooth transposition should be considered a subdivision of ectopic eruption, being the extreme condition in this category.

A clear & objective definition for tooth transposition has been reported by Peck et al[5] as "dental anomaly characterized by the exchange of position between two adjacent teeth, especially in relation to their roots; or development & position normally occupied by a non-adjacent tooth".

Tooth transposition is usually associated with other dental anomalies in the same patient, such as hypodontia, peg-shaped teeth, severe rotations & mal-positioning of adjacent teeth, retention of the deciduous teeth, dilacerations & malformation of other teeth.[6-8] The anomaly affects both males & female, but more frequent among females & in the maxillary arch.[4,9-11] Interestingly, simultaneous occurrence of transposition in both arches is seldom observed even in the deciduous dentition.[4,5]

A possible explanation for tooth transposition would be an exchange in the position between developing tooth buds[2] because of the high incidence of retained deciduous canines associated with tooth transposition, some authors report deciduous teeth as being the primary etiologic factor of this anomaly.

Early diagnosis of a developing transposition is important as it has a high influence on prognosis and can usually be performed by panoramic radiographic examination of the patients who are between 6-8 years of age. When alteration is detected early, interceptive methods including extraction of the deciduous teeth & placement of eruption guides for the permanent teeth may be performed, and when transposition is detected at a later stage, orthodontic planning must address the indication for against extraction & the sequence of correcting tooth positioning.

## CASE REPORT:

A 12 year old female patient came to the Department of Paediatric & Preventive Dentistry, Faculty of Dental science, DDU, Nadiad with the chief complaint of painful, hard swelling in the both right & left labial vestibules. (Illustration-1.a & b)

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# Management of non-vital immature incisor with Mineral trioxide aggregate (MTA) : A case report

★ Dr. Chirag Patel
★★ Kathan Mehta

**ABSTRACT :**

Apexification aims to induce apical closure of the open root apex with a hard-tissue barrier, against which a root filling can be compacted. Apexification with conventional calcium hydroxide therapy has some disadvantages including variability of treatment time, unpredictability of apical closure, difficulties with patient follow-up and delayed treatment. Mineral trioxide aggregate (MTA) is a potential alternative apical barrier material with good sealability and a high degree of biocompatibility overcoming almost all disadvantages of $Ca(OH)_2$. This paper demonstrates the placement of an apical barrier using MTA as an alternative to conventional long-term calcium hydroxide therapy.

**Keywords:** *Apexification, Mineral trioxide aggregate (MTA), Non-vital young permanent teeth, Apical plug, Open apex.*

## INTRODUCTION :

Dental traumatic injuries to permanent anterior teeth at an early age in children may leads to pulpal necrosis & incomplete apex formation in affected tooth depending upon the severity and intensity of trauma. Endodontic treatment of such immature teeth with necrotic pulp and wide open apices is aimed at obtaining an optimal seal of the root-canal system. Apexification (induction of a calcific barrier at open root apex of non-vital teeth) is a non surgical approach for obtaining apical barrier so as to prevent passage of toxins and bacteria into periradicular tissue. This barrier facilitates the placement of an appropriate root canal sealant and filling material, whilst reducing the possibility of their extrusion into periapical tissues.[1,2]

Mineral trioxide aggregate (MTA) has been proposed as a potential material to create an apical plug at the end of the root-canal system, thus preventing the extrusion of filling materials material.[3] Recently in the literature studies have shown favorable results with the use of MTA as a material of choice for the apexification procedure.[1,4,5,6,7] MTA has many characteristics making it a suitable apical barrier material, including bio-compatibility, sealability, low cytotoxicity and induction of a favorable tissue response.[8,9]

The aim of this report is to describe the successful management of traumatized, immature permanent maxillary central incisor using mineral trioxide aggregate (MTA) to form apical calcific barrier (apexification).

## CASE REPORT :

An 11 year old male patient reported to the OPD of department of Pedodontics and Preventive Dentistry, Faculty of Dental Science, DDU with the chief complaint of pain in upper front tooth. On clinical examination fractured #21 was present (Illustration 1A). History revealed trauma to the maxillary anterior teeth before three years. There was no swelling or sinus with any of the tooth. The tooth did not demonstrate any abnormal mobility but tenderness on percussion was present. The medical history was not contributory. No significant family history was revealed. Extraoral findings were unremarkable.

Intraoral periapical (IOPA) radiograph and thermal sensitivity tests of the maxillary anterior teeth were done as a part of investigation. Radiographic examination revealed well defined periapical radiolucency and incomplete root formation with wide open apex in relation to tooth 21 (Illustration 1B). On thermal sensitivity test, tooth #21 and #22 did not elicit

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ORIGINAL ARTICLE

# Identifying Dental Anxiety in Children's Drawings and correlating It with Frankl's Behavior Rating Scale

[1]Jyoti Mathur, [2]Amish Diwanji, [3]Bhumi Sarvaiya, [4]Dipal Sharma


## ABSTRACT

**Aim:** To develop a simple method to assess the level of anxiety by using children's drawings and correlating them with Frankl's behavior rating scale.

**Materials and methods:** A total of 178 patients aged of 3 to 14 years were handed out two-page forms which contained three sections on coloring and drawing, along with general information, and Frankl's behavior rating scale for the visit. The three types of drawing exercises given to the patients were geometric copy drawings, coloring a nonthreatening figure, and an empty sheet for freehand drawing.

**Results:** Out of 178 patients, 60 showed definitely positive behavior, 73 exhibited positive behavior, 37 showed negative behavior, and 8 were definitely negative on Frankl's behavior rating scale; 133 children had none or, 1 stress marker and 45 exhibited 2 or 3 stress markers in their drawings. Chi-square ($\chi^2$) analysis was done with a $2 \times 2$ contingency table. Observed $\chi^2$ value was 46.166, which at 1 degree of freedom was much greater than that at 0.995 percentile. Therefore, the result was highly significant.

**Conclusion:** Children requiring specialized behavioral techniques can be identified by the presence of stress markers in their drawings. This nonverbal activity by itself can have an overall positive effect on the behavior displayed in the dental clinic.


**Keywords:** Children's drawings, Dental treatment anxiety, Stress markers.

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**Conflict of interest:** None

## INTRODUCTION

Dental treatment anxiety is a well-known fact. General perception in the population with regard to dental treatment is pain and discomfort. Such thought processes are bound to affect the behavior of pediatric dental patients even before the first dental appointment.[1-4] Identification and management of child's/patient's behavior is an important aspect in the delivery of successful dental treatment. Many types of behavior rating scales are being used by professionals working in psychology-related fields, such as Conner's behavior rating scale,[5] and many types of behaviorally anchored rating scales.

One scale which is commonly used in dentistry is Frankl's behavior rating scale,[6,7] popular because of its ease of learning and usage. It allows a quick classification of the child patient in one of four categories: Definitely positive, positive, negative, and definitely negative.

Children learn to draw and color at an early age, and as a fact, all children are attracted toward such activities which can be used as a means of nonverbal communication by them. Children's drawings have been used in hospital settings to assess the anxiety levels in admitted patients.[8] Written essays[9] and physiological parameters like changes in electrodermal activity,[10] measurement of salivary amylase,[11] blood pressure (BP), and pulse rate have also been used as indicators of dental anxiety in children.[12,13] Such methods, however, themselves are capable of inducing stress due to excessive questioning and/or usage of BP Cuffs, pulse oximeter or electrocardiogram machines, etc.

This article has emerged from the department of pediatric dentistry, out of a quest to develop a quick noninvasive method to assess the levels of anxiety in the patients walking in for treatment. The aim of this study, therefore, was to find out if children's drawings could be used as an effective tool to assess dental anxiety and to establish a channel of communication with the child patient.

## MATERIALS AND METHODS

Patients between the ages 3 and 14 years were handed out two-page forms where, in addition to general information, the type of dental treatment required was classified as invasive (requiring local anesthesia) or noninvasive (not requiring local anesthesia) was also noted. Frankl's behavior rating scale was especially noted. Rest of the form required patients to draw and color and was divided into three parts.

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# AMELOGENESIS IMPERFECTA: A CASE REPORT

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*Dr. Dharmik Patel
**Dr. Jyoti Mathur

**Abstract**

Structural defects of teeth are the inherited or acquired conditions which affect the normal structure of teeth like enamel, dentin, pulp, or cementum. Due to such defect, patient's normal function of teeth is hampered. So it is necessary to identify the type of defect by proper investigation techniques and establish the treatment plan to restore the function of defect teeth. In this case report, clinical and radiographic investigation procedures of a patient with the structural defect is described.

**Key words** : *structural defect, discoloration of teeth, thinning of enamel, roughened surface, chipping of enamel*

## Introduction

Genetic causes have been identified for both isolated teeth malformations and for the dental anomalies seen in patients with craniofacial developmental defects.[1] Mutation in several genes like ENAM, AMELK, DSPP, DMP-1, IBSP, SPP1, etc. have been associated with orofacial and dental defects.[2] Developmental anomalies of tooth is mostly divided on the basis of: (1) Number of teeth (2) shape of teeth (3) size of teeth (4) structure of teeth. Genetic tooth anomalies are many a times associated with syndromes or transferred by hereditary traits.

Sporadic occurrence of genetic anomalies is presumed to be caused by dominant or recessive multifactorial inheritance, by new mutation or by stochastic occurrences. This article refers to laboratory investigations and histological differences in structural defect of tooth.

### Case report

A 12 years old male patient reported to Department of Pediatric and Preventive Dentistry, Faculty of Dental Science, DDU, Nadiad with the chief complain of discoloration and wearing of all teeth (Illustration 1 to Illustration 5)

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# MANAGEMENT OF DENTOALVEOLAR TRAUMATIC INJURIES IN PRIMARY DENTITION: A CASE REPORT

*Dr. Chirag Patel **Tanzilfatema Bukhari

## ABSTRACT

Traumatic injuries to primary dentition and surrounding structure are very common in children. Dental trauma in pediatric population is a significant problem that may have serious medical, esthetic, and psychological consequences on children and their parents. Especially dentoalveolar trauma is particularly complicated by the developing jaws, the presence of tooth germs and the eruption of permanent teeth. Immediate dental treatment is necessary in such cases along with long term follow-up. The present report describes the management and 6-month follow up of dentoalveolar injuries in a primary dentition in a 4-year-old patient.

**Keywords:** *Dentoalveolar fracture, pediatric patient, composite resin splint*

## INTRODUCTION

Oral injuries comprise of 5% of all bodily injuries.[1] Traumatic dental injuries in primary dentition occur more frequently than in permanent dentition.[2,3] Also, primary dentition is subjected more commonly to displacement injuries as the surrounding bone is less dense and less mineralized.[4] The treatment of children presenting dental trauma in the primary dentition requires a different approach from that used in the permanent dentition.[5] Fractures of alveolar process are often associated with dental and soft-tissue injuries. Dentoalveolar fractures to the mandibular region in primary dentition are especially important to understand because of the potential complications related to close relation to permanent tooth bud and its eruption, alveolar development, and occlusion, as well as facial and psychological factors specifically related to childhood.[6] This paper describes the treatment and 6 months follow up of traumatic injuries affecting mandibular anterior dentoalveolar segment involving primary incisors in a 4-year-old boy.

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# Comparative Evaluation of Clinical Changes in Type-2 Diabetic & Non-Diabetic Patients with Chronic Generalized Periodontitis And Metabolic Improvement of Blood $HbA_{1c}$ Level After Conventional Periodontal Treatment

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***Abstract:***
***Aim:*** *India leads the world today with largest number of diabetic patients in any given country. One forth of total diabetic population of world is in India, majority of them are of type-2 diabetics. Our aim of present study was that after control over periodontal infection by conventional non-surgical periodontal treatment, to evaluate metabolic control of type-2 diabetes by means of improvement in blood HbA1c level after 3 & 6 months.*
***Material & Methods****: Present study was carried out for management of periodontal infection by conventional periodontal treatment – scaling & root planing, in experimental group with type 2 diabetics and control group, non diabetics; both groups with moderate generalized chronic periodontitis. Clinical parameters measured were the plaque index, bleeding on probing index, probing depth & level of clinical attachment and metabolic response in tpe-2 diabetic patients by means of HbA1c at 3 & 6 months.*
***Results****: An improvement in all clinical variables was observed, with no statistically significant differences between the groups, with the exception of probing depth ($p<0.016$) which shows significantly better outcomes for the control group. The improvement observed in blood HbA1c levels confirmed a positive metabolic response to periodontal treatment.*
***Conclusion****:With this study, we conclude that,,non surgical conventional periodontal therapy can lead to definitive improvement in HbA1c level of type-2 diabetics.*
***Key words:*** *conventional periodontal treatment, diabetes mellitus type 2, HbA1c,moderate Generalized Chronic Periodontitis.*

## I. Introduction

Diabetes is a significant illness that is on the rise all over the world. InIndia, the incidence of diabetes is increasing at an alarming rate. There were 24 million diabetics in the year 2000 and this figure is expected to reach 57.2 million by 2025. India leads the world today with largest number of diabetic patients in any given country.[1]

Prevalence, severity and extent of periodontal disease are higher in patient with diabetes mellitus (DM) than in non diabetic control.[2-7] In patients with diabetes mellitus (DM),accumulation of AGEs (Advance Glycated end Products) increases periodontal disease severity [9,37] by upregulation of proinflammatory cytokines from monocytes/polymorphonuclear leukocytes and down regulation of growth factors from macrophages.[9] Periodontal attachment loss increased in diabetic patients because of degradation of collagen fibres by MMPs (MMP-8 & 9), which are elevated in diabetic tissues, including the periodontium. Impaired osseous healing and bone turnover also seen in association with hyperglycemia. [11,12] In individuals with type-2 diabetes, who already has insulin resistance, further tissue resistance to insulin induced by infection like periodontitis may considerably exacerbate poor glycemic control.[8]

Among various methods of measurement of glycemic control,$HbA_{1C}$ assay is a glucose assay, which doesn't require fasting, doesn't rely on patient compliance & gives indication of blood glucose level over an extended period of time. $HbA_{1C}$ assay, is based on the knowledge - blood glucose becomes slowly, nonenzymatically& irreversibly bound to hemoglobin molecules.[14,36] $HbA_{1C}$ is the component resulting from post translational modification of HbA by glucose at the N –terminus of β chain. Glycosylated Hemoglobin (GHb) is a general term for glucose bound nonenzymatically to hemoglobin with a ketoamine structure. Sincethe average life span of RBCs is 120days, the $HbA_{1C}$ assay will reveal patient's glucose status over the

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# Alzheimer's Disease And Periodontitis A Exclusive Link

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***Abstract:*** *Alzheimer's disease (AD), the paramount cause and the most common form of dementia, is clinically characterized by a progressive descent in the cognitive function, which commences with deterioration in memory. Further investigations are required to gain full understanding of the exact etiology and pathophysiological mechanism of this disease. The disease is noticeable by the classical inflammatory features and typified by microglial activation. Also, the affected regions demonstrate a significant rise in the levels of pro inflammatory cytokines. The largely accepted hypothesis states that neuroinflammation plays a critical role in the pathogenesis of AD. Periodontitis results in low grade systemic inflammation through the release of pro-inflammatory cytokines into systemic circulation. Periodontitis often results in oxidative damage and inflammation, which are also displayed in the brain pathology of Alzheimer's disease. As Periodontitis is a treatable disease, it is considered as a modifiable risk factor for Alzheimer's disease. This research paper explores the enigmatic link between AD and Periodontitis. A review is presented on the investigations on the role of Periodontitis in aggravating Alzheimer's disease. The further investigations are targeted towards the adverse effects that Periodontitis may bear towards the onset and progression of AD.*

***Keywords:*** *Alzheimer's disease, periodontitis, systemic inflammation, infection, periodontal pathogen.*

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## I. Introduction

AD is one of the most common causes of dementia in the population aged 60 years and above.[1] Moreover, AD has emerged as a major health problem in the geriatric subjects worldwide.[2] The onset of AD could be either at a early age or in the later part of the life.[3] Whereas the early onset AD is usually due to the genetic structure, the late onset of AD, which is most frequently encountered, is considered to be a result of interaction between genetic and environmental factors.[3] Besides age being the major risk factor for AD, the other risk factors for late onset AD may comprise of family history, education, high fat diet, hypertension, diabetes, history of head trauma, and susceptibility of genes such as apolipoprotein E (APOE). Out of these risk factors, age, family history, and APOE are considered to be the widely accepted risk factors. Periodontitis is also considered to be one of the probable risk factors for AD.[3]

Patients of AD are more often than not found to be older people, with more than 50% falling under the age group of above 85 years. Thus, there is relationship between AD and the age of the patient. AD is seen as an interaction between genetic and environmental factors. The characteristics of AD are: (a) progressive cognitive impairment with impaired judgment and decision making, (b) psycho-behavioural disturbances, and (c) language disability.[2]There still exists gaps in the understanding of the molecular mechanisms involved in the etiopathogenesis of AD. However, a commonly observed pathological characteristic of AD is the accumulation of A β-amyloid (Aβ) and the hyperphosphorylation of tau in the brain.[1] Another major factor associated with the acceleration in onset and progression of AD is neuroinflammation through Interleukin-1 β (IL-1β). The release of multiple inflammatory mediators by activated microglia is driven by IL-1β. Consequently this results in self-propagating neuroinflammation. The secretion of proinflammatory molecules by microglia support the progression of AD.[4] Clinical studies have reported with evidence the extent of microglial activation during the early progression of AD and mild cognitive impairment (MCI).[5] IL-1β expression has been detected in the plaque-surrounding microglia in the AD brain, suggesting that the IL-1β released from the plaque surrounding microglia may contribute to neuronal dysfunction by promoting the formation of dystrophic neurites and via direct neurotoxicity.[1]

Periodontitis is a common chronic multi-bacterial infection which mainly affects the supporting structures of the teeth. This results in a significant bacterial and inflammatory load in the body. Periodontitis is a form of chronic systemic inflammation, which initiates and/or speeds up the progression of AD.[1] additionally, it is also responsible for other systemic inflammatory diseases, such as atherosclerosis and diabetes.[1] The impact of periodontitis on AD has been reported in a number of clinical studies. The recent experimental studies have specified the route of transduction of inflammatory signals from periodontitis to the brain. The current

Review Article

# UNREVEALED FACTORS OF BACTERIAL VIRULENCE IN PERIODONTITIS AND PERI-IMPLANTITIS – GINGIPAINS

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## ABSTRACT

As a part of dental plaque biofilm, Porphyromonas gingivalis is a major causative bacterium of chronic and aggressive periodontitis and play major role in development of peri-implant mucositits and peri-implantitis also. Arginine and lysine-specific proteases- gingipains HRgpA, RgpB and Kgp produced by P. gingivalis are fatal virulence factors for damaging host tissues. Periodontitis and peri-implantitis sites are both inflammatory lesions initiated by a bacterial infection and exist in a nonsterile environment with common cellular components and molecular pathways. These observations suggest that host modulatory approaches like inhibition of gingipains by various methods; those are successful for periodontitis will likely be applicable to peri-implantitis. For the reason, it is important to understand the structural and functional characteristics of gingipains. Present review is an attempt to explain these characteristics, which may be helpful in development of newer treatment strategies.

## KEYWORDS

HRgpA, RgpB, Kgp, periodontitis, peri-implantitis

## INTRODUCTION

Chronic periodontitis is an infectious disease resulting in inflammation with in supporting tissues of the teeth, progressive attachment loss and bone loss. Aggressive periodontitis (AgP) differs from the chronic form primarily by an accelerated rate of alveolar bone resorption and, in severe cases, can lead to early tooth loss.[1] The term peri-implantitis was introduced in the 1980s to describe a destructive inflammatory process affecting the soft and hard tissues around osseointegrated implants, leading to the formation of a peri-implant pocket and loss of supporting bone (1st European Workshop on Periodontology, Ittingen, Switzerland). Despite rigorous clinical intervention strategies, recent reports suggest that up to 30% of adults in the U.S. over the age of 40 years have measurable periodontal bone loss.[2] Numerous studies implicate a variety of organisms with periodontal disease; however, Porphyromonas gingivalis remains the preeminent organism associated with periodontal and peri-implant diseases.[3] Gingipains are trypsin-like cysteine proteinases produced by Porphyromonas gingivalis. The rgpA

LETTER TO EDITOR

# Inclusion of Patient Communication Skills' Curriculum at Undergraduate Level in India

Dear Editor,

As a senior lecturer in the Department of Periodontology and Oral Implantology, I would like to share an issue of teachers role in developing communication skills among dental students, which is based on article published in IJOCR 2017;5(2) titled, "teachers' perspective on inclusion of communication skills in dental education curriculum." I really appreciate the authors' efforts of doing analytical research over this subject. It is very much important to maintain a good rapport with the patient to make the treatment a success. Therefore, by learning communication skills, students can better educate their patients regarding their present and future treatment plan. According to PubMed databases, 65% of successful dentist–patient instructions transmitted through non-verbal methods and only 35% verbal instructions followed by patients.[1] Newer communication skills such as small group discussions, objective structure clinical examination, and real patient simulation should be incorporated in the dental curriculum. Moreover, to judge, how much successful the learning process in students, one common universal student evaluation questionnaire scale should be developed, which would be approved by a worldwide panel of researchers in this particular field of communication skills. Major limitations for inclusion of teaching communication skills in dental curriculum are lack of time in dental curriculum, faculty time, and funding for specialized equipment to educate patients.[2] You are kindly requested to share your views to overcome these limitations.

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ORIGINAL RESEARCH PAPER

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INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# AWARENESS AND ATTITUDE OF PATIENTS REGARDING DENTAL IMPLANTS AS A TREATMENT MODALITY, AT KALOL TOWN, GUJARAT.

Dental Science

| | |
|---|---|
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## ABSTRACT

**Aims:** The purpose of this survey was to know awareness and attitude of patients regarding dental implants as a treatment modality, at Kalol Town, Gujarat. Methods and Material: A cross-sectional study was conducted amongst 400 patients over a period of 2 months. A self-explanatory questionnaire with informed consent was given to the patients above the age of 18 years on their routine dental visit. Statistical analysis used: The collected data was analysed by using SPSS 20 software. Results: Out of 400 patients, 234(58.5%) were males and 166(41.5%) were females, 256(64%) subjects knew about dental implants. In 216(54%) patients, dentists were the main source of information about dental implants and the rest had heard it from other sources like newspapers 80(20%) and friends 58(14.5%).Among them 208(52%) patients were willing to undergo the treatment if needed. Conclusions: The survey concluded that an acceptable number of patients had heard of dental implants as a treatment option for replacing missing teeth, with dentists being the main source of information.

## KEYWORDS

Awareness, Dental Implants, Patients, Survey

## INTRODUCTION

The aim of modern dentistry is to restore the patient's normal function, aesthetics, speech and health by different modalities. Implants are unique because of their ability to achieve these ideal goals. Currently, dental implants are widely accepted as a treatment option for completely or partially edentulous patients.1,2

Dental implant is an artificial root that is surgically inserted into the jawbone to support a single tooth replacement, fixed partial, complete denture or maxillofacial prosthesis.3,4

The treatment of edentulism with traditional removable dentures is less accepted due to many factors like anatomical, physiological, psychological and also Prosthodontic factors like it can often induce impaired masticatory function due to limited retention and stability, especially in the lower jaw.5 Implant treatment has come into focus since this treatment option has provided excellent long term results by increased retention, stability, functional efficiency and quality of life.6

As it is an elective procedure in most of the cases so complete information on implant treatment and other alternative therapies must be provided to guide the patient in choice of the most appropriate option.7 Source of information plays a key role in improving the level of awareness of dental implants which can be provided by various means.

As India is still considered as a developing country, in towns with people having low levels of awareness regarding dental implants and their uses, there is paucity of information regarding the awareness of patients about dental implants in this country. Considering this,a study was conducted with an aim to know awareness and attitude of patients regarding dental implants as a treatment modality, at Kalol Town, Gujarat.

## SUBJECTS AND METHODS

A questionnaire based survey was conducted among 400 patients attending dental clinics, at Kalol town, Gujarat over a period of 2 months. All the patients visiting dental clinics and who were willing to give informed consent and above the age of 18 years were included. A self-explanatory questionnaire was designed to assess the patient's knowledge and awareness about dental implants.

The questionnaire of 11 MCQs were handed to patients during their regular dental visits. They were informed about aims and objectives of the study. Questionnaire was prepared both in English and Gujarati (local language) to get better understanding of questions by the patients.

### Questionnaire

Patient's name:
Gender: Male / Female
Age:a. 21-40 years

b. 41-60 years
c. 60-80 years
d. 80 years & above

Education:
a. illiterate
b. Up to high school
c. Up to graduation
d. Up to post graduation and above

1. Do you have any missing teeth? : Yes/ no
2. If yes what is the cause of it?

a. extraction
b. shedding
c. congenitally missing
d. don't know

3. Have you heard of Dental Implants? : Yes/ no

4. Do you know that implants can be used for replacement of missing teeth? : Yes / No

5. What were your first sources of information about implants?

a. Newspaper/television
b. Dentist
c. Friends
d. Patients

ORIGINAL RESEARCH PAPER

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INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# TOOTH BRUSHING BEHAVIOUR AND DENTAL ABRASION AMONG THE DIAMOND WORKERS OF BAPUNAGAR AREA ,EAST AHMEDABAD , GUJARAT

Periodontology

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|---|---|
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## ABSTRACT

**Aim:** To Assess Tooth Brushing Behaviour And Dental Abrasion Among The Diamond Workers Of Bapunagar Area ,East Ahmedabad , Gujarat.
**Materials and methods:** Four Hundred patients [ 126 female and 274 male ] who had a cervical abrasion was examined.Information on patient age , gender , frequency and technique of brushing , type of tooth brush and which hand to use for brushing , frequency to change a brush was obtained. Data was analysed statistically.
Results : The study revealed a statistically significant relationship between abrasion and age groups as well as genders. Statistically significant difference was found between abrasions and tooth brushing method and which hand use for brushing and type of tooth brush.
**Conclusion :** The prevalence was higher among males as compared to females. The prevalence of lesions was higher in older age group. The horizontal tooth brushing technique and hard tooth brush was significantly associated with the occurrence of cervical lesion .diamond workers who was used right hand for tooth brushing and abrasion was common in a left side and vice versa.

## KEYWORDS

diamond worker, dental abrasion , tooth brushing behaviour

## INTRODUCTION

Loss of hard tissue at the cervical area of teeth, and not due to caries, has been observed, investigated and categorised under various names, including abrasion, erosion and attrition depending on a etiology.

Being the subject of our study, abrasion is defined as the pathological wearing away of dental hard tissue by mechanical forces1-3 .Although the clinical appearance of these lesions varies, they frequently appear to be wedge-shaped defects having a bright surface, normal hardness and colour, and a sharp border3-5. Tooth brushing is the simplest and most effective way to meet oral-hygiene requirements for removing bacterial plaque from tooth surfaces. However, cervical dental abrasion caused by improper toothbrushing6-7. Problems with brushing are commonly related to technique, duration, daily frequency, and the force applied when brushing8-11.

In addition, Radentz et al.12 have determined that the composition and amount of dentifrices play an important role in the development of abrasive lesions. Previous studies4-12 have revealed that cervical toothwear lesions increased with age.However, the prevalence of cervical abrasion lesions by gender is equivocal. Radentz et al.12 reported that males have more lesions than females, while Sangnes and Gjermo13 reported a slightly higher prevalence in females. This study has been carried out to determine whether there is a correlation between dental abrasions and the frequency and technique of tooth brushing as well as to examine abrasion prevalence according to age and gender.

### Aim

To Asses Tooth Brushing Behaviour And Dental Abrasion Among The Diamond Workers Of Bapunagar Area ,East Ahmedabad , Gujarat.

### Materials and method

A questionnaire based survey was conducted among 400 diamond workers of Bapunagar area, East ahmedabad , Gujarat over a period of two and half months.

All the diamond workers who were willing to give informed consent and above the age of 18 years were included.

A self explanatory questionnaire was designed to assess tooth brushing behaviour and dental abrasion. The questionnaire of 11 Questions were handed to diamond workers .

They were informed about aims and objectives of the study.

Questionnaire was prepared both in English and Gujarati (local language) to get better understanding of questions by the diamond workers.

Questionnaire
Name of patient
sex : male / female

1] Age of patient
A] 21 TO 30
B] 31 TO 40
C] 41 TO 50
D] More than 51

2] education of the patient
A] illliterate
B] secondary and higher secondary
C] graduate
D] post graduate or more

3] how you clean your teeth ?
A] with charcol
B] with finger
C] with brush
D] with datan

4] what you use with datan ,brush and finger?
A] salt
B] tooth powder
C] tooth paste
D] any tooth powder

5] How many times you clean your teeth in a day ?
A] one time
B] two time
C] three time
D] more than three time

6] How do you brush your teeth ?
A] horizontal
B] vertical

Case Report

# Treatment of Peri-Implantitis with Implantoplasty and Diode Laser

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## Abstract

Dental implant surgery has developed to a widely used procedure for dental rehabilitation and is a secure and predictable procedure. But, some local and systemic risk factors can result in higher failure rates and affect implant survival. Peri-implant disease, namely peri-implantitis, have been extensively studied in present era as a major cause of implant failure. There are various treatment modalities to treat peri-implantitis, which give satisfactory results and improve survival rate of implant. Though it is difficult to determine what approach will improve implant survival, present case report is an attempt to treat peri-implantitis with implantoplasty and diode laser followed by regenerative periodontal therapy.

**Keywords:** Diode laser, implantoplasty, peri-implantitis, regenerative periodontal therapy

## Introduction

Nevertheless, despite the high success and survival rates of dental implants, there are several risk factors and complications that could lead to their ultimate failure.[1] Peri-implantitis is a progressive and irreversible disease of implant-surrounding hard and soft tissues and is accompanied by bone resorption, decreased osseointegration, increased pocket formation, and purulence.[2] The frequency of peri-implantitis has been reported in the range of 1%–19%.[3]

When left untreated, peri-implantitis may cause progressive tissue destruction, bone loss, esthetic complications, and, eventually, implant loss. Based on numerous clinical trials and systematic reviews, several approaches for implant decontamination are available. In the context of this nonsurgical mechanical debridement, surgical debridement, disinfection with chemotherapeutic agents, and smoothening of implant surface, laser therapy along with regenerative periodontal therapy should be noted.[4-9] Mechanical debridement can be done with carbon, plastic or titanium curettes, ultrasonic scaling, or powder–air abrasion.[9]

When a titanium implant surface has been exposed to the oral cavity and contaminated with bacteria, implantoplasty to completely flatten/smooth the exposed part of the implant using rotary instruments may be indicated.[10] Initially recommended by Lang *et al*.[11] and reported by Suh *et al*.,[12] this technique aims to reduce the roughness of the titanium surface to decrease plaque adherence because it has been demonstrated that rough surfaces accumulate more plaque than smooth or moderately rough surfaces.[13-15] As implant decontamination is the key aspect to the resolution of peri-implantitis, different mechanical and chemical methods have been tested in that respect. Recently, a noticeable tendency has urged scientists toward the application of laser in order to decontaminate peri-implant inflamed area.[8,16,17] *In-vitro* models have proven the efficacy of erbium-doped yttrium aluminum garnet, carbon dioxide laser, and diode lasers in high or even complete elimination of bacterial-loaded titanium discs.[18,19] Diode lasers, in particular, have been shown to have potent bactericidal and photobiomodulatory effects promoting wound healing and tissue regeneration.[20,21]

Current evidence suggests that peri-implantitis does not respond to traditional nonsurgical therapy.[22] In addition, surgical therapy has been demonstrated to result in significantly reduced probing depth and gains in clinical

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# Fibroma of the Gingiva - A Case Report

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**ABSTRACT :**

The fibroma, also referred to as irritational fibroma, is by far the most common of the oral fibrous tumor like growths. While the terminology implies a benign neoplasm, most if not all fibromas represent reactive focal fibrous hyperplasia due to trauma or local irritation. It is a round-to-ovoid, asymptomatic, smooth-surfaced, and firm sessile or pedunculated mass. The diameter may vary from 1 mm to 2 cm. The surface may be hyperkeratotic or ulcerated, owing to repeated trauma. The fibroma is best treated by conservative surgical or laser removal, with a small chance of recurrence if the originating irritation persists. There is no risk of malignant transformation.

**Keywords:** *Fibroma, Inflammatory hyperplasia, Benign tumor.*

## INTRODUCTION :

Exophytic gingival lesions represent some of the more frequently encountered lesions in the oral cavity. Some of the most commonly encountered exophytic gingival lesions are irritational fibroma, peripheral ossifying fibroma, pyogenic granuloma, and peripheral giant cell granuloma.[1] A report of more than 30,000 oral biopsies submitted for diagnosis observed that nearly 13% were taken from the gingiva.[2] Each of the previously mentioned lesions has been associated with or related to trauma or low-grade irritation as an etiologic factor, and these are generally considered to be reactive and/or nonneoplastic.[1]

Fibroma is a common submucosal response to trauma from teeth or dental prostheses and was first reported in 1846 [3,4] as fibrous polyp and polypus. Found in 1.2% of adults, this inflammatory hyperplasia is the most common oral mucosal mass submitted for biopsy and is usually composed of Type I and III collagen.[5] Gingival lesions are also common, although at that location they probably result from chronic infection rather than trauma. The most common clinical aspect of fibroma is the growth of well delimited tissue, of a smooth surface, usually with normal colored mucosa, sessile or pedunculated base, of hard consistence,[6] and smaller than 1.5 cm at its largest diameter,[7] though there have been reports of a 4-6 cm diameter.[8]

With the above description, a case report on gingival fibroma is being described below.

## CASE REPORT :

A 65 years old female patient reported to the Department of Periodontics and Oral Implantology, Faculty of Dental Science, Dharmsinh Desai University, Nadiad, with the chief complaint of painless swelling in relation to lower left back tooth region since 5-6 months.

**Illustration 1.** Firm, nodular and sessile growth- Buccal view.

On intraoral examination the growth was located in relation to lower left first premolar (34), which was extracted six months back (Illustration 1and 2).

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# Peripheral Cementifying Fibroma: A Case Report

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**ABSTRACT:**

Peripheral cementifying fibroma is one of the inflammatory reactive hyperplasia of gingiva rather than neoplastic in nature. There are numerous histologically different types of focal overgrowths which may occur in gingiva. A clinical case report of 15 years old male patient with gingival overgrowth suggesting gradually increase in size of lesion, involving buccal interdental papilla and attached gingiva in relation to upper left and right central incisor which is pink in color and firm in consistency is presented. Histological reports suggested presences of cementicles along with large number of inflammatory cells.

**Key words:** gingival overgrowth, ossifying fibroma, cementicles.

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## INTRODUCTION

Peripheral cementifying fibroma is a non neoplastic entity, which occurs on the gingiva in response to trauma or irritation, plaque, calculus, restorations and dental appliances.[1] Considerable confusion has prevailed in the nomenclature of peripheral ossifying fibroma with various synonyms being used, such as peripheral cementifying fibroma, ossifying fibroepithelial polyp, peripheral fibroma with osteogenesis, peripheral fibroma with cementogenesis, peripheral fibroma with calcification, calcifying or ossifying fibrous epulis and calcifying fibroblastic granuloma.[2] It occurs in the younger age group with a female preponderance with a predilection for maxillary arch. Most of them occur in the incisor cuspid region. It is usually present as a painless mass on gingiva or alveolar mucosa with measurements not exceeding 3cm. It can be either be pedunculated or sessile with its attachment to base. Clinically earlier lesions appear irregular and red and older lesions have a smooth pink surface with ulceration.[3]

## CASE REPORT

A 15 years old male patient reported to the department of periodontology with a chief complaint of growth of gums in upper front teeth since one month.

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# Idiopathic Gingival Enlargement: A Case Report

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**Abstract :**
Idiopathic gingival enlargement is a rare hereditary condition characterized by slowly progressive, non hemorrhagic, fibrous enlargement of maxillary and mandibular keratinized gingiva caused by increase in submucosal connective tissue elements. This case report gives an overview of gingival fibromatosis in a 13-year-old female patient who presented with generalized gingival enlargement. Based on the history and clinical examination, the diagnosis was made and the enlarged tissue was surgically removed. The patient was being regularly monitored clinically for improvement in her periodontal condition as well as for any recurrence of gingival overgrowth.
**Keywords:** *Idiopathic gingival fibromatosis, Gingival hyperplasia.*

## INTRODUCTION :

Idiopathic gingival fibromatosis is a slowly progressive, benign enlargement, which affects the marginal gingiva, attached gingiva, and interdental papilla. The fibromatosis may potentially cover the exposed tooth surfaces, causing aesthetic and functional problems, and in extreme cases may distort the jaws. Gingival tissues surrounding both the maxillary dentition and the mandibular dentition may be affected. The hyperplastic gingiva usually presents a normal colour and has a firm consistency with abundant stippling.[1]

In idiopathic gingival enlargement no causative agent can be identified and family history is always lacking.[2,3]

A definitive diagnosis of idiopathic gingival enlargement can be arrived upon by a thorough medical, dental and family history along with histopathological examination of gingival tissue. The diagnosis of such disease is done by exclusion when no other known causative factor can be identified.[4] This anomaly is classified into two types according to its form
(1) The nodular form and
(2) The Symmetric form
The localized nodular form is characterized by the presence of multiple enlargement in the gingiva. The symmetric form which is the most common type of disorder results in uniform enlargement of the gingiva. The degree of enlargement may vary from mild to severe. As a result, the teeth become buried, to varying degrees, beneath the redundant hyperplastic tissues.[4] Most cases of hereditary gingival fibromatosis appear to be inherited in an autosomal-dominant manner, although autosomal recessive inheritance has also been reported.[5]

In modern times, a mutation in the Son of sevenless-1 (SOS-1) gene has been suggested as a possible cause of isolated (non-syndromic) gingival fibromatosis.[6] However, no definite linkage has been established. Diffuse gingival enlargement is also found to be associated with syndromes like Zimmerman-Laband syndrome (defects of bone, nail, ear and nose accompanied by splenomegaly), Murray-Puretic-Drescher syndrome (multiple dental hyaline tumors), Rutherford syndrome (corneal dystrophy), Cowden syndrome (multiple hamartomas), and Cross syndrome (hypopigmentation with athetosis).[7,8]

The condition has also been reported in association with deficiency of growth hormone caused by lack of growth hormone release factor.[9]

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Case Report

# A noteworthy case of extruded endodontic filling material

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## Abstract:

This case report describes the clinical manifestations and treatment of an iatrogenic expulsion of endodontic filling material in periradicular region of permanent maxillary right central incisor. This presentation recommends to observe meticulous care during execution of nonsurgical root canal treatment and proper usage of endodontic techniques.


Key Words: expulsion, apicectomy, periapical region, endodontic surgery

## Introduction:

The presence of foreign body in the periapical region of tooth involves the possibility of habit of putting an object into mouth especially in children[1] or food compaction with large open pulp chambers or iatrogenic accidental extrusion of filling material during endodontic treatment by dentist.[2,3,4] Surgical intervention is mandatory if there is an extrusion of non resorbable material which harms the periapical tissues. This case describes an extrusion of root canal filling material and its endodontic surgical management.

## Case Presentation:

A 45 year old female patient came to our clinic with complaint of mild pain in upper front teeth since 2 months. On general examination, the patient was well built, well-nourished with good general health. Patient gave history of trauma to upper front teeth 8 months back and she had undergone for the treatment of the same with other dentist at that time. Extraorally, there was no remarkable finding. On intraoral examination, there was presence of full cast ceramic bridge in permanent maxillary right central and lateral incisors and canine (Figure 1,2). There was presence of pain on labial side in apical region of permanent right maxillary central and lateral incisor on pressure, while tenderness on percussion was not present in the same teeth. There were no signs of pus discharge, sinus formation or mobility of the affected teeth. There was a presence of nodule like structure near mucogingival junction on labial side in relation to permanent maxillary right central incisor which was hard and tender on palpation (Figure 1).

Figure 1 - Preoperative clinical photograph showing a bulge near apical region of permanent maxillary right central incisor and presence of porcelain fused to metal bridge from labial side

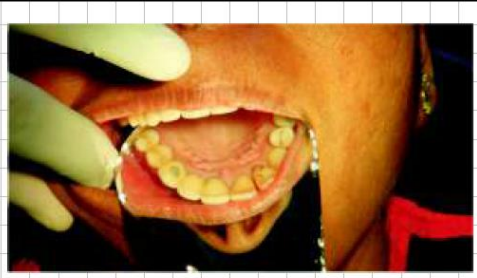

Figure 2 - Preoperative clinical photograph from palatal side

Radiographic examination revealed that permanent right maxillary central and lateral incisors and canine were already treated endodontically with root canal filling. There was a presence of periapical radiolucency in relation to permanent maxillary right central and lateral incisors with overfilling of root canal material in right lateral incisor. Apart from all these features, there was a presence of radiopaque material of almost apical one third of the size near the apex of permanent maxillary right central incisor (Figure 3,4).

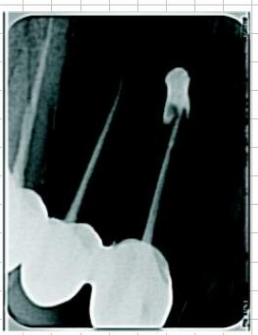

Figure 3 - Preoperative radiograph showing radiopaque foreign material near the apex of permanent maxillary right central incisor and overfilled gutta percha in right lateral incisor

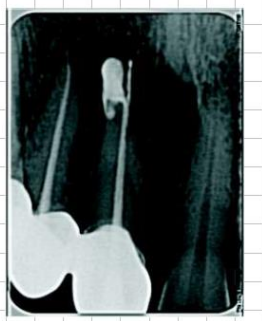

Figure 4 - Preoperative radiograph showing radiopaque foreign material near the apex of permanent maxillary right central incisor and overfilled gutta percha in right lateral incisor

Original Research

# Orthodontic-Periodontic : Inter-Relationship

Aakash Shah[1], Vasumati Patel[2], Meena Shah[3], Nirav Parmar[4], Shalini Gupta[5].

**ABSTRACT**

Orthodontic treatment aims at providing acceptable functional and aesthetic occlusions using appropriate tooth movements. These movements are specifically related to interactions of the teeth with their supportive periodontal tissues. Periodontic and orthodontic interactions usually deal with the establishment of an appropriate diagnosis and the treatment planning needed to enable coordinated periodontic-orthodontic therapy. A harmonious cooperation of the periodontist and the orthodontist offers great possibilities for the treatment of various orthodontic-periodontal problems. The present discussion focused on the effects of a combined periodontal and orthodontic treatment on the periodontal health and dentofacial aesthetics, and the mode that each field can contribute to optimize treatment of combined orthodontic-periodontal clinical problems.

**KEY WORDS :**

## INTRODUCTION

The relationship between periodontology and orthodontics consists of a highly complex, bidirectional and close interaction that is nowadays characterized by controversial scientific opinions and clinical approaches. The term synergy refers to two or more distinct influences oragents acting together to create an effect greater than that predicted by knowing only the separate effects of the individual agents. This definition is applicable to the classic relationship between orthodontic and periodontics specialties in treating patients. Understanding the biologic basis of periodontal surgical procedures, recent advancements in tissue engineering and research development can yield more productive clinical endpoints than ever before. Making the most of what these two specialties offer each other begins with the identification of periodontal problems that could become more complicated during orthodontic therapy and, conversely those that could benefit from orthodontic therapy.

The biologic basis of orthodontic treatment is that bone remodels and tooth moves on application of prolonged pressure to the tooth. Removal of bone occurs in some areas and addition in others, in a selective manner. In essence, the tooth socket migrates and the tooth moves through the bone carrying its attachment apparatus, i.e., periodontal ligament with it. This response occurs through mediation by the periodontal ligament; therefore, orthodontic tooth movement is basically a periodontal ligament phenomenon.

A multidisciplinary approach including an orthodontist and a periodontist is done in patients with periodontal disease. Both specialists should be involved in the treatment planning of such patients, and care should be taken in evaluation of progress of the treatment undertaken. Since orthodontic tooth movements are strongly associated with interactions of teeth and their supporting periodontal structures, we can say every orthodontic intervention has some kind of periodontal dimension. Adult patients opting for orthodontic treatment has increased recently and also the patients with periodontal problems faced by the orthodontists. Orthodontics may be an option in case of repositioning of periodontally compromised teeth. There are osteogenic changes seen in bone during orthodontic tooth movement, and there will be alteration of bone deformities and contours. The topography of the underlying bone and other intraosseous deformities influences the prognosis of periodontal therapy and pockets elimination1.

### Timing of ortho-perio treatment

While establishing the treatment plan, it is important to define the treatment to be performed by the periodontist prior to starting orthodontic treatment as well as during and after orthodontic treatment. This should be done both to be able to perform tooth movement in a healthy environment and to optimize the function of the existing periodontal support and to enhance the final aesthetic result.1

**Procedure performed prior to orthodontic treatment**

- Oral hygiene motivation
- Prophylaxis or therapy to control inflammation
- Surgery to eliminate deep pockets
- Augmentation of attached gingiva
- Frenulectomy (frenectomy) and frenulotomy (frenotomy)
- Elimination of gingival clefts

**Procedures performed during orthodontic treatment**

- Prophylaxis to control inflammation
- Surgical exposure of impacted teeth according to periodontal concepts
- Fibrotomy and curettage during forced eruption and rotation correction

**Procedures performed during and/or post orthodontic treatment**

- Prophylaxis to control inflammation
- Clinical crown lengthening
- Gingivoplasty

**Procedures performed post orthodontic treatment**

Supportive therapy. The above outline is only indicative, as all decisions depend on the individual diagnosis and tailoring the timing of treatment to each patient's unique situation to achieve both the functional and aesthetic therapeutic goals. When labial orthodontic movement is planned, if needed a periodontal surgical procedure to increase the thickness of the attached gingiva prior to initiating orthodontic treatment can serve to optimize the final result. The same holds true for cases where tooth migrations have resulted in spaces opening and loss of the papilla and eventually a reduction or total lack of attached gingiva. In these cases surgery is

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# Effect of Stress and Psychosomatic disorders on Periodontal Health - A Review

★ Dr. Anal Trivedi
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**ABSTRACT :**

For several decades, studies have been conducted to examine the possible association between stress, psychosomatic disorders and personality traits with periodontal disease. Such studies are intuitively appealing, because they hypothesize a relationship between long-standing predispositions of people's psychological and emotional make-up and periodontal disease, which is also characterized by a long-standing clinical course. In this paper, we present an overview mechanism of relationship between stress, psychosomatic disorders and non apnea sleep disorder with chronic periodontitis, aggressive periodontitis, necrotizing ulcerative gingivitis, wound healing, other inflammatory conditions and periodontal therapy also.

***Keywords:*** *Psychosocial stressors, Neuropeptides, Inflammatory cells, Periodontitis, Non-Apnea Sleep Disorder.*

## ITRODUCTION

Stress is defined as a total transaction from den and to resolution in response to an environmental enc unter that requires appraisal, coping and adaptation by the individual. Coping is the response of the individual to stress.[1] Stress is said to influence the host defenses, exerting an immuno-suppressive effect and increasing one's vulnerability to disease.[2]

Psychological disturbances can lead patients to neglect oral hygiene with resultant unfavorable effects on the periodontal tissues. It can down regulate the cellular immune response. Communication between the central nervous system and the immune system occurs via a complex network of bidirectional signals linking the nervous, endocrine, and immune systems. Stress disrupts the homeostasis of this network, which in turn, alters immune function.[2]

There are three types of mode of action of stress mechanism in releasing inflammatory mediators through neural and endocrine system[1-3]

1. Through the autonomic nervous system pathways
2. Through the release of neuropeptides
3. Through the release of hypothalamic and pituitary hormones.[1]

## THE AUTONOMIC NERVOUS SYSTEM :

Stress results in the release of adrenalin and noradrenaline from cells of the adrenal medulla. Through interaction with adrenergic receptors, noradrenaline and adrenaline mediate cardiovascular and metabolic effects. Thiscauses increase in circulating T-helper lymphocytes, cytotoxic T-cells (CD8+) andnatural killer cells, plasma levels of Immunoglobulin IgM, IgG and complement component C3.[1]

### The release of neuropeptides

Neuropeptides such as substance P (SP), somatostatin, the endogenous opioid peptides (beta-endorphin and enkephalins), vasoactive intestinal peptide (VIP) and nerve growth factor from peptidergic sensory nerves also modulate the activity of the immune system and the release of cytokines. They are also present in gingival and periodontal tissues in close contact with the vascular plexus and penetrate into the epithelium. In response to psychological or certain physiological stressors, an infla-mmatory reaction occurs through the release of neuropeptides and inflammatory mediators from the sensory nerves and activation of mast cells or other inflammatory cells.[4,5]

### The hypothalamus-pituitary-adrenal (HPA) axis

During a stress response [psychosocial

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# A SURVEY OF ATTITUDE ABOUT SMOKING, ASSOCIATED WITH PERIODONTAL DISEASE AND DENTAL IMPLANTS

*Dr. Sagar Patel **Dr. Vasumati Patel ***Dr. Shalini Gupta
****Dr. Sumit Satwara *Dr. Kinjal Gabani *Dr. Ripal Shah

## Abstract

**Objectives**

The purpose of the study was to investigate the attitude of patients towards smoking and their knowledge of smoking as a risk factor for periodontal disease and dental implants.

**Methods**

In this cross sectional study, 158 subjects were provided a questionnaire survey about smoking status for the recognition of smoking as a risk factor for periodontal disease and dental implants using the Kano Test for Social Nicotine Dependence(KTSND).

**Results**

Smoking was recognized as a risk factor for periodontal disease by 150 patients(95%) and as a risk factor for dental implants by 92 patients (58%). The KTSND scores of the patients with knowledge of smoking as a risk factor and for dental implants was significantly lower than those of the patients without knowledge of smoking as a risk factor for periodontal disease and for dental implants, respectively.

**Conclusion**

In order to increase the recognition of smoking as a risk factor for periodontal disease and dental implants and patient education must be improved.

***Key words: Dental Implant, periodontal disease, smoking, smoking cessation, Kano test For Social Nicotine Dependence (KANO).***

## Introduction

Smoking is a risk factor for various diseases, including periodontal disease.[1,2] The oral tissue is most directly affected by smoking; carbon monoxide, a component of smoke, initially impedes blood flow and thereafter impedes immune function.

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# TOOTH BRUSHING BEHAVIOURS AND DENTAL ABRASION AMONG THE POPULATION IN NADIAD, GUJARAT, INDIA: A CROSS-SECTIONAL STUDY

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**** Dr. Hiral Purani * Dr. Sagar Patel *Dr. Ripal Shah

## Abstract:

**Aim:**To determine correlation between tooth brushing pattern and dental abrasions among population in Nadiad city,Gujarat. To suggest appropriate remedial measures to prevent self-inflicted injury.

**Material and Method:**The study was carried out on 165 patients aged 20 years and above who visited the Department of Periodontology and Oral Implantology, Faculty of Dental Science Dharmsinh Desai Univarsity,Nadiad. Assessment form comprises a questionnaire and information on brushing pattern.

**Results:**The study revealed a statistically significant relationship between abrasive lesions and age groups as well as technique of tooth brushing. Statistically significant difference was found between abrasions and tooth brushing frequency, while no significant relation was found with the gender and type of toothbrush used.

**Conclusion:**The prevalence of tooth brushing abrasions increases with age and is more affected by technique of tooth brushing. Increased tooth brushing frequency and changing of toothbrush result in an increase in the number of tooth abrasions. Therefore, dental professionals should make evidence-based recommendations to their patients and general masses.

**Key Words:** ***Abrasion, Toothbrushing Pattern, Brushing frequency.***

## Introduction

Tooth wear is a common problem, but most often left untreated. The presence of tooth wear might become more noticeable Nowadays and in future. This occurrence could be due to increased dental awareness and people becoming more interested in keeping their dentition healthy for a longer time which could be exposed to wear.[1] Non-carious cervical lesions (NCCLs) have been attributed to toothbrush abrasion, (commonly termed dental erosion), and abfraction. Dental abrasion is the most prevalent form of NCCL.[2]

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# PERIODONTAL HEALTH STATUS OF DIFFERENT SOCIO-ECONOMIC GROUPS : CROSS SECTIONAL STUDY

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*****Dr. Vishal Sahayata *Dr. Kinjal Gabani *Dr. Sagar patel

**ABSTRACT :**

**Aims & Objective:** To assess the oral health awareness and periodontal health status in different socio-economic groups in outpatient department of periodontology and oral Implantology,Faculty of Dental Science, Dharmsinh Desai University, Nadiad, India.

**Materials and Methods:** This cross-sectional study was conducted on 100 subjects of 30-60 years age group with different socio-economic status classified according to modified Kuppuswamy scale (2012). Subjects were interviewed by the questionnaire and Community Periodontal Index was recorded.

**Result:** This study showed that the Community Periodontal Index (CPI) code 2 and code 3 is more in lower socio-economic status ($p = 0.115$ and $p = 0.079$ respectively). Significant association was seen in code 0, code 1 & code 4 ($p < 0.01$) which is indicative that upper class have more healthy periodontal status than lower.

**Conclusion:** Significant association exists between oral health awareness and periodontal health with the socio-economic status of the individual.

***Keywords: Oral health, Periodontal status, Socio-economic status***

## Introduction

In India, periodontal disease is still the leading cause for the tooth loss in adults.[1] It is a chronic inflammatory disease which leads to loss of attachment and deepening of the gingival sulcus that further causes loss of alveolar bone ultimately leading to tooth loss.. Periodontal health status is associated with age, smoking, systemic diseases, gender, genetics and utilization of the dental care.[2,3] It has been seen that the poor oral health is related to the lower economic status.

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# NANOROBOT - The next generation of Dentistry

*Dr. Taruna Sharma *Dr.VirajTalsania **Dr. Shalini Gupta

**Abstract:**

Nanorobtics is the technology which uses nanorobots that allow precision interaction with nanoscale objects. Treatment possibilities may include permanent hypersensitivity cure, permanent orthodontic realignments during single office visit, local anaesthesia, dentition renaturalisaton, continuous oral health maintenance using mechanical dentifrobots. Dental nanorobots could be constructed to destroy caries-causing bacteria or to repair blemishes of tooth where tooth decay has begun by using computer. These have a strong potential to revolutionise dentistry and might be programmed to crawl through human tissue with navigational precision, to acquire energy to sense and manipulate their surroundings to diagnose and treat diseases. Although the research is still in its preliminary stage, the future of this technology has countless uses.

**Introduction:**

More than half a century ago, at the annual American Physical Society meeting (1959), the physicist Richard Feynman, Nobel Prize winner in Physics, presented his work "Plenty of Room at the bottom" which dealt with the matter of Manipulating and controlling small scale things, a field which he thought would have "a great deal of technical applications." The infected root canal space cannot be disinfected with the standard root canal protocol with the aggressive use of endodontic files.

The physicist suggested that using regular machine-tools, only smaller, and so on, step by step, till the production of molecular machines.[1] High- tech and effective management at microscopic level, termed nanotechnology, is predicted to be an important part of future dental and periodontal health.

The word nano is derived from the Greek word 'dwarf', a nanometer being a billionth of a meter. Nanomaterials are those with parts less than 100nm in at least one dimension including clusters of atoms, grains less than 100nmin size, fibers less than100nm in thickness.[2]

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# Relationship between diabetes mellitus and periodontal disease - A clinical study.

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**Abstract:**

**Introduction:** The relation between diabetes mellitus and periodontal disease is not clear. From the available data, it seemed reasonable to believe that diabetics were more susceptible to periodontal disease than non diabetics. **Aim:** The present study was to clinically evaluate the relationship of diabetes mellitus with periodontal disease along with various parameters. **Materials and Methods:** 200 patients with diabetes mellitus were examined. A thorough oral examination was carried out and relevant history was recorded for all the patients. **Results:** The prevalence of periodontal disease in diabetic patients was 88.4% (gingivitis 26.3% and periodontitis 62%) and complete edentulousness was 9.8%. Remaining 1.9% of patients were periodontally healthy. **Conclusion:** It can be concluded that poorer the glycemic control and longer the duration of diabetes, the greater will be the prevalence and severity of periodontal disease.

**Keywords:** Glycemic control, Periodontal disease, Prevalence, Severity.

## Introduction:

Diabetes mellitus (DM) is a chronic, non-communicable disease and also one of the major global public health issues. It is defined as a clinical syndrome characterized by hyperglycemia due to absolute or relative deficiency of insulin.

The global prevalence of T2DM has reached 382 million people in 2013 and by 2035 this will rise to 592 million's adult inhabitants. Diabetes has caused 5.1 million deaths in 2013. Every six seconds a person dies from diabetes.[1]

An elevation of blood glucose level (hyperglycemia) is the primary feature of DM and results from a defect in insulin secretion by pancreatic β cells, a decrease in insulin sensitivity, or a combination of both.[2]

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Type 2 diabetes mellitus (T2DM) is a highly prevalent metabolic disorder and accounts for about 85-90% of all cases of diabetes in the world and

# Association between diabetes mellitus and risk of peri-implant diseases

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## Abstract:

Dental implant surgery has developed to a widely used procedure for dental rehabilitation and is a secure and predictable procedure. But some local and systemic risk factors can result in higher failure rates and affect implant survival. Diabetes mellitus is a chronic disease that goes in with hyperglycemia and causes multifarious side effects. India leads the world today with largest number of diabetic patients in any given country. Along with all other complications diabetes also affect the peri-implant tissue. Peri-implant diseases, namely peri-implant mucositis and peri-implantitis, have been extensively studied in present era. However, little is known about the association between diabetes and peri-implant diseases. Present review narrates role of diabetes as a risk factor in developing peri-implant diseases, which may lead to implant failure in future.

***Key words:*** *diabetes mellitus, peri-implant mucositis, peri-implantitis.*

## Introduction:

Over the past few decades, oral osseointegrated implants have been widely accepted as an effective treatment for missing teeth.1

Under care and attention of indications, anatomical and intra-individual limiting factors, insertion of dental implants seems to represent a "safe" treatment option.

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# AMNIOTIC-CHORIONIC MEMBRANE: HYPE OR HOPE

*Dr. Deesha Chhaya **Dr. Shalini Gupta ***Dr. Vasumati Patel

**Abstract:**

Periodontitis is a serious concern for clinicians. Several methods have been used for achieving periodontal regeneration. Regenerative technique can be subdivided into two major types: non bone graft associated, bone graft associated and combination of both. The placental membrane used as a non-bone graft associated regenerative technique; possesses numerous growth factors, proteins and stem cell reserves that accelerates wound healing and regeneration. This review article unfolds placental membrane's potential for regeneration specially in the field of periodontal surgeries.

***Keywords:*** *Regeneration, fetal membrane, stem cell reserves.*

## INTRODUCTION

Regenerative medicinal therapy has emerged as a powerful tool to generate biological substitutes and repair damaged tissues, by either transplanting exogenous or stimulating endogenous stem cells with highly proliferative and differentiative capacity to restore proper function and provide better aesthetics.1

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# AWARENESS AMONGST THE GYNECOLOGISTS REGARDING THE ASSOCIATION BETWEEN SEX HORMONAL CHANGES AND PERIODONTAL HEALTH/DISEASES: A QUESTIONNAIRE SURVEY

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## ABSTRACT:

Sex hormones play an important role in periodontal health and disease. For example, puberty, menses, pregnancy, menopause, and oral contraceptives use, influence a woman's periodontal health. A survey was conducted among 50 gynecologists who are practicing in private hospitals. In the form of questionnaire, 16 questions were framed to evaluate the awareness among the gynecologists about female sex hormones on periodontal health. 72% of them were aware that sex hormonal changes are correlated with periodontal disease. Findings showed that most gynecologists were aware and concerned about female patient's oral health during various hormonal phases.

## Introduction

The mouth serves as a mirror to general health status and also acts as a portal for the disease to the rest of the body.[1] Oral health during pregnancy has long been a focus of interest. It involves multiple substantial and hormonal changes that have a momentous impact at the time of pregnancy.[2]

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# PERIODONTAL DISEASE-SYSTEMIC DISEASE INTER-RELATIONSHIP AWARENESS STUDY

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****Dr. Hiral Purani *Dr. Dhvani Valvai *Dr. Deesha Chhaya

## Abstract:

**Aim:** To determine the awareness among patients about the inter-relationship between periodontal and systemic diseases.

**Material and method:** A survey were conducted among 100 patients aged between 35 to 65 years who visited the Department of Periodontology and Oral Implantology, Faculty of Dental Science, Dharmsinh Desai University, Nadiad. Assessment form comprised of a questionnaire having 12 questions framed to evaluate the awareness among patients about periodontal and systemic diseases inter-relationship.

**Results:** 100 patients were surveyed. About 69% of them were not aware that periodontal disease is correlated with systemic diseases like diabetic mellitus, cardiovascular diseases, hematological disorders, hormonal discrepancies and osteoporosis.

**Conclusion**: The awareness about the inter-relationship of periodontal and systemic diseases among patients is very minimal.

***Key Words:*** *Periodontal disease, Systemic disease, Diabetes mellitus.*

## Introduction

For decades, close attention has been paid by physicians and dentists to their own respective fields, specializing in medicine pertaining to the body and the oral cavity, respectively. However, recent studies have strongly suggested that oral health may be indicative of systemic health.

Currently, this gap between allopathic medicine and dental medicine is quickly closing, due to significant findings supporting the association between periodontal disease and various systemic conditions such as cardiovascular disease,

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# 5 Efficacy Of Preprocedural Mouth Rinsing In Reducing Aerosol Contamination Produced By Ultrasonic Scaler

**Author:** Dr. Vasumati Patel, Dr. Shalini Gupta,Dr. Hiral Purani,dr. Dhvani Valvi

## ABSTRACT:

### Aim:

The aim of this study was to assess the importance of pre-procedural rinsing before scaling by ultrasonic instrumentation and to compare the efficacy of commercially available chlorhexidine gluconate mouth rinse and herbal mouth rinse with a control group and to assess the amount of contamination in the clinical environment at Location 1(Patient's chest), Location 2(Operator's chest) and Location 3(Assistant's chest) after the preprocedural mouth rinsing.

### Material and method:

All patients were categorized into three groups. Group A or control group underwent scaling with water as pre-procedural rinse, Group B used 10 ml of 0.2% Chlorhexidine gluconate and group C were administered 10 ml of herbal pre-procedural rinse. Aerosol splatter produced during the procedure were collected on blood agar plates at Location 1(Patient's chest), Location 2(Operator's chest) and Location 3(Assistant's chest) after the preprocedural mouth rinsing and sent for microbiologic analysis for the assessment of bacterial Colony Forming Units (CFUs).

### Results:

The mean Colony Forming Units for control group was 9657.00 ± 490.69, Chlorhexidine gluconate group was 2322.20 ± 646.72 and herbal rinse group was 5170.90 ± 589.38 as well as at location 1, 5716.70 ± 3121.24, at location 2, 3552.63 ± 2129.53and at location 3, 1946.53 ± 1150.89.

### Conclusion:

0.2% chlorhexidine gluconate pre-procedural rinsing was found to be most effective than Herbal mouthwash and water respectively in reducing aerosol contamination during ultrasonic scaling. Location 1(Patient) was found to be at highest risk followed by Location 2(Operator) and Location 3 (Assistant).

**Key Words:** pre-procedural rinsing, 0.2% Chlorhexidine gluconate, Herbal mouthwash, aerosol.

# A SURVEY ON THE USE OF ANTIBIOTICS AMONG THE DENTISTS IN GUJARAT

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## ABSTRACT

**Objectives:** The purpose of the present study was to determine the pattern of antibiotic prescription among dentists of Gujarat and assess their attitude toward growing antibiotic resistance.

**Methods:** An electronic version of the questionnaire of cross-sectional survey regarding antibiotic use and attitude towards growing antibiotic resistance was constructed using google forms that was e-mailed to dental surgeons of Gujarat.

**Results:** The survey included 500 dental surgeons, out of which 397 dental surgeons completed the survey, thereby achieving a response rate of 79.4%. Majority of the respondents (45%) chose amoxicillin + metronidazole in nonallergic patients. Average minimum duration of antibiotic therapy was 5 days (47%). The drug of first choice for patients with an allergy to penicillin was azithromycin. The prime determinant of antibiotic use was facial swelling (82%). The prime determinant to select a particular brand of antibiotics was popularity of that brand (35%). Almost all (98%) dental surgeons were aware of antibiotic resistance being a growing concern. As per their views, there was over prescription of antibiotics in few conditions.

**Keywords:** *Antibiotics, Abuse, Resistance.*

## INTRODUCTION

Odontogenic and Periodontal infections are commonly encountered by dentists for which antibiotics are frequently prescribed. Although a boon, antibiotics can be called as a double-edged sword as its injudicious usage might cause complications. Although considered as an adjunct to definitive treatment, antibiotics are usually prescribed for shorter periods by dentists as a substitute for the definitive treatment. The term "antibiotic" has been derived from combination of two words: Anti meaning "against" and biosis meaning "life."

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# Role of Low- Level Laser Therapy in Periodontal and Peri-implant Healing

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**Abstract:**
Laser irradiation has numerous favorable characteristics, such as ablation or vaporization, hemostasis, bio stimulation (photo biomodulation), microbial inhibition and destruction, which induce various beneficial therapeutic effects and biological responses. Low- level laser therapy promotes periodontal as well as peri-implant healing by various mechanisms. With increasing evidences of benefits, low-level laser therapies play an important role in wound healing/tissue regeneration and these evidences have been summarized in the present review.
***Key words:*** *low-level laser therapy, bio stimulation, healing, tissue regeneration*

**Introduction:**

LASER is an acronym for light amplification by stimulated emission of radiation. Laser light is monochromatic, coherent and collimated beam. Low-level laser treatment, also called 'Soft Laser Therapy' has been used for more than five decades in the health system. It was first introduced by Mester and his colleagues.[1] They pointed out that laser application with 1j/cm$^2$ would result in lesion repair in mice. [2] Low-level laser is a visible red light or near infrared light whose wave length has a low absorption power in water and is capable of penetrating into soft and hard tissues in a depth of 3mm-15mm. Low level laser therapy (LLLT) is also known as laser phototherapy (LPT), bio stimulative therapy (BT), Low- intensity laser therapy (LILT).

**Lasers - widely used for Low level laser therapy**

The first commercialized bio stimulative laser was a helium-neon (HeNe) laser of <1 mW. The use of HeNe laser for biostimulation is limited by the need for an optic fiber, the size of the machine and the still rather low power option, now typically in the range 5-25 mW. It has generally been replaced by the indium-gallium-arsenide: phosphorous laser, a diode producing red laser in the range 600-700 nm and able to deliver as much as 500 mW.

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# PERIPHERAL OSSIFYING FIBROMA – A CASE REPORT

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## ABSTRACT

Peripheral ossifying fibroma (POF) is a reactive inflammatory gingival hyperplasia which shows area of calcification or ossification. It is a non-neoplastic entity of gingiva. The etiology and pathogenesis of POF are yet not clear, but hypothesized as a proliferative reaction originating from the periodontal ligament, as a result of irritating agents such as dental plaque, calculus, orthodontic appliances, and overhanging restorations. This case report presents a case of 50 years old female patient with a complain of gingival overgrowth on upper front teeth region.

***Keywords***: *Ossifying fibroma, gingival hyperplasia, calcifications*

## INTRODUCTION

Peripheral ossifying fibroma (POF) is a non-neoplastic entity, which occurs on the gingiva in response to trauma or irritation. It is a reactive lesion of connective tissue and is not the soft-tissue counterpart of central ossifying fibroma. Localized reactive lesions seen on the gingiva includes focal fibrous hyperplasia, pyogenic granuloma, peripheral giant cell granuloma, peripheral cementifying fibroma and peripheral ossifying fibroma.1¬ POF was first reported by Shepherd in 1844 as alveolar exostosis.1 Eversol and Robin in 1972, later coined the term peripheral ossifying fibroma.1It occurs in the younger age group with a female preponderance. It has a predilection for maxillary arch and most of them occur in the incisor-cuspid region and presents as a painless mass on gingiva or alveolar mucosa measuring not more than 3 cm which can be pedunculated or sessile. Earlier lesions appear irregular, red and older lesions have a smooth pink surface and surface ulceration may be present.[2] Incidences of recurrence have been reported to be 7– 45%. The possible reasons for high recurrence rate is incomplete surgical excision of lesion, incomplete removal of plaque, calculus, and difficulty in access during surgical manipulation due to intricate location of POF being present usually at interdental areas.[3]

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# A QUESTIONNAIRE STUDY ON ORAL PROPHYLAXIS IN PERIODONTICS – MYTH AND TRUTH IN PATIENT VISITING DEPARTMENT OF PERIODONTOLOGY, FACULTY OF DENT AL SCIENCE, NADIAD, GUJARAT

*Dr. Vasumati Patel ****Dr. Sarita Mori **Dr. Shalini Gupta
***Dr. Anal Trivedi ****Dr. Vidhi Pandya ****Dr. Tushar Gangani

**ABSTRACT**

Aim: The aim of the study was to determine the prevalence of myths related to dentistry in the rural population of Nadiad District.

Materials and methods: A cross-sectional survey was conducted in patients who visited Department of Periodontology, Faculty of Dental Science in Nadiad district in a sample of 500 individuals. A self-designed questionnaire consisting of 15 questions were given to all the subjects and they were questioned about dental myths, tobacco habits, and oral hygiene methods.

Results: The results were compartmentalized under two sections: 'Yes' or 'No' and the percentage calculation was done for each question out of 500 respondents.

***Key words:*** *Myths, Dentistry, Rural population.*

## INTRODUCTION

Oral health is critical but an overlooked component of overall health and well-being among children and adults. Oral health problems, such as dental caries, periodontitis and oral cancer are global health problems.[1]They are found in different populations belonging to developed and developing countries. There are reports suggesting that the oral diseases are showing an increasing trend in developing countries in the past few decades.[1]Majority of population in India live in rural areas and have limited health and oral healthcare services available to them.[2]Despite remarkable worldwide progress in the field of diagnostics, preventive and curative health, there are people still living in isolation in natural and unpolluted surroundings faraway from civilization with their traditional values, customs, beliefs and myths intact.[2,3]Cultural forces bind people and also profoundly shape their lives. Culture has its own influence on health and sickness and that is greatly depicted by the values, beliefs, knowledge and practices shared by the people.

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# A QUESTIONNAIRE STUDY ON KNOWLEDGE ABOUT ORAL HYGIENE AIDS AMONG DENTAL STUDENTS IN DHARMSINH DESAI UNIVERSITY

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## ABSTRACT

Objectives: The purpose of the study was to determine the knowledge about oral hygiene aids among dental students.

Methods: A questionnaire survey which consists of self-administered validated, structured, 15 close-end multiple choice questions about oral hygiene aids were circulated among 413 undergraduate dental students from Dharmsinh Desai University. The data extracted was tabulated, statistically analyzed and results obtained.

Results: According to this survey, toothbrush with toothpaste was the most common oral hygiene tool used for cleaning teeth but the use of interdental aids and chemical plaque control agents are not very popular among the dental students. 68% students know the contents of the toothpaste. According to this study, 95 % of students know the proper brushing technique but only 33% of students brush with the correct vertical motion.

Conclusion: Dental students has excellent knowledge about oral hygiene aids, irrespective being students working in preclinic or clinics. Interns has good knowledge about oral hygiene aids, which will help them in their clinical practice. The attitude and behavior toward oral health maintenance of the dental professionals reflect their understanding of the preventive oral health measures, and this is very important for the improvement of their patient's oral health.

**Key words:** *Knowledge, Oral hygiene aids, Dental student.*

## INTRODUCTION

Dentists play an important role in the improvement of the public's oral health education. Therefore, acquiring knowledge and attitudes related to dental health and the prevention of oral diseases is very important during the future dentists' training period. One of the main objectives of dental education is to train students who can motivate patients to adopt good oral hygiene practices. They are more likely to be able to do this if they themselves are motivated. Moreover, dental students should be able to apply this knowledge and attitude to their own dental care.

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Original Research

# Furcation involvement and treatment: A review

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**ABSTRACT**

The presence of furcation involvement is one clinical finding that can lead to a diagnosis of advanced periodontitis and potentially to a less favourable prognosis for the affected tooth or teeth. Furcation involvement therefore presents both diagnostic and therapeutic dilemmas. This review explains the vast aspects of furcation involvement in form of etiology, classification, diagnosis and different treatment modalities.

**KEYWORDS:**

## INTRODUCTION

Periodontal disease is characterised by the loss of connective tissue attachment induced by the presence of periodontal pathogens within the gingival sulcus.1The destruction of periodontal tissues progresses in the apical direction affecting the cementum, periodontal ligament & alveolar bone affected by inflammatory response, type of bacteria present, organic conditions &local factors.The progress of inflammatory periodontal disease may results in attachment loss to affect the bifurcation or trifurcation of multi-rooted teeth.The furcation area has a complex anatomic morphology, which makes it difficult, if not impossible in some instances, to debride this area properly during routine periodontal instrumentation, as well as to clean it during routine home-care practices, when the root surfaces have been colonized by the subgingival biofilm. Furcation involvement is therefore an important complication in the progression of periodontitis and is a risk factor for progression of further attachment loss and, at the same time, reduces the efficacy of periodontal therapy.2The furcation involvement has been defined by the American Academy of Periodontology as 'the pathologic resorption of bone in the anatomic area of a multirooted tooth where the roots diverge'.2 The histopathologiccharacteristics of furcation lesions are not unique but merely comprises the extension of existing periodontal pockets into this specific anatomic area. The local factors associated with furcation sites usually affect the rate of plaque colonization or complicate its elimination by regular oral-hygiene practices, thereby contributing to the development of the lesion. Dental caries and pulpal pathology may also affect the furcationarea.The presence of furcation-involved teeth in a periodontal patient influence the treatment plan.Furcations are frequently not accessible for adequate professional debridement because their entrance is very small for the size of periodontal instruments, and they present with ridges, convexities, and concavities that frequently render the defect impossible to instrument effectively. Therefore, furcation defects represent a formidable problem in the treatment of periodontal disease, principally because of the complex and irregular anatomy of furcations.

## ETIOLOGIC FACTORS

The primary etiologic factor in the development of furcation involvement is bacterial plaque and the inflammatory consequences that result from its long-term presence. The extent of attachment loss required to produce a furcation defect is variable and related to local anatomic factors and local developmental anomalies. These factors may affect the rate of plaque deposition or complicate the performance of oral hygiene procedures, thereby contributing to the development of periodontitis and attachment loss.The contributing factors for furcation involvement includes 1) Anatomical factors like Root trunk length, Root length, Root form, interradicular dimension, Bifurcational ridges, Cervical enamel projections, Enamel pearls and 2) Periodontal factors like Plaque-associated inflammation, Trauma from occlusion, Pulpal pathology, Endodontic-periodontal disease, Vertical root fractures and overcontoured restorations as iatrogenic factor.

Classifications of furcation involvement

1) Glickman's classification of furcation involvement (1972)3:

**Grade I:** A grade I furcation involvement is the incipient or early stage of furcation involvement. The pocket is suprabony and primarily affects the soft tissues. Early bone loss may have occurred with an increase in probing depth, but radiographic changes are not usually found.

**Grade II:** A grade II furcation can affect one or more of the furcations of the same tooth. The furcation lesion is essentially a cul-de-sac with a definite horizontal component. If multiple defects are present, they do not communicate with each other because a portion of the alveolar bone remains attached to the tooth. The extent of the horizontal probing of the furcation determines whether the defect is early or advanced. Vertical bone loss may be present and represents a therapeutic complication.

**Grade III:** The bone is not attached to the dome of the furcation. In early grade III involvement, the opening may be filled with soft tissue and may not be visible. The clinician may not even be able to pass a periodontal probe completely through the furcation because of interference with the bifurcational ridges orfacial-lingual bony margins. However, if the clinician adds the buccal and lingual probing dimensions and obtains a cumulative probing measurement that is equal to or greater than the buccal-lingual

JIDA

Periodontics

# A quesstionaire survey on understanding of the possible factors that could contritube to the student's successful performance in the clinical posting during undergraduate training

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## Abstract

Undergraduate academic years are very important in the dental professional life. It forms the basis of his/her future clinical skills. As these years are crucial; one really needs to pay attention to minute factors that could accentuate the excellence of the clinical skills. These factors might not seem that significant but if considered can bring a major change in student's clinical life. Nowadays, abundant literature is found upon such survey for the specialty students, but this survey focuses upon the factors and the solutions to the problems that could lead to successful performance in clinical posting during undergraduate training.

### Aim

To come out with the factors which could help to understand and improve the experience and treatments given by undergraduate students in their clinical postings.

### Materials and Methods

The present study is a self-designed questionnaire based cross-sectional study performed among the undergraduate students (third year, fourth year and internship) of the DCI registered colleges of Gujarat. A digital version of questionnaire was prepared and sent to the subjects via E-mails and through generated Google form links.

### Results

A huge range of undergraduate students of third year (29.3%), fourth year (38.3%) and internship (32.4%) participated in the survey. Majority of the subjects (70.3%) finds faculty the best option for gaining knowledge and understanding in the clinics, while 59% of the subjects feel stress to be reduced via small breaks in between as a necessity. In the digitalized era 62.1% of the subjects feel the patient's records to be kept in both the hard as well as the soft copies. 81.3% of the respondents showed positive response towards extensive learning.

### Summary and Conclusions

Many of the small factors that extracted during the survey should be considered and given a thought as small changes during the academic clinical years can lead to better professional clinical skills tomorrow.

### Key Words

Clinics, Knowledge, Patient, Skills, Stress, Undergraduate Students.

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# Effect of implant angulation and depth on the accuracy of casts using the open tray splinted impression technique

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Affiliations + expand

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## Abstract

The purpose of this study was to evaluate the accuracy of open tray dental implant impressions when the implants are placed with varying implant angulations and depths. Four partially edentulous models were fabricated using photopolymer resin, each having different angulation and depth of the implant analogs. A total of forty open tray elastomeric impressions were made which were poured in type IV die stone (n = 10). These casts were evaluated and compared for accurate reproduction of the spatial orientation of the implant analogs in the models using digitization in three dimensions. The results were analyzed using the independent T test. Statistically significant differences were observed when the casts were compared with their respective master models. These casts had the implant replicas placed deeper within the replicated soft tissue. Making accurate impressions in partially edentulous situations with dental implants placed with varying depth and angulation is critical and clinically demanding. There is a need for future in vivo research to identify methods and materials, exploring digital impression techniques as well, in order to make precise impressions.

**Keywords:** Implant Impressions; coordinate measuring machine; open tray impression technique; polyvinylsiloxane impression material; splinting.

ORIGINAL ARTICLE

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# Evaluating Efficacy of Mandibular Advancement Device in Patients With Essential Hypertension and Obstructive Sleep Apnea

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**Study Objectives:** Obstructive sleep apnea (OSA) has a close association with hypertension and often leads to uncontrolled hypertension. One treatment modality for mild to moderate OSA is the mandibular advancement device (MAD). The goal of the current study was to evaluate the effect of the MAD on blood pressure and sleep apnea severity.

**Methods:** A total of 25 participants, screened for OSA using the STOP-Bang Questionnaire, and underwent a level 3 home sleep test. Based on apnea-hypopnea index (AHI) calculated from a level 3 home sleep test, selected participants with mild to moderate OSA underwent 24-hour ambulatory blood pressure monitoring. The monoblock type of custom-made MAD was fabricated for each of 21 selected participants. After 1 month of MAD therapy, a level 3 home sleep apnea test was performed again with the MAD in position and 24-hour ambulatory blood pressure monitoring were repeated for comparison with both parameters before MAD therapy.

**Results:** MAD therapy resulted in significant reduction of systolic and diastolic blood pressure ($p<0.05$) and simultaneous reduction in AHI was also reported ($P<0.05$).

**Conclusions:** MAD therapy is associated with significant reduction in AHI and ambulatory blood pressure in subjects with essential hypertension and OSA.

**Keywords:** essential hypertension, level 3 home sleep apnea test, mandibular advancement device, obstructive sleep apnea

**Citation:** Shah M, Mathur S, Upadhyaya S, Makwana R. Evaluating efficacy of mandibular advancement device in patients with essential hypertension and obstructive sleep apnea. *J Dent Sleep Med*. 2020;7(4)

## INTRODUCTION

Obstructive sleep apnea (OSA) is a common disease that usually occurs because of narrowing in the size of the upper airway during sleep and is believed to be a leading cause of transient asphyxia. This event leads to intermittent hypoxemia, sleep disturbances, daytime somnolence, brain arousals, and poor quality of life. As a result of the aforementioned events, the cardiovascular system may already be adversely affected by metabolic and neurohormonal disturbances.[1] Epidemiologic data suggest that there is a strong association between OSA and systemic hypertension and that this association affects cardiovascular outcomes. The upper airway muscular activity is inhibited by an acute increase in blood pressure. This occurrence, together with volume overburden and its relocation to the upper body during rest, which can be experienced by individuals with hypertension, leads to pharyngeal edema and may clarify the connection among hypertension and OSA.[2]

It is reported that continuous positive airway pressure therapy for OSA improves blood pressure of patients with hypertension.[3] A few studies have depicted the antihypertensive effect resulting from mandibular advancement device (MAD) therapy on mild to moderate OSA.[4-6]

Based on the apnea-hypopnea index (AHI) calculated from polysomnographic analysis, OSA can be categorized as mild (AHI = 5 to 15 events/hour), moderate (AHI = 15 to 30 events/hour), and severe (AHI = more than 30 events/hour).[7] Many studies have revealed that use of MAD therapy is an effective treatment to reduce severity of mild to moderate OSA by 50%.[8-10] MADs relieve snoring and sleep apnea by widening or opening the airway through anterior positioning of the mandible during sleep.[11,12]

Many subjective and objective means of diagnosis of OSA have been reported to date. The STOP-Bang questionnaire includes both subjective and objective parameters and is used for screening of patients with significant risk of OSA.[13]

Subjective parameters are used to assess the history of snoring, observed apnea, and tiredness whereas objective parameters includes body mass index, blood pressure, neck circumference, age, and sex of the participants. The Epworth Sleepiness Scale (ESS) is a subjective questionnaire to assess daytime sleepiness in participants with OSA.[14] Polysomnography is the most common and gold standard objective analysis for diagnosis and monitoring of OSA that is noninvasive and does not require any radiation. It is possible to obtain reports of different parameters such as electrocardiography, electroencephalography, electromyography, electro-oculography, respiratory events, oxygen saturation, body

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# Awareness, Attitude & Knowledge of COVID-19 amongst North Indian Population: Mirror of an Outburst Scenario

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## Abstract

**Context:** In the current era, the evolving pathogen, CoVs was originated anonymously in a patient suffering from pneumonia in Wuhan in December 2019 has drawn implausible care around the world. **Aim:** Its aim was to assess the knowledge, attitudes and degree of awareness among the North India population of different ages towards COVID-19 through a well-formatted questionnaire. **Methods and Materials:** A cross-sectional study of 384 participants enlisted from various places was conducted through an effective and dependable questionnaire including socio demographic and COVID-19 knowledge data in the population of Northern India. **Statistical Analysis Used:** ONE-WAY ANOVA test was used to illustrate statistical differences and result came as significant at ($p<0.05$). **Result:** Maximum participants were males (52%) of age 40-59 years (39%); secondary passed (12%) and people working in a private sector (12%). **Conclusion:** Due to collaboration of all the sources as social media, television, newspaper and health related advertisement public was having good knowledge about COVID-19.

## Keywords

COVID-19, pneumonia, Wuhan

## Subject Discipline

Dentistry

Journal of Immunology and Allergy
An Open Access Journal

# Corona Virus: Endemic To Pandemic

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## *Abstract*

*Coronaviruses (CoVs) are imperative pathogens for human and vertebrates which can affect primarily respiratory, gastrointestinal, hepatic and central nervous system of human, domestic animals, birds, bat, mouse and many other wild animals. According to the literature, the epidemiology reported the outburst evidence of Severe Acute Respiratory Syndrome (SARS) in 2002-2003 and the Middle East Respiratory Syndrome (MERS) in 2012 have established the infectious transmission from animal-to-human and human-to-human and now the emerging pathogen is CoVs which was found anonymously in a patient suffering from pneumonia in Wuhan in December 2019 has drawn incredible care around the world.*

## Keywords

Coronaviruses; Middle east respiratory syndrome; Severe acute respiratory syndrome.

## Introduction

In 1968, the term "coronavirus," has been derived from the word "corona-like" or "crown-like" because of its crown like structural resemblance of the virus under electron microscope [1]. Primarily, coronaviruses causes a fatal diseases in birds and mammals but can also infect

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Review Article

# Ageusia, Anosmia: Hallmarks of Covid-19 - Lost and Found

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## Abstract

Currently, COVID-19 is unquestionably becoming a universal problem and for the predictable forthcoming. It has aroused an alarm concerning the spread and infects humans worldwide. In COVID-19, Olfactory and taste disorders (OTDs) are newly testified disorders and have been hypothesized that oral and nasal tissues possibly encompass host cells of SARS-CoV-2. Researchers have concluded that hyposmia or anosmia (decrease or loss of smell) and ageusia (loss of taste) is a key indicator that a person who else gives the impression that he is healthy is carrying the virus and possibly be spreading it to others. Hereby, this article gives an insight review of these indicators.

**Keywords:** COVID-19; Ageusia; Anosmia

## Introduction

The mysterious Coronavirus came into limelight in December 2019, at the Huanan Seafood market in Wuhan State of Hubei Province in China in a pneumonic patient of for which etiology was not known and momentarily WHO was informed for the same. Considering the life-threatening condition, by early January, WHO named it temporarily as 2019-nCoV. On February 11, 2020, WHO renamed it as COVID-19 and SARS-2 by the International Committee on Taxonomy of Viruses (ICTV) [1]. Coronaviruses, having the largest RNA genome is composed of positive-strand RNA, enveloped with round pleomorphic virions of approximately 80 to 120 nm in diameter [2,3]. The most common mode of transmission is from human-to-human which occurs primarily when the respiratory droplets produced from an infected settled in the mouth or nasal mucosa and lungs of people who inhaled air. Even though the foremost symptoms are fever, difficulty in breathing, throat infection, yet smell and taste disorders, such as anosmia (smell loss) and dysgeusia (taste impairment), have gathered


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*Volume – 3, Issue – 2, April - 2020, Page No. : 244 - 249*

# Prevalence of Periodontal diseases in North Gujarat

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

**Abstract**

**Background & Objective:** Periodontitis is one of the most commonly found oral problems, with its prevalence worldwide. It often leads to poor oral hygiene eventually causing number of oral disorders like halitosis, bleeding gums ultimately resulting in tooth loss. The rationale of the study was to verify the periodontal status in the population.

**Methods:** A cross sectional study was done with total of 238 patients of age group ≥10 years was examined. The target population constituted randomized sample of population of northern Gujarat. Oral hygiene prominence was evaluated according to Green and Vermilion Simplified Oral Hygiene Index (OHI- S). Chi square test was done and was calculated by using software sociostatistics which was found to be statistically significant (*P value* = < 0.00001 at p<0.05).

**Results:** Good oral hygiene was maintained by males under age group 20-29 years, they used toothbrush as most common mode of oral hygiene maintenance with the highest frequency under age > 2 times and duration > 2 minutes. Males under age 30-39 years were well aware regarding the importance of regular dental visit.

**Conclusion:** In this present study we concluded that there is lack of awareness in this population along with poor oral hygiene status in most of the population. Regular dental check-ups, oral prophylaxis and education about importance of maintain good oral hygiene and adverse effects of poor oral hygiene need to be done for changing the present scenario.

**Keywords:** OHI-S, Periodontal disease, Prevalence.

## Introduction

Oral diseases are important as they can cause tooth loss and affect the general health and wellbeing of an

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# Awareness of Oral Hygiene measures in the population of Bhavnagar District

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

**Abstract**

**Background:** Periodontitis is one of the most ordinarily discovered oral issues, with its pervasiveness around the world. It regularly prompts poor oral cleanliness in the end causing number of oral issues like halitosis, bleeding gums eventually bringing about tooth misfortune.

**Objective:** The purpose of the study was to determine the oral hygiene status in the population of Bhavnagar .

**Methods:** A cross sectional study was done with total of 468 patients of age group ≥10 years was examined. The target population constituted randomized sample of population of Bhavnagar. Oral hygiene status was evaluated according to Green and Vermilion Simplified Oral Hygiene Index (OHI-S). Chi square test was done and was calculated by using software sociostatistics which was found to be statistically significant (*P value* =.000764 at $p < 0.05$).

**Results:** Good oral hygiene was maintained by females under age group 10-19 years, fair oral hygiene was observed in males under age 20-29 years and poor oral hygiene was observed in females under age > 50 years.

**Conclusion:** In this study we observed that there was absence of alertness with poor oral hygiene status in the majority of the populace. Ordinary dental registration, oral prophylaxis and instruction about significance of keep up great oral hygiene should be accomplished for changing the current situation.

**Keywords:** OHI-S, Oral hygiene, Periodontitis.

**Original article:**

# Oral stereognosis analysis in relation to age and the complete denture prosthesis

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**ABSTRACT:**

This study was conducted to examine the difference in oral sensory function by testing oral stereognostic ability (OSA) and to determine the effect of wearing complete dentures on OSA. The OSA tests were conducted with test pieces of 12 shaped forms on 20 dentate and 30 edentulous elderly subjects free from oral symptoms and pathologies, and 30 younger dentate students as controls. The duration time for recognition was noted and the answers were recorded using a three-point scale. ANOVA and paired t-tests were used to examine significant differences. P-values <0.005 were considered to be statistically significant. The OSA score in older dentate participants and complete denture wearers was significantly higher than in younger dentate subjects. However, no significant difference was found in the OSA score between older dentate participants and complete denture wearers. When older edentulous subjects removed the maxillary and mandible complete dentures, the OSA score was significantly lower and the response time significantly longer than with dentures. Within the limitations of this study, an age-related difference in oral sensory function, as measured by OSA tests, was found. However, oral sensory function was not significantly different between fully dentate persons and complete denture wearers in the elderly.

**Keywords:** oral stereognostic ability, oral sensory function, age, dentate subjects, edentulous subjects, complete denture.

## INTRODUCTION:

Stereognosis is the ability of perceiving and understanding the form and nature of objects by the sense of touch1. The subject is required to identify familiar objects by hand manipulation with the eyes closed. Tactile stimulation produces an awareness to the presence of stimulus. Stereognosis tests are used to evaluate the integrity of sensory feedback .The neurologic evaluation of central nervous system integrity frequently employs stereognostic tests.

In general, deterioration of most sensory abilities, such as visual, hearing, tactile and chemosensory, appear to occur almost inevitably with age in humans. Decline of motor function with age is linear, while that of sensory function is logarithmic. Humans reach an optimum sensory capacity in their twenties, maintain this peak for several years and then it declines, with the rate of decline having a wide individual variation2

Oral stereognostic ability (OSA) has been employed in many studies in order to evaluate oral perception. An individual who scores well in a test of the OSA has received sufficient sensory information with which to identify shapes explored in the mouth7.

Stereognostic testing is not designed to assess specific groups of sensory receptors, but overall sensory ability and oral motor ability1,8.Some studies have suggested decline of the OSA with age9,10,11, but the results are not



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# Socket Shield: A Case Report

Kashinath C. Arabbi, Mahantesha Sharanappa,[1] Yashi Priya,[1] Takshil D. Shah,[2] and Shobha K. Subbaiah[1]

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## Abstract

Go to:

It is fairly common to remove a severely compromised tooth and provide rehabilitation by means of an implant. Resorption of alveolar bone after extraction resulting in loss of bone height and width is an unpleasant sequelae causing difficulty in implant placement. Few procedures have been promoted to attain the required bone height and width, such as guided bone regeneration socket preservation with the use of various graft materials and barrier membranes. The disadvantages of these techniques are some amount of ridge height loss and loss of buccal/facial, ridge contour. The socket shield technique is a new method where a buccal segment of root is retained as a shield, which aids in retaining periodontal ligament on buccofacial aspect. The implant is placed (immediate placement) lingual to this shield. This maintains the alveolar ridge height and buccofacial contour, thus providing superior aesthetics. This case report shows placement of an implant in upper anterior region using this technique.

**Keywords:** *Bone graft, guided tissue regeneration, implants, osseointegration, socket shield*

## Introduction

Go to:

Healing of extraction socket is characterized by bone formation within the socket and loss of the alveolar ridge width and height externally. In aesthetic region, height and thickness of facial and interproximal bone walls are important for successful pink aesthetic outcomes, marked by the color, shape, character of the marginal peri-implant mucosa, and the presence of interdental papilla. Ridge recession and collapse cause unfavorable aesthetics in anterior maxilla. Compromised aesthetics may be masked by thick gingival biotype and a low lip line. Risk for an aesthetic failure is far greater in patients with high lip lines, very thin gingival biotype, multiple missing teeth, and with extensive tissue deficit. Techniques such as immediate


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# A Three-Dimensional Finite Element Analysis of Aramany Class I Obturator Fabricated with Different Alloys

Kashinath C. Arabbi, Takshil D. Shah,[1] Mahantesha Sharanappa,[2] and Shobha K Subbaiah[2]

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## Abstract

Go to:

### Aim:

The aim of the research was to develop a model that accurately represents an Aramany class I defect and its obturator prostheses fabricated with cobalt–chromium alloy and titanium alloy to compare the deflection and the stress distribution in the rehabilitated area.

### Materials and Methods:

Aramany class I defect and the obturator prostheses were generated geometrically using ANSYS 14.5; both were superimposed on each other to mimic the prostheses and the maxilla as one unit. Meshing of models was carried out using hypermesh software and materialistic properties were assigned. The 120 newton load was constituted on the teeth in different directions.

### Statistical Analysis Used:

Statistical analysis of Finite element was not possible. Self-explanatory decoding results in the software were used.

### Results:

The stress distribution and deflection executed by ANSYS provided results that enabled the tracing of Von Mises stress and deflection field in the form of color-coded bands with values in mega pascal.


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# Stress distribution & deflection in an Aramany class II obturator fabricated with cobalt-chromium & titanium alloys – 3D FEA

Takshil D. Shah,[a,*] Y.G. Naveen,[a] Puttaraj Kattimani,[a] Giridhar Kamath,[a] Kalind Shah,[b] and Aasif Raza[a]

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## Abstract

Go to:

### Purpose/objectives

The aim of the research was to develop a model that accurately represents an Aramany class II defect and its obturator prostheses fabricated with Cobalt Chromium alloy & Titanium alloy to compare the deflection and the stress distribution in the rehabilitated area.

### Methods

Aramany class II defect and the obturator prostheses was generated geometrically utilizing ANSYS 14.5, both overlaid on each other to impressionist prostheses and the maxilla as one element. Meshing of models was carried out utilizing HYPERMESH software & materialistic properties were assigned. The 120 N load was constituted on the teeth in different directions.

### Results

The stress distribution & deflection executed by ANSYS provided results that enabled the tracing of Von Mises stress and deflection field in the form of color veiled bands with standards in Mega Pascal (MPa).

### Conclusion

The study shows that Von Mises stresses are higher for the frame work fabricated with cobalt chromium alloy compared to Titanium alloy. The framework made of titanium alloy showed more deflection than cobalt-chromium alloy.

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# Awareness of Stress amongst Final Year Dental under Graduate Students in a Dental Teaching Institution in Western India: *A Cross Sectional Study*

Dr. Haritma Nigam[1], Dr. Pravin M. Parmar[2], Dr. Bansee R. Saran[3], Dr. Takshil Shah[4], Vishwa Brahmbhatt[5], Dr. Suyashvi Gupta[6]

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***Abstract:***
***BACKGROUND:*** *Dentistry involves a procurement of mandatory academic, clinical and interactive assistances throughout the entire phase. It necessitates clinical as well as patient managing assistances enhancing the pressure professed by every students.*
***AIM:*** *A retrospective study was done to detect the stress among the final year [4th year] dental undergraduate students and comparative analysis amongst genders.*
***Materials and Methods:*** *A questionnaire based cross- sectional study was conducted by involving 20 items based on 5-point Likert Scale modified Dental Environmental Stress (DES) questionnaire which was administered to all final year undergraduate dental students of the Institution.*
***Results:*** *Out of the 20 questions, 8 were reported to be "stressful" by >80 % of the students. Of these clinical requirements, academics, exam stress, and insecurity regarding career were the major sources of stress were reported to be "stressful" by >85% of the students.*
***Conclusion:*** *Worries about fulfilling clinical requirements, academics, exam stress, and insecurity regarding career were the major sources of stress reported by the clinical year dental students in the present study.*
***Keywords:*** *academics, clinical, dental students, stress*

Date of Submission: 30-10-2019 Date of Acceptance: 15-11-2019

## I. Introduction

In worldwide everybody's life is full of stress. Stress is defined as the pattern of specific and nonspecific responses an organism makes to stimulus events that disturb its equilibrium and tax or exceed its ability to cope.[1] In our day to day life everyone is having some stress but anything when it crosses its threshold is harmful. For students attending a school, college or university is a gratifying experience but on the similar condition it is also a significant apprehension and stress for students.[2] Stress may affect students' social, physical, and mental health which may directly or indirectly affects their performance and health.[3-7] Hence, this study was aimed to determine the amount of stress in undergraduate dental students. This data could be essential for institutional changes for the improvement of academic performance and psychological well-being of dental students.

## II. Materials And Methods

A cross- sectional study was conducted by involving 20 items which was based on modified Dental Environmental Stress (DES) questionnaire. After an elucidation of the study's aims, informed consent was given and was duly signed by each student. Final year 69 dental undergraduates, 21 males and 48 female students contributed their presence willingly in the study. This data was collected at the end of their final year for the better judgement. The DES questionnaire is a close-ended questionnaire relating to main provinces as like living accommodation, interpersonal relationship, academic performance, clinical skills and miscellaneous factors.[8] The comebacks to the questionnaire were based on a five-point Likert scale with response options of 1= answers

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# A Comparative Study of Different Oral Health Measures in a Population of Rajasthan

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*Corresponding Author: Dr. Pravin M. Parmar , Assistant Professor, Department Of Dentistry, Smimer Medical College, Surat.*

***Abstract:***
***Background:*** *The maintenance of oral hygiene is critical for anticipation of innumerable oral as well as systemic diseases. Different populations utilizes various oral hygiene measures skillfully since ancient times such as toothbrushes and dentifrices.*
***Aims & Objectives:*** *Evaluation and comparison different traditional oral hygiene measures with the use of toothpaste-toothbrush, the most recognized method of oral hygiene maintenance in plaque-cleaning efficiency, recession and tooth wear.*
***Material and Methods:*** *A cross sectional study done amongst the population of small town in Rajasthan.*
***Results:*** *Total 201 traditional oral hygiene method users were compared with same number of toothpaste-brush users. Amongst the patients reported there were maximum tooth powder users (46%) as compared to other traditional measures such as chew stick (33%) and salt/oil. Out of tooth powder users; almost 28 % reported using red toothpowder which gave an impression as tooth wear was also more severe among the toothpowder users.*
***Conclusions:*** *Toothpaste- toothbrush was found to be more effective in controlling plaque, gingival recession and tooth wearing.*
***Keywords: Periodontitis, toothpaste, traditional methods.***

Date of Submission: 04-12-2019 Date of Acceptance: 19-12-2019

## I. Introduction

Oral health is said to be the mirror of general health. It is vigorous for leading an excellence lifespan. In adult's periodontitis is consider to be the foremost cause of tooth wearing. India has mixed population, people are practicing different traditional methods for oral hygiene maintenance such as commercial toothpowders, charcoal or tobacco- based toothpowders, neemstick (chew stick /miswak) or simply salt and oil by finger method.[1] Periodontal disease is considered by loss of supporting tissues of the teeth which affect patient's health directly.[2] This is most commonly found in rural and semi- urban areas due to illiteracy and lack of awareness whereas people belonging to lower socioeconomic groups practice traditional oral hygiene measures due to its lower cost , as these are comparatively cheaper and because of certain misapprehensions concerning their advantageous effects.[3] Professionally it has been proven that utilizing these products, even for short duration of 6–12 months, had resulted in extreme tooth wearing ,reduced clinical crown height resulting in collapsing bite and second most common as hypersensitivity due to exposure of dentin and sometimes even pulp as a result of which it requires widespread treatment such as restorations, endodontic treatment, sometimes even extraction of teeth and its fabrication as per need. In few cases, there is requirement of technique- sensitive measures of full- mouth rehabilitation in order to restore the lost which is time- consuming, require multiple sittings and also economical strengthening.

This paper represents a cross- sectional study to evaluate the influence of these traditional oral hygiene measures on tooth loss, gingival recession, and gingival bleeding.

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# A Comparative Study of Palatal Shapes And Flexural Properties of Edentulous Maxillary Conventional Heat Polymerised Acrylic Resin Denture Bases With Glass Fibre/Metal Mesh Reinforced Bases.

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***Abstract***

***OBJECTIVES: -*** *This in vitro study was performed to determine the relationship of depth of palatal vault and fracture strength of permanent conventional denture bases with the glass fibre & metal mesh reinforced conventional denture bases keeping one standard thickness.*

***METHODS****: - Edentulous maxillary cast of shallow, medium and deep palatal vault were selected. Each cast was duplicated twenty four times. 8 cast of each group of palatal vault configuration were made. Casts of each palatal vault depth form were waxed to 2.00mm thickness. These patterns were processed with DPI Mumbai India heat polymerized acrylic resin. The thicknesses of the denture bases of conventional reinforced with glass fibres & metallic mesh were measured. These denture samples were kept with non tissue side on the platform of universal testing machine and the load is applied at the rate of 5mm/min. Flexural strength was evaluated and the results were analyzed with Mann – Whitney test.*

***RESULTS: -*** *Results revealed that a direct relationship exists between the fracture load and the denture base reinforced with glass fibres & metallic mesh. As the denture base is reinforced, load required to fracture also increased proportionally. The effect of different shapes of palatal vault configuration on fracture strength revealed that denture bases fabricated on shallow palatal vault of 2mm thickness fractured at lower values of load. Thus denture bases on the shallow palatal vault of 2mm thickness are inherently weaker than denture bases on medium and deep palatal vault configurations.*

***CONCLUSION: -*** *DPI Mumbai India Heat polymerized acrylic resin denture bases on shallow palatal vault are inherently weaker and less resistant to fracture than denture bases fabricated on medium and deep palatal vault configurations. Reinforcing the denture bases significantly increases the fracture load and fracture energy and hence increases the fracture strength of the denture base on a shallow palatal vault.*

***Keywords:*** *Flexural strength; palatal vault; denture base resins.*

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## I. Introduction

The introduction of more satisfactory plastic denture base material occurred in 1937 when Dr Walter Wright described the results of his clinical evaluation of methyl methacrylate resin .The acrylic resin generally have been found to have relatively satisfactory qualities including appearance, dimensional stability and simple procedures for processing of denture . The patient is generally pleased with the color characteristics and function of the dentures.[1]

Despite of these excellent properties it is not free from disadvantages. One of the problems encountered in the provision of prostheses is limitation of its strength to meet the functional demands of the oral cavity. During function the denture base is subjected to various stresses like compressive, tensile and shear stress

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# Prosthetic Management of an Ocular Defect – A Case Report

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***Abstract:*** *Magnificent and complex, eyes are the most important organ of the human body. An ocular defect has both psychological and physiological effect on the patient. A removable custom made or stock ocular acrylic prostheses is a better option than implant retained ocular acrylic prostheses due to economic factors and it also helps uplift the patient psychologically and improve the confidence. This article presents a case treated with a stock ocular acrylic prostheses which has good adaptation and esthetics. The stock ocular prostheses showed movement in coordination with contra lateral side eye.*

***Keywords:*** *Ocular defect; Evisceration; Enucleation; Stock ocular prostheses.*

## I. Introduction

Eyes are generally the first feature of the face to be noticed. Loss of eye has crippling effect on the psychology of the patient. The ocular prostheses helps to rehabilitate the patient in the society with normal appearance and self-esteem.Surgical enucleation is indicated in irreparable trauma, fights, infections, tumors, blindness, pain in the eye and cosmetic reasons[1].The surgical procedures for removal of an eye are classified by Peyman, Saunders and Goldberg into three categories: evisceration, enucleation and exenteration[2]. A maxillofacial prosthodontist plays a major role in rehabilitation of such patient with ocular prostheses. The ocular prostheses can be either custom made or stock ocular acrylic prostheses. The stock ocular prostheses are prefabricated ones and also it has less time consuming steps as needed for the fabrication of customized ocular prostheses. The use of stock prostheses is advocated when time is limited and cost is a consideration[2].This case report describes a case treated with stock ocular acrylic prostheses to obtain optimum retention with functional and esthetic results.

## II. Case Report

A 36-year old male reported to the Department of Prosthodontics, Sharavathi Dental College and Hospital, Shimoga for replacement of left eye (fig1); Patient gave history of accidental injury 30 years back where he lost his sight. He was suggested to get left enucleation done because of damage to the retina and supporting structures. Later on, he was operated in Manipal for the same and complete left eye enucleation was done. Tissue bed was edematous and inflamed due to old stock eye.

**Fig 1.** Preoperative Photograph

**Procedure:**

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# Awareness of Teledentistry Amongst Dental Professionals in India Amid COVID-19 Pandemic. A Cross-Sectional Study

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## Abstract

**Background:** COVID-19 has become a crisis across the country these days, which likewise changed living of individual to entity contact and its spread. There the presentation of Teledentistry will be the solitary solution that will have the option to treat patients quickly and expertly. **Aim:** The current study aims to assess the awareness of dental professionals towards teledentistry during COVID-19 crisis in India. **Methods:** A cross-sectional descriptive survey was conceded on over all 142 dentists. A self-organized, close-ended questionnaire containing 20 questions was appropriately assembled and distributed. Data collected from the survey was examined in terms of frequency (yes/no). One Way Anova test was used to exemplify statistical variances and result came as significant at $p < 0.05$. **Results:** The responses from specialist dental professionals (with or without practicing) responded (57%) and dentist working in a private sector (68%) having clinical experience of about 5-10 years (36%). **Conclusion:** Dentists were well aware of this advanced technique and due to feasibility, most of them were ready to practice it in future.

Original Research

# Evaluation of marginal fit of Milled versus Laser Sintered Chrome - Cobalt crowns – an invitro study

Rohan Khedkar[1], Somil Mathur[2], Rakesh Makwana[3], Meena Shah[4]

**ABSTRACT:**

**Statement of problem -** With the advent of new technologies, the use of automated techniques has increased many folds in dentistry. The selective laser melting technique and Milling are attracting interest in prosthetic dentistry. The marginal fit is a key criterion for fixed restorations. **Aim -** The aim of the study was to evaluate the marginal fit of Milled crowns versus the fit of Sintered crowns. **Null Hypothesis -** The null hypothesis is that the average marginal gap widths would not be significantly different between the Laser Sinteredand Milledcrowns. **Materials and Method –** 20 crowns each of milled and sintered, were fabricated and tested under 3D microscope and analysed with an independent two sample t test with equal variance assumed. **Results -** Thesintered crowns showed better marginal fit than milled crowns. The null hypothesis was rejected. **Conclusion –** Within the limitations of this study, the mean marginal fit of sintered and milled crowns seems to meet the requirements for clinical dental applications.

**KEYWORDS: MLS – Sintered crowns, CAD CAM- Milled crowns**

## INTRODUCTION:

Metal Laser Sintering (MLS) is a new method for fabricating metal products directly from CAD data. Automated fabrication is accomplished layer-by-layer by selectively fusing together metal powders1, 2. An important consideration is the marginal fit, which is a key criterion for success of fixed restorations.

It is not clinically desirable that a crown should have a perfect fit with no marginal gap3 because there must be space for the luting agent. However, if the marginal discrepancies are too large, then the luting agent will be exposed to the oral environment.

Many studies have compared the marginal fit of complete metal, metal ceramic, and/or ceramic crowns that were fabricated either through CAD/ computer-aided manufacturing systems or traditional casting machines3,4, 5.

However, this study evaluates the marginal fit of milled crowns versus the fit of sintered crowns with the null hypothesis being that the average marginal gap widths would not be significantly different between the sintered and milled crowns.

## MATERIALS AND METHOD –

A customised Brass Die of the prepared mandibular premolar with height of 6.0mm, a uniform heavy chamfer finish line of 1.0 mm in width, and a total occlusal convergence of 6 degrees was fabricated. The die was scanned with a dental system scanner; (CS 3600; CAD PARISTARPAM), and a 3- Dimensional computer cast was created. The sintered and milled crowns were fabricated based on the 3- Dimensional computer cast.A total of 40 crowns; 20 of each group were fabricated. Group1 consisted of sintered Crowns (EOS COBALT CHROME SP2) whereas Group 2 consisted of milled crowns (CERAMILL SINTRON).

To determine the marginal fit, each crown was placed onto the abutment tooth of the master cast. The crowns were then examined under the 3D microscope(MITUTOYO / QS L210Z0B, at Charusat University, Anand) which was calibrated and stabilised at its eyepiece lens.

A total of 4 measurements for each crown was recorded - Mesial, Distal, Buccal and Lingual. These points were marked on the master model in the centre of each side for standardization. The marginal gap, was measured with a 3D microscope with 0.001mm accuracy and analysed through an image analyser software. The width was measured as the perpendicular distance from the internal surface at the margin of the restoration to the preparation. The marginal fit of each crown was determined as the average of all 4 measurements.

## OBSERVATIONS AND RESULTS

The present study evaluates and compares the marginal fit of both sintered crown and milled crown. The mean values of all aspects were calculated.

The average marginal gap widths for both the groups were between the 100 – 150 $\mu$m which were in the clinically acceptable range6.For the milled crowns investigated in this study, the smallest mean marginal discrepancy was observed in distal aspect (140.95$\mu$m) and the smallest mean marginal discrepancy for sintered crowns was observed in lingual aspect (122.8 $\mu$m).

The results showed that average marginal fit of sintered crowns was better than the rnilled crowns. There was a statistically significant difference in between the two groups.

## STATISTICAL ANALYSIS

To evaluate the difference in average discrepancy of all aspects across sintered and milled fabricated crowns, independent two sample t test with equal variance assumed (MS WORD 2011).

Significant difference was set at p value of $\leqslant$0.05. The normality of the marginal gap data distribution of each group was tested, and the resultsindicated homogeneity of variance. Here, the p value corresponds to the two-sample t test assumed with equal variance assumed is less than 0.05 hence the null hypothesis is rejected.

## DISCUSSION

The marginal fit of fixed dental prosthesis is one of the most important criteria when evaluating the clinical acceptability of crowns. Hence it seemed to be important to investigate newly developed fabrication technologies.

The automated technology allows greater design flexibility; specifications can be input during the design process to customize the fit of the crowns and to meet many different needs or demands.

The null hypothesis that the average marginal gap widths would not

Original Research

# Rehabilitation of A Patient With An Ocular Defect With Customocular Prosthesis: A Case Report

*Dwiti Patel[1], **Somil Mathur[2], ***Dr. Rakesh Makwana[3],***Dr. Meena Shah[4].

**ABSTRACT**

Any ocular defects result in a significant impact on the self-image and personality of an individual. Maxillofacial deficiencies in any patient leads to face crippling problems as well as functional disability and social interactions. Thus, rehabilitation of maxillofacial defects is essential for physical and psychological wellbeing of the patient.The objective of prosthetic rehabilitation is to mimic natural appearance so as to provide a cosmetically acceptable maxillofacial prosthesis. A custom ocular prosthesis is a rightful alternative in situations where surgical reconstruction or the use of implants is precluded in ocular defects. This article outlines a simple procedure for fabrication of customocular prosthesis in a patient with ocular defect following traumatic injury.

**KEY WORDS : Ocular defect; Custom ocular prosthesis; Maxillofacial; Prosthetic rehabilitation**

## INTRODUCTION

The loss of an eye is generally associated with a congenital defect, trauma, tumor, sympathetic ophthalmia.1 Trauma to the eye results in phthisis bulbi; a small, shrunken, non-functional eye.2Surgical procedure for such conditions may require an orbital evisceration, enucleation or exenteration. Evisceration involves removing the contents of globe, leaving the sclera intact. Enucleation is a more aggressive procedure in which the complete eyeball is excised from the muscles and optic nerve. Exenterationinvolves in removal of the contents of the orbit.3 Prosthetic rehabilitation of such ocular defect with a cosmetically acceptable prosthesis that mimics the color, form and orientation of iris will endorse psychological comfort to the patient and to make them socially acceptable.4 The art of making artificial eyes has been known tomankind from the days of the early Egyptianswell before 3000 BC. AmbroiseParre is considered as the pioneer of artificial eye prosthesis. He used glass and porcelain to fabricate eye prosthesis. Until World War II, and the development of refined plastics provided a satisfactory aesthetic ocular prosthesis.5 Ready-made stock eye prosthesis comes in standard sizes, shapes, and colors and they require no special skills or materials for fabrication. Ready- made stock eye shells are relatively inexpensive and less time consuming. A custom ocular prosthesis hasmany advantages such as improved adaptation, improved mobility of the prosthesis, even distribution of pressure due to equal movement thereby reducing the incidence of ulceration, improvedcomfort and enhanced esthetics.

## CASE REPORT:

A fifty- six yearold male patient reported to the department of Prosthodontics, crown and bridgework and oral implantology, Faculty of Dental Science, Dharmsinh Desai Universityfor prosthetic rehabilitation of an ocular defect. The patient gave the history of trauma to left eye seventeen year back followed by enucleation of the eye. Examination of the eye socket revealed a healthy conjunctiva with no signs of infection or inflammation covering the posterior wall of the anophthalmic socket and showing synchronous movements. (Illustration 1)

**Illustration1:Pre-operative clinical presentation of ocular defect**

Fabrication of custom ocular prosthesis was planned for the patient since it provides better esthetics than ready-made stock eye prosthesis.

A customized shell of auto polymerizing resin was fabricated which was attached to the mixing tip of light body cartridge. The patient was asked to seat erect and to stare at a distant spot holding his gaze when the impression was made. To prevent sticking of impression material a petroleum jelly was applied to eyelashes and eyebrow. A polyvinyl siloxane impression material (Aquasil, DentsplyInt) was injected into the ocular defect with the help of customized shell. The impression was retrieved from the socket and evaluated for any defects and voids. (Illustration 2-3)

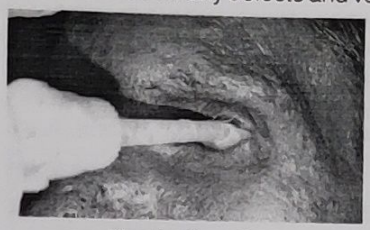

**Illustration 2: Customized impression making of the ocular defect**

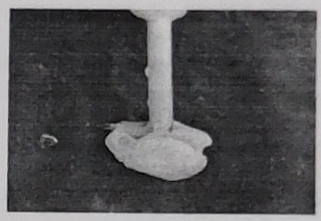

**Illustration 3 : Custom Ocular impression**

The impression was poured with dental stone ( Kalrock, Kalabhai& sons) and cast was obtained into two vertical halves.Baseplate wax (Modelling wax, DPI) was used to fabricate a scleral wax pattern.Wax pattern was checked in the ocular space for the accuracy of fit and adjusted until satisfactory contours of the eyelids were achieved. The position of the iris of the natural eye was used as a reference to mark the iris position on the wax pattern. (Illustration 4- 5)

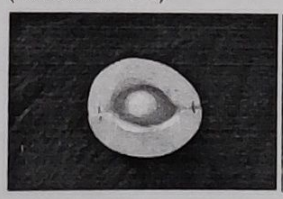

**Illustration 4: Fabrication of scleral wax pattern**

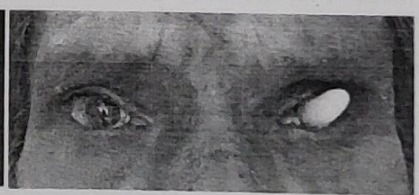

**Illustration 5: Evaluation of wax pattern and positioning of iris disc**

The wax pattern was dewaxed and processed using heat polymerizing clear acrylic resin (Heat cure acrylic resin, DPI), the shade of which was initially matched with the scleral portion of the natural eye. The scleral blank was tried in. To match with the natural

Research Article

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# A Comparison of the Patient's Satisfaction after Receiving Complete Denture Prostheses Fabricated by Under-Graduate and Post-Graduate Students

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## ABSTRACT

**Background**: The purpose of this study was to compare patient's satisfaction after receiving complete denture prostheses fabricated by under-graduate students and post-graduate students.

**Materials and Method**: In this study 60 completely edentulous patients were randomly selected who received complete denture prostheses. Based on fabrication of complete denture prostheses by under-graduate students and post-graduate students, they were divided into two equal sub groups: Group A and Group B, each group having 30 participants. The participant's perception regarding the newly constructed prostheses were recorded using a questionnaire through Visual Analogue Scale (VAS).

**Result:** In this study, the result showed that the participants with complete denture fabricated by post-graduate students, 50% of participants gave totally satisfied (9-10) score for chewing ability, stability and retention, speech and general satisfaction whereas none of the participants with complete denture fabricated by under-graduate students gave totally satisfied (9-10) score.

**Conclusion**: The present study concluded that the participants with complete denture prostheses fabricated by post-graduate students were more satisfactory as compared to the participants with complete denture prosthesis fabricated by under-graduate students.

**Keywords:** Complete Denture, fabrication, students.

## INTRODUCTION

Edentulism has a deep impact on the quality of life affecting individual's physiological, biological, social and psychological state. It can also cause a state of depression due to disturbances in speech, aesthetics, mastication and a feeling of inferiority[1].

Despite the development of dental implant therapy over the last few decades, conventional complete denture still remains the most common treatment of choice for fully edentulous patients in a developing country like India. Hence, there is increased need for successful conventional complete denture fabrication[2].

The aim of the present study was to compare patient satisfaction after receiving complete

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Research Article

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# A Study of Oral Stereognostic Proficiency in Dentulous and Edentulous Participants

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## ABSTRACT

**Background**: Stereognosis means the ability of a person to recognize the shape and surface characteristics of an object using tactile sensations, without looking at them. The purpose of this study was to determine and compare the oral stereognostic ability in dentulous and edentulous participants.

**Materials and Method**: In this study, oral stereognostic ability was tested in 20 edentulous and 20 dentulous participants with the aid of silicone putty referred as test forms, fabricated in three basic shapes cube, sphere and pyramid of specific dimensions. Participants were informed not to open the eyes before placement of the sample in the mouth to avoid the risk of cross-matching of shape by the participant. One of the silicone putty test form was then randomly selected and placed in the subject's mouth. The subject was then asked to identify the shape by marking it on the evaluation sheet.

**Result**: The result showed that both dentulous and edentulous participants were able to identify the sphere shape more than the cube and pyramid shape.

**Conclusion**: The participants of both the groups were able to identify the putty moulded as sphere as it was well rounded and without sharp line angles whereas the participants got confused in the pyramid and cube shape forms which had line angles.

**Keywords:** Oral Stereognostic, Oral health, Dentulous and Edentulous.

## INTRODUCTION

Stereognosis or recognition of shape involves, the most elaborate function subserved by the parietal cortex of the brain. This function requires the perfect reception of the impulses by the stimuli from the object. The sensations produced are synthesized in the cortex and compared with previous similar sensory memories. Oral stereognosis involves a certain amount of motor activity like manipulating the object within the mouth and feeling its surfaces with lips, tongue, teeth and palate. The information obtained must be associated with oral sensory memories derived from visual and tactile experiences.[1]

Classification of stereognosis is done in four different ways:

a) General stereognosis: Overall capacity to recognize the shape of objects
b) Homo stereognosis: Self body recognizing capacity, e.g., palate, tongue

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# An Assessment of Priorities and Treatment Needs of Partially Edentulous Patients Seeking Prosthodontic Treatment

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## ABSTRACT

**Background:** To assess patient's priority while seeking prosthodontic treatment in partially edentulous situations. The null hypothesis states that there is no significant difference between the treatment needs and preferences of partially edentulous patients seeking Prosthodontic treatment based on age and gender.

**Materials and methods:** In this study, 100 partially edentulous patients, including both males and females, were randomly selected. The details were first explained to each patient and written informed consent was obtained in a language which the patient can read and understand. The patients were then administered with a comprehensive questionnaire which focused on assessing their main priority for the respective treatment. The data was collected, compiled in tabulated form and analyzed on the basis of age and gender distribution.

**Results:** The patients below forty years of age, primarily females were more concerned about their aesthetics and preferred natural-looking teeth in comparison to patients above forty years of age who preferred better mastication and were also concerned with the expenditure of the prosthesis.

**Conclusion:** Determining the patient's priority and treatment needs is of great importance for a successful prosthodontic treatment outcome.

**Keywords:** Partial Denture, edentulous, prosthodontics.

## INTRODUCTION

Teeth play a significant part in the maintenance of a healthy personality and a positive self-image. Patients may suffer real or perceived detrimental effects following the loss of one or more teeth which substantially reduces the quality of life affecting the patient emotionally, socially, physically and psychologically.[1]

Prosthodontic treatment involves the replacement of few missing teeth , the functional replacement of nearly all teeth in a badly damaged dentition, or restoring function by means of the removable or fixed prosthesis, implants, complete dentures, or over-dentures.[2] With the advancements and increasing knowledge in dentistry along with the improvement in maintaining oral health, globally, a higher number of people tend to retain all or most of their natural teeth through life.[3]

Besides technical excellence, today's prosthodontic protocols address multidimensional aspects of health care, such as improvement in the quality of life, the effectiveness of an intervention and cost-effective goals. The patients' subjective perceptions

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Original Research

# Orthodontic-Periodontic : Inter-Relationship

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## ABSTRACT

Orthodontic treatment aims at providing acceptable functional and aesthetic occlusions using appropriate tooth movements. These movements are specifically related to interactions of the teeth with their supportive periodontal tissues. Periodontic and orthodontic interactions usually deal with the establishment of an appropriate diagnosis and the treatment planning needed to enable coordinated periodontic-orthodontic therapy. A harmonious cooperation of the periodontist and the orthodontist offers great possibilities for the treatment of various orthodontic-periodontal problems. The present discussion focused on the effects of a combined periodontal and orthodontic treatment on the periodontal health and dentofacial aesthetics, and the mode that each field can contribute to optimize treatment of combined orthodontic-periodontal clinical problems.


**KEY WORDS :**

## INTRODUCTION

The relationship between periodontology and orthodontics consists of a highly complex, bidirectional and close interaction that is nowadays characterized by controversial scientific opinions and clinical approaches. The term synergy refers to two or more distinct influences or agents acting together to create an effect greater than that predicted by knowing only the separate effects of the individual agents. This definition is applicable to the classic relationship between orthodontic and periodontics specialties in treating patients. Understanding the biologic basis of periodontal surgical procedures, recent advancements in tissue engineering and research development can yield more productive clinical endpoints than ever before. Making the most of what these two specialties offer each other begins with the identification of periodontal problems that could become more complicated during orthodontic therapy and, conversely those that could benefit from orthodontic therapy.

The biologic basis of orthodontic treatment is that bone remodels and tooth moves on application of prolonged pressure to the tooth. Removal of bone occurs in some areas and addition in others, in a selective manner. In essence, the tooth socket migrates and the tooth moves through the bone carrying its attachment apparatus, i.e., periodontal ligament with it. This response occurs through mediation by the periodontal ligament; therefore, orthodontic tooth movement is basically a periodontal ligament phenomenon.

A multidisciplinary approach including an orthodontist and a periodontist is done in patients with periodontal disease. Both specialists should be involved in the treatment planning of such patients, and care should be taken in evaluation of progress of the treatment undertaken. Since orthodontic tooth movements are strongly associated with interactions of teeth and their supporting periodontal structures, we can say every orthodontic intervention has some kind of periodontal dimension. Adult patients opting for orthodontic treatment has increased recently and also the patients with periodontal problems faced by the orthodontists. Orthodontics may be an option in case of repositioning of periodontally compromised teeth. There are osteogenic changes seen in bone during orthodontic tooth movement, and there will be alteration of bone deformities and contours. The topography of the underlying bone and other intraosseous deformities influences the prognosis of periodontal therapy and pockets elimination[1].

### Timing of ortho-perio treatment

While establishing the treatment plan, it is important to define the treatment to be performed by the periodontist prior to starting orthodontic treatment as well as during and after orthodontic treatment. This should be done both to be able to perform tooth movement in a healthy environment and to optimize the function of the existing periodontal support and to enhance the final aesthetic result.[1]

### Procedure performed prior to orthodontic treatment

- Oral hygiene motivation
- Prophylaxis or therapy to control inflammation
- Surgery to eliminate deep pockets
- Augmentation of attached gingiva
- Frenulectomy (frenectomy) and frenulotomy (frenotomy)
- Elimination of gingival clefts

### Procedures performed during orthodontic treatment

- Prophylaxis to control inflammation
- Surgical exposure of impacted teeth according to periodontal concepts
- Fibrotomy and curettage during forced eruption and rotation correction

### Procedures performed during and/or post orthodontic treatment

- Prophylaxis to control inflammation
- Clinical crown lengthening
- Gingivoplasty

### Procedures performed post orthodontic treatment

Supportive therapy. The above outline is only indicative, as all decisions depend on the individual diagnosis and tailoring the timing of treatment to each patient's unique situation to achieve both the functional and aesthetic therapeutic goals. When labial orthodontic movement is planned, if needed a periodontal surgical procedure to increase the thickness of the attached gingiva prior to initiating orthodontic treatment can serve to optimize the final result. The same holds true for cases where tooth migrations have resulted in spaces opening and loss of the papilla and eventually a reduction or total lack of attached gingiva. In these cases surgery is

# Preparation and characterization of oxcarbazepine microemulsion

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**Background**
Oxcarbazepine (OXZ) is an antiepileptic drug used to treat partial seizures. OXZ is available in dosage forms of tablet (150, 300, and 600 mg) and suspension (300 mg in 5 ml) in India. Children and adults complain that the suspension form has a downside in its stability (8 weeks).
**Aims**
The aim of the present investigation was to develop a microemulsion (ME) of OXZ for enhanced solubility and stability of drug in product.
**Materials and methods**
An ME comprises isopropyl myristate (oil phase), aerosol OT (a bipolar surfactant), and an aqueous phase comprising ethanol and distilled water in a ratio of 2: 8. Various ratios of oil: surfactant (1: 9 to 9: 1) were taken and the amount of aqueous phase titrated was determined using the water titration method. The data were plotted in a pseudoternary phase diagram and an optimized batch was selected. The batch was characterized by droplet size determination, zeta potential, drug content, and in-vitro dissolution studies.
**Results**
Size of the globules was found to be 53.65 and 59.15 nm in both ME 1 and ME 2, respectively; thus, it can also be termed as nanoemulsion. Zeta potential shows that the formulation is stable as it has positive zeta, giving 6.13 and 5.21 mV as zeta for ME 1 and ME 2, respectively. pH and conductance were also close to neutral, and hence the system was biocompatible.
**Conclusion**
Finally, on the basis of physicochemical characterization and stability studies, it can be concluded that water-in-oil ME for OXZ will serve as a novel drug delivery system with increased solubilization capacity and increased stability.

**Keywords:**
microemulsion, oxcarbazepine, solubility, stability

Egypt Pharmaceut J 15:173–180

1687-4315

## Introduction

The oral route for drug administration is the most mainstream for drug administration. Numerous patients experience issues in gulping solid oral dosage form and do not take their drug as prescribed. It is estimated that half of the populace have trouble in gulping, which brings about a high occurrence of patient rebelliousness and ineffectual treatment. Liquid formulations are satisfactory and have appreciative patient compliance, although having an issue of poor stability of drugs [1,2].

Epilepsy is a disorder of the cerebrum that is described by a persisting inclination to create seizures and by its neurobiological, subjective, mental, and social outcomes. Epilepsy is operationally characterized as a gathering of neurologic issue portrayed by intermittent scenes of convulsive seizures, tactile unsettling influences, irregular conduct, and loss of cognizance. 'Epilepsy' originates from the Greek word epilambanein, signifying 'to be seized' or 'to be overpowered unsuspecting' [3–5].

Oxcarbazepine (OXZ) (or 10, 11-dihydro-10-oxo-carbzepine) is a more up-to-date sweet-smelling antiepileptic drug, affirmed in the USA on 14 January 2000 (as characterized by late American Academy of Neurology-American Epilepsy Society rules, a more up-to-date antiepileptic medication is one endorsed by the US Nourishment and Drug Administration since 1990), which was created as a second era and as a subsequent compound to carbamazepine [6,7]. OXZ has a comparable restorative profile to carbamazepine, yet has fewer





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(An International Peer Reviewed Pharmaceutical Journal that Encourages Innovation and Creativities)

# Formulation and Evaluation of Spironolactone Loaded Emulgel for Topical Application

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**ABSTRACT:**

Emulgel is one of the recent technologies in NDDS used for dual control release of emulsion and gel for topical use. Gel formulations generally provide faster drug release compared with conventional ointments and creams. Spironolactone is a well-known therapeutic agent that is used mainly for its diuretic ability. Recently, it gained a lot of attention for treating alopecia due to its potent anti-androgenic properties. The aim and objective of the study is to formulate spironolactone loaded emulgel for topical application. Emulgel of spironolactone, consist of carbopol-947 or carbopol-974 or HPMCk15 or xanthan gum as a gelling agents for gel formulation and tween 20, span 20, light, PEG-400, light liquid paraffin for emulsion formulation. Emulgel was formulated by emulsion incorporated in gel. Spironolactone loaded emulgel was formulated by using o/w emulsion because of lower solubility in water. Mentha oil was used as a penetration enhancer in emulgel formulation. Optimization of spironolactone loaded emulgel by 32 full factorial design. Optimized formulation evaluated for was evaluated for physical examination, swelling index, skin irritation study, extrudability study, drug content determination,spreadability, globule size determination and in-vivo drug release, rheological study. Optimized formulation give drug release 78.47% and viscosity 1610 cps.

**KEYWORDS:** Spironolactone, Emulgel, Alopecia, Topical gel.

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## INTRODUCTION[1-8]:

When gels and emulsions are used in combined form the dosage forms are known as emulgels. As the name suggest they are the mixture of emulsion and gel. In recent years, there has been great interest in the use of novel polymers with complex functions as emulsifiers and thickeners because the gelling capacity of these compounds allows the formulation of stable emulsions and creams by decreasing surface and interfacial tension and at the same time increasing the viscosity of the aqueous phase. In fact, the presence of a gelling agent in the water phase converts a classical emulsion into an emulgel. Both oil-in-water and water-in-oil emulsions are used as vehicles to transport various drugs to the skin. Emulsions possess a certain degree of elegance and are easily washed off whenever desired. They also have a high ability to penetrate the skin. Emulgels for dermatological use have several favorable properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, nonstaining, water- soluble, longer shelf life, bio-friendly, transparent& pleasing appearance. Use of topical agents requires an appreciation of thefactors that influence percutaneous absorption. Molecules can penetrate the skin by three routes: through intact stratum corneum, through sweat ducts, or through the sebaceous follicle.

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Research Article

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# OPTIMIZATION AND CHARACTERIZATION OF COLON TARGETED DRUG DELIVERY SYSTEM USING COMPRESSION COATING TECHNIQUE

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## ABSTRACT

**Objectives:** The impetus of the present study was to develop colon specific drug delivery system using compression coating technique by Box-Behnken design for the treatment of inflammatory bowel disease (IBD). **Experimental methods:** A colonic drug delivery with a new concept based on a combination of time-, pH-, and enzyme-controlled system was developed. To begin with the methodology core tablet of Mesalamine with lower strength (50 mg) and Spray dried Chitosan acetate were prepared. A Box-Behnken design was used to derive polynomial equation and construct contour plots to predict responses. Critical process parameters (CPPs) were taken as concentration of Spray dried Chitosan (X1), Percentage ratio of HPMC K15M: Guar gum (X2) and Coating Mass (X3). Seventeen batches were prepared as per the Design expert 8.0.7.1 and Critical quality attributes (CQAs) were taken as: Cumulative percentages of drug release at 5$^{th}$ hr (Y1), Time to dissolve the drug for 50% (Y2) and Cumulative percentages of drug release at 14$^{th}$ hr (Y3).. The computer optimization process and contour plots predicted the levels of independent variables X1, X2, and X3 (respectively) and total percent of drug released up to 14 hr. The optimized batch is further evaluated for Invivo drug release study. **Results:** Based on Box-Behnken experimental design, different release profiles were obtained. The optimized formulation containing Chitosan acetate: HPMC K4M: guar gum at 23.76: 51.82: 24.42% weight ratio and the this optimized batch shows 44.61% and 93.75% drug release in absence and presence of Rat cecal respectively.

**KEYWORDS:** Compression coated tablets, Box-Behnken design, Mesalamine, Chitosan acetate, Hydroxy-propyl methyl cellulose (HPMC) K15M.

## INTRODUCTION

A colon-specific drug delivery system (CDDS) by compression coating which is the absolute dry coating without solvent and heat use has been developed as one of the novel targated site specific drug delivery systems. This delivery system possess the combination of one or more controlled release mechanisms such as time, pH controlled and enzyme controlled mechanism and hardly releases the drug in the upper part of the gastrointestinal (GI) tract, but rapidly releases drug in the colon following oral administration. Owing to CDDS specifically delivering the drug to the colon, it is used to treat seriousness from constipation & diarrhoea to the debilitating inflammatory bowl diseases(IBD) (ulcerative colitis & Crohn's disease) through to colon carcinoma which is two third cause of cancer in both man & women.[1,2,3]

Guar gum is a galactomannan and consists of linear chains of (1,4)-β-D-mannopyranosyl units with α-D-galactopyranosyl units attached by (1,6) linkages. The ratio of D-galactose to D-mannose is between 1: 1.4 and 1: 2. These polysaccharides remain intact in the physiological environment of the stomach and the small intestine, but are degraded by the bacterial inhabitants of the human colon. Being soluble in water, guar gum is not able to shield its drug load effectively during its passage through the stomach and small intestine. It was found that a coat of a considerable thickness with other control released ingredients was required to protect the drug core in simulated in vivo conditions. Hence, the focus was shifted to the development of such a dosage form which has intact shielding.[4]

Moreover, Chitosan is also being developed as rate controlling natural poly saccharide due to a wide range of molecular weights its low toxicity and biodegradability was used in the form of Spray dried acetate salt in above mentioned formulation and HPMCK15 was included in preparation of coating layer to control the solubility of Guar gum and premature drug release in stomach and small intestine.[5]

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# FORMULATION AND EVALUATION OF FLOATING MICROSPONGES OF ALLOPURINOL

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## ABSTRACT

The aim of the study is to develop a floating microsponges of allopurinol to minimize the frequency of dosing by increasing half life and sustained release action up to 12 hrs by single unit dosage form. Allopurinol is xanthine oxidase inhibitor drug that leads to decrease in the production of uric acid from xanthine and hypoxanthine. It is BCS class I drug. It shows absorption window in upper gastro intestinal track, which makes it suitable candidate for gastro retentive dosage forms. Floating microsponges of allopurinol was formulated with quasi emulsion solvent diffusion method using Ethyl cellulose and Eudragit EPO as a polymer. A $3^2$ factorial design was applied to optimize the formulation, it was found that formulation containing Ethyl cellulose 175 mg and of Eudragit EPO 75 mg, % drug release of allopurinol in 12 hrs with desired % buoyancy and % entrapment and best formulation was selected. The final optimized formulation shows entrapment 90.61%, buoyancy 86.52% and *in vitro* drug release 94.23% up to 12 hrs. Particle size was measured by optical microscopy. By using FTIR analysis drug and polymer compatibility was observed and using SEM prepared microsponges shape and surface morphology was determined. Accelerated stability study was carried for a period of 1 month. It was found that there was no significant change in formulation.

**KEYWORDS** Allopurinol, Ethyl cellulose, Eudragit EPO, Quasi emulsion solvent diffusion method.

## INTRODUCTION

A Microsponges Delivery System (MDS) is "Patented, highly cross-linked, porous, polymeric microspheres that can entrap wide range of actives and then release them onto the skin over a time and in response to trigger" (Kilicarslan,2003). By Won in 1987, microsponges technology was developed and the original patents were assigned to highly developed polymer systems. Microspongess are porous microspheres having many of consistent voids of particle size ranging between 5-300 µm. To control the release rate of active agents to a programmed site in human body has been one of the biggest challenges faced by drug industry. Microsponges polymers have the flexibility to load a wide range of actives providing the benefits of improved product efficacy, tolerability, mildness and extended wear to a wide range of skin therapies. Improved in

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# FORMULATION AND EVALUATION OF PULSATILE DRUG DELIVERY SYSTEM OF NICORANDIL

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## ABSTRACT

The present study was aimed at preparing a new time dependent pulsed release system containing 'Tablet-in-Capsule' for the programmed release of Nicorandil for the treatment of angina pectoris. The core tablets were prepared using wet granulation with suitable superdisintegrant agents. Eudragit S100 and Eudragit L100 were used as pH dependent polymers for coating the core tablet which were filled in to the capsule. The ratio of Eudragit S100 and Eudragit L100 and the coating level was optimized using 32 full factorial designs. Dissolution characterisation of 'Tablet-in-Capsule' device in media with different pH 1.2, 5.5, 6.8 and pH 7.4 revealed that drug release in colon could be modulated by optimizing the concentration of Eudragit L100 and Eudragit S100 (1:2). The results of study showed that, lag time prior to drug release was highly affected by the coating level. The dissolution data revealed that the level of coating and the ratio of polymers are very important to achieve an optimum formulation. The *In- vitro* release from optimized formulation was found to be independent of paddle speed. Stability study of the optimized formulation indicates no significant difference in release profile after a period of one month.

**KEY WORDS:** Nicorandil, Tablet in capsule, Pulsatile drug delivery, Circadian rhythm, Colon- specific systems.

## INTRODUCTION

**Classification of pulsatile drug delivery systems:** Pulsatile drug delivery systems (PDDS) can be classified in site-specific and time-controlledsystems. Drug release from site-

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Original Article

# Hydrolytic Degradation Kinetic Study of Balofloxacin by Stability Indicating Reversed Phase High Performance Liquid Chromatography Method

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## ABSTRACT

**Background:** Balofloxacin is a third generation fluoroquinolone with a broad antibacterial spectrum ranging from gram-positive bacteria to gram-negative bacteria. It is used in treatment of uncomplicated urinary tract infections. No stability indicating analytical method has been reported for BFX. Also stress degradation studies of Balofloxacin were not found in literature. **Objective:** To develop and validate a stability indicating RP-HPLC method for estimation of Balofloxacin in presence of its hydrolytic degradation products. **Materials and Method:** The chromatographic separation was performed using $C_{18}$ Grace Smart column (250 x 4.6 mm), 5 µm as the stationary phase and Water: Acetonitrile: Tri ethylamine (72:28:1 v/v/v), pH adjusted to 3.0 using ortho-phosphoric acid as mobile phase with detection wavelength 294 nm. The developed method was validated according to ICH Q2R1 guideline. Balofloxacin was subjected to degradation in acidic, alkaline and neutral conditions. **Results and Discussion:** The linearity was established over concentration range of 20-100 µg/ml with correlation coefficient $r^2$ = 0.9979. Recovery of drug was achieved in the range of 99.19–101.65%. Limit of Detection and Limit of Quantitation was found to be 4.13 and 12.51 µg/ml. Balofloxacin was found to be stable under alkaline and neutral conditions, while it degraded under acidic hydrolytic condition. The retention times for Balofloxacin and its acid degradation product were found to be 7.0 ± 0.1 and 5.7 ± 0.1 minutes, respectively. **Application:** The developed RP-HPLC method was applied for estimation of Balofloxacin in its tablet dosage forms and results were found to be in good agreement with the labeled claim. The method was also applied for degradation kinetic study of Balofloxacin in acidic medium. **Conclusion:** The developed RP-HPLC method was found to be accurate, precise, specific and sensitive. It can be applied for routine analysis (assay) of tablets containing Balofloxacin. The degradation of Balofloxacin in all conditions was found to be first order and highest degradation was found in 2.0 N HCl at 75°C.

**Key words:** Stability indicating HPLC method, Balofloxacin (BFX), Degradation products, Degradation kinetic study, Design expert software.

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## INTRODUCTION

Balofloxacin is a third generation fluoroquinolone with a broad antibacterial spectrum ranging from gram-positive bacteria to gram-negative bacteria. BFX exhibits excellent antibacterial activity against gram positive bacteria such as multiple-drug-resistant staphylococci and pneumococci.[1] Chemically it is 1-cyclopropyl-6-fluoro-8-methoxy-7-(3-methylamino-piperidin-1-yl)-4-oxoquinoline-3-carboxylic acid[2] (Figure 1). BFX is a chemotherapeutic bactericidal which eradicates bacteria by interfering with DNA replication. It is used in treatment of uncomplicated urinary tract infections.

Degradation study of drug itself and its pharmaceutical formulation allows a better knowledge of its therapeutic, physicochemical and toxicological behaviour. The study of drug degradation kinetics is of greater importance for development of stable formulation and establishment of expiration date for commercially available drug products and also helps in deciding the routes of administration and storage conditions of various pharmaceutical dosage forms. Thus it is helpful to produce quality, safe and efficacious dosage forms.[3-5] Hydrolysis is one of the prominent routes of degradation of drugs containing functional groups like ester, amide, carboxylic acid, etc. Water, either as a solvent or in the form of moisture, contacts most pharmaceutical dosage forms to some degree. The potential for this degradation pathway exists for most drugs and excipients. It is a known fact that hydrolytic degradation products may be formed due to acidic environment in the formulation in presence of acidic excipients. Extensive literature review reveals that several spectrophotometric, spectrofluorimetric and RP-HPLC methods have been reported for estimation of Balofloxacin in its pharmaceutical dosage forms.[6-12] No stability indicating analytical method has been reported for BFX. Also stress degradation studies of Balofloxacin were not found in literature. Therefore it was thought of interest to develop and validate stability indicating RP-HPLC methods for estimation of Balofloxacin in its marketed dosage forms. The developed method was applied to study hydrolytic degradation kinetics of BFX in acidic medium at different temperature and thereby to determine rate constant, half life and order of reaction. The developed method was also applied to determine the presence of degradation products in marketed formulations stored at 50°C for six months.

## EXPERIMENTAL

### Stability indicating HPLC method for Balofloxacin

#### Instrumentation

The HPLC system (LC-10AT, Shimadzu) consisting of SPD-10A UV detector and $C_{18}$, Grace Smart column (250x4.6 mm, 5 µm), syringe (25 µl capacity, Hamilton) and 0.45 micron nylon millipore filter were used for degradation kinetic study of BFX and analysis of its marketed formulations. Electronic analytical balance (Shimadzu AUX-220) was used for all the weighing purpose.

Drug Delivery

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CRITICAL REVIEW

# A review on therapeutic contact lenses for ocular drug delivery

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**Abstract**

Contact lenses for ophthalmic drug delivery have become very popular, due to their unique advantages like extended wear and more than 50% bioavailability. To achieve controlled and sustained drug delivery from contact lenses, researchers are working on various systems like polymeric nanoparticles, microemulsion, micelle, liposomes, use of vitamin E, etc. Numerous scientists are working on different areas of therapeutic contact lenses to treat ocular diseases by implementing techniques like soaking method, molecular imprinting, entrapment of drug-laden colloidal nanoparticles, drug plate/film, ion ligand polymeric systems, supercritical fluid technology, etc. Though sustained drug delivery was achieved using contact lens, the critical properties such as water content, tensile strength (mechanical properties), ion permeability, transparency and oxygen permeability were altered, which limit the commercialization of therapeutic contact lenses. Also issues like drug stability during processing/fabrication (drug integrity test), zero order release kinetics (prevent burst release), drug release during monomer extraction step after fabrication (to remove un-reacted monomers), protein adherence, drug release during storage in packaging solution, shelf life study, cost-benefit analysis, etc. are still to be addressed. This review provides an expert opinion on different methodology to develop therapeutic contact lenses with special remark of their advantages and limitations.

**Keywords**

Challenges, critical lens property, ophthalmic drug delivery, sustained drug delivery, therapeutic contact lenses

**History**

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## Introduction

Drug delivery to the anterior chamber of eye is a very challenging task for scientists, due to the complex anatomy of eye and resistance to foreign substances, including drugs (Shell, 1982; Lang, 1995; Ding, 1998; Gaudana et al., 2010). At present, majority of the ocular medications are instilled topically either through eye drop solutions or suspensions. However, the conventional eye drop therapy commonly shows low bioavailability to target ocular tissue, due to various pre-corneal loss factors, such as tearing and blinking (tear dynamics), non-productive absorption through conjunctiva, nasolacrimal drainage and also due to low permeability of the corneal membrane (Prausnitz & Noonan, 1998; Yokoi & Komuro, 2004; Zhu & Chauhan, 2005; Urtti, 2006; Del Amo & Urtti, 2008). Thus, due to physiological and anatomical restrictions, the eye drop solution shows a reduced-drug residence time of 1–3 minutes in the tear film and consequently a very-low bioavailability of 1–3%. To compensate for the low bioavailability, clinicians are forced to prescribe eye drops with frequent doses at high-drug loading, to attain desired therapeutic drug level at the target tissue (Chrai et al., 1974; Burns & Mulley, 1992; Stone et al., 2009). High-dosing frequency exaggerates the side effects and reduces patient compliance, especially in treatment of chronic diseases like glaucoma and dry eye syndrome (Patel & Spaeth, 1995; Frishman et al., 2000; Fechtner & Realini, 2004; Šklubalova & Zatloukal, 2005).

To overcome the limitations associated with conventional eye drop therapy, novel delivery systems and devices have being explored by many researchers (Nicolson & Vogt, 2001; Shah et al., 2003; Alvarez-Lorenzo et al., 2006a). The ideal drug delivery system delivers a required amount of drug to the ocular tissue with comfort, easy to administer, and does not interfere with vision or normal eye functioning. In this context, therapeutic contact lenses have being proposed for controlled and sustained ocular drug delivery, due to their unique properties like extended wear and more than 50% bioavailability in comparison to eye drop formulation (Li & Chauhan, 2006; Peng et al., 2010, 2012; González-Chomón et al., 2013,). Drug releases from therapeutic contact lenses in pre- and post-lens tear film, leading to a residence time of more than 30 minutes, in comparison to just 1–3 minutes for eye drop solutions (Mcnamara et al., 1999; Creech et al., 2001). The high drug residence time increases the bioavailability up to 50%, which eventually reduces the dose, dosing frequency, systemic drug absorption and its associated side effects (Jain, 1988; Li & Chauhan, 2006; Li & Chauhan,

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# Role of stabilizing agents in the formation of stable silver nanoparticles in aqueous solution: Characterization and stability study

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**ABSTRACT**

The stability of silver nanoparticles is controlled mainly by two major factors, namely, aggregation and oxidation. In the present study, silver nanoparticles were synthesized by using different series of reducing agents like a strong reducing agent (sodium borohydride), a mild reducing agent (tri-sodium citrate), and a weak reducing agent (glucose) with different capping agents, namely, polyvinyl pyrrolidone (PVP K 30), starch, and sodium carboxyl methyl cellulose (NaCMC). The synthesized silver nanoparticles were characterized by UV-Visible absorption spectroscopy, dynamic light scattering (DLS), atomic force microscopy (AFM), and anti-microbial activity. The particle size of silver nanoparticles varies in the following order: sodium borohydride < tri-sodium citrate < glucose. Combination of sodium borohydride–polyvinyl pyrrolidone and tri-sodium citrate-polyvinyl pyrrolidone yields stable silver nanoparticles compared to other combinations of reducing agents and capping agents. The stability results confirmed that a refrigerated condition (8°C) was more suitable for storage of silver nanoparticles. Anti-microbial activity of silver nanoparticles synthesized in a sodium borohydride–polyvinyl pyrrolidone mixture shows a larger zone of inhibition compared to other silver nanoparticles. Anti-microbial results confirmed that the anti-microbial activity is better with smaller particle size. The size and stability of silver nanoparticles in the presence of different combinations of stabilizing and capping agents are reported.

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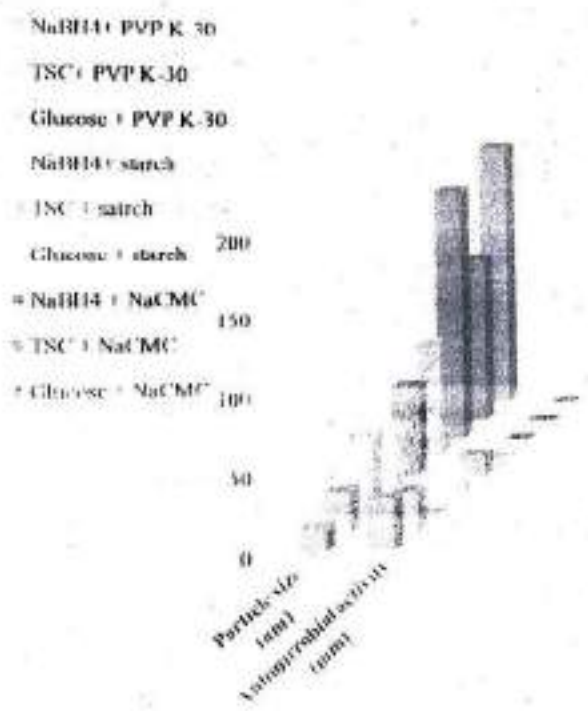
Anti-microbial activity; capping agents; reducing agents; silver nanoparticles

**GRAPHICAL ABSTRACT**

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/ldis.

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Research Article

# Formulation development and characterization of lumefantrine nanosuspension for enhanced antimalarial activity

Ripaikumar Shah, Tejal Soni ✉, Unnati Shah, B. N. Suhagia, M. N. Patel, Tejas Patel,
...show all

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## Abstract

Variable and low oral bioavailability (4-11%) of lumefantrine (LUF), an anti-malarial agent, is characterized by very low solubility in aqueous vehicle. Thus, the present study was intended to formulate lyophilized nanosuspensions of LUF to resolve its solubility issues for the improvement of oral bioavailability. A three level $3^2$ factorial design was applied to analyze the influence of independent variables, concentration of polysorbate 80 ($X_1$) and sonication time ($X_2$) on the responses for dependent variables, particle size ($Y_1$) and time to 90% release of LUF ($t_{90}$) ($Y_2$). Optimized formulation (F3)

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# FORMULATION DEVELOPMENT OF DONEPEZIL HYDROCHLORIDE ORAL DISINTEGRATING TABLETS USING QUALITY BY DESIGN APPROACH

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**Key words:**

QBD, Quality Risk Management, Factorial Design, Orodispersible Tablets.

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**ABSTRACT:** This study posed a challenge for the risk management to research and development projects in a highly regulated and volatile pharmaceutical industry, in which projects are extremely long, complex, costly and prone to failure. Project management in new product development, must be efficient and effective. This emphasizes the importance of risk management. Quality by design (QbD) refers to an advanced approach toward drug development. QbD is a vital part of the modern approach to pharmaceutical quality. There is much confusion among pharmaceutical scientists in generic drug industry about the appropriate element and terminology of QbD. The purpose of this research was to discuss the pharmaceutical QbD for formulation development with a case study of Orally Disintegrating Tablet (ODT) of Donepezil Hydrochloride (DPH). The study describes elements of the QbD for DPH ODT, include: Defining quality target product profile, identifying critical quality attributes, establishing design space, control strategy. ODT of DPH was prepared by direct compression method using Crospovidone, MCC and level of polymer was optimized, factorial design was used as part of risk analysis to optimize the level of other excipients. Thus, the work facilitates the adoption and implementation of QbD for formulation development using QbD and could increase efficiencies, provide regulatory support.

**INTRODUCTION:** Quality risk management is a systematic process for the assessment, control, communication and review of risks to the quality of the drug (medicinal) product across the product lifecycle. Quality risk management should include systematic processes designed to coordinate, facilitate and improve science-based decision making with respect to risk [1].

QUICK RESPONSE CODE

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Possible steps used to initiate and plan a quality risk management process might include: (a) Define the problem and/or risk question, including pertinent assumptions identifying the potential for risk; (b) Assemble background information and/ or data on the potential hazard, harm or human health impact relevant to the risk assessment; (c) Identify a leader and necessary resources; (d) Specify a timeline, deliverables and appropriate level of decision making for the risk management process [2, 3]. Quality risk management supports a scientific and practical approach to decision-making.

It provides documented, transparent and reproducible methods to accomplish steps of the quality risk management process based on current

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**Research Article**

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# Design Development & *In-Vitro* Evaluation of Oral Rapid Mouth Dissolving Tablet Containing Sildenafil Aspirin Co-Crystals Using QbD Approach

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**ABSTRACT**

*The main objective of the present investigations was to apply quality by design (QbD) approach for the development of Oral Dispersible tablet containing Sildenafil Aspirin Co-crystals. Critical ingredients and the process parameters are linked to the critical quality attributes of the well desired product. Variability is reduced by the product and the process understanding which leads to quality improvement, risk reduction and ultimately productivity enhancement. Sildenafil citrate is a well-known selective inhibitor of phosphodiesterase type 5 enzyme (PDE5) extensively used for the treatment of erectile dysfunction (ED). Sildenafil citrate is a BCS class II drug having a low aqueous solubility so co-crystallization with Aspirin is a method of choice to increase the solubility and to have the quicker onset of action by avoiding the first pass metabolism, an oral rapid mouth dissolving tablets had been prepared using Sildenafil Aspirin co-crystals. Fast dissolving tablets of Sildenafil Aspirin Cocrystals were designed, developed, optimized and characterized by using statically $3^2$ factorial design in which two variables namely the concentration of crosspovidone and the concentration of SSG were at three levels (low, medium and high). The main interactive influences were tested using the statistical model. The response surface plots were generated by the software for analyzing the effects of the independent variables on the response. All the batches of the oral dispersible tablet were prepared by the direct compression method. The tablets were evaluated for Pre-compression parameters e.g. Bulk density, Tapped density, Angle of repose, Carr's compressibility index and Hauser's ratio and also post compression parameters like hardness, wetting time, drug content uniformity, friability, Thickness, Disintegration time & In vitro dissolution. The $3^2$ full factorial design revealed that the amount of super disintegrants significantly affect the dependent variables disintegration time and wetting time.*

**Keywords:** Sildenafil aspirin co-crystals; Crosspovidone; *In-vitro* disintegration; *In-Vitro* dissolution; Oral dispersible tablet

## INTRODUCTION

Quality by design (QbD) is an intelligent systematic approach to design quality products by systematic process. The principles of QbD is best explained by ICH Q8, ICH Q9 & ICH Q10, which gives the guidance on Science & Risk-based assessment, product's life cycle and its approach, and the various method designs.

QbD principles promote innovation and continuous improvement of the product quality. Knowledge-based commercial manufacturing ensures enough regulatory flexibility for setting specifications and post-approval changes. Product and process are designed using innovative risk-based techniques to meet predefined quality objectives thereby satisfying the most critical patient needs and regulatory requirements at low cost.

Experimental Design or DOE is defined as "a structured analysis wherein the inputs are changed and differences or variations in outputs are measured to determine the magnitude of the effect of each of the inputs or combination of inputs." Factorial designs allows for the simultaneous study of the effects like concentration of super disintegrants

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# DESIGN AND DEVELOPMENT OF OPHTHALMIC NANOEMULSION FORMULATION FOR REDUCING OCULAR HYPERTENSION

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## ABSTRACT

The objective of present study was to design and develop an ophthalmic nanoemulsion formulation for reducing ocular hypertension. Medium Chain Triglyceride was selected as oil phase due to the high solubility of Brinzolamide in it as compared to other oils and Polyoxyl 35 castor Oil and Propylene glycol were used as surfactant and cosurfactant respectively. The construction of nanoemulsion was further optimized by D-optimal mixture design, taking oil, Smix and water as independent variables and droplet size and drug entrapment as response variables. Mathematical equations and response surface plots were used to correlate the dependent and independent variables. The optimized composition of nanoemulsion was predicted by numerical optimization technique on the basis of the highest desirability value. The predicted optimized nanoemulsion which contained 5% oil, 15% Smix, and 80% water was formulated and evaluated for ophthalmic application. The optimized nanoemulsion formulation showed droplet size (103.03±1.6nm) and drug entrapment in formulation (101.51±0.81% ) which was in close agreement with the predicted value of response variable by the optimization software, i.e. 102.983 nm and 100.038%, respectively. These results confirmed that the D-optimal mixture design can be successfully employed for designing and development of nanoemulsion based formulation of Brinzolamide.

**KEYWORDS:** Nanoemulsion, Brinzolamide, Pseudoternary Phase diagram, Ophthalmic, D-optimal design.

## INTRODUCTION

New drug delivery technologies are revolutionizing the drug discovery and development and creating R&D-focused pharmaceutical industries to suit the needs of the modern world.

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# Determination of Angle of Repose of Pharmaceutical Materials Based On Image Processing Using Labview

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**ABSTRACT**: Physical properties of pharmaceutical products are of great importance in handling, drying, heating, extraction and other relevant processing operations. Majorly these properties are affected by the particle size and shape of the material. Flow property and compressibility of the powdered materials used in the pharmaceutical industry can be measured in terms of various parameters like Hausner's ratio, Carr's index, angle of repose and particle size. Tapped density and Bulk density measurements are also required to determine some of these parameters. Most of the conventional methods used for measurement of these parameters are manual and hence prone to error. This paper presents an approach of image processing using Vision Assistant - LabVIEW for determination of the angle of repose of different pharmaceutical materials and the results are compared with those obtained using conventional methods.

**KEYWORDS:** Angle of repose, image processing, LabVIEW, Flow property, Vision Assistant.

## I.INTRODUCTION

Pharmaceutical materials are available in various states and forms like slurries of varying viscosity as well as solid granular powders. Handling and processing of these granular powders is largely dependent on the flow ability and compressibility of the particles. Various processes like dry coating using hybridizer, Magnetic assisted impaction coater, wet and dry granulation methods are used to improve the flow property by evenly coating one material on the other. The resultant materials developed exhibit better physical properties than their original forms which are measured in form of different pre-formulation parameters using conventional methods. One of these parameters of utmost importance is the angle of repose which characterizes the flow capacity of the material.

Many significant efforts have been made in order to calculate the static repose angle based on theoretical methods. The conventional method used to determine the static repose angle includes measuring the height and radius of the pile of the powder formed by suspending it through a funnel on a flat platform. This approach of measurement has the limitation of forming an irregular circular shape of pile for powders that form light to severe agglomerations.

In this paper an effort has been made to apply image processing approach to determine the angle of repose thereby improving the accuracy of the measurement. Firstly, the images of the piles of different pharmaceutical materials have been acquired by the Vision Assistant toolbox – LabVIEW from National Instruments. These images are then converted to other colorspaces to enhance the important features and filtered to eliminate noise. This helps to improve the processing performance. Laplacian filtering has been found to be most suitable for this application. Also



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# Neuroprotective effect of potassium channel openers against hydrogen peroxide ($H_2O_2$) induced neuronal stress: *IN-VITRO* study

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ABSTRACT

**Aim**: This study was design to assess and establish *in-vitro* neuroprotective role of potassium channel openers (KCOs) against hydrogen peroxide ($H_2O_2$) induced neuronal stress. **Material and methods**: Cell viability assay was done using MTT (3-(4, 5 dimethyl thiazole-2-yl)-2, 5-diphenyl tetrazolium bromide) method to determine $IC_{50}$ value of $H_2O_2$. Based on 50 % Inhibitory Concentration ($IC_{50}$) results of $H_2O_2$, neuroprotective effect of KCOs cromakalim, nicorandil , cinnarizine, and standard vitamin E was determined using U87 cells (human primary glioblastoma cell line). **Results:** Cromakalim, nicorandil and vitamin E significantly produce neuroprotective effects against $H_2O_2$ induced neuronal damage while cinnarizine did not produce significant activity. **Conclusion:** Results of our study demonstrated the neuroprotective role of potassium channel openers against $H_2O_2$ induced oxidative damage to neuronal cells.

**KEY WORDS:** Potassium Channel Openers; *In-vitro*; Neuroprotection

## 1. INTRODUCTION

Potassium channels have been identified by molecular cloning and genetic expression techniques in CNS and they are novel targets for CNS disorders such as Alzheimer's disease, Parkinson's disease, Huntington's disease and stroke. These channels play important role in neuronal physiology of CNS. Their main role is to maintain membrane potential and neuronal excitability [1]. KCOs have been reported to possess anti-apoptotic and antioxidant activity through activating $K^+$ channels [2]. It has been reported that there is 20 % decrease in $H_2O_2$ production in isolated brain mitochondria by KCOs and this effect is abolished by their blockers. Similar cell protective effects were obtained also for neuronal and nephron cells. These cells were exposed to toxic insult of glutamate and $H_2O_2$ [3,4]. Potassium channels are present in plasma membrane as well as in inner mitochondrial membrane of cells. Hence both sites are targeted by KCOs.

Brain is highly susceptible to oxidative damage due to continuous high amount of oxygen consumption. Numerous experimental studies have demonstrated that oxidative stress cause alterations in structure and function of neuronal cells including astrocytes and glial cells [5]. In present study, glial cells were selected as model of neuronal damage by oxidative toxicant $H_2O_2$ which has other potential consequences. Glial cells not only provide nutrients and growth factors for neurons but actively participate in immune reaction and mechanisms. Glial cells also contains other antioxidant enzymes such as superoxide dismutase, glutathione peroxidase which are require for metabolism of xenobiotics and hence they protect brain from oxidative damage [6].

The aim of our study was to evaluate the ability of KCOs to protect culture of human primary glioblastoma cells against $H_2O_2$ induced oxidative cellular damage through *in-vitro* experiments. We investigated the role and mechanism of action of KCOs in neuroprotection against oxidative stress.

## 2. MATERIALS AND METHODS

Fetal bovine serum (FBS), Phosphate buffered saline (PBS), Dulbecco's Modified Eagle's Medium (Ham's F12) and trypsin were obtained from Sigma Aldrich Co, St Louis, USA. EDTA (Ethylenediaminetetraacetic acid), glucose and antibiotics were

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Original Article

# Neuroprotective effects of potassium channel openers on cerebral ischemia–reperfusion injury in diabetic rats

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ABSTRACT

*Objectives:* This study was done to estimate the potential neuroprotective role of potassium channel openers in cerebral ischemia–reperfusion (IR) injury in streptozotocin (STZ) induced type-I diabetic rats (T1DR).

*Methods:* Potassium channel openers – cromakalim, cinnarizine and nicorandil; potassium channel blocker –glibenclamide, insulin (as an antidiabetic standard), telmisartan (as an anti-hypertensive standard agent) and vitamin E (as an antioxidant and antiapoptotic standard agent) were given for 3 days in streptozotocin (45 mg/kg i.v.) induced type I diabetic rats along with middle cerebral artery occlusion. After 24 h of surgery, plasma glucose, neurobehavioral score, cerebral infarct volume, blood pressure and caspase-3 levels were measured to evaluate the mechanism of potassium channel openers (KCOs) for neuroprotection.

*Results:* Following STZ administration and ischemia–reperfusion, blood sugar, neurobehavioral score, cerebral infarct volume and caspase-3 levels were significantly high in diabetic-IR groups. Treatment with cromakalim, cinnarizine, nicorandil, insulin and vitamin E significantly reduce neurobehavioral score while nicorandil and vitamin E significantly reduced cerebral infarct volume. Caspase-3 levels were significantly reduced by cromakalim and nicorandil treated animals. Except insulin and glibenclamide, none of the agents significantly reduce plasma glucose levels.

*Conclusion:* Treatment of ischemic stroke with potassium channel openers in T1DR is neuroprotective. Inhibition of apoptosis may contribute to their neuroprotective effects after stroke in T1DR.



## 1. Introduction

Cerebral ischemic stroke is caused due to obstruction of blood supplied to the brain. It is classified either as ischemic stroke (IS) or hemorrhagic stroke. There are around 83% cases of strokes with IS while the remaining have hemorrhagic brain stroke which results in leakage of blood into the brain. Important etiological factors for pathogenesis include hypercholesterolemia, hypertension and hyperglycemia. It is reported that diabetes mellitus (DM) increases the risk of brain stroke 2 to 3 times more. DM increases the risk of macrovascular and microvascular complications [1,2]. Current treatments options for brain stroke include the use of anti-platelet agents and tissue plasminogen activators (tPA) for their thrombolytic effects. Anti-oxidants such as vitamin C, E and growth factors are found to be neuroprotective in IS. Furthermore, anti-hypertensives, anti-hyperlipidemics as well as oral hypoglycemic agents are beneficial for prevention of IS [3].

However, tPA treatment of stroke after 3 h in patients with DM increases the risk of death and intracerebral hemorrhage [4,5]. Even, reports have found that tPA treatment within 2 h after stroke in type-I diabetic rats significantly increases brain hemorrhage, and increases neurobehavioral score after stroke [6,7]. Thus, there is a need to identify new treatment agents with neuroprotective action in IS and its related disorders like diabetes.

$K^+$ ion channels of CNS (central nervous system) play an important role for providing neuroprotection in animal models of ischemic brain stroke [8]. ATP sensitive potassium channel openers such as nicorandil and cromakalim showed free radical scavenging

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RESEARCH ARTICLE

# Gender Specific Correlation between Obesity and Asthma

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## ABSTRACT

The present study was designed to examine 1) whether continuous feeding with a palatable hypercaloric diet and cycling this diet with chow diet would affect the state of asthma or respiratory parameter; and 2) whether gender would be affected by these diet regimens. Male & Female Swiss albino mice were assigned to four groups: control & asthmatic mice fed with chow diet while obese & obese asthmatic mice fed with a palatable Hypercaloric diet, after 8 weeks of the diet, the animals were killed. The hypercaloric diet and food cycles schedules caused similar increases in body weight gain, total serum cholesterol, triglycerides as well as respiratory parameters. While in SOD as antioxidant parameter, its decline with hypercaloric diet intake. The data showed that the continuous intake of a hypercaloric diet for 8 weeks cause obesity and cause asthma or make existing asthma more severe.

## KEYWORDS

Hyper Caloric Diet, Mice, Triglycerides, Obesity, Asthma

## INTRODUCTION

Asthma is a major respiratory health outcome that is estimated to affect more than 300 million people of all ages worldwide. Epidemiologic study suggests that there is a higher risk of asthma in obese individuals and the reason behind is rapid economic development and urbanization, accompanied by changes in lifestyle, diet and decreased physical activity. In current decades, the prevalence of obesity has increased drastically. Obesity means by more than 30 kg/m$^2$ BMI. Obesity seems to be associated with a high risk of chronic diseases like diabetes and cardiovascular disease, and thus constitutes a major public health problem.

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Preliminary data suggest that obese patients with asthma demonstrate different asthma phenotypes compared with patients of normal weight.[1] The obese asthma phenotype can be reversed by weight loss with improvements in lung function and by that overall asthma control as well as proper medication utilization. The recent trend systematic review showed strong evidence that obesity precedes the onset of persistence and intensity of the symptoms of asthma in adolescence, but the role of sex is not clear.[2] The primary aim of this pre-clinical animal study is to determine whether gender modifies the association between asthma and obesity or not. However, results of clinical studies from the Genes-environments and Admixture in Latino Americans (GALA II) Study and the Study of African Americans, Asthma, Genes, and Environments (SAGE II) both reported that sex was indeed found to play a role in the relationship between BMI and

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RESEARCH ARTICLE

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# Molecular Docking and *In Silico* ADMET Study Reveals Flavonoids as a Potential Inhibitor of Aromatase

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**Abstract:** ***Background:*** Aromatase is an enzyme that plays a critical role in the development of estrogen receptor positive breast cancer. As aromatase catalyses the aromatization of a drostenedione to estrone, a naturally occurring estrogen, it is a promising drug target for therapeutic management.

***Objective:*** The objective of the present study is to evaluate the binding interaction of flavonoid compounds with cytochrome P450 enzyme aromatase and also checked ADME/T properties of best scored compounds.

***Methods:*** To examine different molecules for this purpose, test ligands like Flavonoids derivatives were docked against our target protein aromatase enzyme retrieved from protein data bank (PDB Id: 3S7S), considering Exemestane as the positive control.

***Results:*** Docking results revealed that, with respect to their free binding energy 6B, 6K, 4K and 2K compounds have the lowest binding energy compared to positive control. *In silico* ADME/T predictions revealed that all best scored compounds had good absorption as well as solubility characteristics.

***Conclusion:*** The present findings provided valuable information on the binding process of flavonoid compounds to the binding site of aromatase. These compounds may serve as potential lead compounds for developing new aromatase inhibitors in breast cancer treatment.

**Keywords:** Aromatase, docking, flavanoids, breast cancer, ADMET, ER.



## 1. INTRODUCTION

Breast cancer is the second leading cause of cancer death in women in the developing and developed country as per world health organization [1]. About 2[nd]/3[rd] of breast cancers are termed hormone-dependent breast cancer, which contains estrogen receptors (ER) and requires estrogen for tumor growth. Aromatase is the cytochrome P450 enzyme, the pivotal enzyme involved in the last step of the biosynthesis of estrogens from androgens, are potential targets for the prevention and treatment of this type of breast cancer [2, 3]. The enzyme complex is bound in the endoplasmic reticulum of the cell and is comprised of two major proteins [4, 5]. One is cytochrome $P450_{arom}$, a hemoprotein that converts C19 steroids (androgens) into C18 steroids (estrogens) containing a phenolic A ring and it is *NADPH*-cytochrome P450 reductase, which transfers reducing equivalents to cytochrome $P450_{arom}$, where three moles of NADPH and three moles of oxygen are used in the conversion of one mole of substrate into one mole of estrogen product [6, 7] (Fig. 1).

Aromatase inhibitors that have been used clinically can be categorized either by generations or by mechanism of action, described as first, second and third generation inhibitors according to the order of their clinical development. They can also be classified as type I or type II according to their mechanism of action. Type I and type II inhibitors are also known as steroidal and non-steroidal inhibitors respectively [8-10].

Flavonoids have structural and functional similarities to endogenous estrogens, flavonoids have attracted considerable interest as alternative estrogens, termed phytoestrogens, and extensively studied for their potential role in many estrogen-dependent diseases including breast cancer [11, 12]. Several flavones like Chrysin ($IC_{50}$ 4μM), Apigenin ($IC_{50}$

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# Qualitative and Quantitative Estimation of Guggulsterone E and Z in Different Sodhit Guggul by LC-MS and HPLC Method

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## Abstract

**Objective:** Guggul is the oleo-gum-resin obtained from deep incisions at the basal part of stem bark of *Commiphora wightii* belonging to Burseraceae family. It is very popular ancient Ayurvedic medicine used to cure various diseases. In Ayurveda guggul is always purified prior to use in different formulations. This process is known as sodhana. Guggulsterone E and Z are the prime constituents of *Commiphora wightii*. The main objective of this study was to identify the impact of guggul sodhana process mentioned in Ayurvedic Formulary of India (AFI) on the content of guggulsterone E and Z. The methanol extract of raw guggul and seven different sodhit guggul were qualitatively and quantitatively analysed by using LC-MS and HPLC methods. The LC-MS specrum indicated the presence of guggulsterone E&Z at m/z-313.2 in all samples with a retention time 4.8 min and 5.7 min respectively. The HPLC chromatogram at 245 nm showed guggulsterone E & Z with same retention time in all samples. The study reports that all the sodhit guggul samples contain guggulsterone E&Z. The water shodhit guggul showed 95.95% of total guggulsterone while triphala shodhit guggul showed 74.21%. It is suggested that sodhana process affects the quantity of guggulsterone E&Z but do not modify its chemical properties.

**Keywords:** *Commiphora wightii*, Shodhan Dravya, Sodhana Process

## 1. Introduction

*Commiphora* genus has approximately 165 species. All species are very slow growing with small thorny, sturdy, highly branched small balsamiferous trees with a short trunk and thin papery bark[1]. *Commiphora wightii* (Arn.) Bhandari is one of the species which is widely cultivated in rocky tracts of the dry and semi-dry region of India, Pakistan, Bangladesh,

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Original Article

# EVALUATION OF PHYSICO-CHEMICAL PARAMETERS OF DIFFERENT SHODHIT GUGGUL

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ABSTRACT

**Objective:** The present study was aimed to identify the physicochemical data of shodhit guggul. Guggul is a gum-resin exudate from the plant *Commiphora weightii (Arn.) Bhandari*, belonging to *Burseraceae* family. In Ayurveda, guggul is always purified. This purification is known as Shodhan. Shodhan is a process by which guggul is made non-toxic, effective, suitable and fit for therapeutic purposes.

**Methods:** The seven different shodhan dravya were used to prepare shodhit guggul. They were evaluated by performing physicochemical parameters including five different extractive value; total ash, acid insoluble, water soluble and sulphated ash value; pH, and loss on drying.

**Results:** Analytical results of raw guggul showed total ash, acid insoluble ash, water soluble ash and sulphated ash value to 5.36±0.04%, 0.96±0.03%, 4.51±0.03 % and 8.40±0.04% respectively. These all values of each shodhit guggul were different. The extractive value of raw guggul was comparable with standard value while the extractive value of each shodhit guggul was totally different. The pH value of 1% w/v and 10% w/v aqueous solution of raw guggul was 6.44±0.18 though pH of each shodhit guggul was changed. The loss on drying of raw guggul was found to be 1.88±0.02%w/v, however, this value was different for each shodhit guggul.

**Conclusion:** The present study revealed that the different shodhan process with specific shodhan dravya affects the physicochemical parameters. The analysis and comparison of the data showed the difference in the properties of seven shodhit guggul with respect to raw Guggul.

**Keywords:** *Commiphora weightii*, Shodhana process, Shodhan dravya, Physicochemical Parameters



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## INTRODUCTION

The traditional system of medicine is known as Ayurveda. In Ayurveda, drugs are obtained from plants, animals, and mineral origin. These sources of drugs can be divided into poisonous and nonpoisonous class. The crude drugs obtained from these sources are generally possessed unwanted impurities and toxic substances, which can lead to harmful effect to human body [1]. Some medicinal plants are not safe to use as they can receive many toxic and harmful phytoconstituents in them. These phytoconstituents should be removed from the raw drugs. All these poisonous drugs should be purified and converted into suitable safe dosage forms for therapeutic use. Hence purification is an important step towards their safe, effective and suitable usage. Toxic plants need to be purified by various methods. In Ayurveda, this process is known as Shodhana [2, 3].

Sometimes the toxic components present in the plants are responsible for the therapeutic efficacy too. The main object of purification is not related with the complete removal of that constituent, but to reduce the amount of toxic elements and increase the therapeutic activity of the component. Shodhana is considered as a combined process that serves both purposes [4, 5].

According to the Ayurvedic history, guggul is considered as a God gift. In fact, it is mentioned as early as from 3000 to 10,000 y ago in the vedas, the holy scriptures of India for treating human illnesses. According to vedas guggul is describing as "Agni Sthana" and used for dhupa [6]. *Commiphora* genus is the source of oleo-gum-resin. The name *Commiphora* originates from the Greek words *kommi* means 'gum' and *phero* means 'to bear'. The majority of the species yield a fragrant oleo-gum-resin following damage to the bark [7, 8]. The common name for *Commiphora* species is 'corkwood' means "softness of the wood" and "kannledood" means "cannot die", an indication of the sustainability of the plant. Guggul was used externally as well as internally during the period of Charaka and Sushruta. Vagbhata has described the use of guggal as a drug of choice for medoroga and Vatavikaras [9].

According to sanskrit, guggal means "That which protect against disease". This property of guggul is widely used in ayurvedic applications as it removes toxic substances which are accumulated as a result of slow digestion and metabolism [10]. Guggul is one of the "broad spectrum" health products with a wide range of benefits. Guggul is always purified prior to its medicinal use. Traditionally, guggul is used as a combination with several herbs to enhance its effects [11].

Guggul is exudate oleo gum resin obtained from the stem bark of *Commiphora weightii* belonging to *Burseraceae* family [12]. Guggul mainly cultivated in India. It cultivates in dry regions of Rajasthan, Gujarat, Maharashtra, Karnataka, Saurastra and Kutch [13-15]. As Guggul is an exudate, unorganized drug having external impurities in the form of dust, stone, debris, dry leaves and other foreign materials. After purification, the herb becomes safer and more effective for use. Purified guggul reduced toxicity. It may be taken for a long time without any side effect. Adverse effects are associated with raw gum guggul (unpurified gurgul). The raw guggul may lead to a headache, diarrhoea, anorexia, abdominal pain, skin rashes, irregular menstruation, mild gastrointestinal discomfort and with very high doses, liver toxicity. As raw guggul cannot be used directly. Guggul formulations should be prepared with shuddh guggul (purified guggul). It was reported that gastric irritancy reduced with purified guggul. The pharmacological action is found to be increased after shodhan (purification) of guggul. As shodhan is an important procedure for Guggul [16]. Guggul shodhan is important for increase the activity and decreases some side effect. No any data are available for its physicochemical parameters for the evaluation of purified

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Research Article

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# PREPARATION, CHARACTERIZATION, AND OPTIMIZATION OF MICROEMULSION FOR TOPICAL DELIVERY OF ITRACONAZOLE

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ABSTRACT

Microemulsions (ME) have been proved to increase the cutaneous absorption of both lipophilic and hydrophilic medicaments when compared to conventional vehicles (emulsions, pure oils, aqueous solutions). Hence the aim of the present investigation is to prepare, characterize and optimize microemulsion of Itraconazole (ITZ). Itraconazole is an anti fungal agent, most widely used in the ringworm infection. It is classified as class III drug as per BCS classification. It indicates lower permeability through the skin. Therefore the objective of the research is to improve permeability of Itraconazole through the skin. The microemulsion was prepared using eucalyptus oil, tween 20 and methanol as the oil phase, surfactant and co-surfactant respectively. Pseudo-ternary phase diagrams were constructed to find out the optimum ratio of oil: $S_{mix}$ (surfactant: Co-Surfactant): water. A $3^2$ full factorial design was applied to the optimization of the prepared microemulsion. The microemulsion was evaluated for globule size, zeta potential, in-vitro diffusion study etc. Results of globule size measurements and zeta potential indicated ME7 had high stability than other formulation of the microemulsion. For the optimization transdermal flux and %Q6 was selected as dependant variables. Results of optimization study also revealed ME 7 as optimized microemulsion for high permeability to the skin. Further ME7 was compared to marketed Itraconazole preparation (ITASPORE) and evaluated using similarity factor $F_2$. Results of $F_2$ value was not near to 100 indicated there is no similarity in diffusion profiles of ME7 and ITASPORE. Hence, indirectly it suggests there was increased in permeability of drug by preparing microemulsion.

**Keywords:** Microemulsion, Factorial Design, Eucalyptus oil, Tween 20, Desirability Analysis

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## INTRODUCTION

The incidence of superficial fungal infections of skin, hair, and nails has been increased in worldwide. It has been estimated that about 40 million people have suffered from fungal infections in developing and under developed nations. The progression of fungal infections can be rapid and serious due to compromising with immune function. *Dermatophytes* are one of the most frequent causes of *tinea* and *onychomycosis*. Candida infections are also among the most widespread superficial cutaneous fungal infections[1].

Topical treatment of fungal infections has several superiorities including, targeting the site of infection, reduction of the risk of systemic side effects, enhancement of the efficacy of treatment and, high patient compliance. The efficiency of the topical antifungal treatment depends on the penetration of drugs through the target tissue. Different type of topical effective antifungal compounds has been used in the treatment of a variety of dermatological skin infections. The main classes of topical anti-fungal are polyenes, azoles, and allylamine/benzyl amines. Currently, these antifungal drugs are commercially available in conventional dosage forms such as creams, gels, lotions, capsule, shampoo, ointment [2,3].

Development of alternative approaches for the topical treatment of fungal infections of skin encompasses new carrier systems for approved and investigational

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# COMPATIBILITY STUDY PERFORMANCE OF OPHTHALMIC NANOEMULSION FOR REDUCING OCULAR HYPERTENSION

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## ABSTRACT

The objective of present study was to develop a stable ophthalmic nanoemulsion for reducing ocular hypertension using Brinzolamide (BRZ) 10 mg/mL which is therapeutically equivalent to marketed reference drug product. Pre-formulation study was performed to evaluate the compatibility of product with materials which come in contact with the product during manufacturing. Compatibility study was carried out with metal, silicon tubes, filters and plastic containers. Thermal cycling and Photostability study were also performed to ensure the stability of the product. Brinzolamide ophthalmic nanoemulsion was formulated by dissolving the API in Kollisolv MCT 70 in a S.S vessel under continuous stirring. Stability studies at different conditions were also performed. Compatibility study results indicate that drug product was compatible with the product contact materials. Thermal cycling and photostabilty data indicates that there was no significant degradation in the formulation. As a part of aseptic filtration by sterilizing grade filter validation study was performed to challenge *Brevundimonas diminuta* at level of $\geq 1 \times 10^7$ CFU/cm$^2$. A stable ophthalmic nanoemulsion of Brinzolamide was developed and evaluated for compatibility and stability studies at different conditions were performed and it can be concluded that the product is compatible with product contact materials, thermal and photostable.

**KEYWORDS:** Brinzolamide, Compatibility Study, Thermal Cycling, Freeze thaw, Stability Study.

## INTRODUCTION

The field of ocular delivery is one of the most interesting and challenging endeavour facing the pharmaceutical scientist. The challenge to the formulator is to circumvent the protective barriers of the eye without causing permanent tissue damage. This significantly improved over past few 10-20 years. As an isolated organ the eye is very difficult to study from a drug point of view. It is very difficult to obtain eye tissue containing drugs from humans so one is compelled to use animal tissue. Topical application of drugs to the eye is the most popular and well-accepted route of administration for the treatment of various eye disorders. The bioavailability of ophthalmic drugs is, however, very poor due to efficient protective mechanisms of the eye. Blinking, baseline and reflex lachrymation, and drainage remove rapidly foreign substances, including drugs, from the surface of the eye. Moreover, the anatomy, physiology and barrier function of the cornea compromise the rapid absorption of drugs.[1]

Numerous strategies were developed to increase the bioavailability of ophthalmic drugs by prolonging the contact time between the preparation, and therefore the drug, and the corneal/conjunctival epithelium. The use of a water-soluble polymer to enhance the contact time and possibly also the penetration of the drug was first proposed by Swan.[2] There is no reliable correlation between the performance of ophthalmic vehicles in rabbits and in humans, mainly due to differences in blinking frequency.

Glaucoma is an accumulative optic neuropathy resulted from increasing intraocular pressure. Often, glaucoma has no symptoms and can suddenly result in vision loss. Without proper treatment, glaucoma can lead to blindness. The good news is that with regular eye exams, early detection and treatment, you can preserve your sight. In most types of glaucoma, the eye's drainage system becomes clogged so the intraocular fluid cannot drain. As the fluid builds up, it causes pressure to build inside the eye. High pressure damages the sensitive optic nerve and results in vision loss.[3] There are two major forms of glaucoma in patients: open-angle glaucoma and angle-closure glaucoma. For patients with open-angle glaucoma (defined as having optic nerve damage), lowering IOP is effective and always recommended.[4] In clinical practice, eye drops are the first line treatments for most glaucoma patients including prostaglandin analogue, β-adrenergic antagonists and carbonic anhydrase inhibitors (CAIs). CAIs, such as acetazolamide, methazolamide, dorzolamide and brinzolamide, could decrease the production of the fluid

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# ANALYSIS OF CRYSTAL STRUCTURES OF DIPEPTIDYL PEPTIDASE 4 (DPP 4) CO-CRYSTALLIZED WITH DIVERSE INHIBITORS

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**Keywords:**

DPP 4, GLP-1, Gliptins, Interaction, Binding pose, Drug discovery

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**ABSTRACT:** Crystal structures of target are an indispensible tool in modern methods of rational drug design and discovery. Hence, judicious selection of crystal structures for virtual screening and ligand docking is essential. In recent times, a number of new chemical entities (NCEs) have been introduced into the drug discovery pipeline with these methods in treatment of type 2 diabetes. Dipeptidyl peptidase 4 (DPP 4) enzyme splits an incretin based glucoregulatory hormone glucagon like peptide -1(GLP-1) from N-terminal of peptide, where penultimate amino acid is either alanine or proline. Several DPP 4 inhibitors, "gliptins", are approved for management of type 2 diabetes or are under clinical trials. Crystal structures of DPP 4 have been released by various research groups that may assist rapid discovery of new DPP 4 inhibitors. 18 crystal structures of DPP 4 bound to various inhibitors are analyzed in the present work to gain insight into interactions between the protein and ligands. Chemically all DPP 4 inhibitors are diverse in nature but occupy same binding site. Key amino acid residues essential for optimum interaction between protein and ligands are discussed with emphasis on orientation of ligand in active site of DPP 4.

**INTRODUCTION:** Type 2 diabetes (T2D) is one of the major health concerns around the world as the prevalence of diabetes is rising in all corners of the world. In 2014, 422 million of the world's population had diabetes. The numbers are expected to increase up to 642 million by 2040. The global prevalence of diabetes among adults over 18 years of age has almost doubled from 4.7% in 1980 to 8.5% in 2014. The prevalence of diabetes has been increasing since last 3 decades and is growing most rapidly in low- and middle-income countries [1].

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Diabetes is a major risk factor for cardiovascular disease (CVD), *i.e.*, Myocardial Infarction, angina, atherosclerosis, stroke, hypertension, *etc.* T2D is characterized by insulin resistance and insufficiency. Main aim of management of T2D is to control hyperglycaemia [2]. Existing therapeutics for T2D include biguanides, sulphonylureas, thiazolidinediones, meglitinides and $\alpha$-glucosidase inhibitors. Poor glycaemic control in spite of aggressive therapy is a demoralizing factor in the management of T2D.

Newer agents are being developed that increase insulin secretion. Glucagon-like peptide-1 (GLP-1) and gastric inhibitor peptide (GIP) are naturally occurring incretin hormones that are released in the gut after meals. They stimulate the release of insulin. Naturally produced GLP-1 is degraded by enzyme dipeptidyl peptidase 4 (DPP 4) in gut and

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Research Article

# A COMMUNITY-BASED STUDY FOR EVALUATION OF MORBIDITY AMONG CARDIAC DRUG CONSUMERS

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**ABSTRACT**

The aim of study was to evaluate morbidity associated with cardiac diseases and pharmacoeconomic characteristics for drug usage among residents of Uttarsanda village of Nadiad. Community based cross sectional study was done for evaluating morbidity and expenses among cardiac drug consumers. Our study revealed that among 117 cardiac patients, 63.5% of patients suffered from hypertension, 32.7 % of patients were suffered from diabetes, 8% were suffered from cardiovascular diseases (CVDs), 4.2% from thyroid and 3.4 % from other diseases. Out of 146 families of Uttarsanda village, approximately 61% of families spend their total income for medications and healthcare and 37% families were found not to spend income on healthcare even though diseases were present. More prevalent diseases identified for spending monthly family income were hypertension, congestive heart failure, diabetes mellitus, and hyperlipidaemia. There is a need for cost effective treatment approaches in rural area of India.

**Keywords:** Morbidity, Cardiovascular diseases (CVDs), Cardiac drug consumers

## INTRODUCTION

Cardiovascular disease (CVDs) accounts for a high proportion of morbidity and mortality in India and its prevalence is increasing throughout the world[1]. It has been well reported that diabetes mellitus, hypertension and thyroid disorders are co-morbid diseases with CVDs[2, 3]. Various anti-diabetes, anti-hypertensive and thyroid- anti-thyroid drugs are recommended for the management of patients with cardiovascular disease or their risk factors[4, 5]. Studies based on hospital registries or epidemiological surveys of patients reported moderate to high rate of cardiovascular drug usage[6, 7]. However, rate of drug usage for individuals with coronary heart disease or stroke in the community remained unknown in rural area of India[8]. Further most available research reports are from developed countries or from metacentric clinical studies and whether their findings reflect the actual situation in communities is debatable. Because about 75% of the burden of cardiovascular disease falls on low-income and middle-income countries (developing countries), relevant data for secondary prevention practices are needed in such countries[9]. Even many individuals live in rural areas where access to medical care is difficult. Therefore, we conducted across- sectional study to assess rate of drug usage in cardiovascular diseases and related co-morbid conditions from rural communities of Uttarsanda village, Nadiad, Kheda district of Gujarat.

## METHODOLOGY

**Study design:** A cross-sectional community-based study for evaluation of morbidity and expenses among cardiac drug consumers.

**Study Setting:** Study population was comprised of permanent resident of Uttarsanda Village. Uttarsanda is located in Nadiad of Kheda district, Gujarat. It is a village with total 2433 families. The village has population of 10616 of which 5399 are males while 5217 are females as per Population Census of 2011. Population of children with age 0-6 is estimated 957 (9.01 % of total). Average sex ratio is 966 which are more than Gujarat state average of 919. In 2011, literacy rate of Uttarsanda village was 90.32 % while in Gujarat it was 78.03 %. In Uttarsanda male literacy was estimated at 95.07 % while female literacy rate was 85.42 %. Village is administrated by Sarpanch (Head of Village) who is elected representative of village. Study is carried out as per International conference of Harmonization-Good Clinical Practices Guidelines (ICH-GCP) and as per Declaration of Helsinki guidelines. Study was approved by Ethics Committee of DDMM Heart Institute, Nadiad.

**Inclusion and exclusion criteria:**

1. Inclusion criteria –
   A) Permanent resident of Uttarsanda Village.
   B) Should be able to give consent
2. Exclusion criteria-
   A) Unable or refuses to give consent for the study

**Sample size:** Total sample size estimated was 146 families and out of which 117 patients were with cardiac drug usage.

**Data collecting tool:** A questionnaire was developed. It consisted of socio-demographic information about household, information on drug prescription, drug usage at community level and family income.

Original Article

# Knowledge and Practice about Adverse Drug Reactions among Pharmacists in Nadiad City

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## Abstract

**Objective:** The objective of the study was to evaluate the knowledge and practice about adverse drug reactions (ADRs) among community pharmacists. **Methods:** A cross-sectional study was conducted with a questionnaire provided to 47 community pharmacists in Nadiad, Gujarat, India. **Results:** Nearly 75% response rate was noted as 35 pharmacists participated in the survey. Respondents were evaluated for their knowledge and practice of ADR reporting. For ADR reporting process, only 2.85% of pharmacists were familiar with Pharmacovigilance Programme of India (PvPI). Nearly 57% of participants reported ADR to physicians and 40% reported ADR to nonspecified sources. Around 51% of pharmacists replied that ADR reporting is professional obligation of pharmacists. Around 15% of pharmacists replied that ADRs do not require to be reported. Around 91.42% of pharmacists suggested advice to patients regarding the side effects of the drugs that may occur with the prescribed medicines. **Conclusion:** It may be concluded that community pharmacists have lower awareness regarding ADR reporting and importance of PvPI. This would reflect that the pharmacists have lack of knowledge about ADRs and their reporting. Therefore, government agencies and private institutes should develop strategies to spread the awareness regarding ADR reporting and its importance, which will be helpful to reduce the rate of underreporting.

**Keywords:** Adverse drug reaction, community pharmacist, knowledge

## Introduction

As per WHO, adverse drug reaction (ADR) is an unwanted reaction along with therapeutic use of drug.[1] Monitoring ADRs through pharmacovigilance program by the WHO was started in the 1960s. A number of countries throughout the world have started to report ADRs as they are one of the causes for mortality and morbidity.[2,3] It contributes to 5.3% inpatients in hospitals and affects 2.2 million people throughout the world, causing around 100,000 death annually.[4] The cost of treatment associated with ADRs is around $136 billion. Hence, ADR detection and prevention may be beneficial to reduce the cost of treatment associated with it.[5]

As pharmacists know about drugs in detail, they may be able to identify ADRs of drugs. Pharmacist can identify ADR in hospitals as well as at pharmacy stores.[6] However, practice for ADR reporting by pharmacists is very poor and ADR underreporting is a major problem faced by health-care system.[7] Common reasons linked with ADR underreporting are insufficient knowledge about pharmacovigilance systems, personnel attitude for reporting, and workload at center. In one of the studies conducted in Saudi Arabia, only 23% of participated pharmacists were aware of ADR reporting.[8] It is, therefore, essential to encourage health-care professionals to report ADRs, and such scenario in India is the same as in other countries.[9] Therefore, we evaluated pharmacist practice about ADRs in Nadiad city.

## Methods

A questionnaire related to ADRs was prepared to conduct this cross-sectional study among community pharmacists of Nadiad city, Gujarat, India. It was given (English language) to the community pharmacists to evaluate their knowledge about ADR reporting process. Pharmacy students visited pharmacy

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# ANTI-OXIDANT POTENTIAL OF COMBINATION OF LEPTIN ANALOG AND SALBUTAMOL IN OBESITY ASSOCIATED ASTHMA

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## ABSTRACT

**Objectives:** Objectives of present study is to evaluate anti-oxidant potential of combination of leptin analog and salbutamol in obesity associated asthma. **Methods:** High caloric diet was given to swiss albino mice for eight weeks to induce obesity. Ovalbumin followed by aluminum hydroxide was given to induce asthma. The animals were divided in four groups. They were treated with leptin analog (0.4 mg/kg, i. p. for 7 days) and salbutamol (2 mg/kg, PO for 14 day). Anti-oxidant parameters such as SOD activity, catalase activity, MDA level and GSH level were estimated. **Results:** It was found tissue lipid peroxidation and antioxidant markers improve in leptin analog with salbutamol treated animals when compared to leptin analog treated animals alone. Significantly elevated levels of tissue MDA and lowered levels of GDH, SOD activity and catalse activity were observed in obese asthmatic animals. Subsequent to the treatment with leptin analog with salbutamol significantly lowered the tissue MDA level and elevated SOD activity and catalase activity with increased GSH level. Thus leptin analog with salbutamol was found to be effectively improving oxidative stress and thereby improved the state of obesity induced asthma by anti-oxidant effect. **Conclusion:** Leptin analog with salbutamol is an alternative treatment approach to treat obese asthmatic condition. Hence detailed experimental study is required to established its pre-clinical and clinical use of drug.

**Keywords:** Obesity; Asthma; Leptin; Salbutamol; SOD; GSH; MDA.

## INTRODUCTION:

Obesity is linked to imbalance between energy intake (Talbert et al., 1997). It happens because of excessive food consumption with inactive life-style (Farooqi & O'rahilly, 2006; Palatty & Saldanha, 2012; Bollapragrada *et al.*, 2015). According to information reported by various researchers (Yun, 2010; Anitha *et. al.*, 2016), over one billion adults worldwide are overweight and a minimum of three hundred million of them are clinically obese. Multiple factors contribute to the etiology are sitting life-style, white collar jobs, lack of physical activity and consumption of high energy-rich diets. Obesity is coupled with many disorders including cardiovascular diseases (CVDs), certain kinds of cancer (Myers *et. al.*, 2010), type-2 diabetes (T2DM) and it conjointly raises the danger of pulmonary issues especially asthma attack (Goodpaster *et. al.*, 2005). It is a powerful risk factor for mortality in adulthood. Various study revealed overall 20% men and 30 % females are obese worldwide (Wood & Gibson, 2009). The epidemic of obesity is becoming a global problem, inflicting considerable burden on the individual and society rising morbidity and mortality (Jaffery *et al.*, 2000).

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Research Article

# COMBINATION OF LEPTIN ANALOG AND SALBUTAMOL: TREATMENT APPROACH FOR OBESITY-INDUCED ASTHMA

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**ABSTRACT**

**Objective:** The objective of the study was to investigate the effect of leptin analog and salbutamol in obese asthmatic mice.

**Methods:** Obese asthmatic condition was induced by administration of hypercaloric diet for 8 weeks followed by ovalbumin-aluminum hydroxide. The animals were treated with leptin analog (0.4 mg/kg, i.p. for 14 days) and salbutamol (2 mg/kg, PO for 14 days). Biochemical parameters such as serum leptin, ghrelin, and tumor necrosis factor-α and physical parameters such as tidal volume and airflow rate were estimated to confirm the state of asthma and obesity, respectively.

**Results:** Elevated serum leptin and ghrelin were associated with leptin resistance in obese asthmatic mice. It was found that a significant increase in serum leptin level with animal treated with lepcin analog and salbutamol when compared to animals treated with leptin analog alone. The result of respiratory parameters and serum parameters also improved with the combination of leptin analog and salbutamol. From our study, we found that salbutamol potentiates the effect of leptin analog in obese asthmatic condition.

**Conclusion:** Leptin analog and salbutamol are an alternative treatment approach to treat the obese asthmatic condition.

**Keywords:** Obesity, Asthma, Leptin analog, Salbutamol, Tumor necrosis factor alpha.

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## INTRODUCTION

Obesity is linked to the imbalance between energy expenditures [1]. It is due to excessive food intake with inactive lifestyle [2-4]. Obesity is one of the vital factors to worldwide for the burden of chronic sickness and disabilities. According to reports [5,6], over 1000 million adults worldwide are morbidly obese while of 300 million of them are clinically obese. Multiple factors contribute to the etiology are sedentary lifestyle, lack of physical activity and consumption of high energy-rich diet. The various study revealed that overall 20% men and 30% of females are obese worldwide [7]. The epidemic of obesity is becoming a universal problem, imposing considerable freight on the individual and society rising morbidity and mortality [8].

Asthma, a state of inflammation of airways involves different cells and cellular components such as eosinophils, somatic cells, lymphocytes, epithelial cells macrophages, and neutrophils; plays a crucial role in pathogenesis. These inflammatory cells cause repeated episodes of wheezing, dyspnea, chest tightness, coughing, and reversible airflow obstruction [9]. The inflammation results in elevated bronchial hyperresponsiveness to stimuli [10]. As of 2009, 300 million individuals globally were affected by asthma leading to approximately 250,000 deaths per annum [11].

Epidemiologists, after a detailed study on the asthmatic spectrum, detected different asthmatic phenotypes (different identical characteristics of disease) and genotypes (different pathological origins of identical disease) [12,13]. One in every of phenotypes is obesity-induced asthma [14]. Obesity with asthma has been strongly associated with both genders [15]. Studies revealed that obesity could increase asthma severity and reduced the efficacy of standard asthma medications [16,17]. Various clinical studies showed that over 3 million adults whose body mass index higher than 25 were diagnosed with asthma [18].

It is reported that abnormal leptin and ghrelin levels are associated with obesity and asthma [19,20]. Both hormones regulate food intake through acting on neuropeptide-Y pathway [21]. Various studies showed that obesity is due to either leptin resistance or elevated serum leptin level [7,22,23]. Clinical studies also revealed a higher level of leptin in asthmatic patients [24]. Reports also revealed that the pro-inflammatory effects of leptin are responsible for asthma in the obese population [25,26]. Thus, our investigation focuses on for effect of leptin analog with salbutamol in obese asthmatic mice.

At present, there are no treatment options available for the obese asthmatic condition. Even those treatments used for asthma and obesity have numerous side effects and costly. Therefore, there is a need for identification of effective treatment approach for asthma with obesity. In this study, we investigated the effect of leptin analog and salbutamol through hypercaloric diet-induced obesity in ovalbumin (OVA)-induced asthma in Swiss albino mice.

## METHODS

Swiss albino mice of female sex weight in between 24±6 g were obtained from the central animal house of Faculty of Pharmacy, Dharmsinh Desai University, Nadiad. The animal studies were approved by the Institutional Ethics Committee (DDU/FOP/06/17), ratified by the purpose of control and supervision of experimental animals (CPCSEA) by Ministry of Environment and Forests, Government of India, New Delhi, India. Animals were naive to drug treatment and experimentation at the beginning of all studies. Animals were kept individually in polypropylene cages in an environmentally controlled room of the animal house and maintained at a temperature of 25±2°C with a 12 h dark and light cycle. 10 days of acclimatization were provided to the animal. The animals were provided with water and food *ad libitum*. Mice were fed with laboratory pellet chow diet or

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RESEARCH ARTICLE

# Vulnerability of Hydro-Alcoholic Media on *In Vitro* Drug Release from Galantamine HBr Pellets Comprising of Compritol 888 ATO and Ethocel

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## ABSTRACT:

**Objective:** The objective of the present study was to assess the interaction between the Galantamine HBr pellets and alcohol. Concomitant administration of alcohol and formulation can affect the plasma concentration of drug or give dose dumping effect or failure of the dosage form as the number of excipients especially polymers used in the modified dosage form cannot withstand in the presence of alcohol. **Materials and Methods:** The modified release pellets of galantamine hydrobromide were formulated incorporating a waxy polymer – Compritol 888 ATO and a hydrophobic polymer – Ethocel using extrusion spheronization technique. *In vitro* drug release of galantamine pellets was performed in distilled water and 10-40% ethanol containing distilled water. The saturated solubility of galantamine was measured in different dissolution media and pure ethanol. **Results and Discussion:** *In vitro* drug release study showed similarity at all the levels of alcohol (10-40%) as $f_2$ value was found to be more than 50. *In vitro* drug release was slightly reduced in the presence of alcohol as the galantamine is slightly less soluble in ethanol compared to distilled water. There was change observed in drug release kinetics and mechanism but no significant change was observed in drug release. **Conclusion:** The suitability of Compritol 888 ATO and Ethocel as a matrix forming excipient in the formulation of pellets can resist the effect of alcohol makes it suitable for the alternative polymer in the wider application for designing of modified release dosage form.

**KEYWORDS:** Hydroalcoholic media, Compritol 888 ATO, Ethocel, Sustained release pellets, Galantamine HBr

## INTRODUCTION:

The vulnerability of controlled release formulations when co-ingested with alcohol represents a current major concern of regulatory agencies[1]. Concomitant administration of medications and alcohol especially ethanol can significantly disturb the drug concentration in blood plasma. This is mainly due to the failure of dosage form in the presence of alcohol.

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Failure of the dosage form may be due to the sensitivity of some excipients against alcohol[2]. It may also be due to the higher or lower solubility of drug in alcohol compared to water. Failure of dosage form means initial burst release or dose dumping which leads to toxicity to the patient.

As per the report of World Health Organization (WHO), more than 3 million people died due to the harmful effect of alcohol means 1 in 20 deaths. In these deaths, more than three-quarter are only men amongst all which suggest men are more abused to alcohol compared to women. Overall, the harmful use of alcohol causes more than 5% of the global disease burden. In the current

RESEARCH ARTICLE

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Current Drug Therapy, 2019, 14, 000-000



# Systematic Scrutinisation of Vital Factors for Fabrication and Evaluation of PGS-MCC Based Drug Loaded Pellets by Extrusion Spheronization Technique

Hardik Rana, Vaishali Thakkar*, Kalpana Mudgal, Mukesh Gohel, Lalji Baldania, Mansi Dholakia and L. Tejal Gandhi

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**Abstract:** ***Objective***: The prime objective was to formulate pellet formulation incorporating a newer extrusion- pelletisation aid, Pregelatinised Starch (PGS) and to scrutinise the factors that can affect the quality of the pellets and to overcome the slower disintegration of Microcrystaline Cellulose (MCC).

***Method***: Pellets were prepared initially using PGS, MCC, water, ethanol, HPMC K 4 M and Febuxostat was employed as model drug. Optimisation of formulation was done by employing Quality by design (QbD) and Design of experiment (DOE) approach. Ratio of PGS and MCC, ratio of binder and spheronisation speed were selected as independent variables and disintegration time and % cumulative drug release as dependent variables. *In vitro in vivo* correlation of the optimised batch was carried out using Wagner nelson method. Incompatibility studies have indicated compatibility of drug and excipients.

***Results***: From the experiments, it was proved that the batch comprising 3:1 ratio of PGS and MCC, 1:1 binder solution and 1500 speed yielded good pellets with decreased disintegration time and improved dissolution rate as compared to pure Febuxostat. IVIVC studies indicated one to one correlation between *in vitro* and *in vivo* parameters.

***Conclusion***: Pellets with good quality, minimum disintegration time and improved dissolution of model drug were successfully prepared with maximum amount of PGS. Optimisation using QbD approach was worth fruitful that affected the quality of pellets.

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**Keywords:** Pellets, pregelatinised starch, MCC, immediate release, convolution, IVIVC.

## 1. INTRODUCTION

Multiple-unit dosage forms have several advantages compared with single-unit dosage forms including more stable plasma profiles and little risk of local side effects [1]. Among the various types of multiple-unit dosage forms, pellets have attracted more attention due to their unique clinical and technical advantages. Pellets as a drug delivery system offer therapeutic advantages such as less irritation of the gastrointestinal tract and a lowered risk of side effects due to dose dumping [2]. Pellets have opened a realm to new therapeutic opportunities and a substantial degree of flexibility that were unrealistic in earlier times. In addition, pellets disperse freely in the gastrointestinal (GI) tract, and so, they invariably maximize drug absorption, reduce peak plasma fluctuation, and minimize potential side effects without appreciably lowering drug bioavailability [2, 3].

A diverse range of substances is available for being utilized as an aid for extrusion and pelletisaton. One of the most extensively used excipients for pellet formulations is microcrystalline cellulose (MCC), mainly because it provides wet

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Current Drug Therapy, 2020, 15, 1-19



RESEARCH ARTICLE

# Exploring of Taguchi Design in the Optimization of Brinzolamide and Timolol Maleate Ophthalmic in-situ Gel used in Treatment of Glaucoma

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**Abstract:** ***Objective:*** The present research work focuses on experimental design assisted In-situ gel for fixed dose combination.

***Significance:*** Brinzolamide(BZ) BCS class II drug and timolol maleate(TM), a BCS class I drug is formulated for obtaining the sustained effect, increased ocular bioavailability and reduction of dose leading to better patient compliance.

***Methods:*** The material attributes were gelrite, hydroxy propyl methyl cellulose K4M(HPMC K4M) and HP-β-CD and critical quality attributes identified were gel strength, mucoadhesive index and percentage of drug release of both drugs.BZ and TM were successfully formulated in ion-triggered In-situ gelling system using Taguchi design with minimum trials.

***Results:*** The final optimized formula 0.5 %w/v gelrite, 0.5 %w/v HPMC K4M, 1:2.5 Ratio of drug to HP-β-CD as well as 150rpm stirring rate exhibited acceptable results with enhanced solubility of BZ. The pharmacodynamicstudy revealed a decrease in intraocular pressure for In-situ gel (17.3) compared to conventional marketed suspension. Moreover, delayed mean residence time and high AUC (61.237 and 4523.65) of In-situ gel indicates prolonged residence time with sustained release.

***Conclusion:*** In conclusion, excellent ocular tolerance and longer action of gelrite and HPMC K4M. In-situ gel for BZ and TM can be explored as potential alternative to marketed formulation reducing the frequency of administration and improving patient compliance in glaucoma.

**Keywords:** In-situ gel, HP-β-CD, taguchi design, *in-vivo* animal study.

## 1. INTRODUCTION

Glaucoma is developing as one of the main causes of irreversible blindness and has become the second most common cause of bilateral blindness all over the world [1]. According to epidemiologists, about 66.8 million people have visual problems from glaucoma, with 6.7 million people suffering from blindness. With the increase in age, the prevalence of glaucoma increases [2]. Increased intraocular pressure remains the major causative risk factor for the development of glaucoma, hence the primary goal in the management of glaucoma is the prevention or control of intraocular pressure [2]. In the recent years, the use of fixed-combination antihypertensive medications by patients with glaucoma has increased substantially. These combination therapies are often favoured by patients because of more patient compliance [3]. One such fixed dose combination is Brinzolamide (BZ) and Timolol Maleate (TM) which has a documented efficacy in lowering intraocular pressure, as a separate medication and in combination. BZ, a carbonic anhydrase inhibitor (CAI) helps to inhibit the lowering of the intraocular pressure by decreasing the production of the aqueous humour [4, 5] and TM being a beta blocker, reduces the synthesis of aqueous humour production by blocking the β-receptors on ciliary epithelium, having a half-life of 2.5-5 h [6].

These CAIs have solubility problems and are available in suspensions for topical administration. Upon instillation of an ophthalmic solution, most of the instilled volume is eliminated from the precorneal area resulting in poo bioavailability. The main objective of the improvement in the therapy for the treatment of vision threatening disorde glaucoma is to maintain the drug in the bio-phase for an ex tended period of time by formulating a novel ocular dru delivery system. Several formulation techniques have bee investigated to overcome their poor bioavailability aft topical applications of BZ, such as nanocrystal formulation nano-emulsion, water-soluble salts, liposomal/niosomal fo mulations, In-situ gel formulation and aqueous cyclodextr containing eye drop solutions [8-11]. TM and its combi

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Research Article

# ENDOCRINOLOGICAL ROLE OF LEPTIN IN OBESITY AND ASTHMA

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**ABSTRACT**

**Objective:** Role of leptin resistance in correlation between obesity and asthma.

**Methods:** High-caloric diet was given for 8 weeks to induce obesity. Ovalbumin followed by aluminum hydroxide was given to induce asthma. The animal was treated with leptin analog (0.4 mg/kg, i.p. for 7 days) and leptin antagonist (3 mg/kg, p.o., for 7 days). Biochemical parameters such as serum leptin, ghrelin, and tumor necrosis factor alpha (TNF-α) and physical parameters such as tidal volume and airflow rate were estimated to confirm the state of asthma and obesity, respectively.

**Results:** It was found that leptin and ghrelin were elevated in obese and obese asthmatic condition, responsible for leptin resistance. Treatment with leptin analog and leptin antagonist significantly increases and decreases serum leptin levels, respectively. There was no significant change in TNF-α and ghrelin level after leptin analog treatment. The result of respiratory parameters improved with leptin analog. From our study, we found beneficial role of leptin analog in obese asthmatic condition.

**Conclusion:** Leptin is an alternative treatment approach to treat obese asthmatic condition.

**Keywords:** Obesity, Asthma, Leptin, Leptin antagonist, Tumor necrosis factor alpha.

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## INTRODUCTION

Obesity is one of the inflammatory conditions characterized by fat deposition in the adipose tissue [1,2]. Obesity is linked with several disorders including cardiovascular diseases, certain types of cancer [3], and type-2 diabetes and it also raises the risk of pulmonary problems including asthma [4,5]. It is a strong risk factor for mortality in adulthood. The study revealed that overall 20% of males and 30% of females are obese worldwide [4]. The reason is due to rapid urbanization and westernization of countries. This leads to consumption of larger amounts of food with decreased physical activities, results in higher chances of obesity [5].

Asthma is chronic inflammatory respiratory disorder characterized by airway hyperresponsiveness that leads to recurrent episodes and reversible airflow obstruction [6]. Obesity has been significantly associated with asthma in both genders [7]. Studies indicated that obesity may increase asthma severity and reduce the efficacy of standard asthma medications [8]. Various clinical cohort studies showed that over 300,000 adults whose body mass index >25 were diagnosed with asthma [9].

It is well established that insulin, leptin, and ghrelin levels are significantly altered in obesity and asthma [10]. Leptin and ghrelin regulate satiety center by acting on brain centers. Both control the food intake through acting on neuropeptide Y pathway. Various studies showed that obesity is due to either leptin resistance or elevated serum level [3-5]. Clinical studies also revealed higher level of leptin in asthmatic patients [11].

Both asthma and obesity are chronic inflammatory conditions [9]. Leptin is an inflammatory hormone secreted from adipose tissue [12]. The obese state could lead to asthma in those without prior airway disease in a number of different ways. These include changes in lung structure and function related to diet and mechanics, oxidative stress signaling, cytokine derangement, and neuronal signaling pathways. Growing evidence also suggests that the pro-inflammatory effects of leptin may contribute to the higher incidence of asthma in the obese population [13,14].

At present, there are limited treatment options available for these two comorbid conditions. Even current treatments also have numerous side effects. Therefore, there is a need for identification of newer cost-effective treatment approach for asthma with obesity. The present investigation was done to find possible role of leptin in pathogenesis of asthma with obesity. We investigated role of leptin through high-caloric diet-induced obesity in ovalbumin (OVA)-induced asthma in Swiss albino mice.

## METHODS

Swiss albino mice of female sex weighing between 24±6 g were obtained from the central animal house of Faculty of Pharmacy, Dharmsinh Desai University, Nadiad. The animal studies were approved by the Institutional Ethics Committee (FOP/06/17), ratified by the purpose of control and supervision of experimental animals by Ministry of Environment and Forests, Government of India, New Delhi, India. Animals were naive to drug treatment and experimentation at the beginning of all studies. Animals were kept individually in polypropylene cages in an environmentally controlled room of the animal house and maintained at a temperature of 25±2°C with a 12 h dark and light cycle. 10 days of acclimatization were provided to animal. The animals were provided water and food *ad libitum*. Mice were fed with laboratory pellet chow diet or special high-caloric diet according to the protocol. Composition of experimental diet (gm/kg diet) was according to Soni *et al.* [7].

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Original Article

# DESIGN AND DEVELOPMENT OF RILPIVIRINE NANOPARTICLE CONTAINING CHITOSAN USING IONIC GELATION METHOD FOR HIV INFECTIONS

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ABSTRACT

**Objective:** The primary objective of the current research was to prepare rilpivirine loaded Nanoparticles containing Chitosan using the ionic gelation method for HIV infections.

**Methods:** The nanoparticles of rilpivirine were prepared using the ionic gelation technique. Further, nanoparticles were characterized by Fourier transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), scanning electron microscopy (SEM) and *in vitro* drug release.

**Results:** The optimized nanoparticles were found with a particle size of 130.30±5.29 nm (mean±SD) and entrapment efficiency (% EE) of 77.10±0.50%. Scanning electron microscopy technique exposed spherical particles with uniform size. It was observed that the nanoparticles created showed the absence of the crystalline nature of the drug and its switch to the amorphous state. Results showed that more than 45% of the pure drug is released in 50 min and after 90 min almost about 95% of the drug is released.

**Conclusion:** The research study concluded that *the in vitro* release profile of nanoparticles was found to be sustained up to 24 hr. Sustained release of the rilpivirine could improve patient obedience to drug regimens, growing action effectiveness.

**Keywords:** Rilpivirine, Chitosan, Nanoparticles, HIV


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## INTRODUCTION

Chitosan is an interesting natural material occurring in abundance in the environment. Its excellent biocompatibility and several advantages due to its unique polymer cationic character render it highly useful for pharmaceutical applications. A polysaccharide comparable to cellulose, comprising copolymers of glucosamine and *N*-acetyl glucosamine linked by β-(1–4) linkages, chitosan can be derived by partial deacetylation of chitin from crustacean shells. The primary amino groups lead to special properties that render chitosan very interesting for pharmaceutical applications. In contrast to most other natural polymers, it has a positive charge and is mucoadhesive. Besides other applications, chitosan has been extensively examined for its potential in the development of controlled release drug delivery systems and these controlled release formulations have been made in the form of chitosan gels, tablets, and capsules, in addition to microspheres and microcapsules [1-3].

Nanoparticles have a special role in targeted drug delivery in the sense that they have all the advantages of liposomes including the particle size, but unlike liposomes, nanoparticles have a long shelf life and can usually entrap more drugs than liposomes. Although nanoparticles made of hydrophobic polymers encapsulating hydrophobic drugs have been reported in the literature, very few studies have been made in the preparation of drug-loaded hydrogel nanoparticles. Nanoparticles made of hydrophobic polymers are usually taken up by the Reticuloendothelial system (RES) and have a short residence time in blood. The surfaces of these hydrophobic nanoparticles are made hydrophilic by conjugating with the polyethylene glycol (PEG) type of molecules to make these particles long circulating in blood [4, 5]. We have recently optimized a method of preparation of ultra-low size nanoparticles of hydrogel polymers and have been able to load water-soluble drugs into them. These hydrophilic nanoparticles evade RES and remain in circulation for a couple of hours without PEG conjugation on the particle surface [6]. These hydrogel polymers can have reactive groups on the surface which enable the nanoparticles to be converted to stimuli-responsive particles and they can also be made targetable by attaching receptor-specific ligands. The preparation of nanoparticles from chitosan, a hydrogel polymer, for drug delivery can have several advantages over the use of chitosan microspheres and microcapsules [7, 8].

Nanometer range particles have easy accessibility in the body, being transported via the circulation to different body sites. Extremely small nanoparticles, of<100 nm diameter with a hydrophilic surface, have been found to have longer circulation in blood. Such systems should allow the control of the rate of drug administration that prolongs the duration of the therapeutic effect, as well as the targeting of the drug to specific sites [9]. The preparation of nanoparticles with this versatile hydrogel material has been attempted by several workers to utilize its mucoadhesive properties to transport drugs and DNA across a mucosal surface. The polycationic nature of deacetylated chitosan results in polycondensation in the presence of anionic macromolecules [10, 11]. Thus, Chitosan–DNA nanoparticles can be prepared by the method of coacervation. Besides, the reactive free amino group on the particle surface makes it possible to chemically conjugate various other reactive groups, such as polyethylene glycol (PEG) derivatives, different ligands, antibodies, and other pH and temperature-sensitive moieties. Several methodologies have also incorporated other polymers in the preparative procedure, with the intent of preparing smart hydrophilic nanoparticles under extremely mild conditions [12-14].

Considering the advantages of using ultra-low sized hydrophilic nanoparticles for drug delivery, we have focused on the preparation of chitosan nanoparticles of<100 nm diameter. The preparation of nanoparticles using reverse micelles as a medium makes it possible to produce ultrafine particles with narrow size distribution. The aqueous core of the reverse micellar droplets can be used as a nanoreactor to prepare these particles since the size of the reverse micellar droplets is in the nanometer range and these droplets are highly monodispersed. The present paper describes the preparation of cross-linked chitosan nanoparticles of size<100 nm diameter

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# PROTECTIVE EFFECT OF *HYDRILLA VERTICILLATA* (LINN.F) ROYLE AGAINST CEREBRAL ISCHEMIA REPERFUSION INJURY IN RATS.

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## ABSTRACT

*Hydrilla verticillata* (HYD) is well reported to modify inflammatory response and oxidative stress which are key pathophysiological finding of cerebral reperfusion injury. Therefore present work was designed to investigate the effect of HYD on cerebral reperfusion injury in rats. Each protocol comprised cerebral ischemia (CI) for 30 min followed by reperfusion(R) for 1 h. Animals were treated with HYD (50mg/kgp.o) for seven days. At the end of the experiment, brain tissue was utilized for the measurement of oxidative stress markers, inflammatory response, infarct size and histopathological findings. HYD treated rats demonstrated a significant reduction in infarct sizes when compared with CI/R group of rats. HYD treatment demonstrated a significant decreased in malondialdehyde, nitric oxide levels and a significant increase inthe level of reduced glutathione, superoxide dismutase and catalase,showed modification in oxidative stress. HYD treatment confirmed a significant decrease in myeloperoxidase, C - reactive protein and TNF-α levels indicated a change in the inflammatory response. Histopathological findings revealed a reversal of damage in HYD treated rats. HYD treatment reduced DNA fragmentation of brain tissuein treated animals. HYD was found to be cerebroprotective against CI/R by anti-inflammatory and antioxidant activities.

**Keywords: Cerebral Reperfusion Injury, *Hydrilla verticillata*, Stroke**

**Current Pharmaceutical Analysis**

**Title:**Analytical QbD: Designing Space for HPLC Method Operable Region for Estimation of Preservatives in Herbal Formulation

**VOLUME:** 15 **ISSUE:** 2

**Author(s):**Kalpana Patel, Hinal Jitendrabhai Patel, Jenee Christian*, Lal Hingorani and Tejal Gandhi

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**Keywords:**CCD, HPLC, herbal, preservative, risk, validation.

**Abstract:**Background: Quantification of preservatives in herbal formulation, simultaneously by high performance liquid chromatography analysis is very complex and involves series of steps including sample preparation, selection of suitable mobile phase and its validation for routine applications.

Introduction: Application of Quality by Design (QbD) in the development of novel, simple, accurate and precise RP-HPLC method for concurrent quantification of quaternary preservatives in herbal formulation, focusses on development of robust method.

Methods: Isocratic analysis was carried out using C18 column at 231 nm. Risk assessment studies were executed to determine the critical method parameters which were defined as acetonitrile volume in the mobile phase, volume of injection and orthophosphoric acid concentration in the mobile phase. The effect of the critical method parameters on critical method attributes, i.e. retention time, resolution and chromatographic optimization function was further evaluated by means of central composite design and the optimal conditions were determined through derringer's desirability approach of multi-criteria decision making technique.

Results: The method was statistically validated according to ICH guidelines having good resolution using optimized mobile phase, acetonitrile: 0.11% orthophosphoric acid in water (12.30: 87.70 % v/v) giving acceptable retention time i.e. 3.7128 ± 0.0138 of bronopol, 4.5106 ± 0.00542 of sodium propyl paraben, 10.7228 ± 0.029 of sodium benzoate and 12.252 ± 0.027 of sodium methyl paraben.

Conclusion: Hence, the QbD based method development assisted in generating a design space with knowledge of all method performance characteristics leading to a better understanding of the method, and achieving desirable method quality.

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Research Article

# Formulation development and characterization of lumefantrine nanosuspension for enhanced antimalarial activity

Ripaikumar Shah, Tejai Soni ✉, Unnati Shah, B. N. Suhagia, M. N. Patel, Tejas Patel, ...show all

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## Abstract

Variable and low oral bioavailability (4-11%) of lumefantrine (LUF), an anti-malarial agent, is characterized by very low solubility in aqueous vehicle. Thus, the present study was intended to formulate lyophilized nanosuspensions of LUF to resolve its solubility issues for the improvement of oral bioavailability. A three level $3^2$ factorial design was applied to analyze the influence of independent variables, concentration of polysorbate 80 ($X_1$) and sonication time ($X_2$) on the responses for dependent variables, particle size ($Y_1$) and time to 90% release of LUF ($t_{90}$) ($Y_2$). Optimized formulation (F3)

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# EFFECT OF ESSENTIAL OILS ON TRANSDERMAL PERMEATION OF METOPROLOL SUCCINATE

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*The objective of the present study was to prepare a matrix-type transdermal drug delivery system containing metoprolol succinate and to evaluate the effect of essential oils on transdermal permeation of drug. The solvent evaporation method was employed to fabricate transdermal patches of drug using HPMC K15M and Acrycoat L100 as polymers and polyethylene glycol 400 as a plasticizer. Prepared patches were subjected for evaluation of physical as well as physicochemical properties, moisture characteristics, and ex-vivo drug permeation studies. The results of physical charocterization showed uniform casting and good appearance of patches. Satisfactory mechanical strength was revealed in the results of tensile strength and folding endurance. Ex-vivo permeation study indicated enhancing effect of essential oils on drug permeation through the skin. The maximum flux observed was 94 µg/cm2.hr achieved by formulation M3 containing lemongrass oil (20%). The results suggested that lemongrass oil was effective at higher concentration (20%) after 14 hrs of permeation while peppermint oil and eucalyptus oil were effective at low concentration (10%). Release kinetic suggested diffusion-controlled release of drug which followed the Korsmeyer-Peppas model. In conclusion, essential oils can be utilized as a safe and effective alternative for the permeation enhancement of drugs through transdermal delivery.*

## INTRODUCTION

Transdermal drug delivery has been paid attention as an alternative dosage form to oral delivery[1&2]. In addition to being appropriate for special populations who may have a problem with swallowing, transdermal delivery can avoid the first-pass metabolism and maintain constant plasma drug concentration. Despite these advantages, only a limited number of drugs can be administered percutaneously, due to the low permeability of most of the drugs through the skin.

The major obstacle in the successful development of the transdermal system is the barrier properties of skin which prevent penetration of drug and other substances. The stratum corneum (SC), an outer layer of skin, has been recognized as a potential barrier against skin penetration of most of the drugs[3]. To achieve and maintain a therapeutic concentration of drug in the blood, the resistance of skin (stratum corneum) to the diffusion of drugs must be reduced in order to allow drug molecules to cross the skin. To widen the applicability of transdermal systems, permeation enhancement is a prerequisite to overcome the barrier properties of the skin. Permeation enhancers are the compounds, which promote skin permeability by altering the skin barrier to the flux of the desired penetrant and are considered as an integral part of most transdermal formulations[4]. They can modify the skin's barrier to penetration either by interacting with the formulation that applied or with the skin itself[5]. Incorporation of chemical penetration enhancers into transdermal applications has been used since the sixties. Permeation enhancers must be pharmacologically inert, nonirritating, nontoxic, nonallergic, compatible with drugs and excipients, odourless, tasteless, colourless,

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Research paper

# Topical arginine solid lipid nanoparticles: Development and characterization by QbD approach

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*Keywords:*
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ABSTRACT

The application of L-arginine, the nonessential amino acid, as in pharmaceutical and cosmetics is raised as it shows the number of advantages for internal and external, applications. But its hydrophilic nature and lower partition co-efficient value limit its penetration through the skin. From the different approaches for topical drug delivery systems, solid lipid nanoparticles are a promising vehicle to carry the drug molecule at the appropriate site of absorption and also ensures the fast therapeutic action. With ability to incorporate lipophilic as well as a hydrophilic molecule. The present investigation aimed to implement the Quality by design concept for the development of SLNs incorporated with arginine molecule for its application on skin in the form of cosmoceutical formulation. The developed formulation will enhance the blood circulation of skin cells and hence benefirial for skin as cosmoceutical dosage form. To enhance the loading of drug molecule in a lipolphilic environment like solid lipid, insitu ion-pairing was carried out using an optimum concentration of oleic acid. The optimization was done by QbD approach considering concentration of poloxamer 188, oleic acid and sonication amplitude as the critical processing parameters. Average particle size and % drug loading were taken as critical product quality attributes using 23 full factorial design. The characterisation of freeze dried solid lipid nanoparticles are investigated by transmission electron microscopy, x-ray diffraction study, differential scanning calorimetry and fourier transform infrared spectroscopy. Finally, an in-vitro and ex-vivo drug diffusion stules were carried out to check the permeation of arginine. The optimized SLN formulation were successfully developed having lower particle size and higher % drug loading with effective skin penetration parameters to achieve the therapeutic benefits of Arginine.

## 1. Introduction

The development of the novel drug delivery system (NDDS) includes the number of challenges to meet the ideal characteristics related to the quality of dosage form. As a part of NDDS, solid lipid nanoparticles (SLNs) are come about with different prospective, formulations, methodologies, and routes of administration into the body to produce the needed therapeutic effect with safety [1]. International conference and harmonization guidelines Q8, Q9, and Q10 involve the various tools [Quality by design approach (QbD), Quality risk management (QRM)] for the development of pharmaceutical products. In the present paper, the QbD system was applied for rational forethought and step by step development of SLNs. QbD approach focuses on the inbuilt quality of formulation by assessing the various critical material attributes (CMAs) and critical processing parameters (CPPs) that affect the quality of the product. From the initial development stage of SLNs, the quality target product profile (QTTP) should define with the desired quality criteria of the product. The risk management process involves risk identification, risk analysis, and preventive steps for the nonfailure of the quality of a product. It uses the Ishikawa diagram, Failure mode effect analysis (FMEA), Hazard analysis, and other supported tools, which rank the CPPs and CMAs as per the risk of quality in the product [2]. Finally, the independent variables which affect the most to the critical product quality attributes (CpQAs) of product, are interconnected with the design of experiment (DoE) to analyze the individual and interaction effect of independent factors statistically.

Arginine is an amino acid having three aliphatic methylene groups, which are covered by a positively charged guanidinium group. These groups are responsible for basicity with the highest isoelectric point (10.75). In animal cells, it is the physiological precursor for nitric oxide (NO) synthesis, and hence it controls several important regulatory mechanisms, for example, cell proliferation and angiogenesis. By nitric

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# Green synthesis and properties of arginine derived complexes for assorted drug delivery systems: A review

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ABSTRACT

In the current scenario, green technologies in chemistry and various fields create attention to every researcher. The green synthesis provides environmentally and eco-friendly raw materials and intermediate products, making a simple process without using harmful and toxic reactants. Amino acids are one of the reactants from which the intermediates or excipients can be made using the straightforward methodology, and these are utilized in drug delivery via a different route of Administration. By employing such medication at a cellular level, we can eliminate the adverse events and toxicity of chemically synthesized excipients and achieve a better therapeutic effect. In the present paper, Arginine was reviewed as the starting material from which the greener excipients can be synthesized, and these materials were employed for drug delivery systems. However, some of the synthetic processes employed chemicals, and also usage of the synthesized green material in the formulation of different dosage forms may require proper guidelines, but still, the research is going on for the application of green excipients for therapeutic purposes. Moreover, Arginine, as such, is an amino acid. It can also be utilized in different formulations as an active ingredient, which was also emphasized in the review paper from past research and patents.

This review aims to be comprehensive and have general interest for chemists as it involves the various routes by which excipients were synthesized and the study, including the properties of different excipients and their application.

## 1. Introduction

Synthetic chemistry results in many drug molecules and excipients used in different fields such as food supplements, pharmaceutical industries, confectionaries, etc.

The number of complexes can be derived from the natural resources to fulfill the greener aspect of chemistry as the drug delivery systems and food delivery which gain the greater advantages associated with it. Example of such derivatives which were previously reported includes microparticles of carboxymethyl starch/chitosan polyelectrolyte complexes (Quadrado and Fajardo, 2020), inclusion complex of starch/chia seed oil (Di Marco et al., 2020), starch-mineral biopolymer composite (Fan et al., 2017), and carboxymethyl/starch coated iron oxide magnetic nanoparticle. (Saikia et al., 2015).

In medicine producing industries, the higher market growth for excipients includes evolution in technologies for multifunctional inactive ingredients, substantial use of novel drug delivery systems, and increasing demands for orphan drugs. According to Markets and markets research about the use of excipients in pharmaceuticals, $6.97bn revenue was generated in 2019, and it will reach up to $9.79bn by 2025. Technavio's market research showed CAGR data of above 6% by 2021 for the global use of pharmaceutical excipients. Amongst them, the manufacturing segment of organic chemicals generates 80% of the total market, and due to the application of oleochemicals, this area will grow at a CAGR of 7.8% in 2025. In the field of externally applied dosage forms containing inactive ingredients, during the forecast period the growth will occur at the rate of 7.4% every year due to better patient compliance and local targeted effect on the skin, which will be faster and safer than the systemic drug delivery.

Some of the significant industries concerning the market of excipients include Fuji Chemical Industry Co Ltd, BASF (Germany), Du Pont (US), Ashland, Inc., Evonic Industries Ag, Euro Life Healthcare Pvt Ltd, Azelis Pharm, Dow Chemical Company (US), etc. (Global Pharmaceutical Excipients Market Research Report- Forecast to 2027, 2027).

To fulfill the goals of decrement in greenhouse gas leakage, wastewater treatment as well as proper waste disposal management and

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ORIGINAL RESEARCH PAPER

# Validated stability-indicating HPTLC method for the estimation of adapalene in drugs and the LC–MS identification of its degradation products

Kashyap Thummar [1,2] · Kevin Tilva [1] · Bhumika Dudhatra [3] · Rajnikant Mardia [4] · Navin Sheth [2]

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**Abstract**
A highly sensitive, simple, accurate, and precise high-performance thin-layer chromatographic (HPTLC) method was developed and validated for the quantitative determination of adapalene in the presence of its degradation products. The method employed precoated silica gel G 60 $F_{254}$ on aluminum sheets using an appropriate solvent system which gives a compact spot of adapalene at $R_F$ value 0.58. The densitometric measurement of adapalene bands was carried out at 317 nm in fluorescence mode. The method was validated over a range of 10–100 ng/band. The linear regression data for the calibration plot showed a good relationship with high correlation coefficients. The performance of the method was validated for precision, accuracy, and robustness. The limits of detection and quantification were 1.52 and 4.61 ng/band, respectively. Adapalene was subjected to the ICH-prescribed acidic, alkaline, oxidative, photolytic, and thermal stress conditions, and it undergoes degradation with well-resolved degradation products. These degradation products were further analyzed by mass spectrometry to elucidate the structure of degradation products and proposed the prediction of the degradation pathway.

**Keywords** Adapalene · Thin-layer chromatography · Validation · Stability-indicating method · Degradation

**Abbreviations**

| | |
|---|---|
| DMSO | Dimethyl sulfoxide |
| HPLC | High-performance liquid chromatography |
| HPTLC | High-performance thin-layer chromatography |
| ICH | International Conference on Harmonization |
| LC MS/MS | Liquid chromatography–tandem mass spectrometry |
| ng | Nanogram |
| nm | Nanometer |
| $R_F$ | Retardation factor |
| RPM | Revolution per minute |
| RSD | Relative standard deviation |
| UV | Ultraviolet |

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## 1 Introduction

Acne is the most common skin complaint in the young world-wide. More than 90% of the world population is affected by acne at some point in their lives [1]. Topical retinoid drugs have been most commonly used to treat acne for decades. The clinical usefulness of retinoids is limited by several side effects such as teratogenicity and skin irritation [2]. Adapalene is a member of the retinoid drug class that is typically found in topical preparations used for dealing with acne. It is a new generation product and a good choice in the treatment of acne vulgaris, hyperkeratotic skin disorder, and photoaged skin [3]. Adapalene is a highly lipophilic compound, synthesized from naphthoic acid derivative. Adapalene is a white to off-white powder that is soluble in dimethyl sulfoxide (DMSO) and

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# QUANTITATIVE DETERMINATION OF LACOSAMIDE IN HUMAN PLASMA USING LIQUID CHROMATOGRAPHY-TANDEM MASS SPECTROMETRY AND ITS APPLICATION TO PHARMACOKINETIC STUDY

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**Keywords:**

Lacosamide, Human plasma, LC-MS/MS, Pharmacokinetic study

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**ABSTRACT:** A simple, reliable, and sensitive liquid chromatography-tandem mass spectrometry (LC-MS/MS) method has been developed and validated for the determination of lacosamide, an antiepileptic drug, in human plasma. The lacosamide and internal standard (IS) have been extracted by a simple liquid-liquid extraction method and separated on $C_{18}$ (50 × 4.6 mm, 5µm) column with the mobile phase of 5mM ammonium formate and methanol (50:50, v/v), pumped at flow-rate of 0.5 mL/min. The ion transitions were monitored in positive ion mode $[M+H]^+$ at m/z 251.20 >91.10 for lacosamide and m/z 256.10>211.10 for IS. Method validation revealed excellent linearity over the concentration range of 9 - 9000 ng/mL together with satisfactory intra and inter-assay precision, accuracy, and extraction recoveries. Lacosamide was found stable throughout the various sample handling and processing conditions. It is proposed to evaluate the performance of the developed method by measurement of a plasma concentration of lacosamide versus time in four epileptic patients to monitor pharmacokinetic behavior of it. The variation in estimated pharmacokinetic parameters shows the need for individual monitoring of lacosamide concentration profile in epileptic patients by the sensitive, accurate and specific method.

**INTRODUCTION:** Epilepsy is a chronic non-communicable disorder of the brain that affects people of all ages. Approximately 50 million people worldwide have epilepsy, making it one of the most common neurological diseases globally [1]. Lacosamide ((2R)- 2- (acetylamino)- N- benzyl- 3- methoxy-propanamide) is a third-generation antiepileptic drug widely used as an adjunctive treatment of partial-onset seizures in most adult patients [2].

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Lacosamide has a different mechanism of action than other anticonvulsants, and hence, the patient who have failed to respond other anti-epileptic drugs (AEDs) may respond to lacosamide [3]. Furthermore, the selective action of lacosamide on sodium channel slow inactivation may results in improved tolerability compared to other AEDs. The reported pharmacokinetic parameter of lacosamide suggest that it has low plasma protein binding (<15 %), the maximum concentration in blood plasma was reached approximately 1 - 3 h after oral administration, having a half-life of about 12-16 hours, and it is mainly excreted unchanged through urine (95%) and by different metabolic pathways [4].

The monitoring of blood plasma levels of lacosamide has been playing an important role in the treatment of epilepsy to determine the optimum

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RESEARCH ARTICLE

# Development and characterization of pluronic lecithin organogel containing fluocinolone acetonide

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**ABSTRACT**

The rabble-rousing skin condition can be conventionally treated, but due to some demerits, there is a need to find a novel approach with an appropriate release profile. The research work narrates the optimization of the topical delivery system of Fluocinolone acetonide loaded in pluronic lecithin organogel. The preliminary studies were carried out and, the ternary phase diagram was established by Chemix school version 3.60. The formulation was optimized by taking a different concentration of polymers as independent and viscosity and drug release (6 h) as dependent variables by applying $3^2$ full factorial design. The optimized batch was further compared with marketed preparation and also kept for the stability study. The release profile of the optimized batch exhibited a sustained release of up to 6 h (77.00%). It gave *ex vivo* drug release up to 6 h (90.64%) which is more prolonged than marketed preparation and, cutaneous disposition was found to be higher. Besides, the texture analysis was compared to that of the marketed formulation of the drug. However, the proof of the effectiveness of the formulated pluronic lecithin organogel will require further *in vivo* study for future aspects. In a nutshell, the proposed formulation of fluocinolone acetonide is the simplest and promising dosage form for the treatment of psoriasis.

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**KEYWORDS**
Factorial design; diffusion; self-association; organogel; topical

## Introduction

Psoriasis was found to be worldwide among the various disorders of the skin. Mostly in the developed countries, the prevalence of psoriasis is in the range of 1.5–5% word wide [1]. Approximately 2% of the population of the USA is affected by this condition. However, in some ethnic groups such as Japanese, Australians, and Indians in South America the occurrence of psoriasis is lower [2]. In India, 9.25% of the dermatological cases were found and from that 8% of prevalence was found for psoriasis [3]. The treatment of psoriasis can be done through the topical drug delivery system as well as through light therapy (phototherapy), and oral or injected medication.

Fluocinolone acetonide (FA) is one of the glucocorticoids applied for the prevention of inflammatory skin conditions. It is a BCS class II drug and hence to achieve the controlled release of drugs through topical drug delivery systems was done by different novel drug delivery systems such as liposomes, microsponge, nanostructured lipid carrier in the literature [4–6]. But as the general limitations of the nanoparticulate system such as low % drug loading, stability issues as well as the difficulty in scale-up due to novel technology and higher costing, there is a need to develop the formulation which can control the release of FA to decrease the systemic absorption as well as to reduce the dosing frequency.

Topical applications for eye, ear, and nose are also popular for the drug [7].

Organogel is the novel formulation beyond the limitation of the nanoparticle drug delivery system mentioned above [8].

It is the dosage form for topical application and gains a higher demand due to ease of absorption from the skin. It is thermodynamically stable and also applicable to incorporate the therapeutically active ingredients. But still, the research about gelators remains and it is normally developed by the compatibility of gelators with the different solvent systems. Organogel is discriminated against from hydrogel due to its dominant organic continuous phase. The gelators used in organogel prevent the mobilization of organic solvent by creating a net-like structure by chemical or physical bonds. The physical bonds stand by weak hydrogen bonds and van der Waal's bond. Low molecular weight (LMW) organogelators depend on physical interactions. In some previous literature, a reverse worm-like micellar structure of thick organogel was prepared for a ternary system of lecithin, ascorbic acid, and different varieties of oils. Some other examples of LMW organogelators high molecular weight organogelators are given in the literature [9,10]. The organogelators having low molecular weight is having characteristic to self-assembled in oil and form a network-like structure which inhibits the flow of oil and gelation occurs, whereas the high molecular weight containing gelling agents are entangled in oil and thus cause the gelation [11].

Nowadays pluronic lecithin organogel (PLO) is a very popular drug delivery system in the transdermal route, as it is having the ability to increase the absorption of medicament across the skin. PLO is having a micellar structure consisting of two different phases, oil, and water (with 20–30% of pluronic F127) [12,13].

Therefore the present study aimed to entrap the drug into the micellar structure of organogelator (lecithin) which would provide sustained the release of a drug (as the network-like structure of gelator) as well as the proper solubility of the drug and soothing effect of the skin due to lipidic nature of the gel. Therefore, the drug would be retained on the skin for a longer period and provide the local anti-inflammatory action.

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# Bearing Capacity of Isolated Square Skirted Foundation on Cohesionless Soil: An Experimental and Analytical Study

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***ABSTRACT***

*Skirted foundations are being used increasingly for foundations of offshore structures, the popular name of that foundations is bucket foundations. The provision of skirts on the periphery of shallow foundation will result in increasing confinement of soil and hence improvement in state of stress as well as soil structure interaction. The present paper describes study of model square skirted foundation for axial loads in cohesionless soils. The parameters like aspect ratio of skirt (skirt length), skirt angle α, depth of placement of foundation are considered in experiments and compared with model plane footing without skirts. Bearing capacity of the model foundations were carried out by stress controlled plate load test. Results shows considerable increase in bearing capacity because of provision of skirts, hence skirted foundations is suitable for on shore structures also. The governing mechanism for the behaviour of skirted foundations is explained.*

***Keywords:-****Skirted foundations, mechanism of skirted footing, confinement effect, model plate load test*

## INTRODUCTION

Footings are used to transfer the loads and moments from the columns to the soil. It is necessary to ensure that while performing this job neither soil should fail nor the footing. Another aspect of preventing failure of the soil-footing system is to improve interaction between the soil and the footing structure. To increase the interaction between soil foundation system researchers provided different geometrical profile to the base of the foundation. Some of them are Hyperbolic paraboloid shell foundation, conical shell foundation for isolated footings and Inverted Spherical dome raft, inverted Dom cum raft, Folded cone ring raft etc. for the circular structures as shallow foundations.

## LITERATURE REVIEW

Kurian and Varghese (1969) introduced the idea of hyperbolic shell as a column foundation. Individual Square footing of this type were investigated theoretically as well as experimentally for vertical load. Rao and Narhari (1979) developed a skirted plug and ring foundations where the skirts are not built in with footing but located at further distance. Alam Singh, Ohri and Moorthy (1982) used a skirted footing in which skirtes are bolted to the RCC footing, whereas Kurian (1982) and Alam singh and Chaudhary (1987) used skirts as built in component with the parent footing and noted considerable improvement in bearing capacity. Adel Hunna and El-Rehman (1990) investigated triangular shell strip foundation experimentally and theoretically. Borthakur (1992) used RCC skirts for ring foundations as a ground improvement technique. Al Aghbari and Mohmaedzein (2004) investigated skirted strip footing for the skirt roughness factor, skirt depth ratio as well as foundation base friction.

Shah and Shroff (1991) studied skirted strip footing experimentally and

  

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analytically for axial, lateral and oblique load. He also studied factors affecting skirted foundation behaviour like densification of soil beneath the skirts, roughness of base of skirted foundation, skirt length, skirt angle, change in elastic and plastic properties of sand etc.

## EXPERIMENT SET-UP AND MATERIAL

The scaled model skirted footing were tested in model test tank ensuring the pressure bulb surface is not constrained by tank boundaries. Square skirted foundation for skirt angle 30º, 45º and 60º were adopted for two different aspect ratio nothing but skirt length with respect to base width of model footing width that is 0.4 B and 0.6 B. Where B is the width of the base plat of model footing. The model skirted footing is manufactured such that it behaves as a monolithic with respect to stress condition. The model footing were also tested at depth 0*B and 0.5*B depth to analyse the skirt behaviour with increase in placement depth. First the base plate model footing of 120 mm x 120mm were tested at 0B and 0.5 B depth of placement.

Sand used for the model footing testing having relative density 80 % and angle of internal friction is 40º. Specific gravity of sand was 2.62 and dry unit weight of sand is 1.8gm/cc. The sieve analysis indicates that the sand lies within poorly graded sand (SP) having $C_u$= 2.488and $C_c$=0.714. The sand bad prepared layer by layer with sand drain technique controlling height of fall such that it achieved 80% relative density.

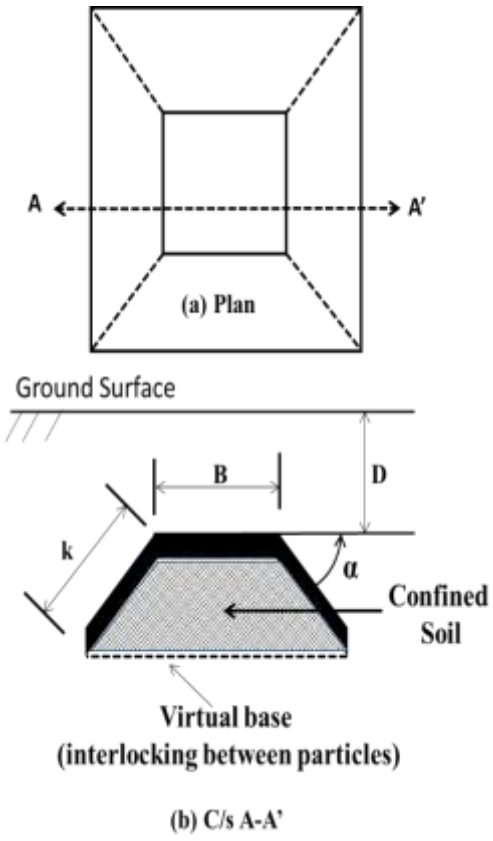


*Fig.Typical Skirted Foundation Section*
K= Skirt length (Aspect ratio)
α= Skirt angle
***Fig.1:-****Sketch of Skirted Model footing*

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***Table 1:-*** *Skirted Model footing*

| Skirt Angle α | Aspect Ratio k | Depth D |
|---|---|---|
| 30º | 0.4B | 0B |
| | | 0.5B |
| | 0.6B | 0B |
| | | 0.5B |
| 45º | 0.4B | 0B |
| | | 0.5B |
| | 0.6B | 0B |
| | | 0.5B |
| 60º | 0.4B | 0B |
| | | 0.5B |
| | 0.6B | 0B |
| | | 0.5B |

**B= Width of base plate of model footing**

Model footings were made my mild steel plate of 10 mm thickness which is square in shape and 120 mm x 120 mm in size. Sand was glued to the base to achieve rough base condition of model footing. The model plate load test facility used in which load applied by mechanical jack. Proving ring of capacity 5 tonne used to measure the applied axial load on model footing. Two dial gauges are placed at opposite diagonal of the square plate to measure settlement of footing. The dial gauges are mounted in such a way that local soil movement will not affect the settlement reading.

***Fig.2:-****Model skirted footing*

***Fig.3:-****Test set-up*

Load increments are applied after one hour and the increments are same throughout the experiment. The settlement of the model footing recorded corresponds to applied load increment. The test were continue up to 20 mm settlement or soil failure whichever occurs earlier. The applied load versus settlement of model footing were plotted and also calculated for bearing capacity and analysed.

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## RESULTS AND ANALYSIS OF EXPERIMENTS

### Depth Effect

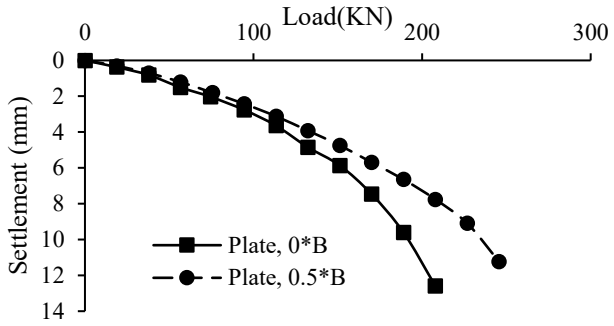


***Fig.4:-****Load vs Settlement for Plane base footing of 120 mm x 120mm*

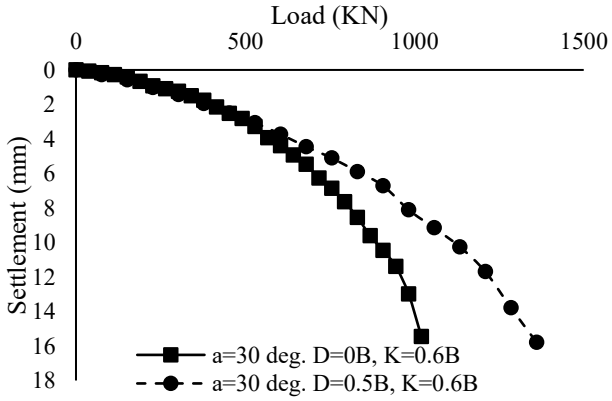


***Fig.5:-****Load vs Settlement (α=30°, k=0.6B)*

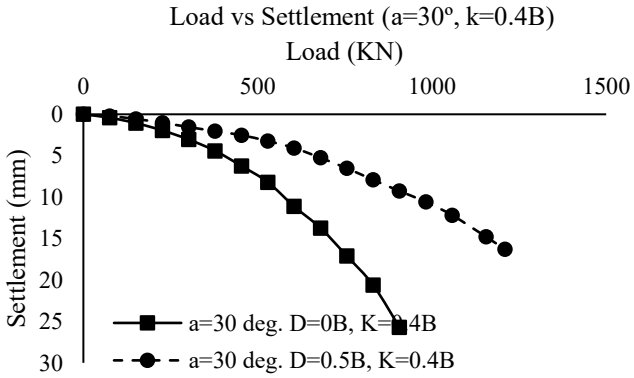


***Fig.6:-****Load vs Settlement ( α=30° , K=0.4B)*

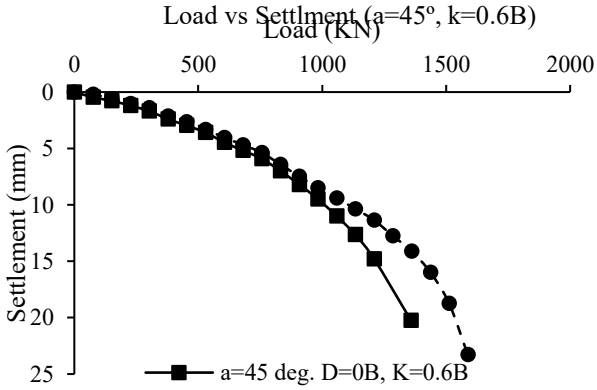


***Fig.7:-****Load vs Settlement ( α=45° , K=0.6B)*

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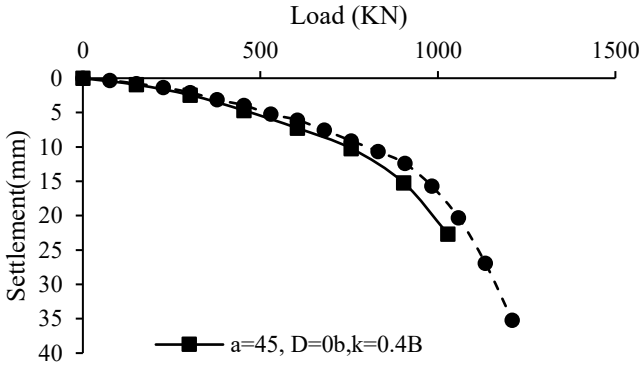


***Fig.8:-****Load vs Settlement ( α=45° , K=0.4B)*

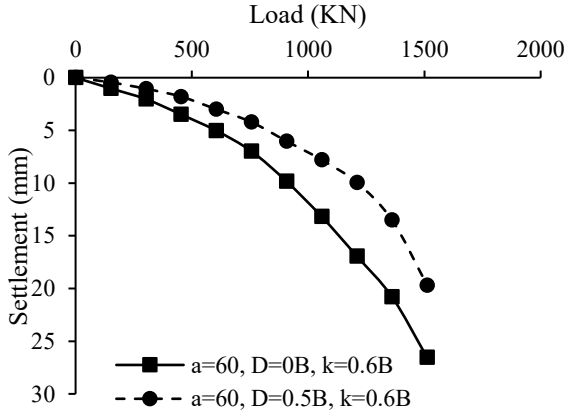


***Fig.9:-****Load vs Settlement ( α=60° , K=0.6B)*

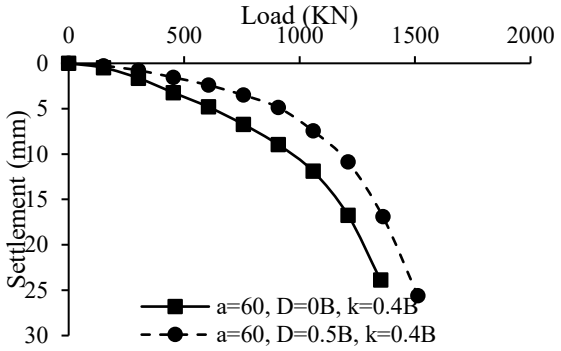


***Fig.10:-****Load vs Settlement (α=60° , K=0.4B)*

***Aspect ratio effect (Skirt Length effect)***

***For 30 degree***

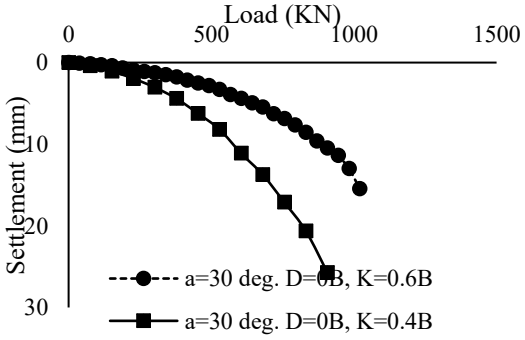


***Fig.11:-****Load vs Settlement ( α=30° , D=0*B)*

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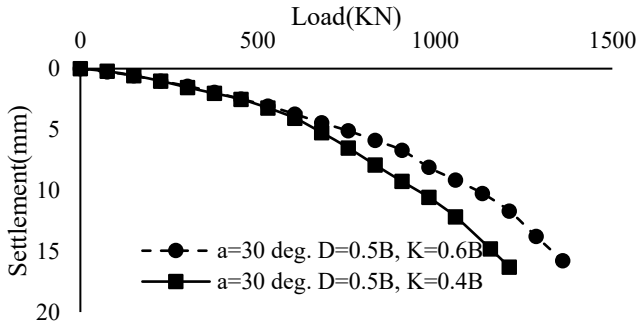


***Fig.12:-****Load vs Settlement ( α=30° , D=0.5B)*

***For 45 degree***

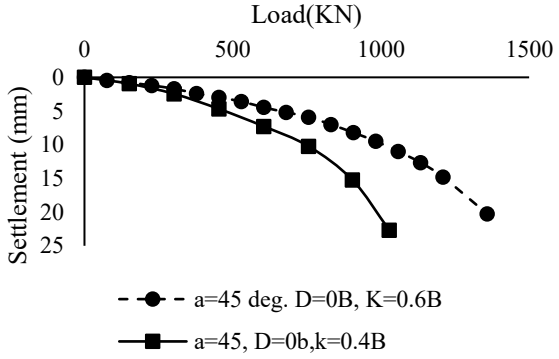


***Fig.13:-****Load vs Settlement ( α=45° , D=0*B)*

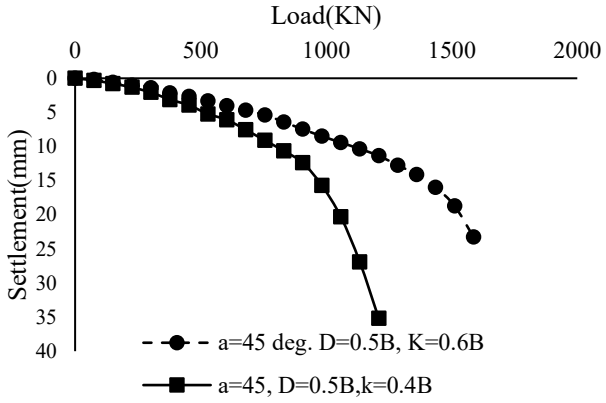


***Fig.14:-****Load vs Settlement ( α=45° , D=0.5*B)*

***For 60 degree***

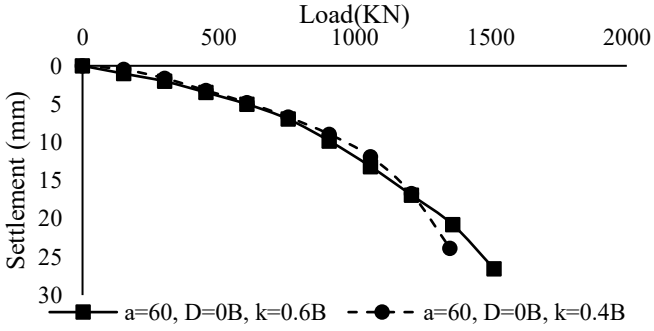


***Fig.15:-****Load vs Settlement ( α=60° , D=0*B)*

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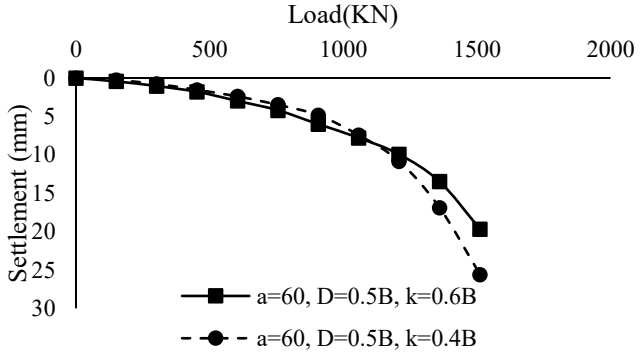


***Fig.16**:-Load vs Settlement (α=60°, D=0.5*B)*

***Skirt angle effect***
***Skirt length 0.6B***

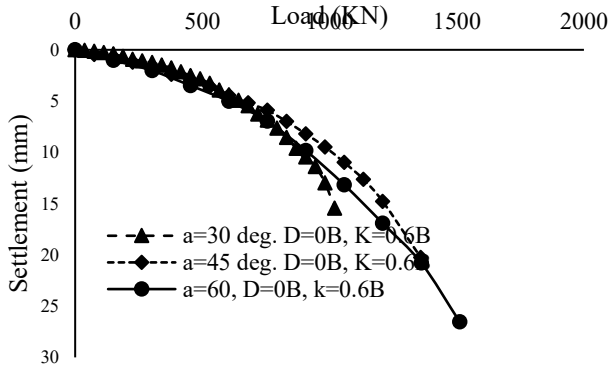


***Fig.17:-**Load vs Settlement ( K=0.6B, D=0*B)*

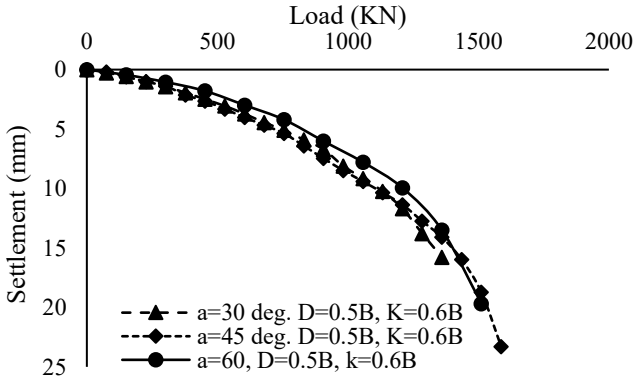


***Fig.18:-**Load vs Settlement ( K=0.6B, D=0.5*B)*

***Skirt length 0.4B***

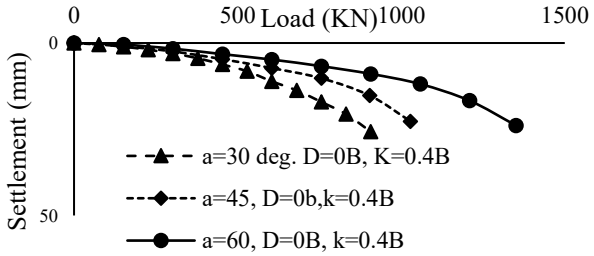


***Fig.19:-**load vs Settlement ( K=0.4B, D=0*B)*

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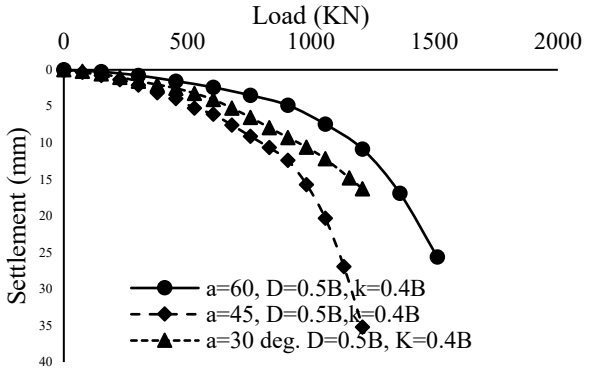


***Fig.20:-****Load vs Settlement ( K=0.4B, D=0.5*B)*

The model plate load test results were compared with skirt and without skirt to understand the improvement in bearing capacity. Also the results were compared for other three variables like skirt angle, aspect ratio (i.e. Skirt length) and depth of placement of model skirted foundation.

**Analytical Verification**

**Analytical Verification of the Experimentation work:**

As the experimentation carried out in cohesion less soil the value of cohesion is considered as zero (i.e. c = 0 KN/m$^2$). Angle of internal friction Ø = 30º considered and kept constant for analytical verification. The corresponding values of $N_q$ and $N_\gamma$ is considered as 22.46 and 19.13 respectively.

The equation for bearing capacity of skirted foundation is

$q_{us} = \gamma D_m N_q + 0.4\gamma B_m N_\gamma$ ---------- (1)

Where, $q_{us}$ is the improved bearing capacity due to skirt, $D_m$ is the modified depth of placement for foundation and $B_m$ is the modified width of the foundation due to provision of skirt. The geometry of the skirted foundation considered for analytical verification is shown in fig-___ below.

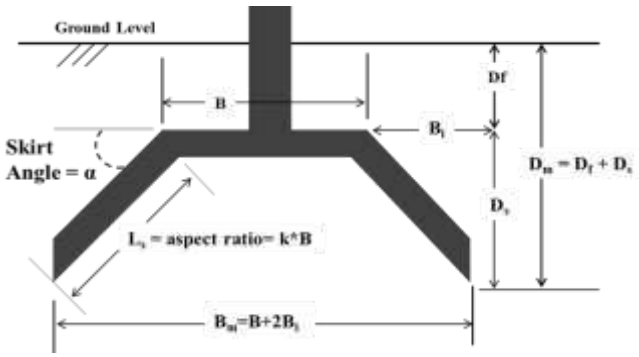


***Fig.21:-****Typical Skirted Foundation with notations.*

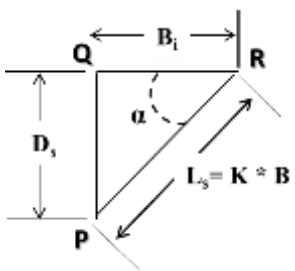


***Fig.22:-****Analytical Development*

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$$\text{Sin } \alpha = \frac{PQ}{PR} \qquad \text{Cos } \alpha = \frac{QR}{PR}$$

$$\text{Sin } \alpha = \frac{Ds}{K*B} \qquad \text{Cos } \alpha = \frac{Bi}{K*B}$$

$$D_s = K^* B^* \text{Sin } \alpha \qquad B_i = K^* B^* \text{Cos } \alpha$$

The excel analysis of the equation (1) carried out in combination with all governing parameters of the skirted foundation. A

| Skirt Angle α | Aspect Ratio = K | B | $D_f$ | Sin θ | Cos θ | K*B*Sin θ = Ds | K* B* Cos θ = Bi | $D_m = D_s + D_f$ | $B_m = 2Bi + B$ | γ | $N_q$ | $N_y$ | $q_{us}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30° | 0.20 | 0.40 | 0.60 | 0.50 | 0.87 | 0.04 | 0.07 | 0.64 | 0.54 | 18.00 | 22.46 | 19.13 | 332.92 |
| | 0.40 | 0.40 | 0.60 | 0.50 | 0.87 | 0.08 | 0.14 | 0.68 | 0.68 | 18.00 | 22.46 | 19.13 | 368.17 |
| | 0.60 | 0.40 | 0.60 | 0.50 | 0.87 | 0.12 | 0.21 | 0.72 | 0.82 | 18.00 | 22.46 | 19.13 | 403.43 |
| | 0.80 | 0.40 | 0.60 | 0.50 | 0.87 | 0.16 | 0.28 | 0.76 | 0.95 | 18.00 | 22.46 | 19.13 | 438.69 |
| | 1.00 | 0.40 | 0.60 | 0.50 | 0.87 | 0.20 | 0.35 | 0.80 | 1.09 | 18.00 | 22.46 | 19.13 | 473.94 |
| 45° | 0.20 | 0.40 | 0.60 | 0.71 | 0.71 | 0.06 | 0.06 | 0.66 | 0.51 | 18.00 | 22.46 | 19.13 | 336.11 |
| | 0.40 | 0.40 | 0.60 | 0.71 | 0.71 | 0.11 | 0.11 | 0.71 | 0.63 | 18.00 | 22.46 | 19.13 | 374.56 |
| | 0.60 | 0.40 | 0.60 | 0.71 | 0.71 | 0.17 | 0.17 | 0.77 | 0.74 | 18.00 | 22.46 | 19.13 | 413.00 |
| | 0.80 | 0.40 | 0.60 | 0.71 | 0.71 | 0.23 | 0.23 | 0.83 | 0.85 | 18.00 | 22.46 | 19.13 | 451.45 |
| | 1.00 | 0.40 | 0.60 | 0.71 | 0.71 | 0.28 | 0.28 | 0.88 | 0.97 | 18.00 | 22.46 | 19.13 | 489.90 |
| 60° | 0.20 | 0.40 | 0.60 | 0.87 | 0.50 | 0.07 | 0.04 | 0.67 | 0.48 | 18.00 | 22.46 | 19.13 | 336.69 |
| | 0.40 | 0.40 | 0.60 | 0.87 | 0.50 | 0.14 | 0.08 | 0.74 | 0.56 | 18.00 | 22.46 | 19.13 | 375.72 |
| | 0.60 | 0.40 | 0.60 | 0.87 | 0.50 | 0.21 | 0.12 | 0.81 | 0.64 | 18.00 | 22.46 | 19.13 | 414.74 |
| | 0.80 | 0.40 | 0.60 | 0.87 | 0.50 | 0.28 | 0.16 | 0.88 | 0.72 | 18.00 | 22.46 | 19.13 | 453.77 |
| | 1.00 | 0.40 | 0.60 | 0.87 | 0.50 | 0.35 | 0.20 | 0.95 | 0.80 | 18.00 | 22.46 | 19.13 | 492.80 |
| 90° | 0.20 | 0.40 | 0.60 | 1.00 | 0.00 | 0.08 | 0.00 | 0.68 | 0.40 | 18.00 | 22.46 | 19.13 | 330.00 |
| | 0.40 | 0.40 | 0.60 | 1.00 | 0.00 | 0.16 | 0.00 | 0.76 | 0.40 | 18.00 | 22.46 | 19.13 | 362.35 |
| | 0.60 | 0.40 | 0.60 | 1.00 | 0.00 | 0.24 | 0.00 | 0.84 | 0.40 | 18.00 | 22.46 | 19.13 | 394.69 |
| | 0.80 | 0.40 | 0.60 | 1.00 | 0.00 | 0.32 | 0.00 | 0.92 | 0.40 | 18.00 | 22.46 | 19.13 | 427.03 |
| | 1.00 | 0.40 | 0.60 | 1.00 | 0.00 | 0.40 | 0.00 | 1.00 | 0.40 | 18.00 | 22.46 | 19.13 | 459.37 |

## DISCUSSION

The experimental results were verified by conducting at least three model plate load tests for reproducibility of the fair representative results. The general trend of results shows improvement of bearing capacity due to provision of skirts to the plane base footing. As the depth of

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placement for foundation increases bearing capacity increases, this similar trend observed for all respective skirt angled and skirt length model skirted foundations, but the effect of depth is not predominant for 30º and 45º skirt angled footing. For identical skirt length. Effect of placement depth is more predominant is 30º skirt angled footing.

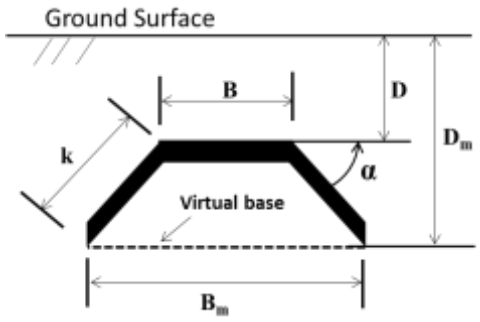


***Fig.23:-****Modified width and depth for skirted footing*

As the aspect ratio (Skirt length) increases for identical depth of placement and skirt angle, bearing capacity increases. The effect of increase in skirt length is not effective as the depth of placement increases. The maximum effect of increase in bearing capacity is observed in 45º skirt angled footing. Beyond 60º the effect of increase in skirt length for improvement in bearing capacity decreases.

The effect of skirt angle for improvement in bearing capacity is mostly dependent on the factors like skirt length and depth of placement. The 60º - 45º skirt angled footings shows highest increase in bearing capacity for all skirt length and embedment depth.

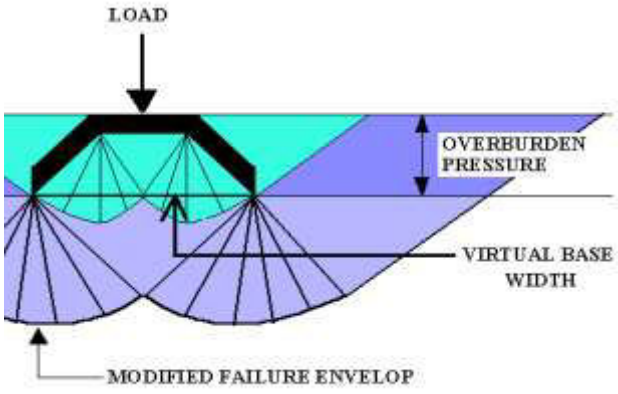


***Fig.24:-****Failure mechanism of skirted footing.*

The mechanism of skirted foundation is to provide confinement to the soil just below the footing. The skirts generates three effects, (i) modified (increased) depth of placement. (ii) Modified (increased) width of footing. (iii) Instead of footing to soil interaction at foundation base, there is soil (confined within soil) to soil (below and surrounded to footing) interaction. It's obvious that the modified failure envelop as shown in figure leads to increase in soil structure interaction.

## CONCLUSION

For identical placement depth, by providing skirts to the plane base footing,

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there is considerable increase in bearing capacity.

As the skirt length increased effect of increase in bearing capacity is predominant for 45º skirt angled footing. Between 45º to 60º skirt angled footing the increase in bearing capacity is more predominant compared to 30º to 60º skirt angled footing.

For 60º skirt angle the effect of increase in skirt length (aspect ratio) is more predominant for increase in bearing capacity.

## FUTURE SCOPES

In this study the skirts are considered as perfectly rigid material, so skirt stiffness and soil bearing capacity comparison can be possible to study. The skirt surface friction, skirts in various bifurcated compartments below footing, circular skirts with elongated skirt length (well foundation like) studies can be possible for further study. Lateral and oblique loads with prototype experiments is possible to analyse skirted foundation behaviour.

## ACKNOWLEDGEMENT

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*With regards,*
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Research Article

# SPT, SCPT, and DCPT Correlation for SC, CL, and SM-SC Soils: A Case Study of Nadiad Soil

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## A B S T R A C T

A number of different static & dynamic penetration tests are used nowadays in site investigation. The Standard Penetration Test (SPT) is the most common in situ test for soil investigations. On the other hand, the cone penetration test is considered one of the best investigation tools. Due to the fast and accurate result that can be obtained it complaints the SPT in many applications like field explorations, design parameters and quality control assessments. SCPT-DCPT are becoming very popular because it provides continuous details of the strata and it is also quick. In this study, correlation of Standard penetration test, Static cone penetration test, and Dynamic cone penetration test results will be carried out. On the basis of soil classification and variability with depth, the major correlations are developed between the SPT value - Ø, SPT value - settlement, SPT value - $R_d$ there are no more direct co relation between the SPT- SCPT- DCPT because this relation depended on local soil parameters. So far very few correlations have been made between SCPT and DCPT test results as compared to the correlations between SPT-SCPT-DCPT. A positive liner relationship will be found between $q_c$, N, $q_D$ for various sandy soils.

**Keywords:** Standard Penetration Test, Dynamic Cone Penetration Test, Static Cone Penetration Test, Sand, Silt, Correlation

## Introduction

Soil is naturally heterogeneous and discontinuous material which is composed of degraded organic matter and minerals due to mechanical or chemical weathering actions on different rocks. These phenomena produce various layers of sedimentation patterns and the geological events further produces different formations.

The soil in Charotar region of Kheda district of Gujarat, for instance, is varying in types and stratigraphy. Therefore, it is difficult task for geotechnical engineers to understand stratigraphy and resulting profile of soil layers for foundation design. In-situ site investigation gives readily, reliable results with visual soil samples for further testing aid geotechnical engineer for decision and judgement for choice of foundation type.

The SPT and CPT tests are believed to be most reliable test among all in-situ test to design foundations. Most of the design theories demands SPT- N value with depth of stratum. The N value available is per meter value and is not varying continuous as the soil strata changes. To achieve accuracy in design continuous ground penetration resistance can be measured and then converted to respective N value at respective depth. To establish correlation between above three in-situ tests, first preliminary auger boring carried out followed by performing SPT, CPT and DCPT tests. 10 different locations were selected in the Dharmasinh Desai

University campus which is all within the 700 m radius. The tests were performed up to 6 m depth and 60 pairs of data obtained for correlation.

Disturbed and undisturbed soil samples were collected and basic soil characterization carried out in the laboratory and classified according to depth. Since the penetration resistance of soil depends on density and particle size of sand, so the attempt will made to correlate SPT N number- CPT $q_c$ - DCPT $N_D$. Field tests were performed complying standard procedure mentioned in Indian standard code.

## Review of Literature

Robertson P.K. produced standard guidelines for cone penetration tests along with interpretation of penetration test results. Kasim A and Chu Ming-yau presented field correlation of cone penetration test with SPT. Migh A and Nixon I. gave comparison of in-situ tests on cohesionless soils. Kulhawy and Mayne highlighted advantages of having procedure to correlate N and $q_c$. It was concluded by most of the researchers that $q_c$/ N ratio increases with increase in grain size; conversely, the ratio decreases with increase of finer material. Similarly, the correlation study indicates that, $q_c$/ N ratio is smaller for sands of high fines content then the clean sands. Further more the studies conclude that, soil compactness and relative density of soil would increase $q_c$/ N ratio.

## Details of Field Test

**Table 1.List of Field Test**

| Experiment | IS Reference |
|---|---|
| Standard Penetration test | IS: 2131 (1981) |
| Dynamic cone Penetration test | IS: 4968-2 (1976) |
| Static cone penetration test | IS: 4968-3 (1976) |
| UDS sampling bore | IS: 10108 (1982) |


**Figure 1.GIS Map and Location in Indian Map**

The field test site was selected at DD University Campus, Nadiad. (22º 40′ 51.8′′N, 72º 52′ 53.4′′ E).

All selected SPT - SCPT - DCPT test sets at identical site lie in the range of maximum 3 m distance from each other. This distance range has been selected to make possible use of similarity and available data.

**Table 2.List of Field Test Performed**

| Type of Field Test | No. of Test |
|---|---|
| S.P.T | 10 |
| S.C.P.T | 10 |
| D.C.P.T | 10 |
| U.D.S | 10 |
| Total number of test bore hole | 40 |

## Data Management

Correction of derived readings from the in-situ tests:

Correction were carried out for SPT - N values as per below mentioned equations.

## Correction for SPT - N Value

### Overburden Correction

As per IS: 2131 - 1981, the overburden pressure correction is given by: (suggested by peck et. al. 1974).

$$CN = 0.77 \log \frac{2000}{p} \quad (1)$$

$C_N$ = correction factor
P = effective overburden pressure (kN/ $m^2$)
$N_C$ = Corrected SPT Value
$N_R$ = Recorded SPT Value
$N_C = C_N.N_R$

### Dilatancy Correction

Terzaghi and Peck (1967) recommended the following correction in the case of silty fine sands when the observed value of N exceeds 15.

$$Nc = 15 + \frac{1}{2}[N_R - 15] \quad (2)$$

$N_c$ = Corrected SPT Value
$N_R$ = Recorded SPT Value
$N_c$ 15, Nc = NR

## Correlation in SCPT Test

$$C_N = (m + n\, m_1) \times \frac{10kN}{m^2} \quad (3)$$

m = mass of cone = 1.1 kg
$m_1$ = mass of each sounding roads = 1.5 Kg
n = No .of rods used

## SCPT Correlation

### Friction Ratio

$$f_r = \frac{q_f}{q_c} \times 100\% \quad (4)$$

$F_r$ = friction ratio
$q_s$ = measured site /slip friction
$q_c$ = tip resistance / point resistance
Then sensitivity of soil is measured as:

$$S_t = \frac{10}{f_r}(f_r \text{ In } \%) \quad (5)$$

Where, $S_t$ = sensitivity of soil

For cohesive soil (untrained shear strength)

$$s_u = \frac{q_c - p_o}{N_k} \quad (6)$$

Po = overburden pressure = ¥ Z

$N_K$= cone factor = 15 to 20

(Depends on the plasticity index of soil)

$$q_c = 612.6 + 587.5I_C \quad (7)$$

Here $I_C$ = consistency index of soil
$q_c$ is measured in Kpa

### As per Schmertman

$$\frac{q_{c.ocr}}{q_{c.NC}} = 1 + K\left(\frac{K_{o.ocr}}{K_{o.NC}} - 1\right) \quad (K = 0.75) \quad (8)$$

$$\frac{K_{O.OCR}}{K_{O.NC}} = (OCR)^n \quad (\text{n} = 0.32 \text{ to } 0.52) \quad (9)$$

**Table 3.K Value for Different Soils**

| Soil Type | K= () |
|---|---|
| Silt, sand silt & slightly cohesive sand silt mix | 0.1 to 0.2 |
| Clean fine sand to medium sand & slightly silty | 0.3 to 04 |
| Coarse sand & sand with gravel | 0.5 to 0.7 |
| Sandy gravel & gravel | 0.8 to 1.0 |

## Interpretation of Data

The data will be interpreted in two different ways. The objective is to see the effect of averaging on the results.

- Layer wise - 0.3 m
- Soil Classification - 0.3

Dynamic cone penetration test produces constant reading at 0.1 m interval with Static cone penetration test shows 0.1 m interval and standard penetration test gives 0.75 m interval. Although tests provide continuous record of ridings but S.P.T gives the fixed depth result. For this reason, it was considered to average the readings of all test at the 0.3 m interval for each soil type and depth.

It is realized that while considering ridings several peaks in the test data were not taken into account so the data is not truly represented. When considering the 0.3 m averaging it is found that different soil types were mixed at the boundary where one soil type is changing into another type. Finally, it found that 0.3 m averaging is most suitable since at the boundary of soil types where readings were averaged, the chances of mixing the two soil types were minimized and the maximum use of available data could be made. So, that 0.3 m averaging is considered to be the best among all the applied methods and it is decided to adopt this method for the rest of the data. In the initial stage of research, several trials of experiments were made to analyse reliability and accuracy of the data obtained from in-situ tests. For correlation of the three test results it is necessary that equal number of ridings be obtained from all tests.

The data is collected from 10 locations of 6m depth all that testing is carried out at same locations and total 60 no of data Paris ($q_c$, N, $N_D$) available for correlations.

**Figure 2.Field SCPT Test**

**Figure 3.Field SPT Test Setup**

## Experimental Output- Field Data Available

The in-situ tests results are shown in the appendix at the end of paper. The test results were classified according to soil classification and represented likewise. Correlation for SC Soil.

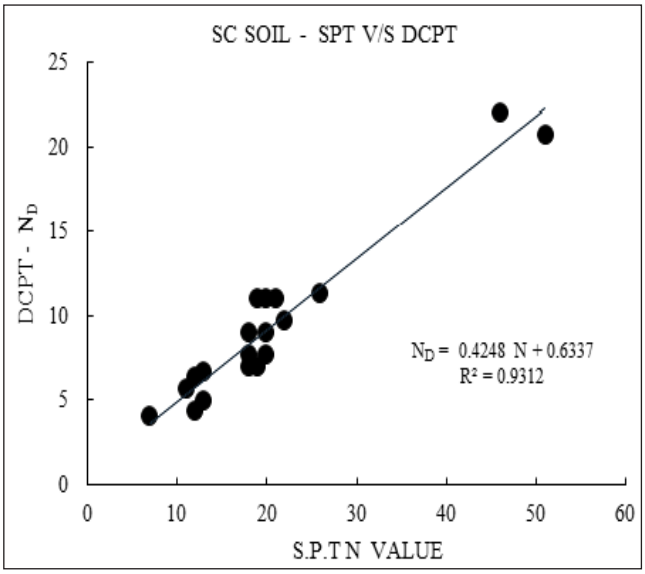


**Figure 4.SPT N and DCPT ND for SC Soil**

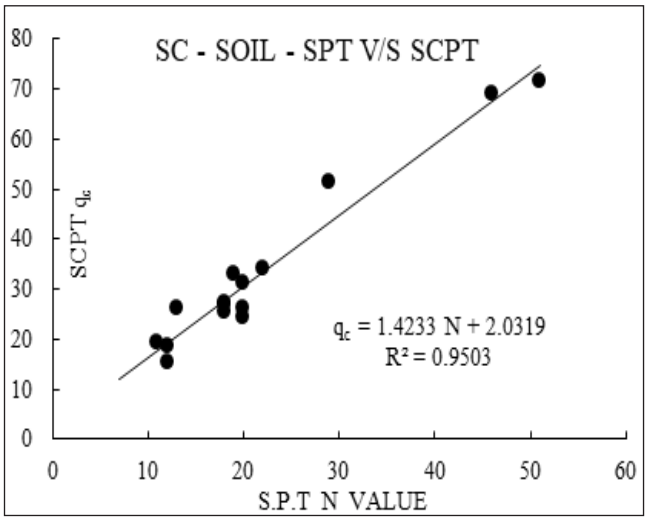


**Figure 5.SPT N and SCPT qc for SC Soil**

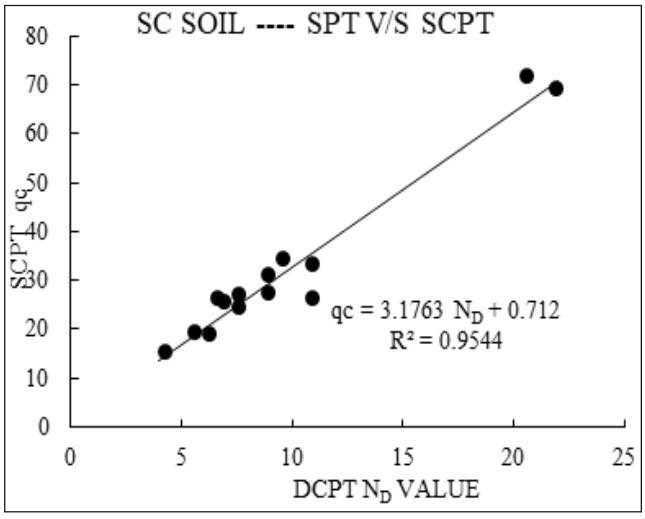


**Figure 6.DCPT ND and SCPT qc for SC Soil**

## Correlation for CL Soil

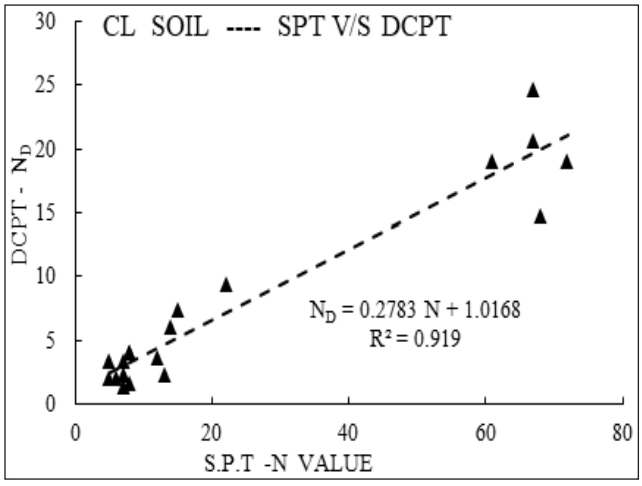


**Figure 7.SPT N and DCPT ND for CL Soil**

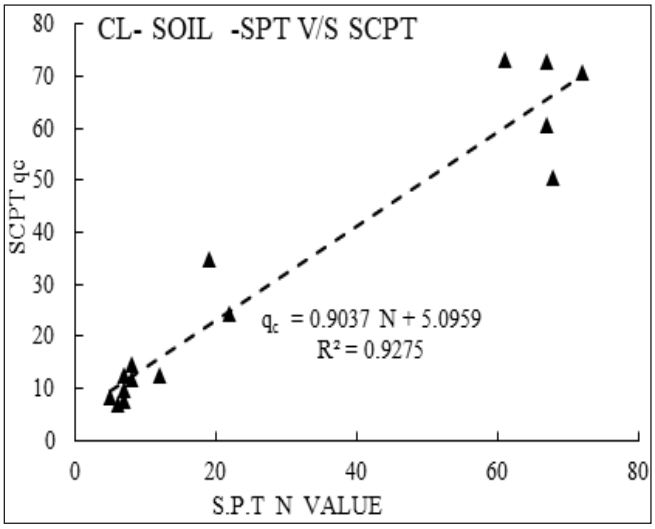


**Figure 8.SPT N and SCPT qc for CL Soil**

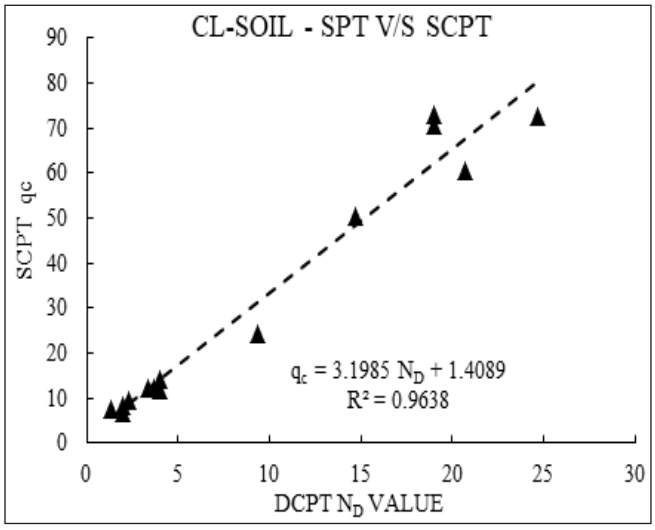


**Figure 9.DCPT ND and SCPT qc for CL Soil**

## Correlation for SM-SC Soil

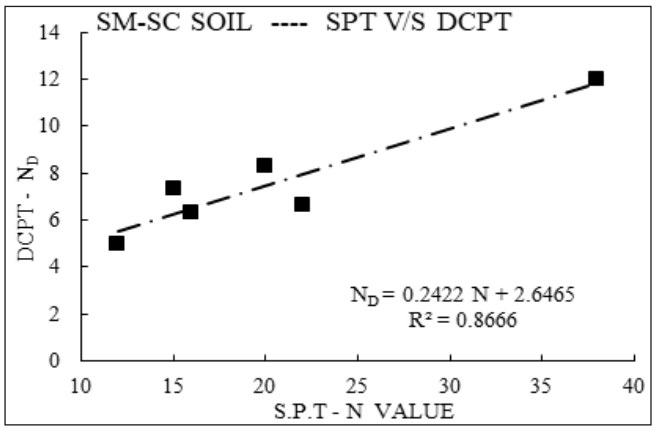


**Figure 10.SPT N and DCPT ND for SM -SC Soil**

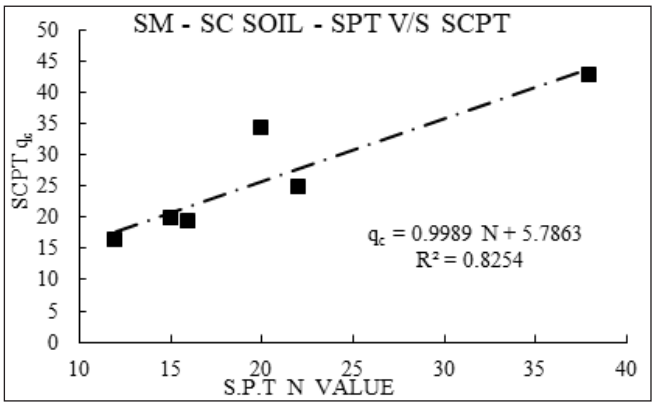


**Figure 11.SPT N and SCPT qc for SM -SC Soil**

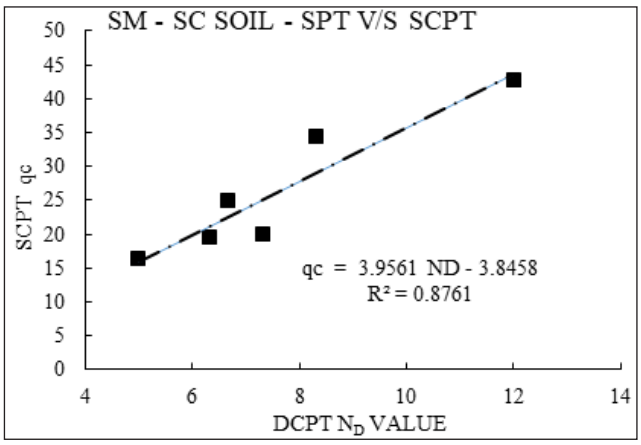


**Figure 12.DCPT ND and SCPT qc For SM -SC Soil**

## Result and Discussion

It significant to understand that correlation of SPT N-value, CPT cone tip resistance ($q_c$), and DCPT $N_D$ is somehow correlation of soil resistance to impact, continuous penetration and continuous penetration with vibration. Three variables are representative of the data used in this dissertation SPT N (blows/ 0.3 m), CPT tip resistance $q_c$ (MPa) and DCPT $N_D$ (blows/ 0.1 m). The data also included SPT boring log. Each boring log contained a soil profile with soil type classifications according to the Unified Soil Classification System (USCS), these classifications were based on laboratory tests (sieve analysis, Atterberg limits).

### Data Matching

The average $q_c$ and $N_D$ values were compared with the SPT N values located at the same elevation. With same available soil Strata because the SPT results are generally taken at 1 m intervals of depth, usually average of second 300 mm of sequence intervals but CPT and DCPT give the continuous results so those are averaged for starting of 0.1 m to 0.3 m in every interval. Data which are higher and lower than 25% in liner trade line are ignored.

### Proposed Correlations

The correlation process involved separating each type of soil from all boreholes and combining them into a single analysis. Many suggested verbal labels to describe the strength of the relationship are available, yet no universally accepted single scale was found.

Obviously, the closer to 1 a correlation coefficient is stronger the relationship. The nearer to 0 (means no relationship) then the weaker is the correlation. The following strength scale was found to describe the correlation strength throughout this dissertation 1 (Perfect); 0.7 to 0.9 (Strong); 0.6 to 0.4 (Moderate); 0.1 to 0.3 (Weak) and 0 (No correlation).

### SPT N - CPT $q_c$ – DCPT $N_D$

In the current work 60 different test pair at ten locations were evaluated to find probable $q_c$ versus N trends the majority of literature was based on $q_c$ and N relationships. The $q_c$ value is considered to be more reliable than $f_s$. Three common soil types between the 60 test points from 10 sites have been identified.

- Clayey Fine Sand (SC) - 26 points
- Clays of low plasticity (CL) - 17 points
- Silty Clayey Fine Sand (SM/SC) - 10 points

Other soil types are Clay (CL), CL-ML, SM were disregarded as infrequent and if present they consisted of thin layers. Therefore, this data would provide poor quality correlations.

### Correlation for SC Soil

Clayey Fine Sand (SC) with plastic fines that exceed 12% Low compressibility and good to fair shear strength are typical of the performance of this soil when subjected to compaction, with a poor to practically impervious drainage quality. A total of 20 data points was considered in this analysis was the range of N-values (7 - 51) DCPT $N_{DYN}$ is (4 - 22.0) and (15.2 - 71.5) was the range of cone resistance.

### Correlation for CL Soil

Clays of low plasticity (CL) with fines that exceed 50%. Low compressibility and fair shear strength are typical of the

performance of this soil when subjected to compaction with a moderate to practically impervious drainage quality. A total of 17 data points was considered in this analysis was the range of N-values (5 - 72), DCPT $N_{DYN}$ is (1.3 - 24.7) and (6.9 - 73.0) was the range of cone resistance.

The current research is compared with past research work which shows parallel results for the N value, which is tabulated here. It is evident that correlation for CL soil not performed in past studies, hence needs to be focused in next research work.

**Table 4.Summary of Results**

| Type of Soil | Values | S.P. T | D.C.P. T | S.C.P. T | Average of all Readings | | | N | $N_{DYN}$ | $q_c$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S.P. T | D.C.P. T | S.C.P. T | | | |
| SC | Max. Value | 34.5 | 14.5 | 71.5 | 20.75 | 9.26 | 33.25 | 1 | 0.45 | 1.60 |
| | Min. Value | 7.0 | 4.0 | 15.2 | | | | | | |
| CL | Max. Value | 72.0 | 24.7 | 73.0 | 20.75 | 9.26 | 33.25 | 1 | 0.32 | 1.28 |
| | Min. Value | 5.0 | 1.3 | 6.9 | | | | | | |
| SM-SC | Max. Value | 38.0 | 12.0 | 42.7 | 20.5 | 7.61 | 26.26 | 1 | 0.37 | 1.28 |
| | Min. Value | 12.0 | 5.0 | 16.4 | | | | | | |

## Correlation for SM - SC Soil

Silty Clayey Fine Sand SM-SC has fair to poor drainage characteristics, good shear strength, and low compressibility when compacted and saturated. A total of 10 points were included in this analysis. The relationship analysis shows that there is a good correlation between data for this type of soil. All that SM -SC Type of Data are from Table 5, are averaged then the relation can be represented as.

**Table 5.Summaries of qc/ N Relationships for Soil Types**

| Soil Description (USCS) | Correlation equation | Correlation Coefficient $R^2$ |
|---|---|---|
| Clayey Fine Sand (SC) | $N_D = 0.42\ N + 0.63$ | $R^2 = 0.93$ |
| | $q_c = 1.42\ N + 2.03$ | $R^2 = 0.95$ |
| | $q_c = 3.17\ N_D + 0.71$ | $R^2 = 0.95$ |
| Silty Clayey (CL) | $N_D = 0.27\ N + 1.016$ | $R^2 = 0.91$ |
| | $q_c = 0.90\ N + 5.09$ | $R^2 = 0.92$ |
| | $q_c = 3.19\ N_D + 1.40$ | $R^2 = 0.96$ |
| Sand (SM/SC) | $N_D = 0.24\ N + 2.64$ | $R^2 = 0.86$ |
| | $q_c = 0.99\ N + 5.78$ | $R^2 = 0.82$ |
| | $q_{c=} 3.95\ N_D - 3.84$ | $R^2 = 0.87$ |

**Table 6.N Values Compared to Literature**

| Type of soil | Current study | Schmert-mann, (1970) | Robertson, (1986) | Danziger, (1998) |
|---|---|---|---|---|
| SC | 0.45 | - | 0.2 | 0.46 - 0.53 |
| CL | 0.32 | - | - | - |
| SM-SC | 0.37 | 0.2 | - | 0.1 - 0.35 |

## Conclusion

During whole dissertation work, 10 standard penetration test, 10 Dynamic cone penetration test, 10 Static cone penetration test, 60 direct shear test, 60 sieve analysis, 60 liquid limit and plastic limit experiments are carried out and obtained 60 no of pair for data set for relating to each other. This chapter shows remarked conclusions for the correlations developed between SPT - N, DCPT $N_{DYN}$ and SCPT $q_c$ for local soil strata at Dharmasinh Desai University, Medical College campus Nadiad.

From the collected 60 data points, most available 89 % of data is divided in mostly three type of soil fist type is clayey sand (SC) of 26 pair second is clays of low plasticity (CL) of 17 pair and third silty sand - clayey sand (SM - SC) type of 10 set from total 10 boreholes at the 6 m depths.

From the correlations between SPT, SCPT and DCPT for local soils, it was observed that the test data used for this study better with ratio but result of this study considerably little vary from existing correlations. Therefore, is achieved would be significant value of established reliable correlations on locally available soils.

Based on most commonly available strata of clayey sand (SC), at the entire depth from all the bore is collected and correlated then the 1 SPT: 0.45 DCPT: 1.60 SCPT that type of general relation is achieved for the general relation. And the second most commonly available strata Clay of Low plasticity (CL) at the entire depth from all the bore is collected and correlated then the 1SPT: 0.32 DCPT: 1.28 SCPT that type of general relation is achieved. Third most commonly available strata clay of Silty Clayey Fine Sand SM-SC, at the entire depth from all the bore is collected and correlated then the 1 SPT: 0.37 DCPT: 1.28 SCPT that type of general relation is achieved.

Finally, two well-known problems with the SPT its labor-intensive operation and its requirement of more people to operate it. On larger sites testing work becomes repetitive, monotonous, and physically tiring. These factors can lead to improper testing procedures, injury, and less accurate results. The idea of CPT and automated DCPT was formulated in hopes of developing better working conditions and to take advantage of improved Value and cost efficiencies on larger scale sites.

Another important factor that may have an influence on the results is the distance between the SPT and CPT and DCPT various boreholes in close area from many sites in this study have shown dissimilarity in strata arrangements and thicknesses.

## Scope of Future Work

It is further investigated by accumulating large amount of high quality data from various soils types, ranging from clay to gravelly sand for full co relations. We can obtain other parameters such as cone sleeve friction ($F_s$) and friction ratio ($F_r$) from the CPT so that it is needed to study between N value and cone sleeve friction or friction ratio to obtain more information about the correlation between SPT and CPT. A new Comparisons have been achieved between the results of pressure-meter and those estimated from S.P.T. and other tests correlations.

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HBRP PUBLICATION

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# Triaxial Test on Soil - Important Insights for Stress-Controlled and Strain-Controlled Test

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***ABSTRACT***

*Triaxial testing of soils is carried out under various loading methods to simulate field loading conditions or to analyze the fundamental behavior of soil material. The objective of this paper is to review the triaxial testing of soil under stress control and strain control loading mode. The triaxial shear test simulates 3- dimensional stress condition including pore water pressure is an identical condition that occurred in situ on soil specimen; this is the advantage of the triaxial test over other shear tests on soil. The triaxial test apparatus, procedures, and sample preparation is explained in brief. The analysis of results over drainage conditions and shearing phase is incorporated. The modern triaxial tests contain thorough control over test setup and accurate results are determined which makes the triaxial test versatile and used for research in geotechnical engineering. The different loading modes are used to simulate the field stress, strain condition and to understand the response of the soil by many researchers. They analyzed test results of the same soil specimen tested under both modes of loading (i.e., stress and strain-controlled) will focus on parameters like progressive failure, peak strength, and residual strength behavior of soil. Monotonic loading under strain control test gives post-peak behavior of soil necessary to understand the progressive failure. Similarly, the stress-controlled test is useful to study time-dependent deformation in clay. The comprehensive study presented here for the stress and strain control triaxial test and finally, it focuses on recent advancement of technologies in respective loading modes.*

***Keywords:-****Triaxial test, stress-strain controlled triaxial test, recent development.*

## INTRODUCTION

### BRIEF REVIEW

The failure in soil generally governs by shear failure, hence determination of shear strength parameters for soil and soil inclusion is very important in geotechnical engineering. The factors that affect the shear strength of the soil are drainage conditions, stress pattern (loading condition), rate of strain, the density of the particles and the strain's direction. Triaxial test on soil is now a days preferred to determine shear parameters for important construction as well as research purpose because of the better simulation of soil samples with field conditions. Here field conditions include various factors such as pore pressure, confinement, direction of strain and stress conditions (3D) (extension, compression, cyclic, increment decrement of load etc.). (After Castellanos B.A., Brandon T.L, 2013).

The Triaxial shear device was discovered over a period of years. The initial triaxial device was invented by Buisman and Hveem (1924) which was having some of the characteristics similar to the present-

  

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day devices. The first device that was similar to modern equipment was developed in the early 1930s by Casagrande at Harvard and Rendulic in Vienna, under the direction of Prof. Karl Terzaghi. After rigorous discussion between geotechnical researchers in 1930, a common view developed that "the triaxial test device was better than the direct shear test device."

Bishop and Henkel [4] (1957) designed a new test technique for the Triaxial test. Pioneering work has been done by Bishop and Henkel (1962), and they published the first book on Triaxial testing named, "The measurement of soil properties in the Triaxial test", in which they describe the state of the art relevant to the triaxial test. Seed and Silver (1971) performed a strain-controlled test at very small strains and concluded that the strain-controlled test causes less water distribution in soil samples before initial liquefaction occurs and provides more accurate results of in situ pore pressure than those of obtained by stress-controlled test.

Kovari V. and Tisa A. [8] (1975) describedmultiple failure states and strain-controlled triaxial tests. Their work was proposed mainly for the rock samples. The parameters adopted in the test were confining pressure, peak, and residual compressive strength. Bishop and Welsley (1975) pointed out that many attempts have been made to develop new equipment in order to be able, for example, to carry out plane strain tests or to apply a true triaxial load. As concerns the study of compressibility, the equipment has also been improved and as of 1969, new procedures were proposed, such as the controlled gradient or controlled–strain tests (Lowe et. al., 1969, Sallfors, 1975). Deveaux D., Vuez A., Amoros D. (1981) developed technology for stress and strain-controlled automatic parameter acquisition system for Triaxial test.

Carrol, W.F. (1988) developed a fast triaxial test device. He performed nonlinear wave analysis to study the stress and strain rate effects on the results of soil parameters. Roy E. and Jiunnren L. (1989) discussed triaxial shear devices and sources of errors. Akitoshi M. Masato M. and Shinichi T. (1988) developed independent principal stress control apparatus. By conducting a specimen test they analyzed the distribution of strain within the soil specimen. Claudio D. and Silvia I. [15] (1997) performed experimental analysis and theoretical interpretation of triaxial load controlled loose sand specimen collapse.

Yoshiharu Asaka et. Al. (2003) developed a new device for conducting a strain-path controlled test with conventional triaxial test apparatus. The designed device was capable of controlling lateral stress during axial strain-controlled test, keeping the principal strain increment ratio constant. They performed a series of stress-controlled drained triaxial compression tests and proposed a constitutive model based on the equivalent linear concept.

Wichtmann T. et al. [21] (2010) performed stress and strain-controlled cyclic triaxial tests on fine sand fora high cycle accumulation model. Movahed V. et al. [14] (2011) evaluated the effect of fines content on liquefiable sands by energy approach by comparing both stress and strain-controlled shear tests. It was observed that the variations of loading frequency had no considerable effect on dissipated energy up to liquefaction for mixtures with fines lower than limiting fines content; both for strain and stress-controlled tests.

Suprunenko G.[18] (2015), studied suction-controlled cyclic triaxial test to measure strain-dependent dynamic shear modulus of unsaturated sand. They concluded that, the Stress-controlled tests mostly led to higher

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values of shear modulus comparing to strain-controlled tests.

S.S. Kumar et al. [9] (2019) assessed the dynamic response of Cohesionless soil using strain and stress-controlled cyclic triaxial tests.

## INTRODUCTION TO TRIAXIAL TEST

Triaxial Test is the most versatile laboratory test in geotechnical engineering. Basically, this test gives the shear strength and stiffness values of the soil which is the most important engineering property of soil mechanics. Primary parameters obtained from the test may include the angle of shearing resistance ϕ′, cohesion c′, and undrained shear strength Cu, although other parameters such as the shear stiffness G, compression index Cc, and permeability k may also be determined.

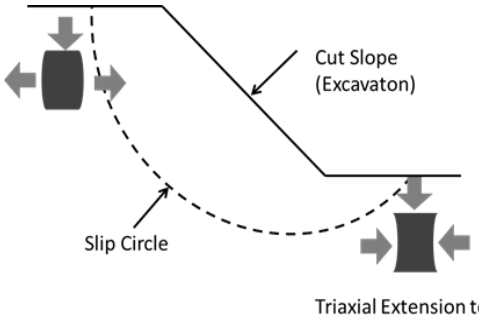


***Fig.1:-****Example of geotechnical application of triaxial test.*

A soil mass's shear strength is the internal resistance per unit area that the soil mass can provide to resist failure and sliding along any plane within it. To evaluate soil stability problems such as bearing capacity, slope stability, and lateral pressure on earth retaining structures, it's necessary to first understand the nature of shearing resistance. The triaxial shear test is one of the most reliable methods available for determining shear strength parameters. In this test a soil specimen (L/D >2) cylindrical shape was used. The test sample is encased by a thin Rubber membrane and placed inside a plastic cylinder containing filled with water or glycerine. The fluid in the chamber applies a uniform confining pressure to the specimen. Axial stress (deviator stress) is applied through a vertical loading ram to cause shear failure of the specimen.

***Table 1:-****Triaxial Tests used in common Engineering Problems*

| Sr. No. | Field Problem | Type of analysis | Type of triaxial test |
|---|---|---|---|
| 1 | First time slope failure | Effective stress | CU or CD |
| 2 | Cut slope failure | | CU |
| 3 | Earth Dams | Total & Effective stress | UU, CU (Triaxial Permeability for earth dams) |
| 4 | Tunnel linings | | |

## DEFINITION

***Triaxial Compression Test***— The triaxial compression test a test in which a cylindrical specimen of soil or rock encased in an impervious membrane is subjected to a confining pressure and then loaded axially to failure in compression.

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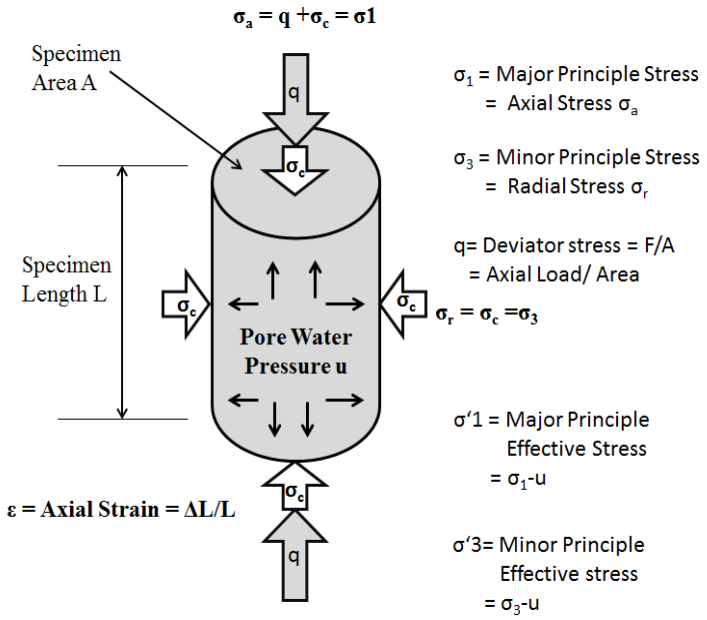


***Fig.2:-****Stress Phenomenon in Triaxial Test Specimen*

***Deviator Stress (Principal Stress Difference)***–Deviator stress is the difference between the major and minor principal stresses in a triaxial test, which is equal to the axial load applied to the specimen divided by the cross-sectional area of the specimen. The major principal stress in the specimen is equal to the deviator stress plus the chamber pressure, and the minor principal stress in the specimen is equal to the chamber pressure.

***Failure Stress***—Failure stress is the stress in the specimen corresponding to the maximum deviator stress (principal stress difference) attained, or by the deviator stress (principal stress difference) at 15% axial strain, whichever is obtained first during the performance of a test.

***Back Pressure-***A fluid pressure in excess of atmospheric pressure that is applied to the drainage boundary of a test. It is normally used in case of cohesive soil specimen as to increase the rate of saturation. This back-pressure cause air in the pore spaces to pass into the solution.

**Apparatus used to perform triaxial tests:**
Strain controlled triaxial load frame, Triaxial cell assembly, Cell pressure supply panel, Scale, Balance sensitive to 0.1 g, Moisture cans, Desiccator, Oven etc.

**Generalized Test Procedure [1]**
The test specimen must be prepared to the required size before being placed in the triaxial cell. Shelby tubes are used to collect undisturbed cohesive soil samples and soil sample is trimmed to the required size, whereas for Cohesionless granular soils the specimen may require preparation directly on the pedestal using a split-part mold. The soil specimen of dia.38mm and height 76mm is placed inside the compression chamber.

The ratio of height to dia. 2:1 is maintained to ensure the failure should be inside the soil specimen and the failure plane should not intersect the loading surface. A membrane suction stretcher can be used to place the rubber membrane around the soil once in position on the pedestal. The device is a circular cross-section and the diameter of the cap and base are equal to the diameter of the soil specimen.

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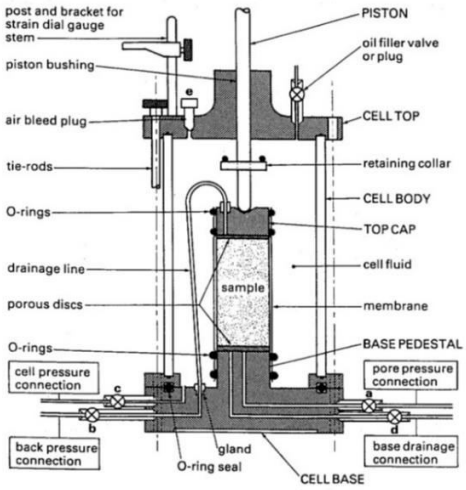


***Fig.3*:-***Conventional Triaxial Equipment used in the test on saturated specimens (After Head, 1986).*

The contact between cap and piston should be concentric. The total cell is assembled following placement of the specimen. During this stage the cell is filled with fluid, pressure/volume controllers connected.

***Saturation*:** The sample is first saturated, which can be done by maintaining difference between cell pressure and back pressure constant. The level of saturation can be checked by determining the Skempton's B parameter. And when B≈1 the saturation process is over.

***Consolidation:*** The consolidation stage is used to bring the specimen to the effective stress state required for shearing. It is typically conducted by increasing the cell pressure maintaining a constant back pressure (often equal to the pore pressure reached during the final saturation B-check), this process is continued until the volume change $\Delta V$ of the specimen is no longer significant, and at least 95% of the excess pore pressure has dissipated. The consolidation response can also be used to estimate a suitable rate of strain when shearing cohesive specimens.

***Shearing:*** The soil is sheared by applying an axial strain $\varepsilon_a$ to the test specimen at a constant rate through upward (compression) or downward (extension) movement of the load frame platen. This rate, along with the specimen drainage condition, is dependent on the type of triaxial test being performed.

**What are the types of triaxial test?**

There are three primary triaxial tests conducted in the laboratory, each allowing the soil response for differing engineering applications to be observed. These are:

- Unconsolidated Undrained test (UU)
- Consolidated Undrained test (CU)
- Consolidated Drained test (CD)

The unconsolidated undrained (UU) test is the most simple and faster procedure, with soil specimens loaded while only total stresses are controlled and recorded. This enables the determination of the undrained shear strength cu, which is suitable for assessing soil stability in the short term (e.g. during or directly following a construction project). It should be noted that this test is typically performed on cohesive soil specimens.

The consolidated drained (CD) test, on the other hand, can be used to describe long-term loading response by providing strength parameters determined under

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effective stress control (i.e. and c). When using cohesive soil, however, the test can take a long time to complete because the shear rate must be slow enough to allow for negligible pore water pressure changes.

Finally, the consolidated undrained (CU) test is the most commonly used triaxial procedure because it allows for the determination of strength parameters based on effective stresses (i.e. and c ) while allowing for a faster rate of shearing than the CD test. This is accomplished by measuring the excess pore pressure change within the specimen as shearing occurs.

***Table 2:-****Rate of strain and drainage condition in types of triaxial tests.*

| **Test** | **Rate of axial strain** | **Drainage condition** |
|---|---|---|
| **UU** | Fastest.failure occure within 20 to 25 minutes | Drainage valves are closed |
| **CU** | Slow enough to adequate equallisation of excess pore water pressure | Drainage valves are closed and excess pore water pressure measured |
| **CD** | Slow enough to result in negligible pore pressure variation | Drainage valves are opened and ΔV measured |

During the shear stage, the specimen response is typically monitored by plotting the deviator stress q or effective principal stress ratio $\sigma_1/\sigma_3$ against the axial strain ε. The stage is repeated until a specified failure criterion is reached, which could be identifying the peak deviator stress or peak effective principal stress ratio, observing constant stress and excess pore pressure / volume change values, or simply reaching a specific value of axial strain.

**EFFECT OF DIFFERENT PARAMETERS IN TRIAXIAL TESTING**

CU test and CD test do not give same results.Values of c' and φ' for an over consolidated clay are little higher when measured in CD test in comparison to CU test because of the work done during volume change in drain test. The shear stress in the failure plane is the shear strength. Here failure is defined in terms of maximum obliquity (max principal effective stress ratio).

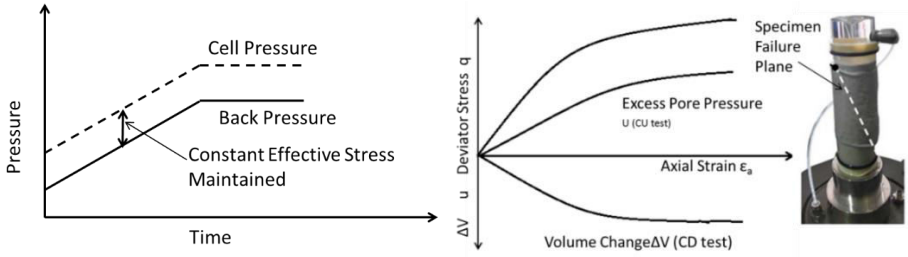


***Fig.4:-****NC Clay (a) Effective stress maintained (b) Variation of q with respect to axial strain. [22]*

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Addition to this maximum value of deviator stress or the principal stress difference has also been very commonly used. The average value of φ' obtained from CD test on undisturbed soil sample range from $20^0$ for normally consolidated plastic clay to $30^0$ for silty sand. For compacted clay the frictional angle results higher value.

***Effect of strain rate*:** The undrain strength increases with increase in the shear rate.i.e when the shear rate increase the undrain strenth increase and viceversa but there is no such variation in the strength in cd test with the change of shear rate.

***Stress Strain relationship*:** In this test the deviator stress is plotted in ordinate and axial strain is plotted in abscissa.In uu test there will be two set of curves obtained one shows peak stress and another shows the continuous curve line.Basically these shape of curves defines the type of failure.1st case shows brittle failure and second one shows ductile failure.The reduction in the value of shear strength from a peak value to a residual value when strain is continuously applied after the peak stress reached in oc clay has some physical significance.

***Volume change and porewater pressure relation*:** The overconsolidated clay and the dense sand produce a well defined peak in the test.The volume is slightly decreases at the starting of the test but with the increase in shear strain the volume goes on increasing (soil specimen dilate) in drained condition and negative pore water pressure developes in undrained test.

In case of normally consolidated clay and loose sand the peak is not well defined and it is a progressive failure .Here the failure(deviator) stress is determined corresponding to 20% axial strain.During the shearing process the volume of the soil goes on decreasing when performing drained test and generation of positive pore water pressure in Undrain test .

***Critical Void Ratio*:** Different soil specimen with different initial void ratio are sheared to failure under same confining pressure.and the volume changes,positive negative are measured.These are plotted against the initial void ratio.The void ratio corresponding to zero volume change is the critical void ratio.

Application of loading mode in triaxial test can be classified as stress controlled and strain-controlled test. In strain-controlled test the specimen is strained axially at a predetermined rate of strain, and in stress-controlled test, the predetermined increments of load are applied to the soil specimen at fixed interval of time. Most of the conventional triaxial test setup is strain controlled loading device which is easier to manufacture by simple worm and gear arrangement. In either test the vertical deformation of the sample is measured. The stress-controlled test is more realistic but strain-controlled test preferred due to convenience.

## STRESS CONTROLLED TRIAXIAL TEST

In this type of test axial stress is increased by finite load increments and the vertical deformation of the sample measured. The load increments (magnitude of stress) and duration of application of it kept constant to achieve a constant rate of it. (i.e., the load increments are followed by time periods at constant stress level)

Compared to the strain control testing method, the use of the stress-controlled triaxial test is less accurate due to the development of different strains during the compression phase and extension phase. The stage-wise construction of the foundation, as well as embankments, requires performing a stress-controlled test to understand realistic soil behaviour.

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## COMMENT ON STRESS AND STRAIN CONTROLLED TRIAXIAL TEST

The strain-controlled shear test appears to be the most widely used of the two methods, probably because a mechanically operated strain-controlled apparatus is the simplest device. Moreover, the strain-controlled test focus on interdependence of peak strength and loading history. A better understanding of the effects of continuously changing confining pressure is important because in actual geotechnical situations, soil failure is accompanied by changes in the principal stresses. The change can be both, a rotation of the stress tensor and an increase or decrease of the stresses. In practice, a rotation of the direction of the principal stresses cannot be realized by triaxial tests.

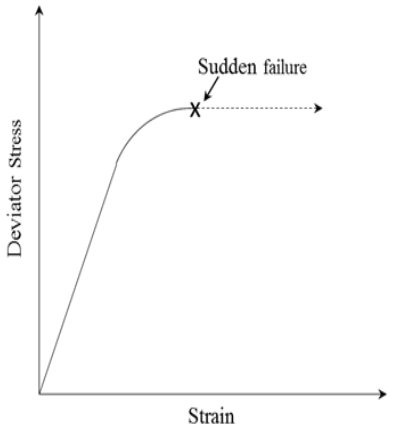


***Fig.5:-****Typical Stress-strain curve for Stress Controlled triaxial test.*

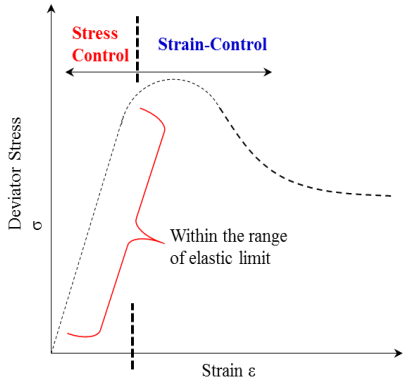


***Fig.6:-****Portions of triaxial test to be made using each type of loading.*

Only the peak shear resistance can be ascertained and plotted in stress-controlled tests. Because failure occurs at a level of stress somewhere between the pre-failure load increment and the failure load increment, the peak shear resistance in stress-controlled tests can only be mathematically represented (i.e., the failure load may be in between the two stages of load increment and exact failure load may be approximated) Even though, stress-controlled experiments inevitably model real-geotechnical field situations better than strain-controlled tests.

Each method of conducting test has several advantages and disadvantages relative to each other. To overcome this deficiency in the triaxial test, it is necessary to decrease gap between the two tests procedure. One of the solutions is to conduct triaxial test at incremental loading at small strains. Another solution is to apply very small magnitude of the stress increment with simulation of small strain rate. This constitutive condition can simulate the field condition of loading, drained and undrained conditions in soils as well as elasto-plastic behavior of soils.

The time rate of application of stress (duration of next increment) is important particular to assure that the load increment duration can be adjusted to assure pore pressure equalization in undrained tests and complete pore pressure dissipation in drained tests for especially during the triaxial testing of clayey materials. For given boundary drainage conditions the time required for pore pressure equalization for drainage depends mainly on permeability and sample dimensions which dominate the drainage path. Mitchell, Hopper and Campanella (1965) have shown that the permeability of a compacted clays depends upon the structure of the

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compacted clay. The structure of the compacted clay again depends on the factors like method of compaction, water content and dry density of the specimen at compaction.

Bishop and Henkel[4] (1962) and Bishop and Gibson[5] (1964) given procedure of selection of time duration for testing. It was observed that considerable errors may occur when the same rate of strain is used for all the tests in a series when testing clayey materials due to lake of pore pressure equalization and incorrect determination of effective stresses and resulting shear strength parameters.

The load-controlled tests were carried out by imposing finite load increments. The load increments are followed by time periods at constant stress level. The strain-controlled test is characterized by a continuous hardening regime up to the steady state on the contrary; the load-controlled test at the stress level characterized by a mobilized friction angle suffers a sudden collapse. There is certain instability occurs in load control test. When a strain-controlled test at constant strain rate is carried out, the system is kinematically controlled: no global axial acceleration is allowed.

On the contrary, when a load-controlled (i.e., Creep) test is performed, the system is free to accelerate and evolve without any kinematical constraint. When load control stresses are performed the microstructure, evolution cannot be considered quasi-static, but must be interpreted dynamically. Within the frame work of strain hardening elastoplastic this implies the redefinition of the hardening rule which govern state variable evolution.

Figure 8 shows that the stress versus strain and volume versus strain behavior was nearly identical for all tests up to about 5% axial strain. The behavior of specimens tested using strain control and combined stress control-strain control is very similar through the peak and out to about 20% strain. At higher strains, there are some differences in stress and volume change. Sample distortions and non-uniform stress conditions at these large stains preclude attributing much significance to these differences.

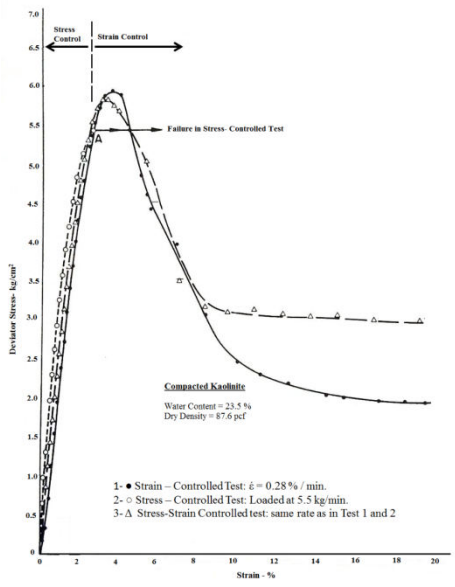


***Fig.7:-****Stress Control – Strain Control test on Compacted Kaolinite.*
*(After Raymond L et.al (1968))*

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In the case of the stress-control test, applying additional stress beyond point A caused continuous deformation at a rate of about 0.3 percent per minute, until sample bulging caused a sufficient increase in cross sectional area that the stress could be carried. During this time, the sample volume and pore pressure were out of balance, and the test was only partially drained. The samples used in these tests were dilating when they failed. Throughout the failure of the sample tested using incremental loading only, a negative pore pressure of about 0.3 kg per sq.cm persisted. Regardless of whether the pore pressure is positive or negative, the final load increment in a drained test using incremental loading will produce only partially drained deformation.

The use of incremental loading for the study of behavior prior to the peak, on the other hand, is important because control of load increment durations provides a positive means of achieving complete drainage, which is not always possible in strain-control type tests. The use of pressure transducers to monitor pore pressure, provides a means of control to ensure complete drainage; however, this increases the drainage path length, thereby increasing the time required to perform the test.

The strain-controlled test involves imposing a constant axial strain rate (1 mm=min), whereas the load-controlled test involves imposing finite axial load increments. Figure 9 depicts the axial load time history.

The experimental results are depicted in Figure 10a. (After Claudio and Silvia [15], 1997) A continuous hardening regime up to the steady state (f 032) characterizes the strain-controlled test. The load-controlled test, on the other hand, collapses abruptly at the stress level characterized by a mobilized friction angle of 25. The mechanical responses of both tests are roughly the same up to this point, but the sudden instability is unique to the load-controlled test.

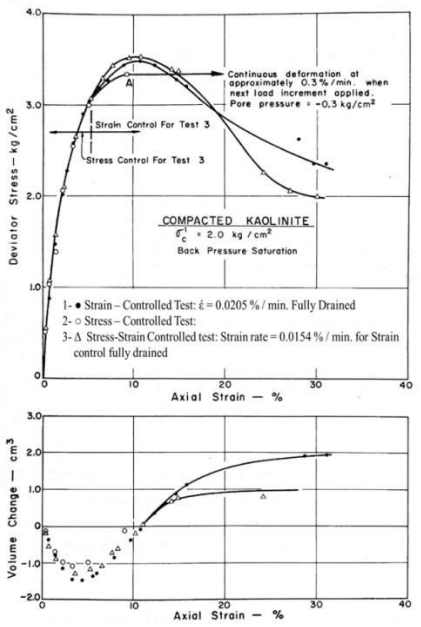


***Fig.8:-****Drained triaxial test results using three loading methods (after Raymond L et.al (1968)*

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The collapse points of the various load-controlled tests 24 are collected in Figure 9 and compared to the ultimate state points obtained using strain-controlled loadings. Figure 10b shows the results of both the standard triaxial test and the q constant test.

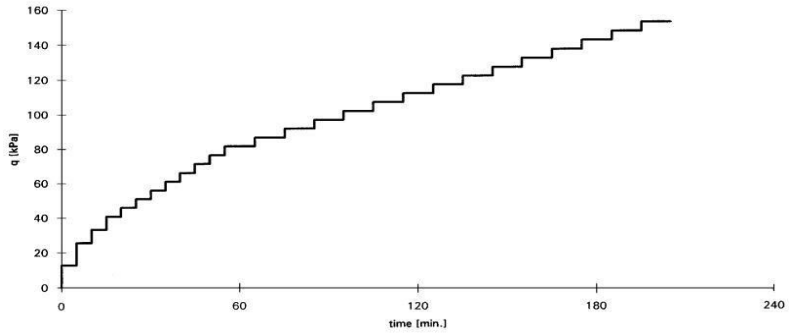


***Fig.9:-****Time vs Load increment in Stress Controlled test (after Claudio and Silvia, 1997)*

The phenomenon is caused by a structural collapse and is the result of progressive grain structure destabilization. To explain the difference in mechanical behavior obtained by performing strain and load-controlled tests, the main aspects of the two test procedures must be outlined.

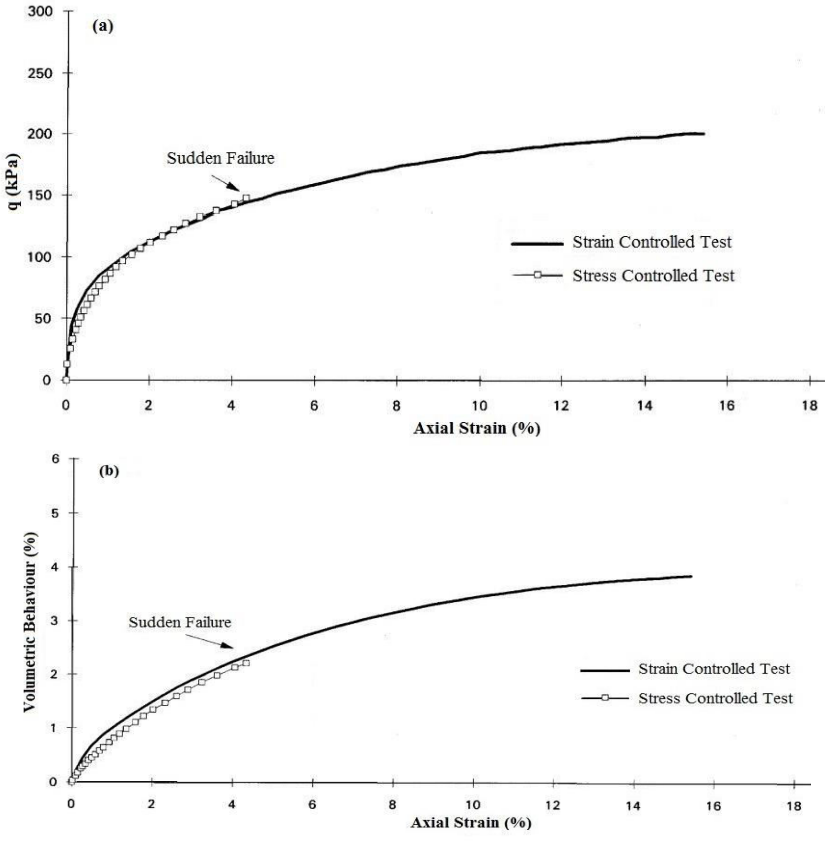


***Fig.10:-****Comparison between two drained standard triaxial compression tests performed by controlling the axial strain or the axial load: [$\sigma_c$= 100kPa]: (a) deviatory stress versus axial–strain curves; (b) volumetric behavior (after Claudio and Silvia, 1997)*

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When performing a strain-controlled test at a constant strain rate, the system is kinematically controlled: no global axial acceleration is permitted. When a load-controlled (i.e., creep) test is performed, the system is free to accelerate and evolve without kinematical constraints.

Movahed et al. [14] (2011) made comparison of stress and strain-controlled test in evaluation of fine content effect on liquefaction of sand through energy approach. Tests results were obtained from a stress and strain controlled both tests performed on a specimen of sand containing 30% non-plastic silt, under shear strain amplitude of 1.0% with frequency of 0.005Hz. For stress-controlled test cyclic shear stress ratio (CSR) of 0.2 with frequency of 01. Hz was selected.

**Advantages of the stress control (Increments of loads) test are:**

1. Load increments are selected based on magnitude and also the time duration of each increment is also selected in such a way that fully drain test may run. This condition is called as equilibrium of stress and time duration, which is important when shear strength characteristics of clays are important to derive with respect to effective stress.
2. Deformation versus time relationship may be observed during each load increment ensures us to analyse weather the drained or undrained condition maintained or not?
3. Yield stress of structurally sensitive clays may be obtained.

**Disadvantage of Stress-control test are:**

1. Failure may be rapid (un expected) and result in a complete collapse of the sample, hence determination of ultimate strength or the stress strain relationship beyond the peak point is not possible, since sudden failure occurs as shown in Figure X.
2. In drained tests, application of the failure load increment will usually cause failure under undrained or only partially drained conditions.
3. In undrained tests, application of the failure load increment usually causes an abrupt failure so that pore pressure at this stage of the test cannot be accurately recorded.
4. Studies of the influence of rate of strain on strength cannot be conveniently made.

**Advantage of the strain-controlled tests:**

1. Peak shear resistance (that is, at failure) as well as lesser shear resistance (that is, a point after failure called ultimate strength) can be observed and plotted.

**Disadvantage of Strain rate control tests:**

1. With strain rate control, complete pore pressure equalization cannot be assured unless the rate of loading is extremely slow, in which case the time of testing may be excessive.

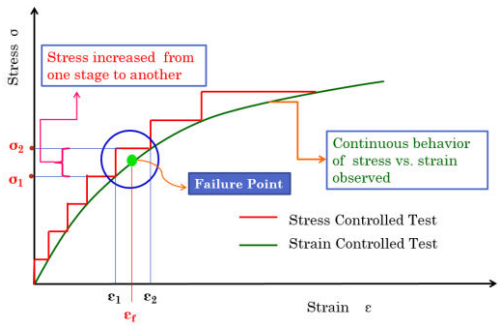


***Fig.11:-****Comparison between Stress and Strain controlled test.*

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Stress increased from $\sigma_1$ to $\sigma_2$ and in between the failure occurs then the corresponding value of strain at failure ($\varepsilon_f$) not available in stress-controlled test.

## DISCUSSION

During the design lifetime of many geotechnical structures, the soil deposits are subjected to dynamic cyclic loadings. These loadings can be caused by natural factors such as earthquakes and ocean storms, as well as human activities such as passing vehicles and vibrating machinery placed on a structure or soil surface.

Significantly, the soil response induced by these dynamic cyclic loadings is generally more complex than that included in static assessments, necessitating engineers to examine the dynamic behavior of soils both in the lab and in the field. A cyclic triaxial test is a new discovery that determines numerous dynamic parameters/behavior of soil to examine such a complex occurrence.

Presently in the field of triaxial test equipment application of computer software and programmers are incorporated and hence at any point of time the stress versus strain behavior in triaxial test setup is available. The use of data loggers and data analyzers gives graphical representations and limits of failure can be concluded directly. Through servo-controlled equipment, the condition of stress and strain to the triaxial specimen can be maintained as per desired level of accuracy.

With the use of strain gauges, local strain instrumentation in soil specimen is possible. As the research in geotechnical engineering is in progress various conditions we need to simulate and also to overcome the limitations of present test facility of the triaxial tests. Depending on the requirement of field simulation, cyclic triaxial test, dynamic triaxial test, frozen and temperature controlled, high pressure-high temperature triaxial test equipment's are devised. To overcome the scale effect and requirement of large-scale testing leads to development of large scale triaxial test equipment. The variety of sensors like pressure sensors, load sensors, displacement sensors (longitudinal and radial), temperature sensors etc., makes the availability of various parameters for analysis.

Today with the help of these facilities we can simulate field conditions like rainfall induced landslide, swelling soil, collapsible soil, and dynamic effect on geotechnical structures and derived various parameters required for research purpose.

The triaxial shear test is more realistic than the other shear test devices. There are complex procedures to prepare the sample for test and to regulate the drainage, pore pressure and deviator stress as per case specific requirement of triaxial test to be conducted, it gives reasonably accurate results of parameters for the specimen tested in it.

The strain control devices are simplest to execute and stress control device are used for research specific requirements. The both method of application of mode of loading measures the deformation may have its pros and cons. Further study required in this direction. More and more complex triaxial test devices are invented and some of them are under research to overcome the field difficulties or limitations of present test devices.

A loading procedure, time rate of application of stress, pore pressure equalization and effective stress parameters effects on triaxial testing in clayey soils explained. It is concluded that the rate of strain, time duration for next magnitude and difference of magnitude (increment in stress) should be decided based on the parameters like permeability of soil and

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sample size under triaxial testing. It is observed that the remolding of triaxial sample for clayey soils represents considerable errors in the shear strength parameters because it depends on the factors like compaction methods, water content and dry density of the sample.

It is advised that, to derive field shear strength parameters under triaxial test, the sample of triaxial test should be directly derived from the field undisturbed sample only, and the rate of stress and stress should exactly simulate the field conditions (i.e., very small-time rate, magnitude of stress is also small and strain rate exactly equivalent to field strain rate). It is advisable to use environment chamber with servo-controlled apparatus to regenerate exact field conditions of failure of soils.

For granular material like soil, the factors like soil type, moisture content, consolidation parameters and the case specific operations during and after construction of geotechnical structure decides the behavior of soil strain sensitive or stress sensitive. Engineering judgement is required to prefer in between the two tests, strain or stress-controlled test.

## CONCLUDING REMARKS

Stress-controlled and strain-controlled both tests have their positions and roles in the world of geotechnical tests simulation. The most important thing is to consider the mechanics that is being modelled and start with the method which most closely represents real life.

- In some situations, both tests are acceptable and generate comparable results.
- Sometimes the choice of the type of test is critical in determining the geotechnical system response accurately.
- In some scenarios strain-control tests offer more suitability with acceptable loss of accuracy in determining the behaviour of geosystem.
- True triaxial test, cyclic triaxial testing facilities with servo-controlled mechanism offer more accuracy to simulate geotechnical field problem gives more reliable data for research purpose as well as execution of important structures.

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REVIEW

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# A review on synthetic investigation for quinoline- recent green approaches

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**ABSTRACT**

Quinolines are a prominent heterocyclic motif and crucial building blocks in creating physiologically active compounds. Due to the fast development of novel medicines with a quinoline nucleus, numerous research papers have been published in a short amount of time. Therefore, to comprehend the present state of the quinoline nucleus in medicinal chemistry science, it is necessary to combine new information with older data. So far, several traditional synthesis techniques have been reported in the literature to synthesize this scaffold. Pfitzinger, Gould–Jacob, Friedlander, Skraup, Doebner–von Miller, and Conrad–Limpach are examples of old synthetic methods. However, they need expensive and demanding conditions, such as high temperature, the use of non-biodegradable chemical compounds degrade the ecosystem, create irritation or harm as pollutants, and represent a threat to the environment. However, traditional synthesis processes need a difficult and time-consuming apparatus set-up, resulting in high costs and pollutants. As a result, scientists are presently developing new and innovative techniques to decrease the use of chemicals, solvents, and catalysts, which are detrimental to both humans and the environment. Therefore, we have attempted to shed light in this current review on various reactions to produce quinolines and their derivatives using various green synthetic methods.

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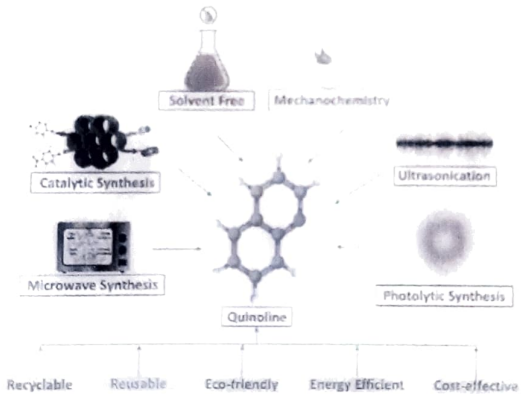


## 1. Introduction

Heterocyclic compounds have been extensively used in medicinal chemistry. Their uses are escalating by the day since they are being analyzed in multifold architectures of the bioactive compound. Quinoline and derivatives belong to the N-containing heterocycles family that has lately attracted the interest of researchers due to their wide variety of applications, such as the diverse spectrum of activities and their numerous uses in industrial and synthetic organic chemistry (1–5). Quinoline is a

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# Development and Validation of RP-HPLC Stability Indicating Method for Simultaneous Estimation of Dolutegravir and Lamivudine in Bulk and Pharmaceutical Dosage Form

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Author KP designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors US and DP managed the analyses of the study. Authors JKP and TBP managed the literature searches. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aims:** Dolutegravir (DVR) and Lamivudine (LMN) is anti-viral drug combination used in treatment of HIV-I infection. FDA approved dosage regime for DVR and LMN is 50mg and 300mg respectively. The aim of present research work is to develop and validate a reverse phase high performance liquid chromatography (RP-HPLC) method for simultaneous estimation of DVR and LMN in bulk and pharmaceutical dosage forms. Further the stability indicating nature of method has been evaluated.

**Methodology:** A chromatographic separation was achieved on Hypersil BDS C18, 250 × 4.6 mm 3.5 µm particle size, column as stationary phase and mobile phase composed of Phosphate Buffer pH 3.0: Acetonitrile (60:40%V/V) with flow rate of 1.5mL/min with 20µL injection volume. The analytes were estimated at 232nm using PDA detector. The DVR and LMN solutions were exposed to various forced degradation stress conditions to evaluate the stability behavior of the product. The method was also validated as per ICH Guideline (Q2R).

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# Development, Validation and Forced Degradation Study of Emtricitabine and Tenofovir Alafenamide in its Pharmaceutical Dosage Form Using RP-HPLC

**Khushboo Patel[1*], Ujashkumar Shah[1], Hirak Joshi[1], Jayvadan K. Patel[1] and Tejas B. Patel[2]**

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Author KP designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors US and HJ managed the analyses of the study. Authors JKP and TBP managed the literature searches. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aims:** The present research was aimed to develop and validate a reverse phase high performance liquid chromatographic (RP-HPLC) method for the quantification of Emtricitabine (EMT) and Tenofovir Alafenamide (TEN) in combination.

**Methodology:** Separation was achieved under optimized chromatographic condition on an Inertsil C18, 250 x 4.6 mm, 5µm column. Various composition of mobile phase was tried. Separation of EMT and TEN was started with Methanol: Buffer and Methanol finally using solvent system of Buffer (pH 3.5) and Methanol in ratio of (30:70) and flow rate adjust at 1.0 ml/min was used as solvent system, the detection was carried out at 262nm using Shimazdu UV-visible detector. The mobile phase run time for the developed analytical method was 10 minutes.

**Results:** The standard curve was found linear in the concentration range of 20-60 µg/ ml ($r^2$-0.9994) and 2.5-7.5 µg/ ml ($r^2$-0.9992) for EMT and TEN respectively. The %RSD was found to be 0.80-0.95% and 0.63-1.09 for EMT and TEN respectively. Percentage (%) recoveries for EMT and

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# Fuzzy Logic Based Metaheuristic Algorithm for Optimization of Type-1 Fuzzy Controller: Fault-Tolerant Control for Nonlinear System with Actuator Fault ⋆

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**Abstract:** This research offers a fuzzy-based harmonic search (HS) metaheuristic technique for optimizing type-1 fuzzy controller for Fault-Tolerant Control (FTC) for nonlinear level control application subject to two uncertainties (i.e. actuator fault and external process disturbances), using type-1 and interval type-2 fuzzy-based HS algorithms. The effectiveness of a fuzzy logic-based adaptive HS algorithm in a nonlinear two-tank level control process with the primary actuator has dwindled (LOE). The work key contribution is the discovery of the best technique for constructing an optimal vector of values for the fuzzy controller's membership functions (MFs) optimization. This is made to improve dynamic response by bringing the process value of the two-tank level control process close to the target process value (set-point). It's worth noting that the type-1 fuzzy controller's optimized MFs use an interval type-2 fuzzy system for parameter adaptation of the HS algorithm, which can handle greater uncertainty than a type-1 fuzzy system. In this case, the limiting MFs of interval type-2 fuzzy sets are type-1 fuzzy sets, which define the footprint of uncertainty (FOU). Simulation results show that FHSO using an interval type-2 fuzzy system outperforms FHSO using a type-1 fuzzy system in the optimal design of a type-1 fuzzy controller.



*Keywords:* Harmonic Search algorithm, Fuzzy controller, Type-2 fuzzy system, Fuzzy sets

## 1. INTRODUCTION

Fuzzy controllers are presently being optimized using metaheuristic algorithms, and these controllers need to be optimized because they frequently do not attain the best performance possible in real-world applications. Because they use the original concept of fuzzy sets, these controllers are known as type-1 fuzzy logic controllers (T1 FLCs) Zadeh (1965).Lotfi Zadeh presented fuzzy logic for the first time in 1988 and presented Zadeh (1988), when he explored fuzzy sets (FSs) and fuzzy logic (FL). In this circumstance, the members of a set are given a numeric value as a measurement of the uncertainty in the so-called membership functions. The membership functions of a fuzzy set's linguistic variable are discussed. Type-2 fuzzy logic was created with the purpose of solving more challenging problems, i.e., circumstances with a higher degree of uncertainty, than type-1 fuzzy logic can handle Zadeh (1996).

Zadeh created Type-2 fuzzy sets as an expansion of standard fuzzy sets (type-1). The membership degrees of a type-2 fuzzy collection are also ambiguous. Because its secondary membership function is only one subset, a type-1 fuzzy set is a special case of a type-2 fuzzy set in this perspective Liang and Mendel (2000).Type-2 fuzzy logic systems can manage more uncertainty because they are made up of type-1 fuzzy logic systems. The articles in Patel and Shah (2021a,b,c, 2019c,d,e) show how type-2 fuzzy systems may be used to handle a wide range of control problems with outstanding results.

Type-1 fuzzy systems have already been optimized using metaheuristic algorithms; for example, the optimization of type-1 fuzzy controllers is investigated in Lagunes et al. (2019), which uses the firefly technique to optimize fuzzy controllers of autonomous mobile robots. The dynamic alteration of the most critical parameters for the GSO algorithm's operation was discussed in Bernal et al. (2019). GSO algorithm was also utilized to optimize a fuzzy controller for an autonomous robot following a trajectory in Bernal et al. (2019). The GSO algorithm was also employed in the optimization of the liquid level fuzzy controller in Bernal et al. (2020).

Alternative metaheuristic techniques are used in other studies to optimize fuzzy controllers. Wagner and Hagras (2007) uses the genetic algorithm (GA) to evolve the

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# Fuzzy-based metaheuristic algorithm for optimization of fuzzy controller: fault-tolerant control application

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## Abstract

**Purpose** – Fuzzy-based metaheuristic algorithm is used to optimize the fuzzy controllers for the nonlinear level control system subject to uncertainty specially in the main actuator that has lost effectiveness (LOE). To optimize the fuzzy controller, type-1 harmonic search (HS) and interval type-2 (HS) will be used.

**Design/methodology/approach** – The type-1 and type-2 fuzzy-based HS algorithms are designed for optimization of fuzzy controllers for Fault-Tolerant Control (FTC) applications, and this research proposes a fuzzy-based HS metaheuristic method. The performance of a fuzzy logic-based HS algorithm applied to a nonlinear two-tank level control process with a main actuator that has lost effectiveness (LOE) and also the same controller will be tested on DC motor angular position control with and without noise.

**Findings** – The key contribution of this work is the discovery of the best approach for generating an optimal vector of values for the fuzzy controller's membership function optimization. This is done in order to improve the controller's performance, bringing the process value of the two-tank level control process closer to the target process value (set point). It is worth noting that the type-1 fuzzy controller that has been optimized is an interval type-2 fuzzy system, which can handle more uncertainty than a type-1 fuzzy system.

**Originality/value** – The type-1 and type-2 fuzzy-based HS algorithms are designed for optimization of fuzzy controllers for FTC applications, and this research proposes a fuzzy-based HS metaheuristic method. The performance of a fuzzy logic-based HS algorithm applied to a nonlinear two-tank level control process with a main actuator that has LOE will be tested on DC motor angular position control with noise. Two nonlinear uncertain processes are used to demonstrate the effectiveness of the proposed control scheme.

**Keywords** Harmonic search algorithm, Fuzzy controller, Type-2 fuzzy systems, Fuzzy sets

**Paper type** Research paper

## 1. Introduction

Fuzzy controllers are now optimized using metaheuristics, and these controllers need to be optimized because they often do not attain the best performance possible necessary for real-world applications. Because they employ the original concept of fuzzy sets Zadeh (1965), these controllers are commonly referred to as type-1 fuzzy logic controllers (FLCs). Lotfi Zadeh first presented fuzzy logic in Zadeh (1988), where he presented the ideas of fuzzy sets and fuzzy logic. The members of a set are assigned a numeric value as a measurement of the uncertainty in the so-called membership functions in this situation. The membership functions of a fuzzy set's linguistic variable are described. In addition to the existing fuzzy logic (type-1) that was suggested from the inception, type-2 fuzzy logic was later developed with the objective of handling more difficult problems, that is, problems with a higher high degree of uncertainty, than type-1 fuzzy logic can solve (Zadeh, 1996).

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# Type-2 fuzzy logic applications designed for active parameter adaptation in metaheuristic algorithm for fuzzy fault-tolerant controller

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## Abstract

**Purpose** – In recent times, fuzzy logic is gaining more and more attention, and this is because of the capability of understanding the functioning of the system as per human knowledge-based system. The main contribution of the work is dynamically adapting the important parameters throughout the execution of the flower pollination algorithm (FPA) using concepts of fuzzy logic. By adapting the main parameters of the metaheuristics, the performance and accuracy of the metaheuristic have been improving in a varied range of applications.

**Design/methodology/approach** – The fuzzy logic-based parameter adaptation in the FPA is proposed. In addition, type-2 fuzzy logic is used to design fuzzy inference system for dynamic parameter adaptation in metaheuristics, which can help in eliminating uncertainty and hence offers an attractive improvement in dynamic parameter adaption in metaheuristic method, and, in reality, the effectiveness of the interval type-2 fuzzy inference system (IT2 FIS) has shown to provide improved results as matched to type-1 fuzzy inference system (T1 FIS) in some latest work.

**Findings** – One case study is considered for testing the proposed approach in a fault tolerant control problem without faults and when actuator, system component faults are considered. For comparison between the type-1 fuzzy FPA and interval type-2 fuzzy FPA is presented using statistical analysis which validates the advantages of the interval type-2 fuzzy FPA. The statistical Z-test is presented for comparison of efficiency between two fuzzy variants of the FPA optimization method.

**Originality/value** – The main contribution of the work is a dynamical adaptation of the important parameters throughout the execution of the flower pollination optimization algorithm using concepts of type-2 fuzzy logic. By adapting the main parameters of the metaheuristics, the performance and accuracy of the metaheuristic have been improving in a varied range of applications.

**Keywords** Interval Type-2 fuzzy logic, Flower pollination algorithm, Fuzzy fault tolerant controller

**Paper type** Research paper

## 1. Introduction

Fault tolerant control is an active research area in recent times, attributable to gives acceptable control performance under the exogenous uncertainty like actuator, system component and sensor faults or process disturbances. And so this work is done for optimization of fuzzy fault tolerant controller (Patel and Shah, 2018, 2019a, b).

*Author contributions*: H. R. Patel analyzed the results; H. R. Patel conceived of the presented idea and developed the framework of this study; H. R. Patel carried out the experiments and H. R. Patel and V. A. Shah wrote the article. All authors discussed the results and contributed to the final manuscript.

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# A metaheuristic approach for interval type-2 fuzzy fractional order fault-tolerant controller for a class of uncertain nonlinear system*

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# A metaheuristic approach for interval type-2 fuzzy fractional order fault-tolerant controller for a class of uncertain nonlinear system*

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**ABSTRACT**

A new optimum interval type-2 fuzzy fractional-order controller for a class of nonlinear systems with incipient actuator and system component faults is introduced in this study. The faults of the actuator and system component (leak) are taken into account using an additive model. The Interval Type-2 Fuzzy Sets (IT2FS) is used to design an optimal fuzzy fractional order controller, and two different nature inspired metaheuristic algorithms, Follower Pollination Algorithm (FPA) and Genetic Algorithm (GA), are used to optimize the parameters of the fuzzy PID controller and Interval Type-2 Fuzzy Tilt-Integral-Derivative Controller (IT2FTID) for nonlinear system. The suggested control approach consists of two parts: an Interval Type-2 Fuzzy Logic Controller (IT2FLC) controller and a fractional order TID controller. Additionally, the two inputs of the IT2FLC are also calibrated using two fine tuning parameters $\beta_1$ and $\beta_2$, respectively. The stability of the proposed controller is presented with some conditions. In addition to unknown dynamics, some unknown process disturbances, such as rapid changes in the control variable, are taken into account to check the efficacy of the proposed control scheme. Two nonlinear conical two-tank level systems are used in the simulation as a case study. The performance of the suggested approach is also compared to that of a widely recognized Interval Type-2 Fuzzy Proportional-Integral-Derivative (IT2FPID) Controller. Finally, the proposed control scheme's fault-tolerant behaviour is demonstrated using fault-recovery time results and statistical Z-tests for both controllers, and the proposed IT2FTID controller's effectiveness is demonstrated when compared to IT2FPID and existing passive fault tolerant controllers in recent literature.

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**KEYWORDS**
Actuator fault; conical two-tank; follower pollination algorithm; genetic algorithm; interval type-2 fuzzy system; system component fault; tilt-integral-derivative controller; frustum two-tank; fuzzy fault-tolerant control

## 1. Introduction

Due to the intricacy of problems, solving them using traditional procedures in a fair amount of time becomes difficult. Metaheuristic strategies have been developed in recent years to address this issue. The strategies can handle complex issues in an acceptable amount of time. Metaheuristic strategies are based on concepts from biological science, physics, animal and insect behaviour, and other fields [1]. In the literature, a variety of metaheuristic algorithms have been created. Genetic algorithm (GA), ant colony optimization (ACO), follower pollination algorithm (FPA), particle swarm optimization (PSO), grey wolf optimization (GWO), harmony search algorithm (HSA), and many others are examples of well-known methodologies. Follower Pollination Algorithm (FPA) is recently developed and a well-known metaheuristic algorithm, which is proposed by Yang in 2012 [2] in 2012. Additionally, interval type-2 fuzzy logic has been shown to be one of the most cited and used methods in the field of robotics and control due to better ability to handle uncertainty and adding human intelligence based on expertise. And hence, we proposed FPA-based interval type-2 fuzzy fractional order fault-tolerant controller for uncertain nonlinear system.

The control of the nonlinear systems (NSs) in presence of unmodelled dynamics (NSs-UD) and in faulty situation are one of the most challenging problems in control engineering. The problem of the uncertain parameters or uncertain functions in the dynamics of the nonlinear systems have been considered in adaptive control techniques, but the problem of the control of NSs with faulty situation has been quite rarely investigated in literature, and thereafter we proposed optimal fuzzy fault-tolerant controller using IT2FTID with FPA metaheuristic approach.

One of the real-world second-order systems (SOS) [3–7] frequently utilized in many industrial production processes [8] is the two-tank level control system. According to the literature, the PID controller [8,9], fuzzy controller [8], fuzzy-PID controller [10], and neural network [11,12] can effectively control the level of a non-interacting (single-tank, two-tank) system. For single-tank or multi-tank level control, the

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# Optimal Wireless Technology Selection Approach for Sustainable Indian Smart Grid

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## Abstract

The smart grid is playing a game-changing role in achieving clean and green energy, infrastructure, and cities, which are all part of the sustainable development goals. The significance of communication infrastructure in the reliable design and operation of the smart grid is well recognized, notably for renewable integration, facilitating distributed energy resources and storage, demand response, and energy efficiency. Since choosing the optimal communication technology is a strategic decision, the problem needs careful investigation, taking into account realistic data traffic estimates to fulfill the communication needs of the applications envisaged. Even though a vast array of technologies with diverse capabilities is available to meet such communication needs, choosing the optimal wireless technology for a smart grid project remains a difficult challenge. In this context, to achieve and maximize the benefits of the smart grid and its applications, a systematic and efficient approach is necessary. This study proposes a data-driven decision-making approach for evaluating the capabilities of viable wireless technology

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# Performance based optimal selection of communication technologies for different smart microgrid applications

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ABSTRACT

Transforming a traditional microgrid to a smart microgrid involves deploying a cost-effective and suitable communication system. Realistic data traffic estimates need to be computed at the design level for the optimum choice of wireless technologies to satisfy the communication demands, which is strategically an arduous problem. The present study involves the development of a data-driven decision-making strategy based on performance evaluation of various wireless network technology options to optimally select the technology for an associative smart microgrid application. A cost function integrating various smart microgrid applications and different wireless communication technologies is developed as the objective function. Major Performance Metric-based weights, such as data rate and delay, are incorporated into the cost function to enhance the performance of the developed strategy. The potential and adequacy of the developed strategy are examined by implementing a real-world smart microgrid case study in India. Based on the performance assessment results, it is suggested that existing RF and GPRS technologies be replaced by LTE 4G technology. The mathematical tool presented with the suggested approach is viable for decision-making in field applications because of its simplicity, ease of adaptation, and scalability.

## Introduction

Smart grids enable the transition or re-structuring of traditional power grids, using Information and Communication Technologies (ICTs) for intelligent operation supporting interoperability amongst different utilities, devices, systems, businesses, regulatory environments, and other stakeholders [1]. A smart microgrid is a group of interconnected loads and distributed energy resources that act as a single controllable entity, with a capability to operate in both grid-connected or island mode [2], enabled through integrated communication and control techniques [3].

Microgrids can be classified based on size, application, operation, architecture, sectoral, and source [4,5]. However, a typical microgrid incorporating a three-level architecture showcasing the conceptual interconnection of smart microgrid's prosumers, taking benefits of different useful applications through the Internet of Things (IoTs) is depicted in Fig. 1. In microgrid communication design, there are three main network levels: (i) Primary level, (ii) Secondary level, and (iii) Tertiary level. Each of these levels possesses its salient fundamental functioning with different microgrid applications and hence, its specific

*Abbreviations:* AMI, Advanced Metering Infrastructure; DA, Distribution Automation; DERS, Distributed Energy Resources and Storage; DGM, Distributed Generation Management; DR, Demand Response; DTM, Distribution Transformer Monitoring; GPRS, General Packet Radio Service; GSM, Global System for Mobile; HAN, Home Automation Network; HEM, Home Energy Management; IoT, Internet of Things; LEO, Low Earth Orbit; LTE, Long Term Evolution; MDMS, Meter Data Management System; MPM, Major Performance Metric; OM, Outage Management; OT, Operational Telephony; OTLM, Overhead Transmission Line Monitoring; PHEV, Plug-in Hybrid Electric Vehicle; PLM, Peal Load Management; PQM, Power Quality Management; QoSv, Quality of Service; RTT, Round Trip Time; SA, Substation Automation; SCADA, Supervisory Control And Data Acquisition; UTC, Coordinated Universal Time; Wi-Fi, Wireless Fidelity; WiMAX, Worldwide interoperability for Microwave Access.

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# SMART HELMET WITH NOTIFICATION SCREEN, ALCOHOL DETECTOR, AND BLUETOOTH SPEAKER

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***Abstract:*** Almost everyone in India who ridden a bike or scooter has done so without a helmet at least once in their lives and over 30% of road accident fatalities during 2019 were on account of not wearing helmets. Wearing a helmet can lead to a reduction reduces in the risk of fatal injury and a 69% reduction in the risk of head injuries according to the WHO. So, the main objective of this device is to make a safe ride. There are two modules, one in the helmet (transmitter) and another in a bike (receiver), to ensure that rider is wearing a helmet or not. Now, as per the National Crime Records Bureau (NCRB), data also shows that mostly 2% of the all-over accidents that happen in India are due to drunk driving. In 2019 alone, nearly 3,000 people lost their lives in road accidents related to drunk driving, while 6,675 people were left injured in such drunk driving-related road accidents, so we put an alcohol sensor close to the mouth and detect the amount of alcohol. If both conditions are true; the rider wearing a helmet and the alcohol level is normal then, the transmitter will send a signal to the receiver and the bike ignition circuit will compete. If anyone's condition is not fulfilled, for example, the rider is over drunk, then the transmitter will send a signal and ignition circuit. Now the third major reason for accidents is due to phones. On average, nearly 29 accidents and about 13 deaths took place every day on Indian roads due to the use of phones in 2019, to solve this we added a small notification screen on the front of the helmet which is connected to the phone via Bluetooth and smart helmet app. If there is a phone incoming call the notification screen will show you whose call is coming, not only calls it will also notify messages. And if the rider wants to pick up that call then he or she has to take off his/her helmet and because one condition is not fulfilled, so the bike is not going to start. This device should come inbuilt into a bike/scooter. If the helmet had lost then the rider needs to buy a new helmet just needs to set the same address in the encoder (IC HT12E) by dip 8 pin switch.

***IndexTerms*- RF modules, Bluetooth OLED Screen, Call Answering, Speaker, Mic, Alcohol Sensor, Clock (RTC).**

## I. INTRODUCTION

The purpose of this project by us is to try to do some good thing for society. Nowadays, accidents are increasing and lots of people are losing their life. The behind that insufficient knowledge of driving, fault of the rider's fault, talking on the phone while driving fast speed of the two-wheelers, drunk alcohol occur accounts of head injuries, so to forestall head injuries in 1914 British physician Dr. Eric Gardner introduce shellacked canvas to safeguard the head while riding and this can be how the helmet was introduced. Almost everything we use is smart: smartphones, smartwatches even smart toothbrushes so why not a smart helmet. So we developed a helmet that incorporates safety still as comfort. The four features are given below

- The main feature of this smart helmet is if the rider doesn't wear a helmet then the bike won't start. The circuit of ignition won't complete.
- Inbuilt Bluetooth speakers system.
- Transparent display for notification which is connected with phone and telephone, message notification.

• Alcohol percentage detector – this feature will stop bike ignition if the rider consumes more alcohol compared to the set value. Steps how this helmet prevents head injuries and accidents

Step-1. Identify the helmet worn or not, if the helmet is worn then the ignition will start otherwise it'll not start till the helmet wear.

Step-2. Measuring the quantity of alcohol by MQ-3 sensor. If measuring the amount of alcohol is out of the limit then ignition won't start and the measured amount of alcohol is under the limit then ignition will start.

Step-3. If a call comes on the present vehicle, An incoming call will show on the display of the helmet and that we can receive the decision by the start of the helmet.

## II. COMPONENTS

Arduino UNO , Relays (x2) , RF Transmitter and RF Receiver ,HT12D & HT12E (Decoder and Encoder) ,DIP 8 Bit switch (x2) , OLED , HC05 (Bluetooth Module) , IC7805 (9v to 5v) , Speakers , MQ3 (Alcohol Sensor) , Switches

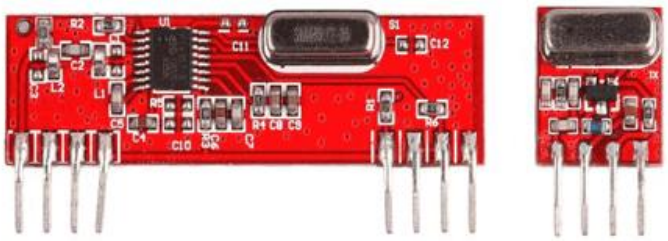
### 2.1 MQ3 (ALCOHOL SENSOR)

This alcohol sensor detects the alertness of the alcohol sensor in the air. The sensing range of this alcohol sensor is from 0.05mg/L to 10mg/L. It has four pins – VCC, Ground, Analog Output, and Digital Output. MQ-3 sensor is detects Alcohol, Benzine, CH4, Hexane, LPG, CO.

Advantages of MQ-3 (Alcohol sensor)

- Low-cost semiconductor
- High sensitivity
- Fast response time

### 2.2 RF TRANSMITTER AND RECEIVER

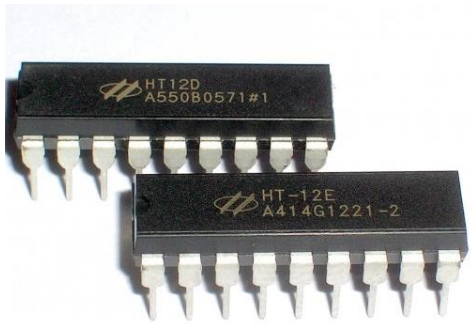


The RF transmitter and receiver module are used to transmit and receive data by using Radio Frequency. It can operate at different ranges from 30 kHz to 300 GHz. And in this device, we used this for communication between bike and helmet.

Advantages of RF Tx and Rx

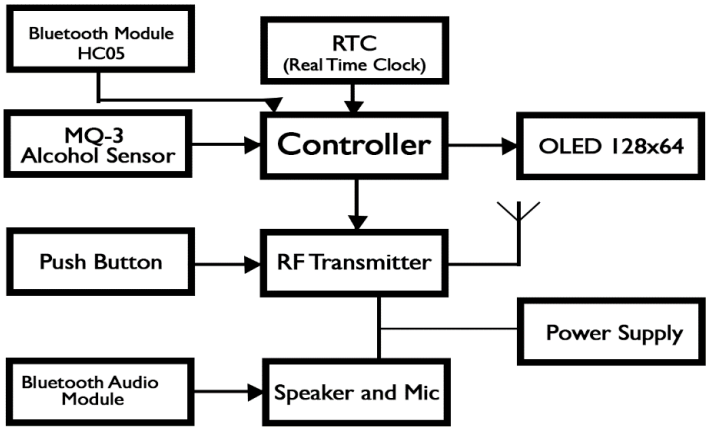
- Low power consumption
- It can operate at 3.3V
- Frequency transmission is 433MHz

### 2.3 HT12E and HT12D (Encoder and Decoder)

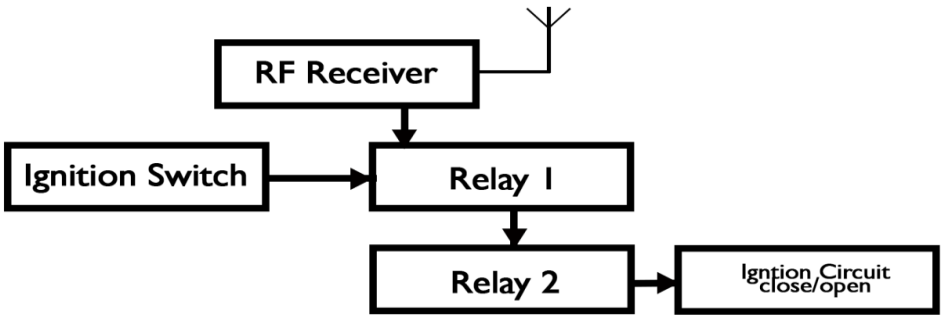



These Encoder and Decoder ICs are used to encode and decode the Radio Frequency and they can only decode single if the addressing to encode and decoder is the same.

## III. HELMET UN BLOCK DIAGRAM




## IV. BIKE UNIT BLOCK DIAGRAM

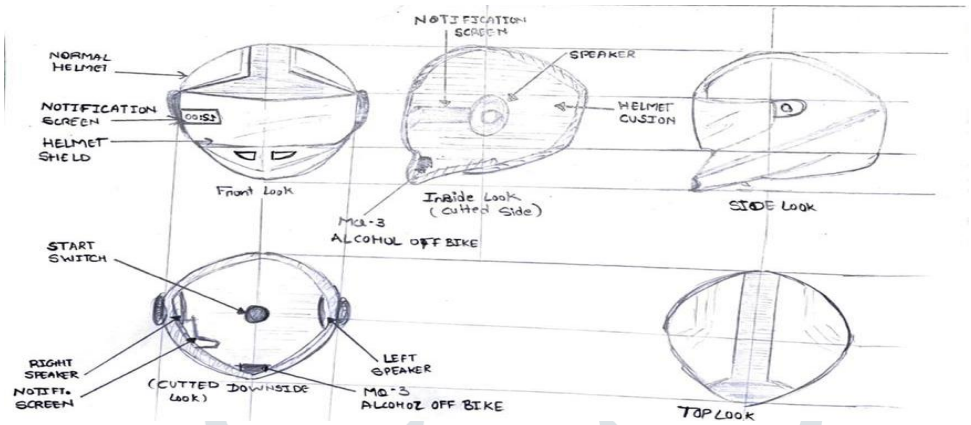


## V. CONSTRUCTION

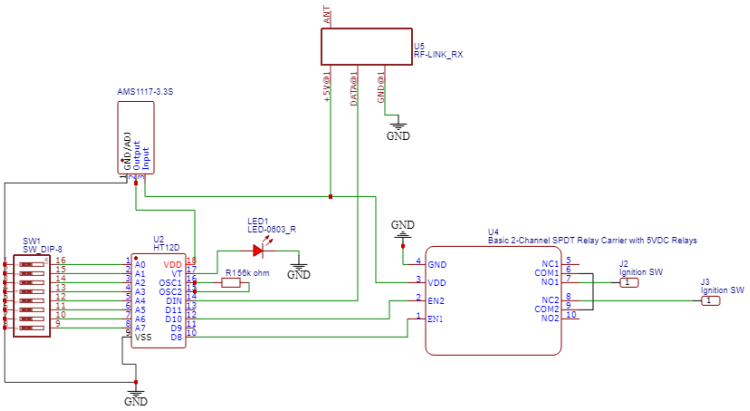
For the construction, we need the circuit board and the components mounted on it. Construction of our system, there are two units 1. Helmet unit 2. Bike unit

In the helmet part, the switch is kept upper side of the helmet therefore when riders wear the helmet and touch to switch and the bike will start. MQ-3 sensor keeps on in front of the rider's mouth. On the back of the helmet keep the speaker for hearing call ringtones or music. The circuits and the battery were fixed inside the helmet. Lcd is placed on the glass of the helmet for notification of incoming calls and the amount of alcohol.

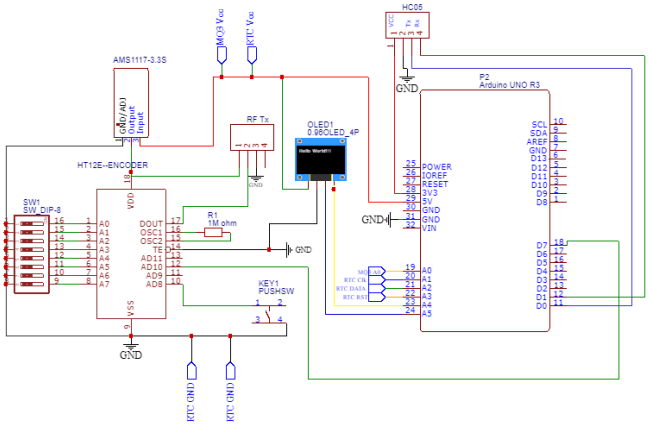
### 5.1 BASIC BLUE PRINT OF HELMET




### 5.2 BIKE UNIT CIRCUIT DIAGRAM




### 5.3 HELMET UNIT CIRCUIT DIAGRAM



## VI. WORKING

Nowadays, every two wheels have an ignition switch. If the switch is off then the engine will not start and if the switch is on the engine will start. So, now one relay1 is connected to the ignition switch, and the relay's triggering input is connected to the RF receiver. There is a switch in the helmet which is connected to the RF transmitter circuit and when the switch is turned on, the RF transmitter transmits a signal to the RF receiver, and relay triggering input will get triggered. Now, another relay2 is connected with relay1 and the ignition switch in series. The triggering input of relay2 is connected to the RF receiver circuit.MQ3 is connected with Arduino UNO, if the alcohol percentage is more than the set value then the UNO will send a signal to the RF transmitter and the transmitter will transmit a signal to the receiver to turn off the relay2.

Now for the rider's comfort, we added Bluetooth speaker .mic and an OLED screen for the notification of calls. The ride has to just connect the phone with the Bluetooth via the Smart Helmet app which is developed by us in MIT app inventor. The app will ask for permission and then whenever there is an incoming call, the screen will show it and there is a button to pick or hang the call. If the call is picked up then the inbuilt speaker will start working and because of a mic, you can be communicated with the call.

## VII. CONCLUSION

As we know not wearing a helmet is against traffic rules but we all know that in India most people are not wearing it. Also, many accidents happen due to using a phone while driving so to prevent this we developed a helmet in which there is a small OLED notification screen, inbuilt Bluetooth speakers with a call answering feature, and for safety, we add an alcohol meter and push-button system. If the rider does not wear a helmet then the push button will not get active and because of this bike's ignition circuit will not complete and if the rider consumed more alcohol then also ignition circuit will not complete. This device can prevent accidents and head injuries and all communication is done wirelessly by using an RF transmitter and receiver.

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# Simulation and Comparison Between Fuzzy Harmonic Search and Differential Evolution Algorithm: Type-2 Fuzzy Approach

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**Abstract:** The harmony search (HS) and differential evolution (DE) algorithms are compared in this study. Additionally, an interval type-2 fuzzy logic system (IT2FLS) allowing dynamic change of the key parameters is offered for each algorithm. The use of fuzzy systems to dynamically alter the primary parameters for each algorithm seeks to improve the performance of the associated algorithms. The optimal design of fuzzy systems for benchmark control issues, particularly in fuzzy controller design, is used to evaluate and compare each algorithm (IT2FHS and IT2FDE). Simulation results demonstrate that the FHS method outperforms the FDE approach when it comes to fuzzy controller optimization.The better errors are found with the application of fuzzy systems to enhance each proposed algorithm, according to statistics.



*Keywords:* Harmonic Search algorithm, Differential Evolution algorithms, Fuzzy controller, Type-2 fuzzy systems, Perturbation

## 1. INTRODUCTION

During the last four decades, meta-heuristic algorithms have evolved and become popular for solving complex optimization problems in a variety of fields, including management, core-engineering, medical, computer, and gaming. The majority of meta-heuristics are based on physics, biology, and ethology, and employ random variables and multiple parameters to achieve the desired function. The proposed algorithm's purpose is one of the key characteristics used to classify meta-heuristics, and it can be classified based on technique presentation judgments.

In recent time, Genetic Algorithm (GA) Patel et al. (2021), Ant Colony Optimization (ASO), Particle Swarm Optimization (PSO), Bee Colony Optimization (BCO) Olivas et al. (2019), Simulated Annealing (SA), and Harmony Search (HS) algorithm Patel (2022) are inspired from natural, physical process or animal behaviour patterns. One of the most recent meta-heuristic algorithms is the Harmony Search Algorithm (HS). This design is based on the concept of musical spontaneity, and it is constantly polishing its pitches to achieve better harmony. The HS has several advantages in terms of simplicity, flexibility, adaptability, and scalability, according to Patel (2022). Adjusting the parameters of the HS method becomes an important task when dealing with optimization performance, specifically numerical optimization issues to search for local optima. A similar issue arises in the case of PSO and the Differential Evolution Optimization (DEO) method.

Three factors have prompted researchers to work on the HS algorithm, Patel (2022): harmonic memory rate (HMR), pitch adjusting rate (PAR), and range bandwidth (BW). Much of the work on HS has been devoted to fine-tuning the parameters and their impact on the algorithm's efficiency. Each of these parameters contributes to HS ability to find the best solutions. For example, the HMR parameter is important for achieving a faster convergence rate, PAR is responsible for increasing solution variety, and BW is used to improve the diversity of exact solutions at the end of the iteration, according to Patel (2022).

The DE algorithm is a type of evolutionary computation. It is used to solve complex problems and effectively solves nonlinear, quasi, linear, and heterogeneous problems, according to Ochoa et al. (2014). There are also several control problem applications that combine fuzzy logic with DE Ochoa et al. (2014); Beirami et al. (2015); Salehpour et al. (2017).

Fuzzy controllers are now optimized with metaheuristics, and these controllers need to be optimized because they frequently do not achieve the best possible performance required for real-world applications. These controllers are known as type-1 fuzzy logic controllers (FLC) because they use the original concept of fuzzy sets Zadeh (1965, 1988). Type-2 fuzzy logic was later developed with the goal of handling more difficult problems, that is, problems with a higher high degree of uncertainty, than type-1 fuzzy logic can solve Zadeh (1988); Liang and Mendel (2000).Because of the advantages of the type-2 fuzzy logic system, it has grown in popularity and is now used in a variety of control applications Patel and Shah (2021a,b, 2019a). The article in Patel and Shah (2021a,b, 2019a,b,c) shows how to solve a variety of control applications using type-2 fuzzy systems with excellent results.

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# Comparative Analysis Between Two Fuzzy Variants of Harmonic Search Algorithm: Fuzzy Fault Tolerant Control Application

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**Abstract:** The goal of this research is to improve the harmonic search (HS) algorithm by using type-1 and interval type-2 fuzzy systems to dynamically change one of the evolutionary method's parameters. We have previously used both sorts of fuzzy systems in a variety of benchmark challenges and discovered that using fuzzy logic in conjunction with the harmonic search algorithm produces good results. In some of the experiments, it is clearly demonstrated that our methodology is statistically superior to other algorithms. Using type-1 and interval type-2 fuzzy systems, the harmony memory (HMR) parameter is dynamically changed during the evolution process in this example. The fundamental contribution of this work is the capacity to establish, by experimentation in a benchmark control issue, which of the two types of fuzzy systems employed with the harmonic search method produces better results. This is because there are no previous studies to our idea that employ and compare type-1 and interval type-2 fuzzy systems. Furthermore, three type of uncertainties are employed in the benchmark two-tank level control system to assess the performance of both fuzzy systems, simulating the disturbances that may present in the actual world and therefore allowing statistical validation if there are substantial differences between type-1 and interval type-2 fuzzy systems.



*Keywords:* Harmonic Search algorithm, Fuzzy controller, Type-2 fuzzy systems, Fuzzy sets

## 1. INTRODUCTION

Over the last four decades, a slew of novel meta-heuristics have evolved. They have used their strengths to solve crucial optimization challenges in areas including resource allocation, industrial planning, scheduling, medical, engineering, and computer engineering, among others. The objective of the proposed algorithm is one of the key features used to categorise meta-heuristics, and it may be classed based on the judgments of technique presentation. The majority of meta-heuristics are based on physics, biology, and ethology, in which random variables and several parameters are used to attain the target function.Over the last four decades, a slew of novel meta-heuristics have evolved. The objective of the proposed algorithm is one of the key features used to categorise meta-heuristics, and it may be classed based on the judgments of technique presentation.

Natural and physical processes, as well as animal behavioral patterns, are now inspiring algorithm ideas, such as the Genetic Algorithm Patel et al. (2021), Ant Colony Optimization (ASO), Particle Swarm Optimization (PSO), Bee Colony Optimization (BCO) Olivas (2019), Simulated Annealing (SA), and Harmony Search (HS) Algorithm Patel (2022). The Harmony Search Algorithm is one of the most recent meta-heuristic algorithms (HS). This design is based on the idea of music spontaneity, and it keeps polishing its pitches to achieve better harmony. In terms of simplicity, flexibility, adaptability, and scalability, the HS has various advantages Patel (2022). It also features a novel stochastic derivative and requires a simpler mathematical equation to generate new solutions at each iteration, especially when an existing solution is taken into account Patel (2022). When dealing with optimization performance in particular numerical optimization issues to search local optima, adjusting the parameters of the HS method becomes the important task. In the case of PSO and the Differential Evolution Optimization (DEO) method, a similar difficulty arises.

The harmonic memory rate (HMR), pitch adjusting rate (PAR), and range bandwidth (BW) are three factors that have prompted researchers to work on the HS algorithm Patel (2022). Since the inception of HS, much of the work has been devoted to fine-tuning the parameters and their impact on the algorithm's efficiency. Each of these parameters has a role to play in supporting HS in finding the optimal solutions. The HMR parameter, for example, is important for accomplishing a faster convergence rate, PAR is responsible for increasing solution variety, and BW is used to improve the diversity of exact solution at the conclusion of the iteration Patel (2022).

Fuzzy controllers are now optimized using metaheuristics, and these controllers need to be optimised because they often do not attain the best performance possible necessary for real-world applications. Because they employ

# FAULT TOLERANT CONTROL SYSTEMS: A PASSIVE APPROACH FOR SINGLE TANK LEVEL CONTROL SYSTEM

By

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***ABSTRACT***

*The paper construes Passive Fault-Tolerant Control Systems (PFTCSs) by examining the approaches from both philosophical and practical points of view. The objective of PFTCS approach is to maintain the desired performance and system stability with the system, actuator faults, and process disturbances. In this paper passive model-based fault tolerant control system in case of a system, actuator faults, and process disturbances are designed for single-tank system and are simulated with the linear model using Matlab. The faults are in single-tank system faults that are modeled as a leak in tank and actuator faults that are modeled as a fall in actuators (control valve) opening, which could lead to a large loss in the nominal performance. The model-based passive fault tolerant control system is designed using a combination of Neural Network (NN) and PI controller to detect faults in the system and maintain the performance and stability. Simulation results are shown and compared between fault tolerant control system and non-fault-tolerant control system with faults and process disturbances. The simulation results are shown in terms of MSE, hence there is a promising performance increase due to the designed controller strategy.*

*Keywords: Actuator Fault, Passive Fault Tolerant Control System (PFTCS), Neural Network, Process Disturbances, Sensor Fault.*

## INTRODUCTION

Over the past three decades, the increasing demand for safety, reliability, profitability, and survivability in any engineering system and the industrial process has encouraged substantial research work in Fault Detection and Diagnosis (FDD) (Gertler, 1988a, 1988b; Isermann, 2005) and, in recent times, on Fault-Tolerant Control Systems (FTCSs). A Fault-Tolerant Control System (FTCS) is state-of-the-art control scheme which can accommodate faults among system components automatically while maintaining system stability along with the desired level of control performance. For designing FTCSs several approaches have been developed for safety-critical system or applications (Blanke et al., 1997; Jiang, 2005; Zhang and Jiang, 2008). Examples of these applications in aircraft system (Alwi et al., 2009), space vehicles (Varma and Kumar, 2010), power plants (Ye et al., 2001), and in chemical industry processing hazardous materials (Ma and Jiang, 2011), to mention a few but not limited.

In an FTCS, the best achievable system performance depends on the availability of equipment redundancies in the control system as well as the analytical redundancy used in the synthesis of fault-tolerant controllers. Depending on how redundancies are being used, present FTCSs can be classified into two categories, explicitly, active FTCSs (Alwi et al., 2009), and passive FTCSs (Yang and Ye, 2010). These two approaches are using different design procedures for same control objective. As far as main control objectives are concerned, both approaches lead to same results, however, due to the unique design approaches used, each method can result in some distinguished properties.

# 3

# FAULT DETECTION AND DIAGNOSIS METHODS IN POWER GENERATION PLANTS - THE INDIAN POWER GENERATION SECTOR PERSPECTIVE: AN INTRODUCTORY REVIEW

**Himanshukumar R. Patel, Dr. Vipul A. Shah**

**ABSTRACT:** The power sector in India is the most significant component of the social overhead capital that effects directly Indian economic through growth of GDP. Since last four decades industrial growth has been increasing significantly, so also power requirements also increasing rapidly. As a result there is low levels of tolerance towards performance degradation in power generation plants (PGPs). Abnormalities or potential faults in power generation plants (PGPs) lead. To situations like low productivity, loss of production, human safety, and environmental hazards. To avoid undesirable conditions and to supply uninterrupted power to industry and other users, power generation industry has started using Fault Detection and Diagnosis (FDD) methods in conventional and renewable energy power generation plants (PGPs) like Nuclear Power Plants (NPPs), Solar Power Plants (SPPs) and Thermal Power Plants (TPPs) to improve reliability and availability of power plants. The paper discusses about different faults related to nuclear power plants (NPPs), thermal power plants (TPPs), and solar power plants(SPPs) and their performance monitoring, instrumentation or sensor calibration, system dynamics, system faults, sensor faults, equipment monitoring, reactor and furnace monitoring, and transient monitoring. The uses of model-based and model-free FDD methods are explained some recent FDD methods are also examined. The popularity of FDD applications is continuously increasing as safety and reliability are significant requirements for different power generation sector. The paper discusses the model-based and model-free FDD methods in NPPs, TPPs, and SPPs types of power generation plants (PGPs).

**KEYWORDS**

Fault detection, Fault diagnosis, Model-based, Model-free, Nuclear power plant, Thermal power plant, Solar power plant

## Introduction

### Indian Energy Scenario

India is one of the largest consumers of energy in the world. However, more than 70 percent of its primary energy needs are being met through imports, mainly in the form of crude oil and natural gas. Power generation in the country uses mainly two types of energy sources: conventional and non-conventional energy sources. The use of non-conventional energy sources are increasing since last two decades for power generation because of its inherent advantages of transportation and certainty of availability. However, the conventional energy pollutes the atmosphere to a great extent.

Power generation capacity in India using non-conventional energy (renewable energy) sourcing depicted in Fig. (2) till 30$^{th}$ November, 2017 as per data available in the Ministry of New and Renewable Energy (MNRE) (All India Installed Power Capacity of Power Stations Information, 2017). It must also be noted that India has increased installed power capacity from a more 1362 Megawatts (MW) to over 3,30,860 Megawatts (MW) since independence and electrified more than 500,000 villages. NP electricity consumption in India is expected to rise around 2.28.

Megawatts hour (MWh) by 2021-22 and around 4.50 Megawatts hour (MWh) by 2031-32 (Pankaj Kumar et al., 2016). Therefore complex, instrumentation, and automation are required in the current power generation plant (PGPs) of India for producing more power with higher efficiency and less operating expenses. In that performance degradation. This is where the role of Fault Detection and Diagnosis (FDD) algorithms became very important.

*energies*

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# Stable Fault Tolerant Controller Design for Takagi–Sugeno Fuzzy Model-Based Control Systems via Linear Matrix Inequalities: Three Conical Tank Case Study

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**Abstract:** This paper deals with a methodical design approach of fault-tolerant controller that gives assurance for the the stabilization and acceptable control performance of the nonlinear systems which can be described by Takagi–Sugeno (T–S) fuzzy models. Takagi–Sugeno fuzzy model gives a unique edge that allows us to apply the traditional linear system theory for the investigation and blend of nonlinear systems by linear models in a different state space region. The overall fuzzy model of the nonlinear system is obtained by fuzzy combination of the all linear models. After that, based on this linear model, we employ parallel distributed compensation for designing linear controllers for each linear model. Also this paper reports of the T–S fuzzy system with less conservative stabilization condition which gives decent performance. However, the controller synthesis for nonlinear systems described by the T–S fuzzy model is a complicated task, which can be reduced to convex problems linking with linear matrix inequalities (LMIs). Further sufficient conservative stabilization conditions are represented by a set of LMIs for the Takagi–Sugeno fuzzy control systems, which can be solved by using MATLAB software. Two-rule T–S fuzzy model is used to describe the nonlinear system and this system demonstrated with proposed fault-tolerant control scheme. The proposed fault-tolerant controller implemented and validated on three interconnected conical tank system with two constraints in terms of faults, one issed to build the actuator and sond is system component (leak) respectively. The MATLAB Simulink platform with linear fuzzy models and an LMI Toolbox was used to solve the LMIs and determine the controller gains subject to the proposed design approach.

**Keywords:** actuator fault; fuzzy control; linear matrix inequalities; T–S model-based fuzzy control; parallel distributed compensation; stability condition; system component fault; three conical tank; Takagi–Sugeno fuzzy model

## 1. Introduction

Many years ago, in 1965, fuzzy sets and logic system were introduced by renowned researcher Zadeh. Although fuzzy logic is applied in numerous complex industrial applications, for example steam engines by Mamdani's, speed control of a DC motor applications and boiler fusion [1,2], Kickert's proposed linguistic rules that describe human operator's control strategy which is applied to control warm water plant [3], and Ostergaard's introduced fuzzy logic control of heat exchange system [4], fuzzy sets and control theory have ability to replicate operator's control strategy in to linguistic rules however stability analysis, robustness and optimality features are not existed, contradictory modern

American Journal of Engineering and Applied Sciences

Original Research Paper

# Performance Comparison of Passive Fault Tolerant Control Strategy with PI and Fuzzy Control of Single-Tank Level Process with Sensor and System Fault

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**Abstract:** Fault-Tolerant Control (FTC) strategy has gain maximum attention in recent years in chemical industries due to economical and safety hazards perspective. Targeting at the decreasing control performance of the single-tank level control process under the constraint of system and sensor faults, this article presents model-based Passive Fault-Tolerant Control (PFTC) strategy which are based on conventional and artificial intelligence control. The deviation between system outputs and model output are called residuals and are used to detect and identify faults. The mathematical model of single-tank level system is derived from real time process data using process reaction curve method. The paper discusses about the performance comparison between model-based PFTC using fuzzy logic and conventional proportional Plus Integral controller (PI). The proposed PFTC strategy is applied on single-tank level control process with system and sensor faults and verifies the performance of PFTC using fuzzy logic plus conventional PI control and other PFTC configuration. Proposed PFTC using fuzzy logic plus PI control gives better control performance even though fault occurs in the system. The control performance of different PFTC strategies are measured in terms of Mean Square Error (MSE), Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) indices.

**Keywords:** Passive Fault-Tolerant Control, Fuzzy Logic, PI Control, Sensor Fault, System Fault

## Introduction

Fault Tolerant Control (FTC) comprises diagnosis with control methods to handle faults in smart way. The aim is to prevent that simple faults develop into severe failure and hence increase plant availability and reduce the risk of safety hazards (Jiang, 2010). Generally 'fault' is defined as an unpredicted variation of the system functionality. We are concerned to detection, diagnosis of faults in an engineering system, whether they occur in the plant and control instrument (Sensor and actuators) or in the components of the process itself. In any industrial closed loop system there are sensors, controller, system or component (actuator, pipe, leak…etc.) faults presented in (Gao *et al*., 2015) (Patel and Shah, 2018) the diagram shown in Fig. 1.

Any Faults deteriorate the system performance as well as stability.

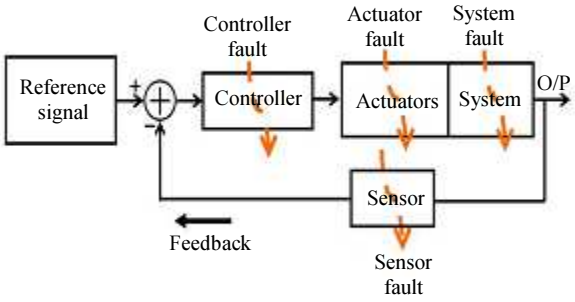


**Fig. 1:** Closed loop control system with posibal faults

Many engineering systems, such as chemical process, aero engines, manufacturing systems, electric machines and industrial electronic equipment are safety-critical systems. There is an ever-increasing demand on reliability and safety of industrial systems subjected to potential process abnormalities and different faults. As a

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# Passive Fault-Tolerant Tracking for Nonlinear System with intermittent Fault and Time Delay ⋆

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**Abstract:** This paper investigates the passive fault-tolerant tracking control problem for a class of uncertain nonlinear system with intermittent fault and time delay. The considered intermittent fault appears in the actuator. The passive fault-tolerant tracking control scheme with a fuzzy logic technique is developed. Then, according to the information from residue fuzzy control will take the appropriate control action to minimizing the effect of the fault and track the reference. The effectiveness of the proposed passive fault-tolerant method is validated by a hybrid two-tank non-interacting level control system (HTTNILCS). The different error indices like integral Absolute Error (IAE), Integral Square Error (ISE) and Integral of Time-weighted Absolute Error (ITAE) is used to show the effectiveness of the proposed approach.



*Keywords:* Actuator fault, Fuzzy logic, intermittent fault, Passive fault-tolerant control, time delay.

## 1. INTRODUCTION

The nominal controller improve closed-loop control system performance under the normal situation in the system, contrary any fault occurs into the system the nominal controller will not tolerate the faults and control performance of the system will degrade significantly. The advanced controller scheme like Fault Tolerant Controller (FTC) is suitable to handle unsafe situation like system instability and degrade control performance. The main objective of FTC is optimized control performance with retaining system stability even faults appears Patel and Shah (2018a, 2019a,b). The FTC strategy generally classified in two types based on controller structure J. Jiang (2012). One is Active Fault Tolerant Control (AFTC), in these control strategy the controller is reconfigurable one, the controller reconfiguration made on the decision of Fault Detection Identification (FDI). The second type of FTC is Passive Fault Tolerant Control (PFTC), in this controller is fixed structure it is designed based on pre-defined control performance criterion, pre-defined magnitude and type of fault in closed loop system M. Blanke (2016).

Since last two decade significant research has done in the FTC scheme for nonlinear system due to requirement of high productivity, profitability and avoiding hazardous situation in any industries some results are presents in Patel and Shah (2020, 2019c, 2018b,c,d,f); Y. X. Li (2017); Li and Yang (2018); S. Tong and Li (2014) and references therein. Author of Patel and Shah (2020, 2019c) proposed novel fault-tolerant control scheme using takagi-Sugeno fuzzy set for nonlinear faulty system. In Patel and Shah (2018b,f) Passive Fault Tolerant Control is designed and applied to nonlinear level control system subject to actuator, system faults, where the only abrupt type of fault considered. In Patel and Shah (2018d) the novel framework of PFTC strategy is proposed and validate on real-time system of interacting and non-interacting level control system with different faults and disturbances, the proposed approach is easy to implement. In Y. X. Li (2017); S. Tong and Li (2014); Li and Yang (2018), the adaptive FTC is designed using fuzzy logic for the large scale nonlinear system taking an account of actuator faults including stuck and loss of effectiveness. Authors of Patel and Shah (2018c,e) explore the responses of single-tank level control system through applying PFTC scheme subject to system and actuator faults, the controller is designed using artificial intelligence techniques (i.e. fuzzy logic and neural network).

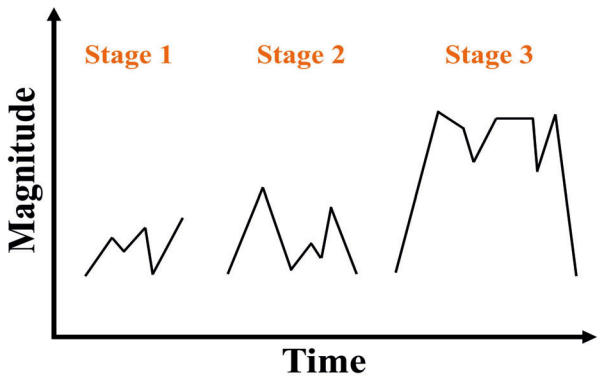


Fig. 1. Nature of intermittent faults (IFs).

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# Passive Fault Tolerant Control System Using Feed-forward Neural Network for Two-Tank Interacting Conical Level Control System Against Partial Actuator Failures and Disturbances ⋆

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**Abstract:** AbstractA novel approach for passive fault-tolerant control (PFTC) system design against actuator faults is proposed. The scheme is based on Feed-forward Neural Network (FFNN) plus conventional PI controller, during the fault occurred into system FFNN will give additional control output to the system according to fault magnitude. The FFNN will trained using back-propagation algorithm. To eliminate the steady-state tracking error, the PI controller is also incorporated. The following fault type and input signals are considered: abrupt, step, sine, and trapezoidal trajectory inputs. The effectiveness and the superiority of the proposed approach are demonstrated using Two-Tank Interacting Conical Level Control System (TTICLCS) example. The simulation performed in MATLAB Simulink platform, also different integral errors like IAE, ISE and IATE are presented to validate the proposed approach.



*Keywords:* Actuator fault, back-propagation algorithm, conical tank, disturbances, Feed-forward Neural Network, fault-tolerant control, PI control.

## 1. INTRODUCTION

Any engineering safety-critical system like a chemical process, aerospace system, and nuclear power plant: the demand is significantly increasing reliability, maintainability, and survivability. Due to these reasons, the industrial process has drawn maximum research in Fault Detection and Diagnosis (FDD) and Fault-Tolerant Control (FTC) Isermann (1997); P. Mhaskar and Christofides (2013); D. Zumoffen and Ceccatto (2007); H. Basak (2017); W. Wang and Cole (2016); Patel and Shah (2019b). Significant attention was paid to FTC from 1980s D. P. Looze and Barrett (1985); Patel and Shah (2019b). And subsequently FTC problem has started to attract more attention in recent time Patton (1997); Frank (2004); H. Noura and Chamseddine (2009); Zhang (2013); Patel and Shah (2019a,d, 2020).

A Fault-Tolerant Control System (FTCS) is a modern control system that possesses; these ensure timely and an efficient fault detection, prevent faults from developing into complete failures, to maintain overall system stability with acceptable performance in the presence of component failures, and reduce the risk of safety hazards Jiang (2010). In general, FTS can be classified into two categories: Passive Fault-Tolerant Control Systems (PFTCS) and Active Fault-Tolerant Control Systems (AFTCS) Patel and Shah (2018a). However, only passive FTCS against the different degree of actuator failures is considered in this paper. In PFTCS, controller is designed from prior knowledge of the faults. PFTCS the controller is sufficiently robust and sensitive against faults. This paper will focus on the development of a novel approach to such fault-tolerant control systems. In any chemical process industries two-tank, three-tank and four-tank interacting level process control are commonly used for the different purpose, hence the research in control of such systems are encouraged by the need of increasing system reliability and safety hazards S. Simani (2015); L.F. Mendonca and da Costa (2008); P. Hajiani (2011) In past two decades extensively research has been done in FTC strategy for multi-tank interacting level control system under different constraints, in H. Noura (2000) actuator fault active FTC design proposed and applied on three-thank interacting system for validate the strategy, for the three-tank benchmark system FTC is design using fuzzy plus Model Predictive Control (MPC) for two faults presented in L. F. Mendonca and da Costa (2007). FTC scheme is implemented on an internet-based three-tank system for the leak (system) and sensor bias faults in D. H. Zhou (2000); X. He and Zhou (2017) respectively. In U. Altinisik (2012) author proposed and validate the signal based FTC approach (Farthest first traversal algorithm) FFTA to detect the sensor bias fault for the three-tank level control system. In N. Parikh and Markana (2017) authors has implemented Non-linear Model Predictive Control (NMPC) to achieve servo plus

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# A passive fault-tolerant control strategy for a non-linear system: An application to the two tank conical non-interacting level control system

## *Estrategia de control pasivo tolerante a fallas par un Sistema no lineal: Aplicación a un sistema de control de nivel sin interacción de dos tanques cónicos*

Himanshukumar R. Patel, Vipul A. Shah

***Abstract*—In practical engineering systems, unknown actuator, sensor or system component faults frequently occur, which results from component and interconnection failures, degrade control performance, system stability, and profitability, and even arise hazardous situation. To avoid abnormal activity like faults and maintain system control performance subject to faults occurring into the system, the Fault-tolerant Control (FTC) is a realistic approach to address the unwanted situation. The two-tank conical system is widely used in chemical and food process industries because of its greater advantages. The non-interacting configuration of the two-tank conical system is highly nonlinear due to its shape and varying area of the tank thought the height of the tank, as a consequence level control of this system is extremely difficult. The paper attributes to design a Passive Fault-tolerant Control Strategy (PFTCS) for a Two-tank conical Non Interacting Level Control System (TTCNILCS) subject to the major system (leak), sensor, and actuator faults with external process disturbances. PFTC will increase system control performance and system stability acceptable level in the presence of sensor, system, and actuator faults. The simulation results demonstrate the proposed PFTC strategy has definite fault tolerant ability against the system and actuator faults also it has good disturbance rejection capability. To verify the efficacy of the proposed PFTC strategy Mean Square Error (MSE) and Root Mean Square Error (RMSE) Integral Absolute Error (IAE) indices are used.**

***Index Terms*—Actuator fault, process disturbance, non-interacting system, nonlinear, neural network, passive fault-tolerant control, sensor fault, system fault**

***Resumen*—En los sistemas de ingeniería práctica, con frecuencia ocurren fallas desconocidas en el actuador, sensor o componente del sistema, que resultan de fallas de componentes e interconexión, degradan el rendimiento del control, la estabilidad del sistema y la rentabilidad, e incluso surgen situaciones peligrosas. Para evitar actividades anormales como fallas y mantener el rendimiento del control del sistema sujeto a fallas que ocurren en el sistema, el Control tolerante a fallas (FTC) es un enfoque realista para abordar la situación no deseada. El sistema de dos tanques cónicos se usa ampliamente en las industrias químicas y de procesos alimentarios debido a sus mayores ventajas. La configuración no interactiva del sistema de dos tanques cónicos es altamente no lineal debido a su forma y al área variable del tanque a través de la altura del tanque, por lo que el control de nivel de este sistema es extremadamente difícil. Este trabajo se lo realiza para diseñar una estrategia de control tolerante a fallas pasivas (PFTCS) para un sistema de control de nivel sin interacción de dos tanques cónicos (TTCNILCS) sujeto al sistema principal (fugas), fallas del actuador con perturbaciones externas del proceso. PFTC aumentará el rendimiento del control del sistema y la estabilidad del sistema en un nivel aceptable en presencia de fallas del sistema y del actuador. Los resultados de la simulación demuestran que la estrategia PFTC propuesta tiene una capacidad de tolerancia a fallas definida contra las fallas del sistema y del actuador, y también tiene una buena capacidad de rechazo de perturbaciones. Para verificar la eficacia de la estrategia de PFTC propuesta, se utilizan los índices de Error absoluto cuadrático medio (MSE) y Error cuadrático medio (RMSE).**

***Palabras Claves*—Fallo del actuador, perturbación del proceso, sistema no lineal, red neuronal, control pasivo tolerante a fallos.**

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## I. Introduction

For any feedback control systems, actuator/sensor and system faults may degrade control performance or even destroy the stability of the overall systems [1]. It is, therefore, significant to enhance the system reliability not only by improving reliability of individual components but by designing state-of-the-art control strategy to compensate the effects of faults to the overall system as well. Thus, the development of the Fault-tolerant Control (FTC) has received considerable attention during the last two decades [2]-[4]. Recent attention has turned to methods of handling nonlinearity in FTC considering specific system structure [5],

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# Actuator and system component fault tolerant control using interval type-2 Takagi-Sugeno fuzzy controller for hybrid nonlinear process

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**Abstract.** The paper present efficient Fault-tolerant Control approach using Interval Type-2 Takagi-Sugeno Fuzzy Controller (IT2TSFLC) with conventional Proportional Integral (PI) controller for MIMO hybrid nonlinear level process. The implementation of control algorithms for MIMO systems is challenging due to variations in dynamics because of changing in operating point and the characteristics of nonlinear dynamic interaction. Such difficulties often deteriorate the performance of industrial MIMO process. This work develops T-S modeling of MIMO hybrid level process thereafter designed FTC using combination of knowledge base IT2TSFLC controller and model base PI controller subject to actuator and system component faults. To verify the applicability of the proposed FTC, this work presents a Two Conical Tank Interacting Level System (TCTILS) to examine the control performance. Along with, simulation results of proposed scheme is compared with Type-1 Fuzzy Logic Controller (T1FLC) and PID controller. Simulation results show that the IT2TSFLC relies a good dynamic behaviour of the TCTILS, a perfect level tracking with no overshoot, lesser settling and rise time. Two different error indices Integral Absolute Error (IAE) and Integral Square Error (ISE) are used to validate the proposed FTC scheme among two other scheme.

Keywords: Actuator fault, interval type-2 T-S fuzzy logic control, nonlinear system, MIMO system, PID controller, system component fault, Two Conical Tank Interacting Level System

## 1. Introduction

In any industries accuracy, profitability, availability and human safety are critical parameters. To maintain these parameters efficient and accurate control algorithms are needed, since past three decades different control algorithms ware developed for various engineering applications presented in [1–5]. Fault-tolerant Control (FTC) is an advance control scheme, which repel the effects of the faults on the control performance and maintain control performance at acceptable level with overall system stability [6]. Hence from past two decades, the importance of FTC systems becomes increasingly apparent, and considerable amount of research has been done in this area [5,7–14]. To tolerate the fault effects on system performance two redundancy ware used, one is hardware and second on is analytical redundancy. The hardware redundancy is not practical solution for any engineering system due to high cost and complexity of the system [15]. To overcome this limitation an analytical (computational) redundancy is right selection. The advantage of the analytical redundancy method is that it makes possible to identify the occurrence of the fault and to deal with the unsafe situation using the information of the extent and class of the faults. To design point of view FTC scheme has classified in two types: Active Fault Tolerant Control (AFTC) and Passive Fault Tolerant Control (PFTC).

The AFTC method is based on the fact that the controller can reset its parameters or even change its structure, as well as implement rapid dynamic compensation control output to keep system stable after the fault

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# Decentralized stable and robust fault-tolerant PI plus fuzzy control of MIMO systems: a quadruple tank case study

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## Abstract

This paper presents a typical design of fault-tolerant control using two decentralized PI plus fuzzy controllers to control the level of the lower two tanks in a nonlinear quadruple tank level process (QTLP). We also present some basic aspects of decentralized control design concerning stability and performance and illustrate them on a case study: a virtual model of a quadruple tank process. Control structure selection based on performance relative gain array (PRGA) is used, and its ability to evaluate the achievable performance is discussed. The controllers are designed based on a conventional PI controller plus fuzzy inference system technique. The relation between inputs/outputs was proved using relative gain array (RGA), and then, we divided the quadruple tank system into two subsystems and controlled each of them separately, both in minimum and non-minimum phases. Both the controllers were designed to control the nonlinear QTLP at any operating points. The proposed approach was compared with a decentralized fuzzy controller subject to actuator/sensor and system component faults. The simulation results show that the proposed decentralized fault-tolerant PI plus fuzzy controller has a more accurate tracking level and less computational time in both minimum and non-minimum phases.

### Keywords

Actuator fault, Fuzzy control, PI controller, Sensor fault, System component fault, Decentralized control, Robust stability, Robust performance.

The stability of uncertain dynamic systems has major importance when real-world system models are to be controlled and different faults occur in a system. Uncertainties due to inherent modeling/identification inaccuracies in any physical plant model specify a certain uncertainty domain, such as a set of linearized models obtained in different working points of the considered plant (Himanshukumar and Vipul, 2018a). Thus, the basic required property of a system is its stability within the whole uncertainty domain to be denoted as robust stability. The robust control theory provides analysis and synthesis approaches and tools applicable for various kinds of processes, including multi-input multi-output (MIMO) dynamic systems (Himanshukumar and Vipul, 2018b). To reduce the multivariable control problem complexity, MIMO systems are often considered as interconnections of a finite number of subsystems. This approach enables employing a decentralized control structure with subsystems having their local control loops. Compared with centralized MIMO controller systems, the decentralized control structure yields certain performance deterioration, which is however outweighed by important benefits, such as design simplicity, hardware,

# A novel design of optimal intelligent fuzzy TID controller employing GA for nonlinear level control problem subject to actuator and system component fault

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## Abstract

**Purpose** – The purpose of this article is about the design of controllers for conical two-tank noninteracting level (CTTNL) system in simulation. Local linearization around the equilibrium point has been done for the nonlinear CTTNL system to obtain a linearized model transfer function.

**Design/methodology/approach** – This article deals with the design of novel optimal fractional-order tilt-integral-derivative (TID) controller using type-1 fuzzy set for the CTTNL prototype system. In this study, type-1 fuzzy TID controller parameters have been optimized through genetic algorithm (GA) and those set of values have been employed for the design of proportional-integral-derivative (PID) controller.

**Findings** – A performance comparison between FTID and PID controller is then investigated. The analysis shows the superiority of FTID controller over PID controller in terms of integral absolute error (IAE), integral square error (ISE), integral of time multiplied absolute error (ITAE) and integral of time multiplied squared error (ITSE) integral errors. The transient and steady state performance of the FTID controller are superior as compared to conventional PID controller. In future, the FTID controller fault-tolerance capability tested on CTTNL system subject to actuator and system component (leak) faults. The detailed study of robustness in presence of model uncertainties will be incorporated as a scope of further research.

**Originality/value** – A performance comparison between FTID and PID controller is then investigated. The analysis shows the superiority of FTID controller over PID controller in terms of IAE, ISE, ITAE and ITSE integral errors. Additionally, fault-tolerant performance of the proposed controller evaluated with fault-

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# Application of metaheuristic algorithms in interval type-2 fractional order fuzzy TID controller for nonlinear level control process under actuator and system component faults*

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## Abstract

**Purpose** – The two-tank level control system is one of the real-world's second-order system (SOS) widely used as the process control in industries. It is normally operated under the Proportional integral and derivative (PID) feedback control loop. The conventional PID controller performance degrades significantly in the existence of modeling uncertainty, faults and process disturbances. To overcome these limitations, the paper suggests an interval type-2 fuzzy logic based Tilt-Integral-Derivative Controller (IT2TID) which is modified structure of PID controller.

**Design/methodology/approach** – In this paper, an optimization IT2TID controller design for the conical, noninteracting level control system is presented. Regarding to modern optimization context, the flower pollination algorithm (FPA), among the most coherent population-based metaheuristic optimization techniques is applied to search for the appropriate IT2FTID's and IT2FPID's parameters. The proposed FPA-based IT2FTID/IT2FPID design framework is considered as the constrained optimization problem. System responses obtained by the IT2FTID controller designed by the FPA will be differentiated with those acquired by the IT2FPID controller also designed by the FPA.

**Findings** – As the results, it was found that the IT2FTID can provide the very satisfactory tracking and regulating responses of the conical two-tank noninteracting level control system superior as compared to IT2FPID significantly under the actuator and system component faults. Additionally, statistical *Z*-test carried out for both the controllers and an effectiveness of the proposed IT2FTID controller is proven as compared to IT2FPID and existing passive fault tolerant controller in recent literature.

**Originality/value** – Application of new metaheuristic algorithm to optimize interval type-2 fractional order TID controller for nonlinear level control system with two type of faults. Also, proposed method will compare with other method and statistical analysis will be presented.

**Keywords** Actuator fault, Flower pollination algorithm, Interval type-2 fuzzy logic, System component fault, TID control

**Paper type** Research paper

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Compliance with ethical standards

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ORIGINAL RESEARCH

# Fault-Tolerant Controller Comparative Study and Analysis for Benchmark Two-Tank Interacting Level Control System

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## Abstract

In recent times fault-tolerant controller is a prime choice because of the handling capability of the multifunction into the closed-loop system irrespective of the faults and the external process disturbances in various engineering applications. This paper presents innovative fault-tolerant control scheme using a neural network, and the main contribution of this work is to design a feedforwarded back propagation neural network for controlling the actuator and system component (leak) faults into the level control process. By adopting the neural network as a fault-tolerant controller the efficacy of the fault-tolerant control scheme is dominating to the conventional scheme proposed by Dutta et al. (Real-time linear quadratic versus sliding mode liquid level control of a coupled tank system" In: International Conference on Devices, Circuits and Communications (ICDCCom 2014), IEEE, 12–12 September 2014, Ranchi, India, 2014; pp. 1–6. 10.1109/ICDCCom.2014.7024741). In addition, statistical analysis is done for validating the proposed fault-tolerant controller scheme and RMSE is also deliberate and give evidence of the performance of proposed FTC scheme. The Two-Tank benchmark Network Level Control structure is taken for simulation of both the fault-tolerant control scheme.

**Keywords** Actuator fault · System component fault · Two-tank interacting level control system · Fault-tolerant control · Neural network

## Introduction

Fault-Tolerant Control (FTC) of the process industries would be a scientific discipline aimed at maintaining reasonable control efficiency and system reliability in a defective situation [2]. The major priority of the FTC is to prevent the creation of simple faults into serious failure, thereby increasing the ability of the system and mitigating the risk of safety hazard [2–4]. Over the last three decades, FTC has been the focus of extensive research [5, 6]. This research effort has been active in a variety of practical industrial applications [7–10]. There are basically two standardized methods for FTC: one would be active FTC the other is passive FTC [11]. Passive FTC built on the basis of the predetermined conditions and severity of the system faults and built the robust controller for the system, the other side of the active FTC approach Fault Detection and Diagnosis (FDD) is the main part needed, the FDD has three primary functions initializing with process fault detection, then isolating and finally identifying [11, 12]. The beauty of passive FTC architectures arises through their inherent ability to handle all sorts of potential design faults. The next very significant explanation would be that the methods in the form become understandable and reasonably straightforward to explain to professionals, which appears to be a key aspect of the introduction of a modern industrial control scheme. Passive FTC architectures, therefore, are extensively used and common in petroleum and energy sectors where the fulfillment of constraint is especially important [11].

A significant aspect of passive FTC techniques is a detailed knowledge of the process and all sorts of potential fault conditions. There are several controllers (i.e. $H_\infty$, Model Predictive Control, Sliding Mode Control, PID Controller, Artificial

This article is part of the topical collection "Data Science and Communication" guest edited by Kamesh Namudri, Naveen Chilamkurti, Sushma S J and S. Padmashree""

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# Stable fuzzy controllers via LMI approach for non-linear systems described by type-2 T–S fuzzy model

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## Abstract

### Purpose

The purpose of this paper is to stabilize the type-2 Takagi–Sugeno (T–S) fuzzy systems with the sufficient and guaranteed stability conditions. The given conditions efficaciously handle parameter uncertainties by the upper and lower membership functions of the type-2 fuzzy sets (FSs).

### Design/methodology/approach

This paper reports on a relevant study of stable fuzzy controllers and type-2 T–S fuzzy systems and reported that the synthesis of controller for nonlinear systems described by the type-2 T–S fuzzy model is a key problem and it can be resolve to convex problems via linear matrix inequalities (LMIs).

### Findings

The multigain fuzzy controllers are established to improve the solvability of the stability conditions, and the authors design multigain fuzzy controllers which have extensive information of upper and lower membership grades. Consequently, the authors derive the traditional stability condition in terms of LMIs. One simulation examples illustrate the effectiveness and robustness of the derived stabilization conditions.

### Originality/value

The uncertain MIMO nonlinear system described by Type-2 Takagi-Sugeno (T-S) fuzzy model, and successively LMI approach used to determine the system stability conditions. The proposed control approach will give superior fault-tolerant control permanence under the actuator fault [partial loss of effectiveness (LOE)]. Also the controller robust against the unmeasurable process disturbances. Additionally, the statistical *z*-test are carried out to validate the proposed control approach against the control

## Keywords

Takagi—Sugeno (T–S) | Type-2 fuzzy logic system | Linear matrix inequalities fuzzy control

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# Automatic Image Description Generation Using Deep Learning Techniques

*Jinal Butala, Dr. Brijesh Bhatt*

## Abstract

*Automatic Image Description Generation methods are extremely useful for image retrieval, search and organization. Previous approaches either use the existing labelled dataset to compose sentences or compose a new description for the test image by exploiting available descriptions of the training images. In practice these methods have limited accuracy, hence if the most important objects in an image cannot be identified, then they cannot generate valid description. Another difficulty lies within the final description generation step; it is crucial to generate grammatically correct sentences.*

*In this paper, we propose a two-stage framework. In the first stage we predict image objects using convolutional neural network (CNN) network Alexnet[1] and the second stage of our framework generates caption for the image using these objects. We segment images and then apply alexnet on each segment one by one and identify the objects present in image. Later, construct sentences using Computer Vision System Toolbox Cascade object detector (COD). Using this technique to identify image classes, we obtain BLEU score to be 51.96 for Alexnet based approach and 46.01 for CNN based approach. Note that BLEU[2] (bilingual evaluation understudy) is an algorithm for evaluating the quality of machine-translated text.*

## Keywords

Convolutional neural network, Deep learning, Alexnet, Artificial intelligence, Cascade object detector, Computer vision toolbox

## Full Text:

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## Refbacks

There are currently no refbacks.

# Question Answering Survey: Directions, Challenges, Datasets, Evaluation Matrices

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**Abstract**

The usage and amount of information available on the internet increase over the past decade. This digitization leads to the need for automated answering system to extract fruitful information from redundant and transitional knowledge sources. Such systems are designed to cater the most prominent answer from this giant knowledge source to the user's query using natural language understanding (NLU) and thus eminently depends on the Question-answering(QA) field.

Question answering involves but not limited to the steps like mapping of user's question to pertinent query, retrieval of relevant information, finding the best suitable answer from the retrieved information etc. The current improvement of deep learning models evince compelling performance improvement in all these tasks.

In this review work, the research directions of QA field are analyzed based on the type of question, answer type, source of evidence-answer, and modeling approach. This detailing followed by open challenges of the field like automatic question generation, similarity detection and, low resource availability for a language. In the end, a survey of available datasets and evaluation measures is presented.

*Keywords:* Question Answering, Machine Reading Comprehension, Knowldge based Question Answering, Video based Question answering, Question answering datasets, Question answering evaluation measures

## 1. Introduction

Information retrieval(IR) has been an active area of research for past many decades as manual retrieval of fruitful information from enormous data is a tedious and time-consuming task. Handling this issue and retrieval of updated and important information brings the attention of many researchers [102, 120, 20, 58]. The notable performance improvement in the area can be observed by digital personal assistants (such as Amazon Alexa, Apple Siri, Google Home, etc.), robots-communication, clinical uses of conversation agents for mental health, Chatbot, etc.

Generally, these applications are tuned to have users input in the form of text, video, or speech [118, 103, 9, 115, 74, 22, 25, 83, 64]. Based on the question or input, the system will perform the required action. The pivotal requirement here is to understand and process the output produced by the information retrieval(IR) module [109, 40], and is the role of the question answering system.

Question answering is a field of information retrieval[58] and natural language processing (NLP), concerned with building systems that automatically answer questions posed by humans in a natural language.[1].

As many syntax, semantic, and discourse level challenges involved in this field, it is one of the prominent research directions of recent decades. This can be witnessed by figure 1 which indicates statistics of total submitted and accepted papers of QA field in Association for Computational Linguistics (ACL). It clearly indicates the surge in the popularity of the field.

Pragmatically helpful resources for answering the query include Wikipedia, quora, Reddit, tweeter, stackoverflow, etc.[85, 84, 110, 57, 38, 30, 49, 24, 114]. Many researchers are working in the applications which entertain users query by identifying desired information from such colossal datasets and cater it in accordance to the query.

Finding the best possible answer from one of these datasets is a challenging task [19, 98, 86, 101] due to features selection, its mapping with model and finding relevancy ranking of all candidates answers etc. common challenges. Apart from this, there are some

[1]The definition is borrowed from the Wikipedia. https://en.wikipedia.org/wiki/Question_answering

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# Neural Network Based Indian Folk Dance Song Classification Using MFCC and LPC

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**Abstract:** A large number of folk dance videos are uploaded on the web or added as a situational song in the Bollywood movies. The classification of folk dance videos is essential for dance education, to preserve cultural heritage, and for music companies to provide better customer oriented service. India is a country having many regional languages and each region has its own popular folk dances. Four different Indian folk dances namely, '*Garba*', '*Lavani*', '*Ghoomar*' and '*Bhangra*' are considered. A Folk Dance Classification Framework is proposed which extracts audio signal from video, takes a fragment of 125 seconds from the beginning and further separates it into a set of small segments, calculates Mel-frequency Cepstral Coefficients (MFCC) and Linear Predictive Coding (LPC) coefficients, generates high dimensional feature vector, reduces dimensionality using Principle Component Analysis (PCA) and classifies segments using Scale Conjugate Gradient Neural Network. The performances of chosen classifiers, K-Nearest Neighbor, Naïve Bayes and Neural Networks, are compared. Class labels of all segments are clubbed together and based on majority voting class label is assigned to a folk dance song. System achieves more than 90% accuracy.

**Keywords:** Classification, Folk dance song, Mel-frequency Cepstral Coefficients, Neural network, Linear predictive coding.

## 1. Introduction

The human generated tags are used to categorize and describe the living and non-living things of the vast universe. The tags used for dance are known as 'Dance Genre'. Dance song comprises of purposely selected sequences of human movement accompanied with vocal and background music. Folk music and folk dances constitute a significant part of the folk heritage around the world. The preservation of the folk music and choreographies and their dissemination to the younger generations is a very important issue since folk dance forms an important part of a country's or region's history and culture[1]. Many years ago, classification of dance genre was purely manual through conversation with public and experts' opinion. Automatic dance genre classification is essential because of resource digitization and plenty of new audio and video songs are added every year. Currently, most of the popular sites provide meta-data or text based annotation Automatic dance song analysis will be one of the services used by music distributors to catch the attention of music lovers and to achieve maximum profit. More than a decade, researchers are paying attention to audio signal analysis and classification.

The earliest civilizations discovered in the Indian subcontinent are those of Mohenjo Daro and Harappa in the Indus valley, and are dated about 6000 B.C. It seems that by that time dance had achieved a deemed measure of discipline and it is likely that it must have played some important role in the society, Two beautiful little statuette of bronze dancing girls were found at Mohenjo Daro in 1926 and 1931 respectively [2].

There are mainly two popular dances in India: Classical Dance and Folk Dance. Classical Dance was practiced in courts, temples and on special

# Indian Monuments Classification using Support Vector Machine

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*International Journal of Electrical and Computer Engineering (IJECE)*

# *Content-based high-resolution satellite image classification*

**Malay S. Bhatt & Tejas P. Patalia**

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# Computer Vision Systems for Content-based Image Classification

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**Abstract** In this paper, computer vision based Content-Based Image Classification systems have been described which are useful in various service and product industries. We have proposed Confidence Co-occurrence Matrix, which is a modification of Generalized Co-occurrence Matrix. The proposed framework merges properties of Confidence Co-occurrence Matrix along with other features such as RGB and HSV Histograms, Local Binary Pattern and Canny's edge detection approach. Proposed approach creates a fixed- size descriptor of size 1632. Once a feature vector has been constructed, classification is performed using Linear Support Vector Machine. The System is tested on four different wellknown datasets namely, sport events Database, Flavia Leaf Dataset, Leeds Butterfly Dataset and Birds Dataset . The proposed system is implemented in MATLAB and achieves an average class accuracy of 96%, 99%,95% and 95% for the four datasets respectively .

**Keywords** Classification, Edge Detection, Confidence Co-Occurrence Matrix, Histogram, Local Binary Pattern, Support Vector Machine.

**AMS 2010 subject classifications** 68U10, 93E10.

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## 1. Introduction

In the last decade, Content-based Image classification has attracted people from both academia and industry. The task is to automatically classify an image by feature extraction and assignment of a label. The Content-based Image Classification produces many successful applications in areas like Agriculture, Music, Bio-metric, and Medical science to name the few.

Any activity done under specific environment, with the help of some objects, is widely known as 'event'. The activity can be carried out by humans (singing, cooking etc.) or by the nature (earthquake, flood etc.) or by any human-made objects (automated task or task carried out by robots). There are three types of dataset available for event classification: video, audio, and image. As many people capture events by clicking pictures, it is not always necessary to have the video information available. The event recognition from images is more challenging task as compared to background scene classification and object recognition. The remainder of this paper is organized as: Section 2 covers literature review, Section 3 gives a detailed view of the proposed system and explains Confidence Co-occurrence Matrix in detail, Section 4,5,6 and 7 discuss datasets and experimental setup, Section 8 describes results and comparisons among chosen classifiers and Section 9 concludes our work

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pattern) for protein sequence. Each components of Equation 2 are explained in Table 4.

$$\phi_1 = (f(\beta), f(\alpha), f(\alpha\lambda_1\alpha\lambda_1\alpha), f(\beta\lambda_1\beta\lambda_1\beta), f(\beta\lambda_1\beta), f(\beta\alpha\beta), f(\alpha\lambda_2\beta\lambda_2\alpha)) \tag{2}$$

Where $\alpha = [G|H|I]\{3,\}$, $\beta = [E|B]\{2,\}$, $\lambda_1 = [T|S|C]^+$, $\lambda_2 = [T|S|C]^*$, $f$ is a function calculating frequency of motif, {X,} indicates occurrences of X or more based on minimum pitch found in respective structure, + indicates one or more occurrences, * indicates zero or more occurrences, | denotes OR and G, H, I, E, T, B, S and C are 8 states of secondary structure.

The local information present within protein's secondary structure is helpful in prediction tasks. It is observed by evaluating various three dimensional structures of protein sequences that many times motifs repeat themselves in a certain part of sequence only pertaining to structural and functional activity. Such local information optimizes machine learning process by maximizing confidence for prediction and reduces computational complexity by narrowing down spatial arrangements search space. Thus, local information provides twofold benefits to prediction process. For incorporating such local and spatial ordering information, secondary structure representation of protein sequence is divided into four parts of approximately equal length. Equation (2) is applied on each of the four parts. These details are shown in Equation 3. Equation 3 produces feature vector of 28D from secondary structure representation of protein sequence.

$$\phi_2 = \begin{pmatrix} f(\beta)_{p1}, f(\alpha)_{p1}, f(\alpha\lambda_1\alpha\lambda_1\alpha)_{p1}, f(\beta\lambda_1\beta\lambda_1\beta)_{p1}, f(\beta\lambda_1\beta)_{p1}, f(\beta\alpha\beta)_{p1}, f(\alpha\lambda_2\beta\lambda_2\alpha)_{p1}, \\ f(\beta)_{p2}, f(\alpha)_{p2}, f(\alpha\lambda_1\alpha\lambda_1\alpha)_{p2}, f(\beta\lambda_1\beta\lambda_1\beta)_{p2}, f(\beta\lambda_1\beta)_{p2}, f(\beta\alpha\beta)_{p2}, f(\alpha\lambda_2\beta\lambda_2\alpha)_{p2}, \\ f(\beta)_{p3}, f(\alpha)_{p3}, f(\alpha\lambda_1\alpha\lambda_1\alpha)_{p3}, f(\beta\lambda_1\beta\lambda_1\beta)_{p3}, f(\beta\lambda_1\beta)_{p3}, f(\beta\alpha\beta)_{p3}, f(\alpha\lambda_2\beta\lambda_2\alpha)_{p3}, \\ f(\beta)_{p4}, f(\alpha)_{p4}, f(\alpha\lambda_1\alpha\lambda_1\alpha)_{p4}, f(\beta\lambda_1\beta\lambda_1\beta)_{p4}, f(\beta\lambda_1\beta)_{p4}, f(\beta\alpha\beta)_{p4}, f(\alpha\lambda_2\beta\lambda_2\alpha)_{p4}, \end{pmatrix} \tag{3}$$

Where $\alpha = [G|H|I]\{3,\}$, $\beta = [E|B]\{2,\}$, $\lambda_1 = [T|S|C]^+$, $\lambda_2 = [T|S|C]^*$, $f$ is a function calculating frequency of motif, $p_i$ indicates $i^{th}$ part of sequence for $1 \le i \le 4$, {X,} indicates occurrences of X or more based on minimum pitch found in respective structure, + indicates one or more occurrences, * indicates zero or more occurrences, | denotes OR and G, H, I, E, T, B, S and C are 8 states of secondary structure.

Frequency of each pattern represents compositional, distributional and transitional aspects of motifs. It has huge impact in discriminating protein structural classes based on its secondary structure representation.

Features extracted from patterns of secondary structure have limitations when different patterns are involved in a single record. It may lead to incorrect classification or correct classification with a narrow margin. Machine learning models created with such constraint may compromise their validity soon with arrival of more complex unseen data. For handling this issue, we also incorporate feature based on primary structure representation of protein.

SCOPe 2.07 dataset includes header description along with sequence, fold and class information. Header contains the information of species for a protein sequence. Species information is also available in protein sequence database uniref100 (Consortium et al., 2018) (Consortium, 2007). Similarity of species information is likely to be observed in proteins categorized to similar structure and function in future. It is known that protein tertiary structure is manifestation of function. Functional differences are observed in species. Difference in species information also leads to difference in physicochemical features like amino acid profile, surface charge, etc (Ikuma et al., 2016; Steffen et al., 2016). Hence, the species are expected to have strong correlations with structural class. Species represent knowledge of evolutionary history of a protein. Evolutionary knowledge strengthens the prediction of structural class of protein for sequence of low identity. This keyword based features when coupled with secondary structure based features provides a distinct way of distinguishing protein structural classes. The steps to extract relevant and non redundant keywords from header information of ASTRAL 1.73 dataset is shown below in PseudoCode 1.

PseudoCode 1: Keyword Extraction from Header Information of Protein Sequences of ASTRAL 1.73

```
For r = 1 to R
    Extract header from each record r
    Assign r to respective protein structural class c (i.e. c = 1 to C, where C = 4)
For c = 1 to C
    Create a dictionary: DictO_c(keyword, frequency)
    Sort dictionary DictO_c in ascending order of frequency
    Remove (keyword, frequency) pair from the head (top 5%) and tail (bottom 5%) of DictO_c
Merge DictO_c for c = 1 to 4 into DictF after removing redundant keywords.
```

The importance of keywords determined through the ensemble method: Random Forest. The reasons for selecting Random Forest for keywords selection are; methodology and reasoning is interpretable, generalization is sound and it is highly accurate. The importance of features is derived based on their purity in the given base classifier in comparison to other base classifiers. Gini importance of python's scikit-learn is used for impurity calculation (Garreta and Moncecchi, 2013; Pedregosa et al., 2011). For feature selection, only training set data is used to avoid possible overfitting of model. The dictionary is containing total of 66 keywords representing all four classes. To reduce the sparseness of feature vector we identify set of 30 keywords, from all keywords with approximately 92% support for representing the four protein structural classes as given in Fig. 7. The keywords are shown as '.' to accommodate in a figure. Equation 4 represents feature vector based upon the header information of primary structure of protein. It generates 30D feature vector.

$$\phi_3 = (b(K_i) = 1 if K_i \in HeaderInformationofInputSequenceOtherwise0) \tag{4}$$

Where, b is a Boolean function determining presence of keyword K in input sequence's header information for $1 \le i \le 30$

The final feature set $\phi_f$ is of 65D. It is described in Equation 5. This feature set is used for constructing features vectors from protein sequences for predicting protein structural class using machine learning algorithm.

$$\phi_f = (\phi_1, \phi_2, \phi_3) \tag{5}$$

The process followed to construct feature vector of 65D based on representation of primary and secondary structure for a SCOPe protein sequence is summarized in Fig. 8. C# language is used to implement all functionality shown in Fig. 8.

### 2.4. Machine learning algorithm

The use of machine learning algorithm has spread beyond the computer science to majorly all domains in last two decades (Domingos, 2012). The exponential growth of biological data needs algorithms that can learn to identify important parameters and features while performing tasks intelligently. Machine learning algorithms are the ones which can fulfil this requirement. Different types of machine learning algorithms are popular in bioinformatics such as supervised learning, clustering and probabilistic graphical models (Olson et al., 2017; Lozano et al., 2006).

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# Discovery of Significant miRNA-biomarkers for Breast Cancer using Decision Tree Classifier

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**ABSTRACT: Breast cancer is the most common cancer in women around the world, making biomarker discovery for breast cancer very important. Machine learning based methods are adopted hugely in almost all computational biology tasks due to advancements in computing facility. Due to The Cancer Genome Atlas (TCGA) project, it is possible to analyze genomic and molecular cancer data using machine learning algorithms. Breast cancer data available from TCGA is processed and analyzed with decision tree algorithm. Tree classifier uses 465 miRNAs as attributes after removal of 581 miRNAs with 50% or more sparseness. The decision tree classifier identifies hsa-mir-139, hsa-mir-10b, hsa-mir-3677 and hsa-mir-21 as the significant miRNAs for distinguishing breast cancer and non-breast cancer sample. The functional enrichment results suggest hsa-mir-205, hsa-mir-21 and hsa-mir-33b are associated with breast cancer.**

**Keywords:** breast cancer, decision tree classifier, miRNA biomarker, The Cancer Genome Atlas.

**Abbreviations:** TCGA, the cancer genome atlas; GDC, genomic data commons; RNA, ribonucleic acid; miRNA, micro ribonucleic acid; SVM, support vector machine.

## I. INTRODUCTION

Breast cancer is reported as the most common diagnosed malignancy in the women [1-3]. Mortality can be controlled by finding out improved diagnostic strategies. The microRNA (i.e. miRNA) are small (19-24 nt), non-coding RNA [4]. miRNA are responsible for managing several activities in the human immune system [5]. Defects in the working of miRNA are related with cancers and other diseases [6, 7]. The emergence of high throughput technologies made it possible to collect large amount of biological data for cancer through The Cancer Genome Atlas (i.e. TCGA) project [8].

There are three main challenges while leveraging advantages due to availability of biological data using computational techniques and gaps found in research work of this field. The proposed approach must be capable of handling hundreds of parameters present within data. The obtained prediction results must be validated by results captured using experimental methods. The networked relation must be captured between predicted parameter and targeted entity.

Differential expression is the widely used statistical method for biomarker discovery. Machine learning algorithms can be used to identify key biomarkers in terms of miRNA. Recently, decision tree classifier is used to predict lung cancer status and sub-type [9] using TCGA dataset. The work used 5 miRNAs in the diagnosis of lung cancer status and sub-typing. The researchers use SVM based classifier to classify cancer patients of TCGA into early and advanced stages [10]. Their work identifies 34 significant miRNAs that achieves mean accuracy of 80.38% during a 10-fold cross validation. The TCGA dataset is also used to find biomarkers for soft tissue sarcomas using Random forest algorithm [11]. The colorectal cancer data from TCGA is used to find prognostic miRNA using expression analysis [12].

It is observed during literature survey, research works on identifying miRNA-biomarkers from TCGA dataset has not yet obtained desired results for breast cancer. While breast cancer is the malignancy reported widely all over the world in the women population. Even, recent research works are not fully establishing relation between reported miRNA with gene product for understanding impact due to malignancy. Thus, in the current study we aim to identify biomarkers for breast cancer using decision tree classifier. Biomarkers used for deciding thresholds in tree classifier are linked with other experimental works related to breast cancer. This step is essential in validating our research results. Then, network of significant miRNA and gene product is prepared for functional enrichments. This gives understanding from other dimension in terms of miRNA-gene relation targeting disease non-disease situation. The functional enrichment results assert decision tree classifier claims. Decision tree classifier is used to establish a machine learning model which is sound and interpretable. Decision tree algorithm also implicitly perform feature screening which has additive advantage where thousands of attributes are present.

The classifier predicts important miRNA-biomarker for breast cancer with accuracy of more than 97% consistently surpassing other research works [9, 10, 12] while handling hundreds of attributes during machine learning. The reported miRNA-biomarkers are verified against experimentally found evidences for their role in breast cancer. Finally, a networked relation is established for showing clear association between predicted parameter and targeted entity. This would become a starting point for research in protein-protein interaction and targeted drug discovery.

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# Protein Fold Prediction for Protein Sequences of Low Identity Based on Evolutionary and Spatial Features Using Random Forest Algorithm

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**Abstract:** Protein fold prediction is a milestone step towards predicting protein tertiary structure from protein sequence. It is considered one of the most researched topics in the area of Computational Biology. It has applications in the area of structural biology and medicines. Extracting sensitive features for prediction is a key step in protein fold prediction. The actionable features are extracted from keywords of sequence header and secondary structure representations of protein sequence. The keywords holding species information are used as features after verifying with uniref100 dataset using TaxId. Prominent patterns are identified experimentally based on the nature of protein structural class and protein fold. Global and native features are extracted capturing the nature of patterns experimentally. It is found that keywords based features have positive correlation with protein folds. Keywords indicating species are important for observing functional differences which help in guiding the prediction process. SCOPe 2.07 and EDD datasets are used. EDD is a benchmark dataset and SCOPe 2.07 is the latest and largest dataset holding astral protein sequences. The training set of SCOPe 2.07 is trained using 93 dimensional features vector using Random forest algorithm. The prediction results of SCOPe 2.07 test set reports the accuracy of better than 95%. The accuracy achieved on benchmark dataset EDD is better than 93%, which is best reported as per our knowledge.

**Keywords:** Evolutionary; Protein Fold; Protein secondary structure; Random Forest; Spatial; Structural classification of protein.



## 1. Introduction

Knowledge of protein folding provides vital insights on structural and functional aspects of proteins, in current times. Demystifying the process of protein three dimensional structure formations from protein sequence is among the most complex mysteries. Protein fold prediction is the intermediate stage in pipeline of protein tertiary structure discovery [1].

Essentially, protein folding leads a protein being transformed from its denatured state to its biologically and functionally active confirmation [2]. Protein fold prediction is acquiring three dimensional protein structures from protein sequences without being concerned of protein sequence similarity [3].

The protein fold prediction pipeline consists of two main stages. Feature extractions from protein sequence and modeling of features using machine learning algorithms [4]. There are several types of features that can be extracted from protein sequences like; sequential,

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# Recent Trends in Machine Learning-based Protein Fold Recognition Methods

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**Abstract:** Proteins are macromolecules that enable life. Protein function is due to its three-dimensional structure and shape. It is challenging to understand how a linear sequence of amino acid residues folds into a three-dimensional structure. Machine learning-based methods may help significantly in reducing the gap present between known protein sequence and structure. Identifying protein folds from a sequence can help predict protein tertiary structure, determine protein function, and give insights into protein-protein interactions. This work focuses on the following aspects. The kind of features such as sequential, structural, functional, and evolutionary extracted for representing protein sequence and different methods of extracting these features. This work also includes details of machine learning algorithms used with respective settings and protein fold recognition structures. Detailed performance comparison of well-known works is also given.

**Keywords:** evolutionary; protein fold; protein secondary structure; random forest algorithm; spatial; structural classification of protein



## 1. Introduction

Protein Sequences consist of 20 standard amino acids, which fold into their respective three-dimensional structure. The protein function is due to its three-dimensional structure and shape [1,2]. It is challenging to understand how a chain of amino acid residues is folded into its three-dimensional structure. There is a wide gap in sequence and structure availability. Many experimental methods are currently used to determine protein structure, including X-ray crystallography [3,4] and NMR spectroscopy [5]. These methods cannot help reduce the vast amount of gap present between sequence and structure, as they are slow and much costlier [6]. The machine learning-based methods may help significantly in reducing this gap. It is a challenging task to predict a protein tertiary structure from a protein sequence directly. Identifying a protein fold from a protein sequence can help predict a protein tertiary structure and function. An in-silico method for protein fold recognition has many applications in biology, chemistry, and medicine [7–12].

Identifying a fold category of a protein sequence is called fold recognition [13–16]. The process of protein fold recognition is summarized in the following Figure 1. The different types of feature vectors are created from input protein sequences. Features vectors are combined for use by machine learning algorithms. Combining features plays an important role in representing protein sequence information for building a machine learning model.

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RESEARCH PAPER

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# EVALUATION OF OPENMP OPTIMIZATION IN HETEROGENEOUS COMPUTING MODE BY CODE OFFLOADING ON INTEL XEON PHI CO-PROCESSOR

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***Abstract:*** As the computing needs are increasing, the utilization of compute powers of multi-processors and co-processors together is an active area of research. This paradigm is known as Heterogeneous computing. With the increasing data sizes and complexity of algorithms, and dead lock reached in processor clock frequency due to power constraints, multi core and many core CPUs and GPUs have been used for parallel computing. It has become new approach for high volume data processing in the field of image processing. The present authors had earlier tested on the Intel Quad Core i7 processor with 8 threads and two Intel Xeon 12 core with 48 threads CPUs for optimization of K-Means clustering image processing code using remote sensing data. The speedup of 5x was achieved on Intel i7 core CPU and 13x was obtained on Intel Xeon CPU when dynamic scheduling as threads deployed were large. In continuation of the earlier studies, the present study analyses the Intel Xeon phi coprocessor 7120P(device) HPC accelerator performance with processor base frequency of 1.24 GHz along with OpenMP Parallel computing model. It is observed that the offloading will not give best result with small data size. To get the full benefits of offloading on Intel Xeon phi coprocessor, computation offloading with OpenMP utilizing both processor and coprocessor gains accelerations and increases the performance if communication overhead is less than the computation times which is highly application dependent.

***Keywords:*** Key words: Intel i7, Xeon, Intel Xeon Phi, Code Offloading, OpenMP, Image Processing, K-Means Clustering, Code Optimization.

## I. INTRODUCTION

Since the requirement and need of more and more compute power is increasing rapidly, there many new architectures are to fulfill this requirements. One of them is GP-GPU to fulfill this requirement. The GPU manufactured by NVIDIA mainly for gaming systems have found way into parallel computation as GP-GPUs. The GPGPU Provides high parallelism and fast computation speed for parallel applications, but its CUDA programming complexity presents a significant challenge for developer and has been greatly simplified by introducing improved library functions for better memory management [3]. Even though the CUDA Programming model was developed specifically for NVIDIA GPU, the heterogeneous programming of GP-GPU is still complex as compared to programming to General Purpose CPU and Intel Xeon phi co-processor/Processor using parallel programming model such as OpenMP. The another architecture which can accomplish the requirement of accelerated computing is many integrated core (MIC) architecture of Intel Xeon Phi coprocessor (fig. 1). A program source code written for standard Intel® Xeon® processor(CPU) can be compiled and run on a Intel® MIC Products (Intel Xeon phi). The programming these cores can be with the OpenMP directives in standard C, C++, and

FORTRAN source code[4]. The newer version of OpenMP like OpenMP v4.0 [5] provides directives to program accelerators and also new directives to address the management of a shared-memory. OpenMP v4.0 focuses on latest Intel Xeon phi co-processor and processor technologies. OpenMP v4.0 contains some key directives like "target" which compiles and loads the executable onto a device and the "map" clause for selection of data item to be transferred to and from the device. The "target data" directive allows allocating of device and transferring of data to it. Before the actual offload takes place, the "device" clause has provision of allowing a specific device if more than one device is present in the system. [6].

Three modes of offloading are shown in fig. 2. The most common Execution modes in heterogeneous environment is offloading a compute intensive portion of a code to the Device [7, 8]. The mode is known as native mode, wherein the entire code is uploaded on the device for execution .

**Offload mode:** In this mode, an application starts execution on a host and later some selected highly computationally intensive parallelizable portions of the code are offloaded (i.e. sent) to device(s) for the execution on coprocessors by using all the cores and resources on the device computing system. This mode is used when a program contains largely and highly parallel codes and the concerned data for processing on the device(s) are large in size. The data required for processing on device(s) by the offloaded program for computation is to be transferred from CPU to coprocessor(s) only once without any need of multiple transfers. In this model, the coprocessor acts as an accelerating device similar to GPU. The Offload is achieved

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# Parallel Computing Models and Analysis of OpenMP Optimization on Intel i7 and Xeon Processors

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**ABSTRACT**

With the increasing data sizes and complexity of algorithms, and dead lock reached in processor clock frequency due to power constraints, multi core and many core CPUs and GPUs have been developed for parallel computing. This has become an inevitable approach for high volume data processing such as image processing. There have been several APIS for parallel processing developed with added merits and potentials, such as OpenACC, OpenMP, OpenCL and CUDA. Among these, the CUDA is implementable on NDVIDIA's GP-GPUs. Whereas others are implementable on multicore and many core CPUs and GPUs, include Intel Xeon Phi co-processors. Here we review both the hardware and software architectures of the devices and API. Then, compare the performance of OpenMP 2.x API when used on Intel Quad Core i7 (8 threads) processor with dual Intel Xeon 12 core (48 threads) CPUs by optimizing an image processing code on clustering in multispectral feature space using remote sensing data. The maximum speedup 5x is achieved on Intel i7 core CPU and speedup of 13x is achieved on Intel Xeon CPU by invoking dynamic scheduling when number of threads deployed are large. Minimum and maximum stack size required for different number of threads are also explored.

Keywords: *Intel i7, Xeon, OpenACC, OpenMP, OpenCL, CUDA, Image Processing, K-Means Clustering Algorithm, Code Optimization.*

## 1. INTRODUCTION

The Remote Sensing applications and many other applications like Medical imaging, Multimedia Technology and advanced and fast graphics used in gaming software etc. deal with large volume of data which require time effective parallel data processing algorithms and techniques. Now a day, the high speed computers are available which contains many core and multi core processors and coprocessors with high configuration for parallel computation. Parallel Computing has become an inevitable approach for high volume data processing such as image processing and also increasing demand of real time processing of images. Older approaches of multi core programming have been deprecated and hence there is a need to develop newer approaches that drastically increase the speed and performance.

There are different types of parallelism to achieve parallel computing in terms of software. First one is the instruction level of parallelism, which extracts the parallelism from a single instruction stream working on a single stream of data which provide low level of parallelism. Second is the processor level parallelism supporting more than one processor used for highly parallel application in which overall application is divided into subtasks and then computed on multi-processor simultaneously. Due to this, an application can utilize all the processors boosting the application performance. While there are high performance computers which contain large number of cores and multi-processors that can be simultaneously used for computing to get high performance and faster speed. For this, parallel application need to execute on many core and multi-processor architecture and require programming models that automatically scale with the number of processors or cores available and also provide synchronization between them.

### 1.1 Parallel Processing on CPU/GPU

In Remote sensing image processing, large number of images are processed and repetitive operations are performed on pixels using SIMD execution model on multi-processor in parallel to get better performance. There are many hardware and software approaches for

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# Fog Computing:
## Applications, Concepts, and Issues

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C. K. Bhensdadia, Dharnsinh Desai University, Nadiad, India

### ABSTRACT

The Internet of Things could be a recent computing paradigm, defined by networks of extremely connected things – sensors, actuators and good objects – communication across networks of homes, buildings, vehicles, and even individuals whereas cloud computing could be ready to keep up with current processing and machine demands. Fog computing provides architectural resolution to deal with some of these issues by providing a layer of intermediate nodes what's referred to as an edge network [26]. These edge nodes provide interoperability, real-time interaction, and if necessary, computational to the Cloud. This paper tries to analyse different fog computing functionalities, tools and technologies and research issues.

### KEYWORDS

Applications, Cloud, Fog Computing, Internet of Things

### 1. INTRODUCTION

At a really generic level of understanding it is said that Internet of Things (IoT) may be the network infrastructure where the physical and virtual objects are all equipped with sensing and communication capabilities in order that they will use the Pervasive Internet for data transmission and other controlling and monitoring purposes. This definition could seem rather dubious at the primary scan. The inferences and the implications of the definition are going to be clearer as we have a tendency to move forward with the content of this text.

To put this simply, "IoT is a scenario in which objects, animals or people are provided with unique identifiers and the ability to automatically transfer the data over a network without requiring human-to-human or human-to-computer interaction". Explosive growth of Smart Devices and PCs brought the amount of devices connected to the Internet to 12.5 billion in 2010, while the world's human population exaggerated to 6.8 billion. It is estimated by CISCO that IoT was "born" between 2008 and 2009 (see Figure 1).

'Fog Computing' is the computing directly at the edge of the network, which might deliver new applications and services particularly for the longer term of web. This computing relies on the basis that process jobs, which can be executed on edgy nodes (located in between the cloud and user devices) to reduce communication latencies. Thus, fog computing provides higher Quality of Service (QoS).

In fog computing, fog nodes offer resources/services at the edge of the network. They will be devices with limited capability like set-top boxes, access points, routers, switches, base stations, and end devices, or devices with lots of capability i.e. machines like Cloudlet and IOx.

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# Resources and components for gujarati NLP systems: a survey

**Nikita P. Desai**[1] · **Vipul K. Dabhi**[1]



**Abstract**
Natural Language Processing (NLP) represents the task of automatic handling of natural human language by machines. There is a large spectrum of possible NLP applications which aid in automating tasks like text translation amongst languages, retrieving and summarizing data from very huge and complex repositories, spam email filtering, identifying fake news in digital media, finding political opinions, views and sentiments of people on various government policies, providing effective medical assistance based on past history records of patients etc. Gujarati language is an Indian language with more than sixty million users worldwide. At present, many efforts are laid for developing NLP applications and resources for Indian languages. This survey gives a taxonomy and comprehensive report regarding component and resource development for Gujarati NLP systems. Also, few prominent tools available in open domain are tested, and their posterior analysis is presented. Possible measures to handle the issues in resource and component development of Gujarati NLP system are also discussed. This report might be useful for industry, researchers and academicians to have a clear picture of the research gaps, challenges and opportunities in Gujarati NLP systems.

**Keywords** Indian language · Gujarati · Natural language processing · Tools · Lexical resources · Corpus · Components

## 1 Introduction

Natural Language Processing (NLP) is a subfield of artificial intelligence with blend of linguistics and computer science fields. It focuses on facilitating communication with computers in human language. It targets to make computers read, process, understand and write text in a language which is natural for humans.

The field of Natural Language Processing can be formally described as a field where theoretically motivated computational techniques are used, for analyzing and

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*Research Article*

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# Peptide Markers based Prediction of Antigen Sequence using Neural Network

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**ABSTRACT**

*Bioinformatics has witnessed considerable progression in recent years; the prediction of antigen sequence in big data environment still remains challenging. A novel approach is proposed here to generate and evaluate tri-peptide markers, where a combination of high frequency tri-peptides can signify a characteristic of target antigen sequence. A dataset of Plasmodium falciparum antigen sequences is extracted from benchmark uniref100 protein sequence database; Training and test set are generated from extracted P. falciparum dataset. Genetic Algorithm (GA) is used here to identify an optimal set of tri-peptide markers from training set. Through different generations of GA, markers are evaluated using approximate selection function. A total 100 tri-peptides are identified using GA and the rest 150 are extracted by examining fitness function using iterative convergence algorithm. A back propagation neural network is trained to predict target antigen sequences using selected tri-peptide markers. The algorithm is tested on a test set which is non-inclusive in training set and the prediction result obtained shows 93% accuracy. This algorithm can also be useful to synthesis new sequence as possible drug antigen for given target protein.*

***Key words:*** *Plasmodium Falciparum; Tri-peptide Residue; Occurrence Frequency; Population Ratio; Genetic Algorithm; Iterative Convergence Algorithm; Back-propagation Neural Network.*

## INTRODUCTION

Antigen (Ag) is a foreign substance that enters in human body and persuades an immune system, which affects the production of antibodies (Abs); in other words Ag causes production of Abs against itself in immune system[20,21]. *P. falciparum* is protozoan parasite that causes malaria in human body. Since the protein is the candidate for parasite Ag it can be used to design vaccine against parasite Ag[2]. *P. falciparum* proteins are immunogenic according to analysis of Katarzyna *et al*[3]. This *P. falciparum* causes the most dangerous form of diseases like malignant malaria[1]. In 2015, World Health Organization has reported that there are around 214 million cases of malaria worldwide which resulted into 438000 deaths[4].

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# Empirical Study of Job Scheduling Algorithms in Hadoop MapReduce

**Article** *in* Cybernetics and Information Technologies · April 2017

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# Empirical Study of Job Scheduling Algorithms in Hadoop MapReduce

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***Abstract:*** *Several Job scheduling algorithms have been developed for Hadoop-MapReduce model, which vary widely in design and behavior for handling different issues such as locality of data, user share fairness, and resource awareness. This article focuses on empirically evaluating the performance of three schedulers: First In First Out* (*FIFO*)*, Fair scheduler, and Capacity scheduler. To carry out the experimental evaluation, we implement our own Hadoop cluster testbed, consisting of four machines, in which one of the machines works as the master node and all four machines work as slave nodes. The experiments include variation in data sizes, use of two different data processing applications, and variation in the number of nodes used in processing. The article analyzes the performance of the job scheduling algorithms based on various relevant performance measures. The results of the experiments are evident of the performance being affected by the job scheduling parameters, the type of applications, the number of nodes in the cluster, and size of the input data.*

***Keywords:*** *Big Data, Hadoop, MapReduce, job scheduling, analysis, experimental evaluation.*

## 1. Introduction

For today's era of the digital world, generating data rapidly, MapReduce [1] provides an ideal framework for the processing of such large data by using parallel and distributed programming approaches. In the MapReduce, a computation is divided into two functions: Map and Reduce. These two functions can be modified based on the type of processing needed by an application. The MapReduce works with Hadoop [2] for processing a large number of datasets, which may be structured or unstructured. The architecture needed for processing using MapReduce consists of one Master node (running JobTracker) and many Slave nodes (running TaskTrackers). Hadoop is an open-source framework that enables distributed processing of large datasets through its distributed file system and distributed

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# An Internet of Things Based Model for Smart Water Distribution with Quality Monitoring

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**ABSTRACT**: Water is an important resource for life and its existence. Nowadays, due to increase in migration from a rural area to urban areas, the population in cities is increasing rapidly. To meet the need of water requirement, its distribution and quality check, a novel approached is proposed which is based on IoT (Internet of Things). The proposed system consist different sensors like water flow sensor, pH Sensor, water control valve and a raspberry PI as a core controller. A water control valve is controlled through web interface based on water flow sensor value to ensure equal and adequate water distribution to each connection (end point).

**KEYWORDS**: Water management; water distribution; water quality monitoring; architecture model; IoT; cloud computing.

## I. INTRODUCTION

Water is an important resource for life and its existence. Due to a shortage of the fresh water, it is necessary to have control over water distribution. Hence, there is a need for better water distribution technology while also considering its quality.

Traditionally water distribution is carried out zone wise. If the new area is developing around the city, a new water distribution zone is developed with a new municipal water tank in that zone. Even in the specific zone, area or society wise manual water control valves are used for water distribution among the different societies or areas. This manual water control valves are used because of the limitation of the required water pressure to supply water to all the areas or societies within that zone. This manual water control valve is opened to provide water in the specific area at a specific time while other valves in that specific zone are closed to have minimum water pressure so water can reach to its destination. Another important thing is that the water quality is observed only at the Municipal water tanks which are located zone wise and hence water quality is not been checked at end points where chances of water contamination is present due to rust in the pipeline, hole in the pipeline and some other reasons. Even if water quality is checked at end points, it is time consuming, labour intensive and all end points are not going to cover. Hence, there is need of smart water distribution system with continuous water quality check.

By focusing on the above issues, we have proposed model base on IoT environment to overcome the above problems. In our proposed model, we have used raspberry Pi as a controller and different sensor which can upload data to the cloud. Some sensor can be controlled through the cloud using web interface.

The rest of paper is organized as follows: The sections II shows related works. Section III consists of overall proposed diagram and working of the proposed system. Section IV shows the conclusion of our proposed model. Section V shows the future work that can extend a system to a new height.

# Detection and classification of rice plant diseases

**Article** *in* Intelligent Decision Technologies · July 2017

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# Detection and Classification of Rice Plant Diseases

Harshadkumar B. Prajapati* Jitesh P. Shah†
Vipul K. Dabhi‡

November 15, 2016

**Abstract**

Identification of diseases from the images of a plant is one of the interesting research areas in the agriculture field, for which machine learning concepts of computer field can be applied. This article presents a prototype system for detection and classification of rice diseases based on the images of infected rice plants. This prototype system is developed after detailed experimental analysis of various techniques used in image processing operations. We consider three rice plant diseases namely Bacterial leaf blight, Brown spot, and Leaf smut. We capture images of infected rice plants using a digital camera from a rice field. We empirically evaluate four techniques of background removal and three techniques of segmentation. To enable accurate extraction of features, we propose centroid feeding based K-means clustering for segmentation of disease portion from a leaf image. We enhance the output of K-means clustering by removing green pixels in the disease portion. We extract various features under three categories: color, shape, and texture. We use Support Vector Machine (SVM) for multi-class classification. We achieve 93.33 % accuracy on training dataset and 73.33% accuracy on the test dataset. We also perform 5 and 10-fold cross-validations, for which we achieve 83.80% and 88.57% accuracy, respectively.

Keywords: Image processing, machine learning, classification, disease classification, disease detection, disease segmentation, rice disease

## 1 Introduction

Plant diseases are one of the causes in the reduction of quality and quantity of agriculture crops [1]. Reduction in both aspects can directly affect the overall

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# Simulation and 3D Visualization of Mobile Call Detail Records to Assist Crime Detection Algorithm Design

The Indian Police Journal
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BPRD Publication
www.bprd.gov.in

**Nishaba D Rana***

**Himanshu S Mazumdar****

**Abstract:**

Investigation of large number of crimes those are committed in recent days use mobile call record analysis as one of the powerful method to detect crime suspects. Almost every person in modern world is electronically connected with each other in complex space time matrix. The presence of any individual and his communication with others are continuously monitored and logged by mobile service providers as Mobile Call Detail Records (CDR). Mobile has become a primary device for communication which has inbuilt identity and location services like IMEI, phone number, GPS etc. mobile call records for modern population are huge and fall under big data category of secure, private and protected archive. Access of such data is restricted and needs valid legal permission to use. This restriction poses a big hurdle in development of any algorithm or utilities using CDR which models call pattern of real criminal activities using computational intelligence. Discriminating natural social and business call patterns from call characteristics of criminal modus operandi is one of the major goals of such pattern recognition.

A simulation and 3D visualization method is developed to generate huge CDR database keeping natural but complex space time matrix of call patterns embedded with call characteristics of criminal modus operandi. Simulation is done first by generating subscriber detail records (SDR) considering the pattern of city telephone directory. A large size CDR database is generated using weighted random call pattern between simulated SDR. CDR is further modified using call pattern of different criminal modus operandi. Objective of such elaborate simulation of huge call records is to develop advanced search algorithms, queries and visualization methods that could be used on real call data to locate actual crime and criminal information.

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# Extractive Based Automatic Text Summarization

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**Abstract:** Automatic text summarization is the process of reducing the text content and retaining the important points of the document. Generally, there are two approaches for automatic text summarization: Extractive and Abstractive. The process of extractive based text summarization can be divided into two phases: pre-processing and processing. In this paper, we discuss some of the extractive based text summarization approaches used by researchers. We also provide the features for extractive based text summarization process. We also present the available linguistic preprocessing tools with their features, which are used for automatic text summarization. The tools and parameters useful for evaluating the generated summary are also discussed in this paper. Moreover, we explain our proposed lexical chain analysis approach, with sample generated lexical chains, for extractive based automatic text summarization. We also provide the evaluation results of our system generated summary. The proposed lexical chain analysis approach can be used to solve different text mining problems like topic classification, sentiment analysis, and summarization.

**Key words:** Automatic text summarization, extractive, abstractive, linguistic processing, lexical chain analysis, topic classification, sentiment analysis.

## 1. Introduction

In today's era of computerized world, the information grows at an exponential rate and it is very difficult to find the representative summary of available information. Automatic text summarization technique finds the relevant information from document or text. It reduces the time required for reading the whole document and also reduces the space needed for storing large amount of data. The automatic text summarization problem can be divided into two sub-problems, Single Document and Multi-Document [1]. The input of the single document summarization process is a single document and output is summary for the given document [2]. The multi-document summarization process takes multiple documents related to a single topic and generates summary by considering important sentences from all documents [3].

A summary can be generated by selecting some part of original text document or can be generated by including all relevant information of the text document [2]. However, both cases provide a summary which reduces the reading time. Automatic text summarization problem can be solved using two approaches: Extractive and Abstractive [1]. An extractive text summarization extracts important sentences from the original document. Extractive approach uses statistical or linguistic features for selecting informative sentences. An abstractive text summarization recognizes the original text and re-tells it in fewer words.

# Extraction of human face features from color images

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# Extraction of Human Face Features from Color Images

Harshadkumar B. Prajapati* Nidhi R. Brahmbhatt†
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July 15, 2018

**Abstract**

Face detection has been widely studied by researchers. However, detection and extraction of human face features is very important as it plays a vital role in variety of applications involving automated face processing. This article focuses on extraction of face parts such as eyes, nose, lips, mustache, and beard on Indian people, for which we have prepared our own face dataset containing variety in faces, from both urban and rural areas. This study focuses on how a detected face part becomes useful in detecting other face parts. We implement our approaches of detecting face parts and evaluate them on our dataset. We exploit YCbCr color model, Viola Jones technique, landmark detection, and level set evolution technique in our approaches of face part detection and extraction. We found that our approaches are effective on extracting face boundary, eyes, nose, and lips and provide comparable results.

Keywords: Image Processing, Facial Features, Human Face Boundary Extraction, Eye Extraction, Nose and Lip Extraction, Beard and Mustache Extraction

## 1 Introduction

Computer based automatic extraction of human facial features is an important research topic due to its widespread applications such as face recognition, face grouping, facial expression recognition, etc. Extracting facial features [1] involves discovering exact locations of different face parts, such as eyes, nose, mouth, eyebrows, beard, moustache, chin, etc., and then separating these portions for further required processing. Extraction of human face parts plays an

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# Survey and Analysis of Human Activity Recognition in Surveillance Videos

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January 10, 2019

**Abstract**

In computer vision, recognizing human activity or behavior is a core challenging problem. This article provides a crisp study of human activity recognition systems in the area of visual surveillance. These systems are used for analysis and understanding of the human behavior. The study starts with the description of various emerging video processing domains, followed by a general process of human action recognition. Then the article covers human detection techniques from images and video. Finally, article also provides a survey of different features and models used in activity recognition systems and an overview of benchmark dataset of video surveillance. From this state-of-the-art survey, researchers can outline promising directions of research.

***Index terms***— visual surveillance, bag-of-visual-words, human activity recognition, motion features.

## 1 Introduction

Visual surveillance is becoming vital for protecting people and property in the recent era when crime rates are increasing[15]. As high-quality cameras are now available easily, many surveillance cameras are already installed around us, but there is a lack of manpower to look after continuous activities happening 24 hours a week [22]. Moreover, such surveillance system produces a lot of video data which leads to increased storage requirements [18]. This storage requirement can put an additional financial burden. Hence, we require an efficient visual surveillance system, which helps to reduce large manpower, human

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# Comparative Study of Frequent Graph Structure Pattern Mining Algorithm

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***Abstract—*** *Structure base frequent pattern mining andclassification has remained one of the most interesting and widely use for bioinformatics, chem.-informatics, web content classification like Wikipedia, social networking, molecular structure classification, protein structure identification...etc. The unknown molecular structure, Social Networking, Protein Structure classification…etc are highly non sequential structure data and it depends on many parameters like type of relation between them and property which makes it more interesting at the same time very difficult to classify dataset. Because of complexity and intrications, the problem has received attention of many researchers all over the world. As a lot of application dataset are represented in term of graph structure pattern, software developers experience difficult to classify the frequent graph sub structure in datasets. Many different types of algorithms have been suggested by researchers' over the period of time base on two types one is Apriori base and another is frequent pattern growth base approaches. In the Apriori-based graph mining method Candidate set generation is still costly especially when there exist a large number of long patterns In Frequent pattern growth Time is wasted as the only pruning that can be done is on single items. These approaches have many pitfalls like most of them identify repeated frequent patterns; all identified frequent patterns are not interesting. This researcher work suggests and provides comparative survey of different sub graph mining algorithm like Gspan, Subdue, FSM …etc. This Comparative survey can be useful to identify and select appropriate sub graph mining algorithm for different types of application.*

***Keywords****—Frequent sub graph mining, Isomorphism, Pattern growth, Apriori*

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## I. Introduction

There are different types of data which can be represented in term of graph structure like web resource, social networking, molecular structure...etc. To classify structure we require identifying most frequent pattern. For identification of frequent pattern there are different graph mining techniques like Apriori base technique and frequent pattern growth base technique. Each technique has some pros and corns regarding performance and working mechanism. This section provides a generic overview of the process of FSM. Any frequent sub graph mining process involves 3 aspects, i) graph representation ii) sub graph Enumeration and iii) frequency counting.

### 1.1 Graph Representations

The simplest mechanism whereby a graph structure can be represented is by employing an adjacency matrix or adjacency list. Using an adjacency matrix the rows and columns represent vertexes, and the intersection of row i and column j represents a potential edge connecting the vertexes vi and vj . The value held at intersection < i, j > typically indicates the number of links from vi to vj . However, the use of adjacency matrices, although straightforward, does not lend itself to isomorphism detection, because a graph can be represented in many different ways depending on how the vertexes (and edges) are enumerated Washio&Motoda 2003. With respect to isomorphism testing it is therefore desirable to adopt a consistent labelling strategy that ensures that any two identical graphs are labelled in the same way regardless of the order in which vertexes and edges are presented (i.e. a canonical labelling strategy). A canonical labelling strategy defines a unique code for a given graph.

### 1.2 Canonical labelling:

It facilitates isomorphism checking because it ensures that if a pair of graphs is isomorphic, then their canonical labelling will be identical Kuramochi&Karypis. One simple way of generating a canonical labelling is to flatten the associated adjacency matrix by concatenating rows or columns to produce a code comprising a list

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# Automatic Detection and Classification of Corona Infection (COVID-19) from X-Ray Images Using Convolution Neural Network

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**Abstract---The novel coronavirus universally known as the COVID-19 outbreak arises at the end of 2019 in one of the East Asian countries and it is subjected to widespread discussion and debate. There are almost 200 countries affected across the globe by COVID-19. And, it has ruined many lives and the global economy. The virus is spreading very rapidly at the pace of around 10 fold in less than a month. Also, in the case of COVID- 19, it is critical to detect the infection, as it employs various symptoms which may differ from person to person. Hence, diagnosis in starting stage and treatment are very much important for such type of infectious disease. The chest x-ray is one of the primary techniques among blood tests and Computed Tomography contributes a major role in the early diagnosis of COVID-19. There is a rising need for automated and auxiliary diagnostic tools for early diagnosis, as there are no accurate and truthful automated toolkits on hand. In this research study, we have designed a Convolution Neural Network architecture – a deep net for the classification of x-ray images of chest among two classes: COVID-19 or Non-COVID- 19 infection. The anticipated model is expected to provide accurate diagnostic results and produced classification accuracy of 99%, 100%, and 100% with 70%-30%,75%-25% and 80%-20% train-test data split respectively, for the binary classification of the x-ray image to be COVID-19 or Non-COVID-19 infection category. We have designed the CNN with optimized parameters with 3 convolution layers and optimized number of filters in each layer.**

**Key Words--- Deep Learning, COVID-19, Chest X-ray, Convolutional Neural Network, Instinctive detection**

## I. INTRODUCTION

The coronaviruses (CoVs) are most infectious in birds but, from several decades it is capable to change host and infecting the humans as well. The coronavirus also known as SARS-CoV-2 is a new member of SARS (severe acute respiratory syndrome) virus spices recognized by its genome sequences [1]. The novel coronavirus epidemic arises in one of the East Asian countries during December 2019 and has extensively blowout across the countries. The coronavirus is rapidly spread from humans to humans. The novel coronavirus indications vary from one person to another person. The extreme symptoms of the COVID-19 are high body temperature, dry cough, and weariness as well as few symptoms are sore throat, diarrhea, and headache [2]. The serious symptoms of the COVID-19 are chest aching and struggle in breath [2]. There are 7818 coronavirus positive cases and 170 deaths are confirmed across the globe during the end of January [3]. The "Public Health Emergency of International Concern" has been declared by The World Health Organization (WHO) on Janyary 30, 2020 due to the extensive increment in coronavirus positive cases [4]. WHO entitled this disease as COVID-19 by February 2020 [5]. As of 25 May 2020, 53,04,772 COVID-19 positive cases and 3,42,029 deaths are confirmed across the globe and 1,50,762 COVID-19 positive cases, and 4,349 deaths are confirmed across India [6] [7].

The COVID-19 is transmissible, thus many countries are applied lockdown to prevent the spreading of COVID-19. Due to this kind of situation, the Government of India has launched many competitions to get innovative ideas from intelligent minds to deal with every domain such as patient care management, fake news detection, movement tracking, large scale sterilization, stabilizing affected business, virus containment and video conferencing for online education [8]-[11].

The numbers of researchers are working on finding proper treatment, antivirus drugs, and therapeutic vaccines of COVID-19. The detection of COVID-19 infection at a premature stage and isolation of the disease infected people is mandatory as the antivirus drug and therapeutic vaccine was not available. The unexpected hike in a positive COVID-19 leads to the need for a massive amount of medical resources. The real-time reverse transcription-polymerase chain reaction (RT-PCR) test is used to detect COVID-19 infection. But, RT-PCR test takes more time to

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# Neural Network Based Indian Folk Dance Song Classification Using MFCC and LPC

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**Abstract:** A large number of folk dance videos are uploaded on the web or added as a situational song in the Bollywood movies. The classification of folk dance videos is essential for dance education, to preserve cultural heritage, and for music companies to provide better customer oriented service. India is a country having many regional languages and each region has its own popular folk dances. Four different Indian folk dances namely, '*Garba*', '*Lavani*', '*Ghoomar*' and '*Bhangra*' are considered. A Folk Dance Classification Framework is proposed which extracts audio signal from video, takes a fragment of 125 seconds from the beginning and further separates it into a set of small segments, calculates Mel-frequency Cepstral Coefficients (MFCC) and Linear Predictive Coding (LPC) coefficients, generates high dimensional feature vector, reduces dimensionality using Principle Component Analysis (PCA) and classifies segments using Scale Conjugate Gradient Neural Network. The performances of chosen classifiers, K-Nearest Neighbor, Naïve Bayes and Neural Networks, are compared. Class labels of all segments are clubbed together and based on majority voting class label is assigned to a folk dance song. System achieves more than 90% accuracy.

**Keywords:** Classification, Folk dance song, Mel-frequency Cepstral Coefficients, Neural network, Linear predictive coding.

## 1. Introduction

The human generated tags are used to categorize and describe the living and non-living things of the vast universe. The tags used for dance are known as 'Dance Genre'. Dance song comprises of purposely selected sequences of human movement accompanied with vocal and background music. Folk music and folk dances constitute a significant part of the folk heritage around the world. The preservation of the folk music and choreographies and their dissemination to the younger generations is a very important issue since folk dance forms an important part of a country's or region's history and culture[1]. Many years ago, classification of dance genre was purely manual through conversation with public and experts' opinion. Automatic dance genre classification is essential because of resource digitization and plenty of new audio and video songs are added every year. Currently, most of the popular sites provide meta-data or text based annotation Automatic dance song analysis will be one of the services used by music distributors to catch the attention of music lovers and to achieve maximum profit. More than a decade, researchers are paying attention to audio signal analysis and classification.

The earliest civilizations discovered in the Indian subcontinent are those of Mohenjo Daro and Harappa in the Indus valley, and are dated about 6000 B.C. It seems that by that time dance had achieved a deemed measure of discipline and it is likely that it must have played some important role in the society, Two beautiful little statuette of bronze dancing girls were found at Mohenjo Daro in 1926 and 1931 respectively [2].

There are mainly two popular dances in India: Classical Dance and Folk Dance. Classical Dance was practiced in courts, temples and on special

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# Indian Monuments Classification using Support Vector Machine

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**ABSTRACT**

Recently, Content-Based Image Retrieval is a widely popular and efficient searching and indexing approach used by knowledge seekers. Use of images by e-commerce sites, by product and by service industries is not new nowadays. Travel and tourism are the largest service industries in India. Every year people visit tourist places and upload pictures of their visit on social networking sites or share via the mobile device with friends and relatives. Classification of the monuments is helpful to hoteliers for the development of a new hotel with state of the art amenities, to travel service providers, to restaurant owners, to government agencies for security, etc.. The proposed system had extracted features and classified the Indian monuments visited by the tourists based on the linear Support Vector Machine (SVM). The proposed system was divided into 3 main phases: preprocessing, feature vector creation and classification. The extracted features are based on Local Binary Pattern, Histogram, Co-occurrence Matrix and Canny Edge Detection methods. Once the feature vector had been constructed, classification was performed using Linear SVM. The Database of 10 popular Indian monuments was generated with 50 images for each class. The proposed system is implemented in MATLAB and achieves very high accuracy. The proposed system was also tested on other popular benchmark databases.



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## 1. INTRODUCTION

Content Based Image Retrieval system has become a significant research issue as plenty of image data have been generated in areas like medicine, Fashion Design, art galleries, entertainment, education, manufacturing and more. QBIC System of IBM [1], Chabot of U.C. Berkeley, Photobook of Massachusetts Institute of Technology (MIT) [2], VisualSEEK [3] and MARS [4] are popular examples of CBIR software systems. The text based retrieval system involves manual annotation of images which involves problems like the vast amount of laborious task and most importantly human perception of the image. Different person perceives the same image differently [5-7].

For many years, a tremendous amount of multimedia data in the form of images, audio and video have been generated due to availability of cost-effective electronic devices like camera, mobile or Handy cam. These multimedia data have been shared, uploaded or emailed to relatives and friends staying away to make them feel that they had not missed the precious moments. Millions of such photographs are uploaded and it is almost impossible to manually classify these pictures as per the monuments people visited. In January 2013, the India was at 3rd position with 62.6 million Facebook members [8].

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RESEARCH PAPER

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# EVALUATION OF OPENMP OPTIMIZATION IN HETEROGENEOUS COMPUTING MODE BY CODE OFFLOADING ON INTEL XEON PHI CO-PROCESSOR

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***Abstract:*** As the computing needs are increasing, the utilization of compute powers of multi-processors and co-processors together is an active area of research. This paradigm is known as Heterogeneous computing. With the increasing data sizes and complexity of algorithms, and dead lock reached in processor clock frequency due to power constraints, multi core and many core CPUs and GPUs have been used for parallel computing. It has become new approach for high volume data processing in the field of image processing. The present authors had earlier tested on the Intel Quad Core i7 processor with 8 threads and two Intel Xeon 12 core with 48 threads CPUs for optimization of K-Means clustering image processing code using remote sensing data. The speedup of 5x was achieved on Intel i7 core CPU and 13x was obtained on Intel Xeon CPU when dynamic scheduling as threads deployed were large. In continuation of the earlier studies, the present study analyses the Intel Xeon phi coprocessor 7120P(device) HPC accelerator performance with processor base frequency of 1.24 GHz along with OpenMP Parallel computing model. It is observed that the offloading will not give best result with small data size. To get the full benefits of offloading on Intel Xeon phi coprocessor, computation offloading with OpenMP utilizing both processor and coprocessor gains accelerations and increases the performance if communication overhead is less than the computation times which is highly application dependent.

***Keywords:*** Key words: Intel i7, Xeon, Intel Xeon Phi, Code Offloading, OpenMP, Image Processing, K-Means Clustering, Code Optimization.

## I. INTRODUCTION

Since the requirement and need of more and more compute power is increasing rapidly, there many new architectures are to fulfill this requirements. One of them is GP-GPU to fulfill this requirement. The GPU manufactured by NVIDIA mainly for gaming systems have found way into parallel computation as GP-GPUs. The GPGPU Provides high parallelism and fast computation speed for parallel applications, but its CUDA programming complexity presents a significant challenge for developer and has been greatly simplified by introducing improved library functions for better memory management [3]. Even though the CUDA Programming model was developed specifically for NVIDIA GPU, the heterogeneous programming of GP-GPU is still complex as compared to programming to General Purpose CPU and Intel Xeon phi co-processor/Processor using parallel programming model such as OpenMP. The another architecture which can accomplish the requirement of accelerated computing is many integrated core (MIC) architecture of Intel Xeon Phi coprocessor (fig. 1). A program source code written for standard Intel® Xeon® processor(CPU) can be compiled and run on a Intel® MIC Products (Intel Xeon phi). The programming these cores can be with the OpenMP directives in standard C, C++, and

FORTRAN source code[4]. The newer version of OpenMP like OpenMP v4.0 [5] provides directives to program accelerators and also new directives to address the management of a shared-memory. OpenMP v4.0 focuses on latest Intel Xeon phi co-processor and processor technologies. OpenMP v4.0 contains some key directives like “target” which compiles and loads the executable onto a device and the “map” clause for selection of data item to be transferred to and from the device. The “target data” directive allows allocating of device and transferring of data to it. Before the actual offload takes place, the “device” clause has provision of allowing a specific device if more than one device is present in the system. [6].

Three modes of offloading are shown in fig. 2. The most common Execution modes in heterogeneous environment is offloading a compute intensive portion of a code to the Device [7, 8]. The mode is known as native mode, wherein the entire code is uploaded on the device for execution .

**Offload mode:** In this mode, an application starts execution on a host and later some selected highly computationally intensive parallelizable portions of the code are offloaded (i.e. sent) to device(s) for the execution on coprocessors by using all the cores and resources on the device computing system. This mode is used when a program contains largely and highly parallel codes and the concerned data for processing on the device(s) are large in size. The data required for processing on device(s) by the offloaded program for computation is to be transferred from CPU to coprocessor(s) only once without any need of multiple transfers. In this model, the coprocessor acts as an accelerating device similar to GPU. The Offload is achieved

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# Parallel Computing Models and Analysis of OpenMP Optimization on Intel i7 and Xeon Processors

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**ABSTRACT**

With the increasing data sizes and complexity of algorithms, and dead lock reached in processor clock frequency due to power constraints, multi core and many core CPUs and GPUs have been developed for parallel computing. This has become an inevitable approach for high volume data processing such as image processing. There have been several APIS for parallel processing developed with added merits and potentials, such as OpenACC, OpenMP, OpenCL and CUDA. Among these, the CUDA is implementable on NDVIDIA's GP-GPUs. Whereas others are implementable on multicore and many core CPUs and GPUs, include Intel Xeon Phi co-processors. Here we review both the hardware and software architectures of the devices and API. Then, compare the performance of OpenMP 2.x API when used on Intel Quad Core i7 (8 threads) processor with dual Intel Xeon 12 core (48 threads) CPUs by optimizing an image processing code on clustering in multispectral feature space using remote sensing data. The maximum speedup 5x is achieved on Intel i7 core CPU and speedup of 13x is achieved on Intel Xeon CPU by invoking dynamic scheduling when number of threads deployed are large. Minimum and maximum stack size required for different number of threads are also explored.

Keywords: *Intel i7, Xeon, OpenACC, OpenMP, OpenCL, CUDA, Image Processing, K-Means Clustering Algorithm, Code Optimization.*

## 1. INTRODUCTION

The Remote Sensing applications and many other applications like Medical imaging, Multimedia Technology and advanced and fast graphics used in gaming software etc. deal with large volume of data which require time effective parallel data processing algorithms and techniques. Now a day, the high speed computers are available which contains many core and multi core processors and coprocessors with high configuration for parallel computation. Parallel Computing has become an inevitable approach for high volume data processing such as image processing and also increasing demand of real time processing of images. Older approaches of multi core programming have been deprecated and hence there is a need to develop newer approaches that drastically increase the speed and performance.

There are different types of parallelism to achieve parallel computing in terms of software. First one is the instruction level of parallelism, which extracts the parallelism from a single instruction stream working on a single stream of data which provide low level of parallelism. Second is the processor level parallelism supporting more than one processor used for highly parallel application in which overall application is divided into subtasks and then computed on multi-processor simultaneously. Due to this, an application can utilize all the processors boosting the application performance. While there are high performance computers which contain large number of cores and multi-processors that can be simultaneously used for computing to get high performance and faster speed. For this, parallel application need to execute on many core and multi-processor architecture and require programming models that automatically scale with the number of processors or cores available and also provide synchronization between them.

### 1.1 Parallel Processing on CPU/GPU

In Remote sensing image processing, large number of images are processed and repetitive operations are performed on pixels using SIMD execution model on multi-processor in parallel to get better performance. There are many hardware and software approaches for

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# Content-based high-resolution satellite image classification

Malay S. Bhatt & Tejas P. Patalia

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## Abstract

Content-based image classification has produced successful and automated applications in various service and product industries. In this paper, high-resolution satellite scene classification based on multiple feature combination is considered. We have proposed confidence co-occurrence matrix, which is a modification of the generalized co-occurrence matrix. The proposed framework combines RGB histogram, HSV histogram, local binary pattern, confidence co-occurrence matrix properties and Canny's edge detection approach. The approach creates a fixed-size feature vector of size 1632. Once a feature vector has been constructed, classification is performed using linear support vector machine. The system is tested using widely popular benchmark Satellite Scene dataset and UC Merced land used dataset having 19 and 21 classes respectively. The proposed system also works well in agricultural science. The system is also tested on folio dataset having 32 species of leaf. Th

Journal of Mobile Computing, Communications & Mobile Networks



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# Automatic Image Description Generation Using Deep Learning Techniques

*Jinal Butala, Dr. Brijesh Bhatt*

## Abstract

*Automatic Image Description Generation methods are extremely useful for image retrieval, search and organization. Previous approaches either use the existing labelled dataset to compose sentences or compose a new description for the test image by exploiting available descriptions of the training images. In practice these methods have limited accuracy, hence if the most important objects in an image cannot be identified, then they cannot generate valid description. Another difficulty lies within the final description generation step; it is crucial to generate grammatically correct sentences.*

*In this paper, we propose a two-stage framework. In the first stage we predict image objects using convolutional neural network (CNN) network Alexnet[1] and the second stage of our framework generates caption for the image using these objects. We segment images and then apply alexnet on each segment one by one and identify the objects present in image. Later, construct sentences using Computer Vision System Toolbox Cascade object detector (COD). Using this technique to identify image classes, we obtain BLEU score to be 51.96 for Alexnet based approach and 46.01 for CNN based approach. Note that BLEU[2] (bilingual evaluation understudy) is an algorithm for evaluating the quality of machine-translated text.*

## Keywords

Convolutional neural network, Deep learning, Alexnet, Artificial intelligence, Cascade object detector, Computer vision toolbox

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# Computer Vision Systems for Content-based Image Classification

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**Abstract** In this paper, computer vision based Content-Based Image Classification systems have been described which are useful in various service and product industries. We have proposed Confidence Co-occurrence Matrix, which is a modification of Generalized Co-occurrence Matrix. The proposed framework merges properties of Confidence Co-occurrence Matrix along with other features such as RGB and HSV Histograms, Local Binary Pattern and Canny's edge detection approach. Proposed approach creates a fixed- size descriptor of size 1632. Once a feature vector has been constructed, classification is performed using Linear Support Vector Machine. The System is tested on four different wellknown datasets namely, sport events Database, Flavia Leaf Dataset, Leeds Butterfly Dataset and Birds Dataset . The proposed system is implemented in MATLAB and achieves an average class accuracy of 96%, 99%,95% and 95% for the four datasets respectively .

**Keywords** Classification, Edge Detection, Confidence Co-Occurrence Matrix, Histogram, Local Binary Pattern, Support Vector Machine.

**AMS 2010 subject classifications** 68U10, 93E10.

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## 1. Introduction

In the last decade, Content-based Image classification has attracted people from both academia and industry. The task is to automatically classify an image by feature extraction and assignment of a label. The Content-based Image Classification produces many successful applications in areas like Agriculture, Music, Bio-metric, and Medical science to name the few.

Any activity done under specific environment, with the help of some objects, is widely known as 'event'. The activity can be carried out by humans (singing, cooking etc.) or by the nature (earthquake, flood etc.) or by any human-made objects (automated task or task carried out by robots). There are three types of dataset available for event classification: video, audio, and image. As many people capture events by clicking pictures, it is not always necessary to have the video information available. The event recognition from images is more challenging task as compared to background scene classification and object recognition. The remainder of this paper is organized as: Section 2 covers literature review, Section 3 gives a detailed view of the proposed system and explains Confidence Co-occurrence Matrix in detail, Section 4,5,6 and 7 discuss datasets and experimental setup, Section 8 describes results and comparisons among chosen classifiers and Section 9 concludes our work

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Research Article

# Predicting structural class for protein sequences of 40% identity based on features of primary and secondary structure using Random Forest algorithm

Apurva, Mehta [a], Mazumdar, Himanshu [b]



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## Highlights

- The latest and largest dataset SCOPe 2.07 used along with benchmark datasets ASTRAL 1.73, 25PDB and FC699.
- The Random Forest algorithm uses Primary and Secondary Structure based feature vectors for prediction.
- The species based features are recognized as sensitive features for predictions.
- The performance of class α/β and α + β increased significantly.

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# Protein Fold Prediction for Protein Sequences of Low Identity Based on Evolutionary and Spatial Features Using Random Forest Algorithm

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**Abstract:** Protein fold prediction is a milestone step towards predicting protein tertiary structure from protein sequence. It is considered one of the most researched topics in the area of Computational Biology. It has applications in the area of structural biology and medicines. Extracting sensitive features for prediction is a key step in protein fold prediction. The actionable features are extracted from keywords of sequence header and secondary structure representations of protein sequence. The keywords holding species information are used as features after verifying with uniref100 dataset using TaxId. Prominent patterns are identified experimentally based on the nature of protein structural class and protein fold. Global and native features are extracted capturing the nature of patterns experimentally. It is found that keywords based features have positive correlation with protein folds. Keywords indicating species are important for observing functional differences which help in guiding the prediction process. SCOPe 2.07 and EDD datasets are used. EDD is a benchmark dataset and SCOPe 2.07 is the latest and largest dataset holding astral protein sequences. The training set of SCOPe 2.07 is trained using 93 dimensional features vector using Random forest algorithm. The prediction results of SCOPe 2.07 test set reports the accuracy of better than 95%. The accuracy achieved on benchmark dataset EDD is better than 93%, which is best reported as per our knowledge.

**Keywords:** Evolutionary; Protein Fold; Protein secondary structure; Random Forest; Spatial; Structural classification of protein.



## 1. Introduction

Knowledge of protein folding provides vital insights on structural and functional aspects of proteins, in current times. Demystifying the process of protein three dimensional structure formations from protein sequence is among the most complex mysteries. Protein fold prediction is the intermediate stage in pipeline of protein tertiary structure discovery [1].

Essentially, protein folding leads a protein being transformed from its denatured state to its biologically and functionally active confirmation [2]. Protein fold prediction is acquiring three dimensional protein structures from protein sequences without being concerned of protein sequence similarity [3].

The protein fold prediction pipeline consists of two main stages. Feature extractions from protein sequence and modeling of features using machine learning algorithms [4]. There are several types of features that can be extracted from protein sequences like; sequential,

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# Recent Trends in Machine Learning-based Protein Fold Recognition Methods

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**Abstract:** Proteins are macromolecules that enable life. Protein function is due to its three-dimensional structure and shape. It is challenging to understand how a linear sequence of amino acid residues folds into a three-dimensional structure. Machine learning-based methods may help significantly in reducing the gap present between known protein sequence and structure. Identifying protein folds from a sequence can help predict protein tertiary structure, determine protein function, and give insights into protein-protein interactions. This work focuses on the following aspects. The kind of features such as sequential, structural, functional, and evolutionary extracted for representing protein sequence and different methods of extracting these features. This work also includes details of machine learning algorithms used with respective settings and protein fold recognition structures. Detailed performance comparison of well-known works is also given.

**Keywords:** evolutionary; protein fold; protein secondary structure; random forest algorithm; spatial; structural classification of protein



## 1. Introduction

Protein Sequences consist of 20 standard amino acids, which fold into their respective three-dimensional structure. The protein function is due to its three-dimensional structure and shape [1,2]. It is challenging to understand how a chain of amino acid residues is folded into its three-dimensional structure. There is a wide gap in sequence and structure availability. Many experimental methods are currently used to determine protein structure, including X-ray crystallography [3,4] and NMR spectroscopy [5]. These methods cannot help reduce the vast amount of gap present between sequence and structure, as they are slow and much costlier [6]. The machine learning-based methods may help significantly in reducing this gap. It is a challenging task to predict a protein tertiary structure from a protein sequence directly. Identifying a protein fold from a protein sequence can help predict a protein tertiary structure and function. An in-silico method for protein fold recognition has many applications in biology, chemistry, and medicine [7–12].

Identifying a fold category of a protein sequence is called fold recognition [13–16]. The process of protein fold recognition is summarized in the following Figure 1. The different types of feature vectors are created from input protein sequences. Features vectors are combined for use by machine learning algorithms. Combining features plays an important role in representing protein sequence information for building a machine learning model.

# Question Answering Survey: Directions, Challenges, Datasets, Evaluation Matrices

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**Abstract**

The usage and amount of information available on the internet increase over the past decade. This digitization leads to the need for automated answering system to extract fruitful information from redundant and transitional knowledge sources. Such systems are designed to cater the most prominent answer from this giant knowledge source to the user's query using natural language understanding (NLU) and thus eminently depends on the Question-answering(QA) field.

Question answering involves but not limited to the steps like mapping of user's question to pertinent query, retrieval of relevant information, finding the best suitable answer from the retrieved information etc. The current improvement of deep learning models evince compelling performance improvement in all these tasks.

In this review work, the research directions of QA field are analyzed based on the type of question, answer type, source of evidence-answer, and modeling approach. This detailing followed by open challenges of the field like automatic question generation, similarity detection and, low resource availability for a language. In the end, a survey of available datasets and evaluation measures is presented.

*Keywords:* Question Answering, Machine Reading Comprehension, Knowldge based Question Answering, Video based Question answering, Question answering datasets, Question answering evaluation measures

## 1. Introduction

Information retrieval(IR) has been an active area of research for past many decades as manual retrieval of fruitful information from enormous data is a tedious and time-consuming task. Handling this issue and retrieval of updated and important information brings the attention of many researchers [102, 120, 20, 58]. The notable performance improvement in the area can be observed by digital personal assistants (such as Amazon Alexa, Apple Siri, Google Home, etc.), robots-communication, clinical uses of conversation agents for mental health, Chatbot, etc.

Generally, these applications are tuned to have users input in the form of text, video, or speech [118, 103, 9, 115, 74, 22, 25, 83, 64]. Based on the question or input, the system will perform the required action. The pivotal requirement here is to understand and process the output produced by the information retrieval(IR) module [109, 40], and is the role of the question answering system.

Question answering is a field of information retrieval[58] and natural language processing (NLP), concerned with building systems that automatically answer questions posed by humans in a natural language.[1].

As many syntax, semantic, and discourse level challenges involved in this field, it is one of the prominent research directions of recent decades. This can be witnessed by figure 1 which indicates statistics of total submitted and accepted papers of QA field in Association for Computational Linguistics (ACL). It clearly indicates the surge in the popularity of the field.

Pragmatically helpful resources for answering the query include Wikipedia, quora, Reddit, tweeter, stackoverflow, etc.[85, 84, 110, 57, 38, 30, 49, 24, 114]. Many researchers are working in the applications which entertain users query by identifying desired information from such colossal datasets and cater it in accordance to the query.

Finding the best possible answer from one of these datasets is a challenging task [19, 98, 86, 101] due to features selection, its mapping with model and finding relevancy ranking of all candidates answers etc. common challenges. Apart from this, there are some

[1]The definition is borrowed from the Wikipedia. https://en.wikipedia.org/wiki/Question_answering

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# Fog Computing Algorithms: A Survey and Research Opportunities

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***Abstract* – The classic Internet of Things-Cloud Computing model faces challenges like high response latency, high bandwidth consumption, and high storage requirement with increasing velocity and volume of generated data. Fog computing offers better services to end users by bringing processing, storage, and networking closer to them. Recently, there has been significant research addressing architectural and algorithmic aspects of fog computing. In the existing literature, a systematic study of architectural designs is widely conducted for various applications. Algorithms are seldom examined. Algorithms play a crucial role in fog computing. This survey aims to performing a comparative study of existing algorithms. The study also presents a systematic classification of the current fog computing algorithms and highlights the key challenges and research issues associated with them.**

***Keywords* – Algorithms, cloud computing, fog computing, Internet of Things (IoT), survey, taxonomy.**

## I. Introduction

This Internet of Things (IoT) is a world where everyday objects are connected to the Internet and the data from the local environment is measured, collected, stored and processed. The advent of the IoT and mobile Internet has created an unparalleled flood of the enormous amount of data. Nonetheless, in most situations, resource-constrained IoT systems are not adequate to process or store the generated data directly. The IoT, therefore, requires assistance from a powerful computing paradigm like cloud computing (CC). However, the centralized service model of CC causes increased service delay and bandwidth consumption as the volume of data increases. Additionally, the data exchange through an open network increases the security threat to sensitive data [1]. To overcome the issues, a group of researchers [2] from Cisco introduced Fog Computing (FC) in 2012. FC provides computation and storage facilities at the network edge [3]. Latency-sensitive, bandwidth-efficient and secure computing is supported by getting some of the computing and storage close to the end devices, rather than doing them in the cloud.

Rapidly growing fields of IoT, VANETs and the Internet of Drones create numerous applications that need quick and real-time responses and thus can be benefited by fog computing [4]. Recently, FC has attracted the significant attention of researchers. Basic research in the area can be classified into architectural aspects and algorithmic aspects of FC [5]. Recently, several studies have been conducted considering an architectural point of view. Byers [6] surveyed practical deployment of fog computing considering system and application design, software implementation, security, computing resource management and networking from an architectural point of view. Nahaet at al. [7] identified use cases that can get benefit from fog computing. They also listed the architectural requirements in the context of the fog computing use cases. Aazam and Huh [8] reviewed several existing architectures to identify the research issues in big data-related application execution. Wanget et al. [9] studied existing architectures of cloud/fog/edge for connected vehicles and classified them into the categories of computer-aided and computational enabled architectures. Alli and Alam [10] presented a survey on state-of-the-art fog computing architectures, standards, tools and applications.

Algorithmic aspects are seldom examined in the existing literature. Authors [5] have examined the existing architectures and algorithms and compared them over various criteria. However, a dedicated comprehensive study and comparative analysis of new fog algorithms are required in the rapidly growing field of fog computing. Fog algorithms are essential for the effective utilization of the developed fog architecture and the provision of secure and timely services to various fog computing applications. The relevance of fog computing algorithms and the lack of systematic study of the algorithms are the impetus for this survey. This paper aims to review and analyse recent fog algorithms. Relevant work needs to be structured appropriately because of the diversity of the literature on fog computing algorithms. This study represents a comprehensive study and systematic classification of current literature from an algorithmic point of view. In contrast with [5], this survey compares and analyses the algorithms over category-specific parameters for each of the categories identified for the fog computing algorithms. This survey also highlights the research opportunities and key challenges associated with each category of the fog algorithms.

The paper is organised as follows. Section II introduces the concept of fog computing and associated technologies. Section III discusses the research methodology and Section IV presents the classification and review of the existing algorithms,

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# Analysis and Comparative Study of Hadoop Image Processing Frameworks

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**ABSTRACT**

*With the advancement in networking and storage technologies over the past few years, sharing of data over the Internet has been increased rapidly. Data types of the shared data has also become versatile. Data are shared in forms in text, image, videos etc. With this increase of data, there has been arisen requirement to process those data in order to find useful outcome out of that. In order to do so, Big Data technologies have been developed. Hadoop is one of the most popular frameworks developed in Big Data technologies. But since Hadoop was primarily developed to support textual data analysis, it is quite difficult to perform analysis on other formats such as images and videos. To support image and video processing various other frameworks and libraries have been developed. This paper demonstrates analysis and comparison between two Hadoop image processing frameworks; HIPI and MIPr.*

**Key words**: *Hadoop, HIPI, Image Processing, MIPr*

## 1. Introduction

The use of data presented in image format in fields of satellite imaging, medical imagery, astronomical data analysis, computer vision etc. has been increased over the years. And as a result of it, requirements to process those images have also been increased. Various algorithms, tools and techniques have been developed to analyze and process those images. In last few years, the overall data stored and shared in digital form is increased so much that it is difficult for traditional standalone data processing systems to analyze and process those data and get an useful outcome from it. To overcome these issues various technologies such as distributed processing and parallel programming models have been introduced. Also, requirements to modify or develop new algorithms for processing data in distributed and parallel environments have been arisen.

### 1.1 Big Data

In field of computing, Big data refers to newfound ability to crunch a vast quantity of information, analyze it instantly, and draw sometimes astonishing conclusions from it [1]. Essentially, the data is large enough that traditional data processing systems are not capable of handling.

### 1.2 Apache Hadoop

The Apache Hadoop software library is a framework that allows for the distributed processing of large data sets across clusters of computers using simple programming models. It is designed to scale up from single servers to thousands of machines, each offering local computation and storage. Rather than rely on hardware to deliver high-availability, the library itself is designed to detect and handle failures at the application layer, so delivering a highly-available service on top of a cluster of computers, each of which may be prone to failures [2]. Even though there are other technologies exist, most of the Big Data are processed in Hadoop because it's highly fault tolerant highly scalable characteristics [3].

Hadoop project consist of four modules: Hadoop Common; which provides common utilities and support, Hadoop Distributed File System; which is a distributed file system, Hadoop YARN; which is a framework for

# FEATURE EXTRACTION IN HADOOP IMAGE PROCESSING INTERFACE

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**ABSTRACT**

With the ease of Internet access and higher data rate availability to citizens all over the world, data sharing has become versatile in terms of type of data. Instead of just sharing data in textual form like few years back, people now are sharing the data in forms of pictures and videos. In most widely used social media platform – Facebook, users upload 350 million pictures every day. But, the traditional image processing systems are not capable of processing such a huge amount of data due to limitations in storage and computational capabilities. Moreover, MapReduce programming model of Hadoop framework provide processing of large amount of data. But since MapReduce programming model was created with intend to process the textual data, it is quite inefficient to process the images using MapReduce programming model directly. Also, technical complexity of MapReduce is high and hence before working on the image processing tasks, one has to understand this model. This is inconvenient and time consuming process. To ease this complexity, various image processing frameworks have been introduced which abstracts the MapReduce model while focusing on image processing task. Hadoop Image Processing Interface is one of those frameworks with various features and support to OpenCV.

Key words: Hadoop, HIPI, Image Processing, Feature Extraction

## 1. INTRODUCTION

The use of data presented in image format in fields of satellite imaging, medical imagery, astronomical data analysis, computer vision etc. has been increased over the years. And as a result of it, requirements to process those images have also been increased. Various algorithms, tools and techniques have been developed to analyze and process those images. In last few years, the overall data stored and shared in digital form is increased so much that it is difficult for traditional standalone data processing systems to analyze and process those data and get an useful outcome from it. To overcome these issues various technologies such as distributed processing and parallel programming models have been introduced. Also, requirements to modify or develop new algorithms for processing data in distributed and parallel environments have been arisen.

### 1.1 BIG DATA

In field of computing, Big data refers to newfound ability to crunch a vast quantity of information, analyze it instantly, and draw sometimes astonishing conclusions from it [1]. Essentially, the data is large enough that traditional data processing systems are not capable of handling.

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# Discrete TCP: Differentiating Slow Start and Congestion Avoidance

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**Abstract:** Deployment of wireless links (terrestrial and satellite) along with wired links has made extension of the Internet even in remote places feasible. TCP/IP protocol suite is an integral part of the Internet. Congestion control of TCP plays a vital role in the performance of the Internet. TCP's unconditional flow control in case of a packet loss has always been a concern for researchers. Further, halving congestion window in such conditions without taking in to account the current network state is also considered inappropriate. The problem is compounded in wireless networks where packet losses occur often due to channel errors rather than the shortfall in the available bandwidth. In this situation, TCP's conservative behaviour underutilises the bandwidth. We therefore, propose a scheme to address the issue of underutilization of network resources. The proposed approach, Discrete TCP (DTCP), differentiates slow start and congestion avoidance phases while tuning data flow over a transport connection. DTCP evaluates *ssthresh* and *cwnd* before setting up parameters, based on the existing network condition to enhance the performance. The proposed scheme is compared and analyzed with various existing schemes with the help of extensive simulations using ns2. Results of simulation based experiments indicate significant performance improvement of DTCP on erroneous links and in heterogeneous networks and confirm its suitability.

**Keywords:** SACK TCP, Discrete TCP, Sow start, Congestion avoidance, Congestion control, ssthresh, cwnd.

## 1. Introduction

The World Wide Web has seen an immense growth in past couple of decades. Because of everyday expansion of Internet, there is a requirement for efficient protocols. HTTP (web browsing) and FTP (file transfer) are two widely used protocols over the Internet. At the transport layer, both utilize TCP (Transmission Control Protocol) at the transport layer [1]. In Internet, most of the traffic is TCP-based. Thus, TCP has an imperative role in the performance of the Internet. TCP is used in the Internet that supports many applications such as web access, file transfer and email. Due to its extensive use in the Internet, it is desirable that TCP remains in use to offer reliable services for communications in wireless networks and in heterogeneous networks.

TCP is a reliable end-to-end transport layer protocol designed for wired networks characterized by negligible random packet losses [2]. TCP keeps increasing the sending rate of packets as long as no packets are lost. Due to inherent reliability of wired networks, there is an assumption made by TCP that any packet loss is due to congestion. TCP will invoke its congestion control mechanism whenever any packet loss is detected. Most of the congestion control mechanisms reduce sending data rate to relieve the network from congestion. The reduction is not decided based on the degree of congestion and it affects the performance. If the sender has crossed a certain threshold, then a drastic reduction in the data flow results in inferior performance. If the sender is still probing the network capacity, data rate should be significantly decreased to help the sender stabilize according to available network resources. Most of the TCP variants do not take these circumstances into account while setting up the data rate and offer the same treatment in both the scenarios.

# Composite TCP: Refining Congestion Control

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**Summary**
Internet users need reliable transmissions for web browsing, email, file transfer, and database access. TCP is the dominant reliable transport protocol on top of which all of these services run. Since TCP is originally developed to be used on the wired network, it safely assumes that segment losses are due to congestion. This is not true for wireless media where, due to fading channels and user mobility, transmission errors are more frequent. It unconditionally reduces its flow when a packet loss is detected, assuming that it has occurred because of congestion in the network. This incorrect assumption in case of a packet loss occurring due to channel noise, adversely affects the performance of TCP. This paper focuses on the same problem of TCP related to random errors causing packet loss. Treatment for losses should be different for corruption and congestion to improve efficiency. The proposed Composite TCP (CTCP) utilizes the SACK information available from a receiver along with round trip time to avoid flow control when the loss is because of a random error. The performance b of Composite TCP is compared and analyzed with existing variants over networks with exhaustive simulations using ns-2. Simulation results indicate that the proposed protocol significantly improves performance.

***Key words:***
*SACK TCP, congestion control, Round Trip Time, cwnd, ssthresh*

## 1. Introduction

TCP/IP is a well-proven and accepted protocol suite, which has successfully ensured stable and robust network operations since evolution. These properties have made TCP/IP protocol suite an inseparable part of the Internet. The ongoing ramping up demand for Internet calls for new architectures and new technologies capable of providing high quality and high speed Internet services. TCP is the dominant reliable transport protocol, used for web browsing, email, file transfer etc[1]. Thus, TCP has an imperative role in the performance of the Internet.

TCP provides reliable service along with end-to-end connectivity at the transport layer [2]. TCP increases the packets sending rate if no packet losses are encountered. Due to the inherent reliability of wired networks, there is an assumption made by TCP that any packet loss is due to congestion. To reduce congestion, TCP will start its congestion control mechanism whenever any packet loss is detected. Due to its extensive use in the Internet, it is advisable that TCP remains in use to offer reliable services for communications in wireless networks and in heterogeneous networks.

In this paper, we propose a new approach to discriminate random losses from congestion induced losses. Retransmission and flow reduction are decoupled by identification of the type of the loss. Most of the congestion induced losses are multiple in nature. A single loss from the window can be attributed to random errors. Estimated delay of the connection is examined to affirm the cause of the loss. Remedial action is decided based on the type of loss to achieve improved network performance as well as robustness. The proposed scheme is evaluated with established existing versions of TCP by various simulations.

The rest of the paper is organized as follows. We explain existing TCP variants in the next section. A new algorithm called Composite TCP is explained with state transition diagram in Section 3. Simulation environment along with topologies are described in Section 4. The simulation results of conduct simulations are analyzed in Section 5. We conclude the paper in Section 6.

## 2. Existing Variants of TCP

TCP has undergone many revisions in the past three decades. Wired and wireless networks are notably different in terms of bandwidth, speed, propagation delay, and channel reliability [3].

The connotation of the diversity is that packet losses are not only because of congestion, but can also result from characteristics of wireless links. While TCP performs well in wired networks, it might deteriorate performance severely in wireless networks if it wrongly considers non-congestion-related losses as a sign of congestion and consequently invokes congestion control, as reported in [3,4,5].

TCP ensures reliability by using a retransmission timer. TCP increases the congestion window (cwnd) by one per acknowledgement. Hence, it effectively doubles cwnd during every round trip time (RTT). When cwnd reaches slow start threshold (ssthresh), it enters congestion avoidance phase. cwnd is increased by one per an RTT in this phase. If data is not acknowledged prior to timer

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# India's Social Stock Exchange (ISSE) – A 360° Analysis - Today's commitment for tomorrow's action

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**ABSTRACT**

This conceptual research aims to study the core components of India's first proposed Social Stock Exchange (SSE), its structure and regulations, including types of eligible social enterprises, investors and financial instruments, disclosures, and reporting requirements along with the global SSE to carry out an informed and nuanced comparison. The research relies primarily on secondary and descriptive in the study. The study results show that India, the world's most populous democracy, is about to launch a SSE in 2021 which will serve as a mediator between social enterprises that need funding and investors who are willing to invest their money and by designing and providing robust solutions which transform the habit of charity into a culture of social investment. Exchange focuses more on the development of the ecosystem, emphasizing policy and regulatory advocacy where Social ends and profit motives do not contradict each other. This implies profit generation for social purposes is a key sustainability feature. SSE should be a means for the markets to serve the society not for society to serve the markets.

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**KEYWORDS**
Social Stock Exchange (SSE); social enterprise; For Profit Enterprise (FPE); Not for Profit organization(NPO)

## 1. Introduction

The society in India is very diverse, adaptable, and vibrant. Social economy realities are sheltered by different parlance from 'nongovernmental sector' to 'the 3rd sector' and more recently to 'social economy entities' and 'social enterprises,' involving various types of organizations from nongovernmental organizations and mutual aid associations to cooperatives and lately social enterprises. The social sector has been a driving force in India's developing economy, with many organizations working to empower local communities and develop resilience to the struggle of poverty, climate change, and other socio-economic problems. Mainly focused on reducing the perils facing the disadvantaged sections of society pertaining to healthcare, education, gender, livelihood, sanitation, and various humanitarian causes, social organizations have been quintessential partners in ameliorating some of these developmental challenges that the country is facing (KPMG 2020). It means there is a wide spectrum of problems and issues that needs attention from the Government and Social Enterprises working to address the same. There are social issues that are not addressed and are still untouched by

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# Measuring Online Brand Experience & it's impact on Consumer Satisfaction and Loyalty

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## Abstract

The authors of this article apply (Brakus J J, Schmitt B H and Zarantonello L, 2009) model of four brand dimensions and the impact on customer satisfaction and loyalty to the online brand Google to verify these findings. The authors conducted empirical research during July 2021 with 147 University students at Marwadi University, Rajkot, Gujarat, through an online questionnaire using Google Form®. The authors applied SEM & could only verify the model of (Brakus J J, Schmitt B H and Zarantonello L, 2009) partially with online brand. The findings concludes that online brand experience significantly influencing brand personality positively which in turns impact satisfaction & loyalty significantly. Hence, it can be said that brand personality plays an important mediating role. Online Brand Experience doesn't have any significant impact on satisfaction & loyalty directly. Additional research is needed to further test the online brand experience model.

**Keywords**: Experience marketing, Experiential marketing, Brand experience, Google, Google Experience.

## Introduction

Consumers nowadays no longer buy products and services in order to fulfill a functional need but instead purchase the emotional experiences around it (Morrison S and Crane F G, 2007), (Zarantonello L and Schmitt B H, 2010). For the "Starbucks experience" consumers are willing to pay almost $3 for a small cup of coffee – double the price compared to a traditional eatery. Experience marketing theory tries to find answers to what exactly makes a purchase an experience and what impact experience marketing has. The brand experience model of (Brakus J J, Schmitt B H and Zarantonello L, 2009) provides meaningful answers to these two questions. On the one hand it proves that brand experience positively affects consumer satisfaction and loyalty. On the other hand, it provides an empirically validated brand experience scale based on the dimensions sensory, affective, intellectual, and behavioral. The scale is meaningful in academic research, but even more important "as marketers engage in projects to understand and improve the experience their brand provides for their customers, they can use the scale for assessment, planning, and tracking purposes." (Brakus J J, Schmitt B H and Zarantonello L, 2009).

This article attempts to examine the relationship between (Brakus J J, Schmitt B H and Zarantonello L, 2009) four brand experience dimensions, five brand personality dimensions, customer satisfaction and loyalty for the online brand Google. However, the findings of this research reveal that, when applied to the Google brand, the model developed by (Brakus J J, Schmitt B H and Zarantonello L, 2009) suggests that brand personality plays a very significant mediating

# Antecedents of Online Brand Experience & its consequences: A study on Amazon E-Commerce



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**Abstract**

To provide an integrative model of online brand experience, this paper combines findings from brand management, marketing, and information systems research. In this model, various factors such as brand love, perceived ease of use, perceived usefulness, brand trust, customer effort, event marketing, brand clues, marketing communication combines to affect consumer experience online & it's impact on satisfaction and loyalty. The empirical tests involve structural equation modeling and primary data from a survey of 419 users of online e-commerce giant Amazon. The results demonstrate all the factors positively affect online brand experience. Positive experiences result in satisfaction and loyalty, which affects the profitability of the firm.

**Keywords:** Online Brand Experience, Antecedent, Consequence, Brand Experience, Amazon, E-Commerce.

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## 1. Introduction

Global branding has undergone a significant transformation thanks to the internet and related technology. Online companies have emerged from obscurity over the past 15 years to become well-known names with market valuations that rank them among the top 100 most valuable brands in the world. In fact, one such name (Amazon) now tops global ratings with an estimated worth of $260.5 billion in brand value. (forbes, 2022). The main factor driving this accomplishment is traffic, or the recurring encounters between an online business and its users. (Song, Zhang, & Huang, 2010). Keeping the consumer engaged through frequent encounters is still a crucial problem for the online brand. (Bart, Shankar, Sultan, & Urban, 2005) (Bridges & Florsheim, 2008) (Christodoulides, 2009) (Helm, 2007) (Kollmann & Suckow, 2008). Within two distinct areas of academic study, it is nevertheless of utmost importance to comprehend what factors lead to a pleasant online brand experience and how to create those conditions. Online brands are conceptualised as technological components according to the information systems (IS) tradition, in particular studies based on the technology acceptance model (Davis,1989). According to the system usability viewpoint, this research tends to concentrate on brand elements that are task-related and takes user outcomes such as utility or functioning into account (Kim, 2005; Koufaris, 2002; Pavlou, Huigang, & Yajiong, 2007). On the other hand, online brands are typically viewed in marketing literature as enhanced goods or services that help consumers connect in computer-mediated environments to suit specific needs. (Hoffman & Novak, 1996, 2009). Marketing academics place a strong emphasis on the subjective brand assessments and the emotional elements of the brand experience, stressing the importance of brand personality (Okazaki, 2006), image (Da Silva & Syed Alwi, 2008a, 2008b; Kwon & Lennon, 2009)

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# ONLINE BRAND EXPERIENCE: SCALE DEVELOPMENT AND VALIDATION

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**Abstract**
The research aims to develop a multi-dimensional scale that focuses on retail brand experience and its measurement. It has been seen that online brand communities have failed to maintain the quality of the consumer engagements, and it has impacted the overall profitability of the brands. Therefore, implementation of a scale is necessary to measure the overall level of engagement. Overall, it will also help the brand to improve their strategic outcomes. Along with that, overall quality of the online brand community engagement and quality of consumer interaction will also get improved.

***Keywords:*** Online Brand experience, satisfaction, loyalty, Amazon, scale development

## Introduction

It can be observed in the last couple of decades that a powerful research stream has come into play that focuses on the development of consumer-brand relationship. Consumer brand involvement is observed significantly in this line of research that reflects the overall interest level of the consumers towards the product. On the other hand, even after the insights gained from the consumer involvement research, shifting of scholarly emphasis can be seen towards different perspectives. A need for assessing the dynamic characteristics of consumer -brand relationships is observed, that are located explicitly in marketing settings.

Within the research context, interactive brand-related dynamics observed within the brand experienceis gaining a lot of attention. It is also associated with the consumer culture theory and the service dominant logic, associated with relationship marketing. The rationale regarding this process can be termed as the growing scholarly recognition towards consumer brand interaction and brand-based processes. Therefore, effective brand performance is gradually associated with ***Consumer brand experience (CBE).*** The research rationale aims to evaluate the importance of CBE scale development, and its relationship with sales growth, consumer relationship and brand referrals.

Most of the brand communities in the segment provide a unique purpose. However, the universal goal of the brands is to conduct explicit marketing investment towards ensuring long term business relationship with potential customers. As mentioned by Padmavathy*et al.* (2019), as a way to ensure viable returns from these investments, better consumer insights need to be extracted from the consumer interaction segment. It is more likely to provide financial and attitudinal benefits towards the brand, resulting in improved financial performance. Improved measurement of the CBE will also result in operational standards of excellence, resulting in an enhanced brand communication. Even after these needs, consumer motivation regarding brand community participation has failed to cope up with the ever-changing landscape of the industry (Lu *et al.* 2019). The CBE scale can be presented as an effective option in this regard, as a way to measure the overall consumer interaction with the brand. The research aims to present CBE as a key metric towards assessing brand performance. It can be observed that empirical research related to CBE has lagged, resulting in a limited understanding related to the concept. The main research factors can be termed as consumer engagement with brands, brand experience in self-concept and overall engagement.

The research objectives can be termed as:

1. To develop a scale which measures Online Brand experience.
2. To assess the impact of Online brand experience on satisfaction and loyalty.

The research questions can be termed as:

# INVESTIGATING THE ROLE OF BEHAVIOURAL BIASES IN THE FORMULATION OF THE INTENT TO INVEST IN GOLD: A STUDY OF GUJARAT STATE

Shivali Chirag Shah*
Naresh K. Patel**

**ABSTRACT**

*In recent years, the average income of Indians has increased significantly (Chaudhuri and Ghosh, 2021). Although it is well established that rising income drives up gold demand (World Gold Council, 2017), the relationship between gold purchase and income in India is more complex. Many factors influence the gold investment decision, and behavioural biases are among them. The primary goal of this research paper was to determine impact of behavioural biases on the intention to engage in gold investment. Overconfidence bias, loss aversion bias, and recency bias are the three behavioural biases examined in this study. 250 retail investors were selected through judgmental sampling techniques. According to the findings, all three biases are statistically significant and have a significant impact on gold investment intentions. Overconfident, risk averse, and recency biased respondents invest in gold.*

***Keywords:*** *Gold Investment Intention, Overconfidence bias, loss aversion bias, recency bias*

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# "GREEN SHOE OPTION IN INDIA: A REVIEW"

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## Abstract

The primary market is an important constituent of the Indian financial system. It plays a fundamental role in promoting the economic growth and development of a nation by mobilizing the savings with the public towards investing it in the securities market. Investors invest in an IPO in anticipation to lock the profits by the differential between the issue price and listing price. But after the listing of shares on the stock market, when the listing price falls below the issue price in the secondary market, it harms the confidence of the investor, the reputation of the issuer company and the capital market. It also deters potential investors from investing in the capital market, which altogether hampers the development of an economy. Hence, this study is an attempt to understand and review the price stabilisation mechanism, the Green Shoe option in an IPO in India.

**Key words** – IPO, Green Shoe Option, over allotment option, Price stabilisation

# "Effectiveness of Green Shoe Option as a price stabilisation mechanism in India by GARCH model"

Dr. P.K. Priyan[#1], Ms. Agnya Patel[#2]
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## *Abstract*

*The option of GSO introduced by SEBI allows the investment bankers to perform price stabilization of securities. The idea behind the introduction of the GSO option was to increase investor confidence and reduce the price volatility. This study is an attempt to determine the effectiveness of Over Allotment Option in the IPOs in its purpose of stabilising the aftermarket prices. This paper seeks to evaluate and estimate the volatility of IPOs with Green Shoe Option and IPOs without Green Shoe Option issued and listed in the National Stock Exchange (NSE), Mumbai, during the period 2004 to 2016 using GARCH Model.*

**Key words** – Green Shoe Option, over allotment option, Price stabilisation, GARCH, Volatility

# *Aftermarket Performance of IPOs in India: A Comparison between IPOs with Green Shoe Option & IPOs without Green Shoe Option*

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***Abstract***
*Several studies reflect that the IPOs are normally underpriced in short run, however there are certain securities which are observed to be overpriced and hence the stabilizing option comes into existence. The price stabilization protects the IPO from huge price fluctuations and protects investors from significant loss. Such concept is known as Green Shoe Option (GSO) in the industry and is internationally recognized system to stabilize the aftermarket prices of IPOs. GSO is accountable to improvise the imbalance raised in the market and stabilize the stock price in the respective market. This study is an attempt to study the aftermarket performance of IPOs listed on National Stock Exchange in India during the period of 2004 to 2016. It seeks to evaluate and compare the short term performance and long term performance of IPOs with GSO and IPOs without GSO. The findings suggest that there is no significant difference in the performance of IPOs with GSO and without GSO.*
*Keywords – aftermarket performance, green shoe option, IPO*

**Introduction**

There are various other studies that examine the long and short run performance of the firms issuing the IPOs. There have been instances that indicate that in case of Indian IPOs, the initial returns have been very high and this substantiates the fact that the phenomenon of under pricing exists in the capital markets of India. In cases where the investor holds the money till the end of fifth year, his earnings would have been more than the market returns
.
From an Indian context, there have been multiple researches that have been done to gauge the long-run performance and majority of the instances were taken within a period of three years of listing. In a study conducted by (Madhusoodan & Thiripalraju, 1997)on BSE IPOs during the period of 1992-1995, the results showed that there is a higher return yielded in comparison to the negative returns recorded in most parts of the globe. Another research showed that the IPOs in India are underpriced and there has been a long-run underperformance reported. As per the academicians, the phenomenon of IPO under pricing has been observed in each country across the globe.

It was analyzed that there is a list of mixed findings concluded by the different researchers in case of IPO and its market performance in long run. The findings were different across the different countries across the globe. (Levis, The long-run performance of initial public offerings: The UK experience 1980–88, 1993)And (Espenlaub, Gregory, & Tonks, 1998)(Aggarwal & Rivoli, Fads in the initial public offering market, 1990)stated that there is a limited description over the existence of long-run performance evaluation of overpriced IPOs in UK. Furthermore, (Aggarwal & Rivoli, Fads in the initial public offering market, 1990), (Ritter, 1987) and (Loughran & Ritter, 1995)had conducted similar research studies in US and analyzed that there is a similar output received in that region. Research conducted by Ibbotson stated that there is a negative relation between initial return on IPO and long run performance in US (Price, 1975). The study conducted in Australia show that overpriced IPOs result in poor performance in the long run (Lee, Taylor, & Walter, 1996). As per the research of (Hwang & Jayaraman, 1992) and (Kim, Krinsky, & Lee, 1995), the overall performance of IPO stocks in the region of Japan, Spain, Malaysia and Korea

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# INDIA GAS EXCHANGE TODAY'S REALITY AND PATH AHEAD

**Keywords:** Indian Gas Exchange (IGX), Indian Energy Exchange (IEX), Oil and Gas sector of India.

**J E L Classification:** Q4, P28, O13.

**Abstract:** This research aims to study structure, functioning and operational mechanism of India's first gas exchange i.e. Indian Gas Exchange (IGX) which is a subsidiary of Indian Energy Exchange (IEX). Exploratory research is used to study and investigate conceptual framework and operational mechanism of IGX. The results of the study show that IEX has unveiled the nation's first automated natural gas exchange trading platform called IGX for well organized and hefty Gas market and to stimulate gas trading in the country. IGX would lead India towards Gas Based Economy by designing and providing robust solution for natural gas trading and access. So far as price mechanism

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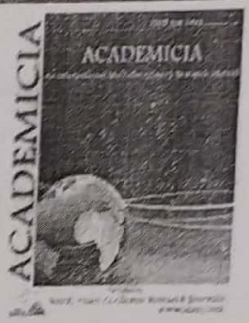


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# BAAHUBALI - THE BEGINNING: AN INSIGHT

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## ABSTRACT

*Baahubali is a 2015 Indian bilingual epic historical fiction film directed by S.S. Rajamouli. Produced by Shobu Yarlagadda and Prasad Devineni, it is the first of two cinematic parts. The film was simultaneously made in Telugu and Tamil and dubbed into Hindi, Malayalam and French languages. Baahubali casted of Prabhas, Rana Daggubati, Tamannaahand Anushka Shetty in lead roles. Ramya Krishnan, Sathyaraj, Nassar, Adivi Sesh, Tanikella Bharani and Sudeepappear in supporting roles. Baahubali: Baahubali, first non bollywood film to gross over 500 crore (US$75 million) worldwide till date. An International version of Baahubali: edited by Vincent Tabaillon is scheduled for a screening at the Busan International Film Festival in October 2015. The film was shot using Arri Alexa XT camera; the principal photography began at Rock Gardens in Kurnool on 6 July 2013. Sabu Cyril was the production designer for the film, the soundtrack and background score for the film was composed by M. M. Keeravani, and V. Srinivas Mohan was the visual effect supervisor. The film released on 10 July 2015 in 4,000 screens worldwide in Telugu, Tamil, Hindi and Malayalam languages. According to Assocham (2010) claimed that in Indian film Industry, the hardly 5 % of the films used to get break-even. In such circumstances, the case study attempted to know the crucial role of marketing that make film to become a hit or blockbuster in the box office collection. Can Marketing create sense of urgency or desire to consume in the mind of audiences to watch*

Article can be accessed online at http://www.publishingindia.com

# What Makes Audience to Watch Bollywood Films in India: An Empirical Study

**Frince Thomas Chemmanoor*, Falguni H. Pandya****

ABSTRACT

**Purpose:** *The present paper intends to study how to increase box-office collection by producing audience centric film.*

**Objectives:** *To investigate and examine what audience likes to see in films.*

**Design/Methodology/Approach:** *The paper has used descriptive research design because it intends to investigative questions and results to discovery of association among variables. Data are collected from 1165 respondents of different age groups, education, income background, and locality through structured questionnaire-cum-interview method. A questionnaire is constructed using Likert scale and administered using convenience sampling approach. Data are analysed using the SPSS 17 software.*

**Research Limitations/Implications:** *Future research can be conducted for further improvements in measuring techniques and also by adding more volleys of questions. Even in the case of set of influences, they might well differ in other countries or at other times. In sum, all the caveat and limitations just enumerated a need for support in future investigations for using data in multiple time periods, in multiple countries, and with multiple viewers. Future researches can address the generalisability of our findings across time periods and geographical settings.*

**Finding:** *This paper adds historical and theoretical depth for debate to attitude of audience to watch Bollywood films in respect to characters, likings, and theme of films. The attitude of audience of watching Bollywood films is not an actively researched topic in India. The study therefore contributes toward better understanding to many stakeholders of films while it is being produced.*

**Practical Implications:** *The findings can provide some relevant scope for directors and marketers of Bollywood movies.*

**Keywords:** *Film, Attitude, Box-office, Audience*

## INTRODUCTION

India, with a population of 1300 million and still counting, has a diversified cinematic culture of Mumbai, Andhra Pradesh, Gujarat, Karnataka, Kerala, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal, and Maharashtra in various languages especially Hindi, Telugu, Gujarati, Kannada, Malayalam, Punjabi, Tamil, Bhojpuri, Bengali, and Marathi. Film industry is a key and perhaps the most vibrant industry of Indian economy. The number of films produced annually in India is higher than in any country of the world including the USA's Hollywood. While Hollywood produces around 550 movies a year, the Indian film (movie) industry produces more than 1000 movies every year (Krishnan & Sakkthivel, 2010). Around four million Indians 'go to movies' on any given day of the year, and this number swells during festivals and holidays (Krishnan & Sakkthivel, 2010). The Hindi film making industry in India that is based out of Mumbai, referred to as commonly 'Bollywood' by the media and people, is largest film producing centre in India (Sarkar & Nayak, 2009).

The film industry is the part and parcel of Entertainment and Media Industry (E&M) and plays a significant role to economy of any country. It consists of film production houses, film studios, distributors, exhibitors, film directors, music directors, choreographers, script writers, and many more that includes actors, actresses, and other important characters. The major clusters of film making ccentres in the world are located in United States, Nigeria, Egypt, Hong Kong, Canada, Australia, Indonesia, United Kingdom, and India (European Audiovisual Council, Council of Europe, 2009). Due to low cost production, mainly of place & personnel, and increasing curiosity of viewing the scenes of other countries, many a times shooting of films take place outside of the country where

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# Synergy

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# A Study of Customers' Perception toward Apparels in Online Shopping

**Frince Thomas Chemmanoor***

**Abstract**

**Purpose:** To study on-line shopping experience from customers.

**Design/methodology/approach:** The paper is constructed on the basis of descriptive research. A sample size was 90 respondents who filled the questionnaire. The sampling approach used was convenience sampling.

**Findings:** The study found that customers are attracted by discounts, good offers & low priced products. Customers preferred CoD (cash on delivery) because they faced difficulties in on-line payment. As a result, some effective measures need to take for improving payment related issues. Customers should be given with some additional discount for making immediate on-line payment.

**Research Limitation and Implication:** The present study is restricted to population of Gujarat. The study is limited to few shopping websites.

**Originality and Value:** A study is of primary and secondary approach. This study is confined only to online users. This study is conducted to analyse the current trends of online shopping in apparel segment. Further, it investigates experiences and preferences of the respondents in online shopping

**Keywords/Paper type:** Online shopping, Apparels and Customer Perception

**Type of Paper:** Research paper

## Introduction

Online fashion is emerging as the fastest growing category in India's booming e-commerce market, backed by strong technology as well as marketing dexterity. It is growing at such a fast rate that experts believe by 2020, India is expected to generate $100 billion online retail revenue out of which $35 billion will come from fashion e-commerce. In other words, online apparel sales are set to grow four times in the next 5 years to contribute significantly to the burgeoning e-commerce growth.

Experts believe, while apparel has always been one of the most popular segments in retail, there was much scepticism about the growth of online clothing, as Indian shopaholics who love the touch, feel and fits of their favourite piece of garment, may dissuade from buying. However, miraculously Indian Online apparel sites have managed to break this barrier.

By 2018, India is set to witness 500 million internet users whereas 280 million Smartphone users could be the key drivers for e-commerce portals, as a recent Forester Consumer Research observes that there will be 26-30 percent increase in apparel, footwear, baby-care and skincare products in the coming months.

A survey conducted by Baggout also revealed that clothes and footwear are the two most popular categories in Fashion and apparel is one of the three most sold online product category today.

Digital marketing is yet another area these fashion sites are investing in to lure customers. From retailing giant Amazon to domestic players such as Snapdeal, Jabong and Myntra, every player in this category is spending generously on print and social media and other forms of digital marketing as part of their sales strategies.

Needless to say, with better brands, deals and discounts, price category and return policy, the future looks bright for online clothing, especially, the rise in Indian women shoppers coupled by the huge demand for trendy clothes will continue to fuel this segment.

- Online shopping is commonly known as internet shopping or e-shopping. Online shopping is done when the consumers purchase products on-line. Through online shopping, consumers shop for required products without physically visiting the store. Nowadays, the consumers have become more shopping conscious and surf the internet on a daily basis and buy products even across the globe. Development in technology and an increase in the

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# To Study Scope and Improvement of Aggregator Food Delivery Services in Gujarat

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## Abstract

The purpose of Online Food Ordering System is to automate the existing manual system by the help of computerized equipment and full-fledged computer software, fulfilling their requirements, so that their valuable data/information can be stored for a longer period with easy accessing and manipulation of the same. It can lead to error free,secure, reliable and fast management system. It can assist the user to concentrate ontheir other activities rather to concentrate on the record keeping. Thus it will helporganization in better utilization of resources. The organization can maintaincomputerized records without redundant entries. The aim is to automate its existing manual system by the help of computerizedequipment's and full-fledged computer software, fulfilling their requirements, so that theirvaluable data/information can be stored for a longer period with easy accessing andmanipulation of the same. These days' people are prone to placing food orders online and capitalizing this trend a lot of restaurants are yielding good returns by registering themselves on online ordering sites like Foodpanda, Zomato, Swiggy, etc. and many local ordering websites are also following suit. To sustain and grow in such fast growing industry, players should offer something different from competitors with efficiency. In this research, researchers will focus on service gaps in existing online food delivery industry and how Swiggy, Zomato, Foodpanda, etc have transformed this gap into opportunity to establish them as a strong

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# Does Star Cast Effect Box Office Collection of Bollywood Films?

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## Abstract

### Does Star cast effect Box office collection of Bollywood Films?

**Purpose**: The Study is aimed to understand impact of star cast on Box office collection of Bollywood films.

**Objective:** To determine Factors influence audience to watch Bollywood films.

**Design/methodology/approach**: A case study is constructed on basis of Primary and Secondary data. A questionnaire is constructed by Likert scale and managed by using convenience sampling. A sample size was of 79 respondents who filled questionnaire. Another sample of top 10 films in 2018 in term of Box office collection has considered for purpose of analysis. The authors could add finding of case study to the body of knowledge of research in Bollywood films which otherwise having very limited knowledge in public domain.

**Practical implications:** The findings can provide some significant scope for Directors, Reviewers and Marketers in directions, reviews and promotions respectively.

**Keywords: Star Cast, Audience, Box-office collection, Bollywood Films.**

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# "ANALYSIS OF AGRICULTURAL COMMODITIES AND ITS FUTURE TRADING PROSPECTS IN INDIAN CONTEXT"

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## ABSTRACT

India is an economy based on commodity where more than 65% population depends on agricultural products. Till 1970 Indian commodity market was popular but its growth stops due to very diverse restrictions and strict regulations introduced by Government of India. After 2003 these restrictions & regulations have been relaxed which leads to quick growth of the commodity market in India. The purpose of this study is to provide an overview of Agricultural Commodity Futures in India. The period of study in this paper is taken on monthly basis from 2007-2017. Objectives behind research are to study and analyze the commodity market of selected agricultural commodities (Chana, cotton, Turmeric, Barley, Soya bean) and to study the price movement among selective agricultural commodities. Tools used for data analysis in the study are Simple Moving Average, Relatively Strength Index (RSI), Bollinger Band, Accumulation/ Distribution Line. Motive behind using tools to analyze price movements and volume by using historical data and learn how to apply in study.

**KEY WORDS:** Agricultural Commodities, Future Trading,

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# TO STUDY THE RURAL INVESTORS AVENUES OF INVESTMENT WITH REFERENCE TO THEIR LEVEL OF FINANCIAL LITERACY

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**ABSTRACT:**

Since last decade, the Indian economy has witnessed a number of structural and fundamental changes in the financial markets. The economies around the world have increasingly considered financial literacy as a key pillar for the growth and development of a sound financial system. In current times, financial literacy has gained the attention of policymakers, regulators, governments and several other organizations. Today's investors across the nation, have more options to spend, save and invest their money for a shorter and/or longer period of time, as compared to their previous generations. These investors have access to a number of saving and investment opportunities provided by the large range of entities through various mode. The present study attempts to make significant contribution in the field of financial literacy in India, where there is no baseline survey/data available and even the concept has just caught the fancy of policy makers and others. This study may help policy makers, authorities, N.G.O., financial planners and institutions those who are engaged in promotion of financial literacy through financial education with the objective of converting the country from country of savers to country of informed investors.

**KEY WORDS:** Financial Literacy, Investment Avenues, Savings, Rural investors.

## Introduction

Financial literacy refers to the ability to make informed choices and make effective decisions on money use and management. It is the education and understanding of different financial fields, including subjects related to personal finance management, money and investment. This topic focuses on the ability to manage personal finance matters in an efficient manner, and it includes the knowledge of making appropriate decisions about personal finance such as investing, insurance, real estate, paying for college, budgeting, retirement and tax planning.

Financial literacy is seen as an important necessity in modern society to function effectively, as well as developments in retirement income policies and job patterns. Financial literacy can be broadly defined as the ability to familiarize and understand financial market products, especially rewards and risks for informed choices. Viewed from this standpoint, financial literacy primarily relates to personal financial literacy to enable individuals to take effective actions to improve overall well-being and avoid distress in matters that are financial.

The require for money related education is felt within the created and the developing nations alike. Within the created nations, the expanding number and complexity of monetary items,

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# A Review of Research Studies on Factors Affecting Consumers' use of Nutritional Labels

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## Abstract

**Objective:** This paper aims to summarise and draw roles of various demographical and situational factors affecting usage of nutrition label in consumer purchase decision. In addition, it also rationalises various types of label formats that could influence use of nutritional label.

**Design:** A systematic review was conducted by searching databases online. To identify the articles online, researchers have searched journal articles and conference proceedings. Total 60 articles were extracted out of which 50 were selected based on the topic specification.

**Results:** Nutrition label is one of the most important sources of nutrition information about product. Nutrition labels are considered as one of the trustworthy source of information as it is given by manufacturer and approve by government agencies. Demographic factors like education and income have positive relation with usage of nutrition label. Females and married consumers are more likely to use nutrition label as compared to respective counterpart. Age, frequency of purchasing a product, time availability and household size are negatively related to the usage of nutrition label. One of the most effective ways of simplifying the nutrition label is to introduce a simple, easy to understand and unified labelling system.

**Conclusion:** The demographic factors affect the usage of nutrition label, it's the responsibility of food producer to elicit label according to the requirement of potential customers. The chances of usage of nutrition label can increase if the labelling designs by considering demographic and situational factors of target market.

**Keyword:** Nutritional; Labels; Health risks; Ingredients; Net quantity; Shelf life; Grade/quality; Manufacturer; Dealer; Importer; Food standards

## Introduction

The diet-related health issues have been increased intensely from last few years across the globe. Now, it's really important to take corrective steps in this field considering the fact that the people suffer a lot from the health risks like blood pressure, cardio disease, and high body mass index. In response to this serious issue of health risk, the governments of various countries has raise the concern about different issues like eating habit of people, physical activity, and attitude towards healthy living. In this situation, self-discipline on the consumption of food is really very important. The nutrition and calories requirement varies from person to person based on their physic. It became really important that the consumer must have knowledge of the product they are consuming.

The best way to inform the consumer about the product and the nutrients it carries is to provide information about the product. Food label on the product plays the role of informing the consumer about the product, its ingredients and nutrients it contains. A label serves the following three primary functions:

(i) It provides basic product information (including common name, list of ingredients, net quantity, shelf life, grade/quality, vegetarian society logo, country of origin, name and address of manufacturer, dealer or importer and food standards agency.

(ii) It provides health, safety, nutrition information which includes instructions for safe storage, handling, nutrition information such as quantity of fats, protein, carbohydrate, vitamins & minerals and preservatives, colors, if used any, quantity per serving of stated size of food (in the nutrition facts table) and specific information on products for special dietary use.

(iii) It also acts as a vehicle for food marketing promotion and advertising promotional information and claims such as 'low fat', 'cholesterol free', 'high source of fiber', 'natural', 'organic', 'no preservatives added' and the like. Labels help people sometimes in some cases if they have the knowledge or motivation to use the information, which may or may not be in a format they can understand. Food labeling is found to be a very vital public health tool aimed at providing consumers with information which may influence their purchasing decisions. According to the FDA in the USA, a

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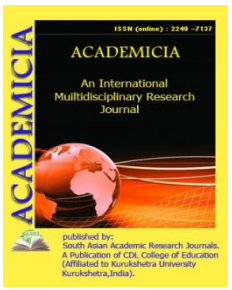


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# AN EMPIRICAL STUDY ON FACTORS INFLUENCING TO INTERORGANISATIONAL KNOWLEDGE SHARING

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## ABSTRACT

*Lack of interorganisational knowledge sharing has been consistently found to be the most critical failure factor in supply chain management. This paper intends to study the factors affecting to interorganisational knowledge sharing behaviour. This study also aims to discover the relationship between factors and interorganisational knowledge sharing in order to create practical strategies for the establishment of effective interorganisational knowledge sharing practices. The hypotheses derived were tested by data collected with 40 organised retailers. Simple linear regression analysis was used to study the various relationships. Results indicate the existence of strong relationships between the variables. Theoretical contribution and practical implications are also discussed. An empirical study was conducted on organised retail industry of India. The Indian retail industry has experienced high growth over the last decade with a noticeable shift towards organised retailing formats. Suggestions and comments from the pilot study were evaluated, and those found to be valid were incorporated into the survey. Few questions were rephrased to make them easier to be understood.*

**KEYWORDS:** *Interorganisational knowledge sharing, Organised retail industry, Factor analysis, Simple linear regression analysis*

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# Brand orientation & Firms' Performance: A Systematic Review

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***Abstract***
***Purpose****– This study aims to make available a detailed literature review on brand orientation and its relationship with brand performance and further on the financial performance of the firms.* ***Design/methodology/approach****–The study had incorporated the detailed research papers from various prominent researchers and high ranked journals. The papers were collected from the duration of 1993 to 2019. Lastly, 67 papers from 80 researchers and 13 journals were identified studied.* ***Findings*** *–The result reveals that there exists a direct positive effect of brand orientation on brand performance. Further, there exists a positive relationship between brand performance and the financial performance of a firm. Additionally, brand orientation delivers substantially to the creation of economic outcomes directly.*
***Originality/value****–This study has shown that the brand orientation (BO)–brand performance (BP)– financial performance (FP) exists and in turn is positively associated with firm performance. Thus, the study results offer a more detailed understanding of the BO–BP-FP relationship.*
***Keywords****: Brand orientation, brand performance, brand-oriented firms, and firm's performance.*

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## I. Introduction

Traditionally brands were associated with regular consumer goods (Roberts & Miller 2007). Generally, the branding concept is very well developed in the field of Marketing (Aaker & Joachimsthaler, 2002; Evans et al. 2012; Kapferer, 2008; Keller, 2003). American Marketing Association defines the brand as "a name, term, sign, symbol, design or design which is intended to identify the goods or services of one seller or group of sellers and to differentiate them from those of competitors." Brands certainly enable differentiation (Brïdson & Evans 2004; Hankinson 2000; O'Cass & Grace 2004; Simões & Dibb 2001). Ambler & Styles (1996) defined brand holistically as "the promise of the bundle of attributes that someone buys...the attributes that make up a brand may be real or illusory, rational or emotional, tangible or invisible". A brand can also signify ownership (Balmer & Gray, 2003; Brïdson & Mavondo, 2002; Hajipour et al. 2010). Branding is used in diverse contexts (Roberts & Miller, 2007) like products (Jevons 2005), services, places, people (Ghodeswar 2008), firms and organizations (Azizi et al. 2012), public figures, Governments, or countries can be branded (Ind 2004).

The growing branding literature embraces the value adding aspect (e.g., Jevons 2005; Stride & Lee 2007). Besides firms, consumer benefits are also apparent. Well-known brands deliver promises and create value consistently. Perceived benefits match with user's needs. Brands become an expression of value (Abimbola, 2007; Brïdson & Evans, 2004; Ghodeswar, 2008). Besides functional benefits, brands fulfill emotional needs as well. Particularly, the intangible emotional aspects and symbolic values become significant because functional values are difficult to maintain (Brïdson & Evans 2004; Reid et al. 2005; Stride & Lee 2007). The study by Wai Jin J. et al. (2017) found that the brand orientation and brand management capability is not solely responsible, but a good support of formalization is needed for building a strong brand.

### Brand orientation

The vital principle of contemporary branding theory is that the brand should be included in the strategic planning of an organization, and this aspect is known as brand orientation. For the very first time, Urde in 1994 referred to brand orientation and defined it as "an approach in which the processes of the organization revolve around the creation, development, and protection of brand identity in an ongoing interaction with target customers to achieve lasting competitive advantages in the form of brands. He added that there are three main drivers forcing companies to be brand- oriented. These are decreasing product divergence, increasing media costs, and the integration of markets. Anees-ur-Rehman et al. (2016), stated that to become brand-oriented, firms need to focus their efforts on creating value addition for their brands by coordinating their branding activities and placing a higher priority on the agenda of top management. Brand orientation represents an inside- out identity driven approach, according to that brand development should be guided by the vision, mission, and values of an organization. Brand-oriented firms are said to go beyond market orientation, which is an outside-in approach. A brand-oriented firm interacts with and responds to the needs of their customers and is a result of internal realignment around the brand. Wong and Merrilees (2005) said that brand orientation refers to the extent to which the marketing strategy and activities are centered on the brand and further in their study in 2008 depicted brand orientation as "a mindset that ensures that the brand will be recognized, featured and favored in the marketing strategy."Brand orientation seeks organization-wide dedication to brands, i.e., the brand gets strong support from all internal stakeholders. It has to be familiar, understood, and acted upon throughout the firm, and it has to be the top priority of employees. There is a supporting result to this view given by Hankinson (2001); he defined brand orientation as the extent to which the organization regards itself as a brand." The brand-centric strategy makes brand orientation precondition for firms to

# NUTRITION LABEL USAGE AND CONSUMER DEMOGRAPHICS

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**Abstract-**

Objective: To study consumer awareness and use of nutrition label.

Design: A convenience sampling was used to select the sample of the study. Survey was conducted with 2200 consumer at supermarket sites selected. Questionnaire contained questions related to awareness and usage of nutrition label and consumer demographics. We have performed $X^2$ tests to examine association between the demographic variables and reading nutrition label.

Setting: Ahmedabad, Rajkot, Surat and Vadodara, four main cities of Gujarat.

Results: The results confirm out hypotheses that education, age, BMI, and marital status are significantly associated with reading nutrition label. Majority of the consumer refer label on food for Manufacturing date, price and brand. There are various format of food label available out of them majority of consumer were aware about "Per Packet Measurement of nutrition label".

## 1. Introduction

Consumers are generally influenced by various factors in decision making process. The demographic factors are of major interest to any manufacturer because it can change peoples' decisions. The markets can be fragmented in to various micro segment based various demographic variables. Study of demography is a vital and measurable statistics of a population (Schiffman, Leon and Leslie LazerKanuk 2004). The demographic variables are gender, age, education, marital status, religion, general nationality, stage of life cycle, social class, family size, occupation (Kotler 2003).Demographics used to describe the number individuals in the population and also the structure of population in terms of various demographics. Each of these demographic factors affect various decisions of consumes.

A majority of the consumers are aware about nutrition label; they have reasonable knowledge of it and can use these labels whenever stimulated but very few refer the nutrition labels while purchasing product (K. Grunert 2008).Food label provide information about various aspects of product like technical, environmental, health and safety aspect. Nutrition label offer somewhat success to a public health communication method, by providing important contribution towards information sharing. Label helps people in some cases, if they have the knowledge and motivation to use information on the product (Rotfeld 2009). It enables consumers to compare the nutrition values of similar food products and then make healthy food choices based on the relevant nutrition information(Grunert et. al. 2010). Consumer can use information available to make healthier choice (Padberg and Caswell 1992). Earlier the food label was limited to food name, price, quantity and identity of producer. But now it's really demand of the time to provide detailed information about nutrition labels as a part of food label (Singla 2010).

Packed food producers are keenly interested in providing information to consumers. They are continuously finding ways to inform consumer about the quality of product at the point of purchase. As a result of these attention from both the side, food label become an important source of information.Such growing interest of industries and consumer in the food labels push government to ensure that the information provided on product must be understandable, trustworthy and consistent. The Food Safety and Standard Authority of India (FSSAI) clearly states that no person shall sale any packed food product which is not label in the manner as specified by the regulation. There are evidence revels that the provisions of nutrition label allow consumers to switch consumption from 'unhealthy' products to 'healthy' products more easily (Zarkin and Anderson 1992).

In many parts of the world, food processing companies, government and consumer are scrutinizing the provision of nutrition information on food labels. With the help of nutrition label consumer can choose healthy food and can easily maintain healthy diet. With the help of it manufacturer can differentiate their product easily and it became easy for them to win trust of consumer by providing right information. Government can have control over the quality of food, with the help of nutrition label and also can save certain cost which incur by non-communal disease most probably generated by unhealthy diet, which again lead by unhealthy food choice.There for itsimperative to know the factors that affect consumers' usage of nutrition label.There are many factors affecting consumer's choice of using nutrition label while shopping. This study revisits the role of demographic factor in use of nutrition label among consumers. It aimed to identify the relation between demographic factors and usage of nutrition label.

## 2. Hypothesis building

### 2.1. Reason for using nutrition label

Consumers use nutrition labels with different reasons; some of them use nutrition label to have healthy food and to avoid chronic disease, whereas some may already have chronic disease and advised by their doctors to follow certain nutrition guidelines. There are studies, have assessed the relation between nutrition label usage and health of consumer. By identifying such association and contribution to usage of label, could help to understand the impact of nutrition label among consumer purchase decisions.

### 2.2. Hypothesis

**Age**

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# The Nutrition Label – Which Information is Important to The Consumer?

**Mr. Gautam Donga, Dr. Naresh Patel**

*Abstract*— **Purpose - To study importance given by consumer to the various information on nutrition label, and to survey consumer of various cities of Gujarat, India, to determine the percentage of consumers who read nutrition label, how frequently they read nutrition label while purchasing different food products.**

**Methodology - Consumers from Ahmedabad, Surat, Vadodara and Rajkot were surveyed using a structured questionnaire. The survey has been conducted at outside the various retail stores in all the four cities. Questionnaire contain questions on various components of Nutrition label, frequency of reading nutrition label while purchasing specific categories of products and demographic information (n = 2192).**

**Findings - Of 2192 respondents, 95.8 percent were aware about nutrition label and 88 percent reported reading nutrition label. The most important information on nutrition label for respondents were 'Total fat', 'Calories from fat' and 'Cholesterol'. When ask about specific product categories, read nutrition label more frequently were snacks, soft drinks, and chocolates.**

*Index Terms*— **Nutrition labeling, Food labeling, Nutrition, India.**

## I. INTRODUCTION

The diet-related health issues have been increased intensely from last few years across the globe. Now, it's really important to take corrective steps in this field considering the fact that the people suffer a lot from the health risks like blood pressure, cardio disease, and high body mass index. In response to this serious issue of health risk, the governments of various countries has raise the concern about different issues like eating habit of people, physical activity, and attitude towards healthy living. In this situation, self-discipline on the consumption of food is really very important. The nutrition and calories requirement varies from person to person based on their physic. It became really important that the consumer must have knowledge of the product they consuming.

The best way to inform the consumer about the product and the nutrients it carries is to provide information about the product. Food label on the product plays the role of informing the consumer about the product, its ingredients and nutrients it contains. A label serves the following three primary functions: (i) it provides basic product information (including common name, list of ingredients, net quantity, shelf life, grade/quality, vegetarian society logo, country of origin, name and address of manufacturer, dealer or importer and food standards agency; (ii) it provides health, safety, nutrition information which includes instructions for safe storage, handling, nutrition information such as quantity of fats, protein, carbohydrate, vitamins & minerals and preservatives, colors, if used any, quantity per serving of stated size of food (in the nutrition facts table) and specific information on products for special dietary use; (iii) it also acts as a vehicle for food marketing promotion and advertising promotional information and claims such as 'low fat', 'cholesterol free', 'high source of fiber', 'natural', 'organic', 'no preservatives added' and the like. Labels help people sometimes in some cases if they have the knowledge or motivation to use the information, which may or may not be in a format they can understand. Food labeling is found to be a very vital public health tool aimed at providing consumers with information which may influence their purchasing decisions.

According to the FDA in the USA, a label is the primary point of contact between the producer and the purchaser and should be thought of as an integral part of the producer's marketing plan. According to the FDA (1998), a label should clearly and minimally state the name of the product, the net weight, the nutrition facts panel (nutrition label), the name and address of the manufacturer, and the brand name. According to the Federal Food, Drug, and Cosmetic Act, the labeling is "a written, printed, or graphic matter (i) upon any article or any of its containers or wrappers or (ii) accompanying such article at any time while a device is held for sale after shipment or delivery for shipment in interstate commerce". The food labels act as a signaling mechanism by which food companies assure their potential consumers regarding their sound quality control practices.

One of the most important components of a food label is nutrition label which is available on the packed food product. Nutrition label alone is likely to offer limited success to public health communication method but it can make a small but important contribution towards making informed food choices. Consumers can use health claims, which appear on the food packages to identify foods with certain nutrition qualities related to risk factors and wellness. Consumers' ability to choose their diets somewhat depends on the quantity and quality of information available through a variety of sources, including nutrition panel food labels (Caswell and Padberg 1992). The following are Components of Nutrition Label;

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# Technostress: A Conceptual Framework

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**Technostress**, which is stress induced by computer use (Laudon, 2018). It has also been defined as, "Stress or psychosomatic illness caused by working with computer technology on a daily basis". (Oxford Online Dictionary, 2018). Criag Brod (1984) introduced the concept of technostress first time in 80s. Brod argued that technostress can be felt in the form of technophobia, confusion, fear, with major symptom being the anxiety.

Technostress has also been defined as "state of arousal observed in certain employees who are heavily dependent on computers in their work" (Arnetz and Wiholm 1997).

Technostress Creators (Ragu-Nathan et al., 2008): Technostress creators are perceptions of elements that are likely to produce stress

1. Tehno-overload: A situation under which, users of ICT are forced to work more and with more speed.
2. Techno-invasion: A situation under which, users of ICT feel constantly "connected" or that they can be reached anytime, leading to a blurring of a line between personal and work-related context.
3. Techno-complexity: A situation under which, users of ICT feel that, they need to spend their time and make efforts to learn various aspects of ICT because of not possessing enough skills to deal with the complexity related to ICT.
4. Techno-insecurity: A situation under which, users of ICT fear they either they may be replaced by technology (i.e. they will lose their jobs) or they will be replaced by someone, who knows ICT more then they.
5. Techno-uncertainty: A situation under which, users of ICT feel that they are uncertain and unsettled due to the fact that, ICT is continuously changing and one needs to upgrade accordingly.

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# First-order resonant in periodic orbits

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In the frame work of Saturn–Titan system, the resonant orbits of first-order are analyzed for three different families of periodic orbits, namely, interior resonant orbits, exterior resonant orbits and $f$-Family orbits. This analysis is developed by considering Saturn as a spherical and oblate body. The initial position, semi-major axis, eccentricity, orbital period and order of resonant orbits of these families are investigated for different values of Jacobi constant and oblateness parameter.

*Keywords*: Periodic orbits; interior resonance; oblateness; Poincaré surface of section; Saturn–Titan system.

Mathematics Subject Classification 2020: 37N05, 70F05, 70F07, 70F15, 70K28

## 1. Introduction

The resonance is a physical phenomenon that characterizes an amplitude increasing, which happens when the natural frequency of dynamical system is either equal or nearby the frequency of used periodic forces. In the case of periodic forces being applied on a dynamical system whose a specified frequency of resonance, the system will oscillate with a higher amplitude than if the same forces are used to non-resonance frequency system [19]. It is worth to mention that the frequency of system is known as resonant frequency or resonance frequency when the amplitude has

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Research Article

# On the trace of powers of square matrices

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## Abstract

Using Cayley-Hamilton equation for matrices, we obtain a simple formula for trace of powers of a square matrix. The formula becomes simpler in particular cases. As a consequence, we also demonstrate the formula for trace of negative powers of a matrix.

**Mathematics Subject Classification (2020).** 15A24, 15A45

**Keywords.** trace of a matrix, powers of a matrix, Cayley-Hamilton theorem, spectral radius

## 1. Introduction

With the advancement of highly complex computer network topologies and eternally growing number of nodes in the existing networks, certain applications require to find the number of cliques in the graph of a given network. Using the adjacency matrix $A$ of the graph, one clique of vertices $v_1, v_2, v_3$ contributes the 2 to each of the $a_{11}, a_{22}, a_{33}$. Thus the count of cliques will be $\frac{Tr(A^3)}{6}$ [2]. In [6], an identity involving the Eulerian congruence on trace of powers of integer matrices modulo $p^r$ is obtained, where $p$ is prime, and $r \in \mathbb{N}$. [4] makes a short survey of related results. For a square matrix $A = [a_{ij}]$, the *trace* of $A$ denoted by $Tr(A)$, is the sum of main diagonal entries of $A$, that is $Tr(A) = \sum_i a_{ii}$. [5] obtains the formula of computation of the eigenvalue with maximum modulus of a matrix using the trace of its higher powers. Our formula thus contributes to finding the spectral radius of a matrix. [1] also developes the similar formula for $n^{\text{th}}$ power of a $2 \times 2$ matrix. Our formula is a general one and does not require computation of entries of $n^{\text{th}}$ power.

The current paper is in the sequel of [3], wherein we have obtained the formula for the sum of the powers of matrices and its consequences. In Section 2, we set the required notations and recall the terminology. We also state the main result Theorem 2.1. The simplification of the long computations in the proofs are achieved by introducing the functions $l_m(n, k_0, k_1, \ldots, k_{m-2})$ used for finding trace of $n^{\text{th}}$ power of an $m \times m$ matrix $A$. The introduction of $l_m(\cdot)$ is motivated by the list of expression of $Tr(A^n)$ for a $3 \times 3$ matrix $A$ for first few powers of $A$. The jargon of notations, as one will be convinced, is used only for the proof to be simplified. However, the actual application of our formulae to real computation does not require much of knowledge except the definition of the Trace and a couple of related definitions. The proof of the main theorem is discussed in Section 3. In fact, a technical formula (3.1) for $l_m(\cdot)$ is obtained in a series of Lemmas using Mathematical Induction. Very important and useful particular cases are discussed

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# Characterization of ideals of rhotrices over a ring and its applications

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**Abstract:** We define higher order rhotrices over a commutative unital ring $S$ and obtain a ring $\mathcal{R}_n(S)$ of rhotrices of the order $n \in \mathbb{N}$. We characterize the ideals and maximal ideals of $\mathcal{R}_n(S)$. As a particular case, we record ideals of rhotrix rings over integers and rhotrix algebras over complex plane $\mathbb{C}$. As an application, we characterize the maximal ideals of the commutative unital Banach algebra $\mathcal{R}_n(\mathbb{C})$.
**Keywords:** Rhotrix over a ring, Unital ring, Maximal ideal, Banach algebra.
**2010 Mathematics Subject Classification:** 15B99, 46J20.

## 1 Introduction

The concept of rhotrices was introduced by Ajibade [1] in 2003 as objects of order higher than $2 \times 2$ and lower than $3 \times 3$ matrices, as an extension of the initiative on *matrix-tertions* and *matrix-noitrets* suggested by Atanassov and Shannon [2]. In literature it is realized that with a slight perturbation of the arrangement of a matrix, a rhotrix – a rhomboidal array is obtained. As in [1], a *rhotrix* of order 3 is defined as

$$R = \left\langle \begin{array}{ccc} & a & \\ b & h(R) & d \\ & e & \end{array} \right\rangle,$$

where $a, b, d, e, h(R) \in \mathbb{R}$. $h(R)$ is called the *heart of the rhotrix*. For higher order rhotrices, it is difficult to realize a rhotrix as objects of order higher than $(n-1) \times (n-1)$ and lower than $n \times n$

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# ON THE SUM OF POWERS OF SQUARE MATRICES

DINESH J. KARIA, KAILASH M. PATIL AND H. P. SINGH

*Abstract.* Given a $2\times 2$ matrix $A$, we obtain the formula for sum of $A^n$, $(n\in\mathbb{Z})$, using its trace and determinant only; this includes the negative powers in the case of a nonsingular matrix too. Here we mean by sum, the sum of all the entries of the matrix. Various special cases arising out of values of trace and determinant are discussed and as an application we also derive Marcus-Newman inequality proved by D. London. $2\,\mathrm{su}(A^3)\geqslant \mathrm{su}(A)\,\mathrm{su}(A^2)$, for all $A\in\mathscr{F}_2\cap\mathscr{M}_2^+$.

*Mathematics subject classification* (2010): Primary 15A24, Secondary 15A45.
*Keywords and phrases*: Sum of elements of a matrix, power of a matrix, nonsingular matrix, symmetric matrix, trace, determinant.

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# Secure and efficient arithmetic-based multi-secret image sharing scheme using universal share

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ABSTRACT

Visual secret sharing (VSS) scheme is an encryption technique to hide secret message into two or more meaningless images, called as shares. Shares are stack together to decrypt the secret message using human visual system. To share many secrets, multi-secret image sharing schemes are often used. Diversity in sharing multiple secrets is using the universal share. Company organizer shares multiple secret images using this common share. Computation cost is the major drawback of such scheme. This study presents computationally efficient arithmetic-based multi-secret image sharing scheme using the universal share. Binary arithmetic-based scheme utilizes distinct value selecting function while encoding and decoding of secret images. Distinct value selecting function enhances randomness property of shares and fulfills threshold property. Thus, the proposed method provides computationally efficient method while satisfying threshold security criteria.



## 1. Introduction

In order to ensure security of data, the best way to protect secret information is to encrypt them using cryptographic technique in advance before sharing them. Visual secret sharing (VSS) scheme; also called as visual cryptography (VC) scheme [1,2], is a cryptographic technique to encrypt secret information like picture or text, into $n$ meaningless share images in which independent or ($n$ - 1) shares disclose no information about the secret image. Decryption of the secret image is performed by superimposing all $n$ share images in which decryption operation involves only human visual system instead of computation resources. Basic operation of this proposal is logical OR.

Though classical VSS schemes have advantage of no computation requirement in decryption phase, usually it experiences pixel expansion, poor contrast, codebook requirement, and poor alignment issues [2]. Researchers have proposed methods to solve these issues like Kafri and Keren [3] proposed three different algorithms using random grids (RG) to overcome pixel expansion and codebook requirement, Liu *et al.* [4] showed a method to tackle alignment problem, and Wang *et al.* [5] presented an optimal contrast scheme. However, classical VSS schemes experience poor visual quality due to basic OR operation [6] and alignment issue [2]. Use of polynomial-based VSS [7,8] and Boolean-based VSS [2,6] schemes solve these problems. Moreover, related research has been carried out for cheating prevention [9], combination of cryptography and steganography [10], threshold secret sharing [11], scalable secret sharing [12], weighted secret image sharing [13], different sized secret image sharing [14], and cylindrical random grid-based [15] schemes.

Polynomial-based multi-image sharing scheme using Lagrange's interpolation is proposed by Feng *et al.* [8]. Further, Fang and Lin [16] utilized this concept and presented a method with common share called as universal share. Company organizer keeps this universal share for managing $n$ secret images amongst $n$ employees. Use of complex computation is the major drawback of this method. Boolean-based multi-image sharing scheme using light-weight computation is proposed in [2]. Their scheme solved alignment and contrast loss drawbacks using Boolean operations. Though their scheme primarily focuses on multi-secret image sharing, it can be utilized as universal sharing scheme as well. Share $S_1$ is a common share in their method for low entropy secret images. Thus, their method is less complex for universal share scheme compared to [16]. In [17], Chen and Wu reviewed threshold property of [2] and illustrated threshold inaccuracy as shares are not randomized images. Recently, Deshmukh *et al.* [18] presented Boolean XOR and arithmetic modulo-based three multi-secret sharing schemes. First two methods use Boolean XOR and arithmetic modulo-based third method uses addition and

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# Effect of Transverse Surface Roughness on the Performance of a Magnetic Fluid Based Two Layered Porous Inclined Slider Bearing

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**Abstract-**Efforts have been made to analyze the performance of two layered porous inclined slider bearing with transversely rough surfaces under the presence of a magnetic fluid lubricant. The external applied magnetic field is oblique to the lower surface. The surface roughness is characterized by a stochastic random variable with non-zero mean, variance and skewness. The associated stochastically averaged Reynolds' equation is solved to obtain the pressure distribution leading to the calculation of load carrying capacity. Further, the expression for friction is derived and the position of centre of pressure has been determined. The computed results show that the bearing system registers a relatively better performance as compared to that of a bearing system dealing with a conventional lubricant. The transverse surface roughness induces an adverse effect on the steady state performance. Besides, providing an additional degree of freedom, this investigation offers some scopes for reducing the adverse effect of porosity and standard deviation by the positive effect of magnetization in the case of negatively skewed roughness when negative variance is involved. This investigation conclusively establishes that the porosity parameter plays a crucial role from design point of view even if a suitable value of the magnetization parameter has been chosen.
**Index Terms-** Slider bearing; magnetic fluid; surface roughness; porosity; load carrying capacity.

## 1. INTRODUCTION:

Double layered porous plates are found to be useful in reducing the permeability in order to retain the lubricant between the plates and hence to improve performance when the porous plates are not completely saturated with lubricant. Marshall and Morgan [1] established that the use of double layered porous housing in which the inner layer has a reduced pore size and hence low permeability is advantageous because it reduces the seepage of the lubricant into the porous wall and helps to bring the lubricant between the surfaces during starvation period. Cusano [2] dealt with the lubrication of two layered porous journal bearing. Srinivasan [3] made use of the Morgan – Cameron approximation and simplified the analysis of two layered porous bearing. In fact, she considered the squeeze film behavior between two layered porous plates of various geometries and derived the expressions for various bearing performance characteristics in closed form. Gupta, Patel and Hingu [4] analyzed the problem of two layered porous journal bearing taking the curvature of the bearing into account. Bhat and Patel [5] discussed the problem of hydrodynamic lubrication of two layered porous slider bearing with tangential velocity slip. Besides, the following investigations (Circular plates of Patel and Hingu [6], annular plates studied by Hingu [7] and externally pressurized bearings by Ajawalia [8]) regarding the double layered bearings have been conducted. All the above investigations dealt with the conventional lubricants. Oil based or other lubricating fluid based magnetic fluid can act as a lubricant. The advantage of magnetic fluid as lubricant over the conventional ones is that the former can be retained at the desired location by an external magnetic field. Use of magnetic fluid as a lubricant improving the performance of the bearing system has now been very well recognized. Agrawal [9] considered the problem of slider bearing working with a magnetic fluid as the lubricant and found its performance better than the one with conventional lubricant. Bhat and Deheri [10] extended this analysis by considering a magnetic fluid based porous composite slider bearing with its slider consisting of an inclined pad and a flat pad. The effect of electric and magnetic fields on the flow of electrically conducting lubricants has been studied. Usually, two general configurations of the slider have been analyzed. One configuration uses a transverse magnetic field with tangential electric field while the other uses a tangential magnetic field with a tangential electric field. Bhat and Hingu [11] conducted a study of the hydromagnetic squeeze film between two layered porous rectangular plates. Here it was shown that MHD induces a relatively better performance.

But owing to elastic, thermal and uneven wear effects the configuration of the bearing encountered in practice are normally far from being smooth. It is an established fact that the bearing surfaces tend to be rough after receiving some run in and wear. Even sometimes the contaminations of lubricants and

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*Research Article*

# Evolution of Periodic Orbits within the Frame of Formation Satellites

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In the framework of formation satellites, the periodic orbits of deputy satellite are analyzed when the chief satellite is moving in an elliptical orbit. This analysis is developed on 1- to 10-loop periodic orbits of the deputy satellite. These orbits along with their associated loops are discussed under some specific initial position sets. The effects of different initial velocities, initial true anomalies, and eccentricities on the initial position and orbital period of periodic orbits of deputy satellite are investigated.

## 1. Introduction

The periodic orbits have substantial and leading role in exploring and understanding the behavior of dynamical systems. At most, they define strange attractors, which lead to chaotic dynamical systems. The special solution of a dynamical system, which repeats and generates itself in time, is called *periodic orbit*. From the mathematical point of view, the orbit is a set of points associated by the evolution function of the proposed dynamical system. These points are considered as a subset from the phase space, which are covered by the dynamical system trajectory within frame of a particular set from the initial conditions. Some recent works, analyzing the periodic orbits, are addressed in [1–4].

The sufficient condition for the existence of periodic orbits is given when the Hamilton system is a function in the action-angle variables; further, these obtained results are applied to Hamiltonian of the perturbed Kepler problem in [5]. Also, a geometric approach to asymptotically stabilize with a phase of fixed periodic orbits for global Hamiltonian dynamical system is established in [6]. While in [7], the new families of periodic orbits analytically for the Hamilton system are found, which characterize the local motion in the region around the galaxy center. Furthermore, in [8], the theory of averaging is applied to prove the existence of twelve families of periodic orbits in a 3-dimension for a galactic Hamiltonian dynamical system. Since we are interested to evaluate the periodic orbits within frame of formation satellites, we will give also an overview about the literatures and importance of formation satellites in the following paragraphs.

The formation flying of small multiple satellites as a replacement of using single large satellite has shown great interest for different defense- and science-based space missions. Formation flying consists of a set of satellites, which have the same dynamic state and governed by one control law. Abundance and precision of the proposed system in terms of formation satellites are more effective tools, which give a job more accuracy than using a conventional large single satellite. It also reduces the maintenance and launching costs, extremely expands the surveillance area, and gives more resilience into the design of space mission. For example, a sensor of ground observation can be loaded on bunch of satellites flying in a specified formation for increasing aperture size instead of constructing a large single satellite with more expense. There are chances of aborting the whole mission in the event of satellite failure. Proper management of satellites cluster with special planning and scheduling reduces the chances of failure.

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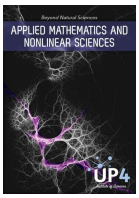

Applied Mathematics and Nonlinear Sciences

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# On the triangular points within frame of the restricted three–body problem when both primaries are triaxial rigid bodies

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## Abstract

In the framework of the restricted three–body problem when both primaries are triaxial rigid bodies, for different cases of Euler's angles, the locations of the triangular points, and the stability conditions of motion in the proximity of these points are constructed. The numerical solution is obtained by using a fourth order Runge–Kutta–Gill integrator with some graphical investigations.

**Keywords:** Restricted three–body problem, Triaxial rigid body, Euler angles.
**AMS 2010 codes:** 70F07, 70F10, 70F15.

## 1 Introduction

Restricted three–body problem (RTBP) plays very important role in celestial mechanics and space science. [12, 15] and [23] are very good books in celestial mechanics which explains importance of RTBP in space dynamics. Classical RTBP is explained in detailed in [15]. [2, 3, 6, 8] have studied RTBP with different perturbations like solar radiation pressure, oblateness, air drug etc. With both primaries as point masses. [7] have studied numerical integration with Lie series in the case of RTBP.

It is well known that the classical planar restricted three body problem (CRTBP) possesses five liberation or stationary points. These points are known as Lagrangian points. Out of these five points three points are collinear which are unstable where as two points are triangular which are stable in nature. [1, 4, 5, 11] studied

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# THE PERTURBED PHOTOGRAVITATIONAL RESTRICTED THREE–BODY PROBLEM: ANALYSIS OF RESONANT PERIODIC ORBITS

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Abstract. In the framework of the perturbed photo–gravitational restricted three–body problem, the first order exterior resonant orbits and the first, third and fifth order interior resonant periodic orbits are analyzed. The location, eccentricity and period of the first order exterior and interior resonant orbits are investigated in the unperturbed and perturbed cases for a specified value of Jacobi constant $C$.

It is observed that as the number of loops increases successively from one loop to five loops, the period of infinitesimal body increases in such a way that the successive difference of periods is either 6 or 7 units. It is further observed that for the exterior resonance, as the number of loops increases, the location of the periodic orbit moves towards the Sun whereas for the internal resonance as the number of loops increases, location of the periodic orbit moves away from the Sun. Thereby we demonstrate that the location of resonant orbits of the given order moves away from the Sun when perturbation is included.

The evolution of interior first order resonant orbit with three loops is studied for different values of Jacobi constant $C$. It is observed that when the value of $C$ increases, the size of the loop decreases and degenerates finally into a circle, as well as the eccentricity of periodic orbit decreases and location of the periodic orbit moves towards the second primary body.

1. **Introduction.** The model of the restricted three-body problem plays a significant role in constructing the motion of artificial satellites. This model can be also used to describe the motion of the planets, the minor planets and the comets. The

2010 *Mathematics Subject Classification.* 37N05, 70F07, 70F15.

*Key words and phrases.* Photogravitational restricted three–body problem, periodic orbits, interior resonance, exterior resonance, oblateness, Poincaré surface of section.

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# On Higher Order Resonant Periodic Orbits in the Photo–Gravitational Planar Restricted Three–Body Problem with Oblateness

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## Abstract

This study includes interior higher order resonant orbits in the framework of photo–gravitational planar restricted three–body problem with oblateness. Seventh, ninth and eleventh order interior resonant periodic orbits are analyzed for Sun–Earth system with perturbation and without perturbation for four different families. The location, eccentricity and period of resonant orbits are investigated for these families, namely, classical case, perturbation due to solar radiation pressure only, perturbation due to oblateness only and perturbation due to both solar radiation pressure and oblateness for a given value of Jacobi constant $C$. It is observed that there exist periodic orbits for seventh and ninth order resonance which are passing around the Earth. We have analysed these orbits without and with perturbation due to oblateness of the Earth in detail. Such orbits are seldom found in literature. Further, eccentricity of periodic orbit which is not passing around the Earth is more than eccentricity of the periodic orbit passing around the Earth with given number of loops and for the same family. It is observed that for a given order of resonance, period of orbits are increased by 6 or 7 units as number of loops is increased by 1. This indicates that the time elapsed for making one loop is approximately equal to the period of the Earth, which is 6.2827 units. The location of periodic orbits recede from Sun as the number of loops increase. For an orbit with given number of loops, the location of periodic orbits shifts towards Sun and the eccentricity of the periodic orbits decrease as the order of resonance increases.

**Keywords** Restricted three–body problem · Periodic orbits · Interior resonance · Photo–gravitation · Oblateness · Poincaré surface of section

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Research Article

# Estimation of PM10 Distribution using Landsat 7 ETM+ Remote Sensing Data

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**Abstract** Remote sensing imagery is a rich source of information with applications in varied fields. Monitoring of environment pollution is one of them. The work presented in this paper is focused on estimation of the ambient concentration of pollutant using remote sensing. Particulate Matter with particle sizes less than 10 microns (PM10) is estimated for the study area Vadodara. Landsat 7 ETM+ data of different wavelength has been processed and analyzed for the relationship with coincident ground station PM10 data. The radiance values observed by the satellite and its difference with the radiance calculated after atmospheric correction for the same pixel is considered as a measure to estimate PM10. This difference, called path radiance is calculated and correlated with the ground station PM10 values. Using regression analysis on the calculated data and the ground station PM10 data, the algorithm for PM10 estimation is generated and PM10 map is generated for the study area. The algorithm shows good results for the test data. Pollution estimation through remote sensing is an efficient technique as it can be carried out in less time. Estimation and analysis for larger area is possible using remote sensing approach. The 30 meter resolution of Landsat satellite makes it more suitable for local and regional study.
**Keywords:** *Landsat ETM+; PM10; Remote Sensing*

## 1. Introduction

Air pollution is a major problem causing damage to human, animal, crops and water bodies (Kampa and Castanas, 2008; Kanakiya et al., 2015). Respirable Suspended Particulate Matter (RSPM) also known as particulate matter 10 (PM10) are particles with size less than 10 microns (Husar et al., 1981; Ayub and Sharma, 2011). The ambient concentration of PM10 is measured under the National Ambient Monitoring Program (NAMP) by Pollution control board under which, the data is collected for selected stations of the city periodically. Remote sensing can be effectively used to estimate the concentration of PM10 for air quality. The atmosphere affects satellite images of the Earth's surface in the solar spectrum (Lillesand and Kiefer, 1980; Saleh and Hasan, 2014). Hence, different algorithms applied to find about accurate concentration of PM10 particulate from the captured image from satellite of any given area.

Many scientists have used different algorithm to find out PM10 level in different areas of world using satellite image. Li et al., (2015) has used aerosol optical thickness (AOT) based Particulate Matter study. Lim et al., (2007) has used Landsat data for PM10 distribution. Emili et al., (2010) has used

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# Spectral Response of Multispectral Sensors to Remote Sensing Based PM10 Retrieval

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*Abstract* - **The spectral characteristics are a key to remote sensing applications. The extraction of meaningful information from the imagery necessitates good knowledge and understanding of the spectral characteristics of the satellite sensors. Multispectral satellite sensors record information in wide of spectral channels. The spectral response in specific wavelength plays a major role in remote sensing applications. PM10 estimation using remote sensing is now becoming popular approach for pollution monitoring. Several approaches have been used for estimation of PM10 using various satellite sensors. This paper presents the sensitivity of satellite sensors at different wavelengths and its application to estimate PM10. The atmospheric absorption, reflectance and transmission behavior for Visible and Infrared ranges is a key to particulate matter monitoring. The sensitivity of different channels of MODIS, MERIS, SPOT5, Landsat TM/ETM+ and Landsat 8 have been analyzed. The sensor characteristics have also been presented to find the suitability of these sensors for PM10 distribution.**

*Key Words*— **Landsat, MERIS, MODIS, PM10, Spectral response, SPOT5.**

## I. INTRODUCTION

Highlight a section that you want to designate with a certain Respirable Suspended Particulate Matter (RSPM) also known as particulate matter 10 (PM10) are particles with size less than 10 microns [1] [2]. Ground station based monitoring of PM10 cannot provide distribution mapping of an area as the concentration is highly variable. Remote sensing is an effective approach for mapping the PM10 distribution [3] [4].

The remote sensing sensors can be categorized into active and passive sensors. Passive sensors need an external source of energy, which is normally given by the sun which is the natural source of energy [5]. The reflected and emitted energy from the target object is detected by the satellite sensors. Active sensors have their own source of energy. The transmission of energy from the surface is recorded by the sensors for different portion of the electromagnetic spectrum including both visible and non-visible regions of the spectrum [6]. Transmissivity is the ability of the atmosphere to allow the energy to pass through it. It depends on the wavelength and type of radiation. The atmospheric gases allow energy with certain wavelength to pass through, whereas absorbs certain wavelength energy. In certain range of EM spectrum, there is very little or no absorption of energy, which allows the energy to easily pass through the atmosphere.

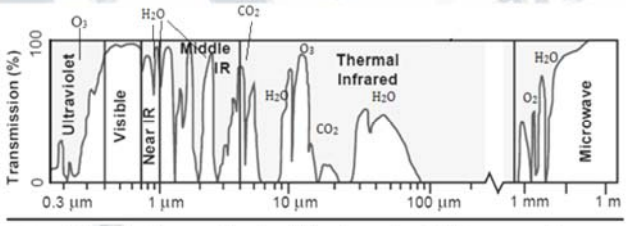


***Fig. 1 Atmospheric Windows in EM ranges****

*Source: *Source: Randall B. Smith, Introduction of Remote Sensing of Environment, 2012, TNTmips microimages.com

These wavelength ranges are known as atmospheric windows and records the best energy values to acquire the information about the phenomena of the earth. Atmospheric windows are present in the visible part (0.4 µm - 0.76 µm) and the infrared regions of the EM spectrum [7] [11].

In the UV (0.25 –0.4 µm) and visible (0.4–0.7 µm) range of wavelengths, the sun energy and its reflected light dominates the radiance being emitted back to the space. Very few gases (O3, SO2, NO2, formaldehyde and glyoxal) exist that have absorption features that allow their detection at UV and visible wavelengths [12] [13]. Aerosols dominate visible radiative transfer. Particulate Matter can be recognized using visible wavelength, because light scattering by aerosols is strongly dependent

# An Analysis of Examination Tools and Methods to Control Congestion in Network

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***ABSTRACT:*** ***The real necessity of Network of Computer are Innovative work method to plan a fresh convention or else calculation as well as in additionally ventures in the direction of approve then check rightness of activity plus their arrangement possibility. We take a few device methods that are accessible intended for the examination of network of computer blockage control in the region. The motivation behind investigation is toward investigate different conceivable study instruments as well as strategies accessible used for blockage regulator in network of computer.***

***KEYWORDS: TCP, Ad-hoc, Simulation, Emulation, Live Testing***

## 1. INTRODUCTION

Outline, advancement and assessment of system clog control conventions are a perplexing assignment including different stages. Among them the trial and assessment stages, which in the long run gives a worldwide view, are indispensable strides in examine and advancement procedure of appropriated applications and correspondence conventions. In this unique situation, three standard strategies for innovative work regularly utilized are emulation, simulation and live experimentation [2].

The reason for this examination stays to survey the foremost explore instruments plus strategies intended for Control Congestion. An endeavor has be situated to arrange main inquire about instruments as well as methods used for organize blockage control through thinking about the highlights, comparative benefits and faults. Along these lines this examination will follow a superior picture of significant issues, difficulties and conceivable arrangements identified with organize clog control inquire about instruments and methods.

The paper is sorted out as takes after: In Segment 2, a transitory audit of exploration systems utilized designed for arrange blockage control. Area 3 demonstrate the fundamental perceptions establish amid to this investigation. At last Section 4 finishes up the study of the paper.

## 2. Computer Network Research Techniques

Here a compact outline of Innovative Network work instruments are introduced. The intention is to expand different apparatuses utilized for compute network innovative work.

Simulation is an extremely effective and conservative way to explore different avenues regarding conventions. System reenactment regularly utilizes impromptu model and consistent event driven systems. Standard apparatuses, for example, NS-2 [3] or OPNET [4] give a center reproduction motor, also as an extensive arrangement of convention models. These reproduction apparatuses enable investigations to be done monetarily with minimal effort. Test systems utilizes particular displaying procedures which streamline the examined issue by focusing on the most basic issues identified with plan and advancement of correspondence conventions. For example, arrange reproduction utilizing NS-2 has been utilized by the greater part of the analysts to outline also, advancement of switch based blockage control calculations. Be that as it may, reenactment devices don't work in ongoing condition since they depend on virtual timing plan. One more basic issue while utilizing test system is to confirm that the administrations what's more, exhibitions offered by the recreation demonstrate are either steady with the genuine exploratory execution of the convention or not. At last, just two arrangements are left to understand a continuous assessment of a correspondence convention 1. Network Emulation and 2. Live Testing.

Emulation remains thought in the direction of a mix of equally simulation and live testing. In the meantime quite a while, advances in rapid handling and systems administration have permitted the quick advancement of system emulators. This method includes implementing and estimating genuine conventions plus application executions above a specific system wherever portion of the correspondence engineering be there reproduced progressively. The point of emulation exists to enable a dispersed programming to route moreover in sensible circumstances or particular circumstances. It is utilized toward accomplish tests utilizing together genuine convention executions as well as system replicas. Fundamentally, this permits formation of a precise correspondence condition. This correspondence condition may deliver particular objective practices as far as nature of administration. Furthermore, emulation goes for giving "counterfeit weaknesses" going on the system toward assessment carefulness of the tested convention. These impedances incorporate missing particular parcels, decreasing the system transmission capacity with a particular planning or presenting interval above the system. Emulation stays especially valuable in troubleshooting as well as in testing period.

# FRAMEWORK AND ALGORITHM FOR INCREASING QUALITY OF SERVICE – SOFTWARE DEFINED NETWORKING

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**Abstract:** Regardless of the huge achievement and acceptance of computer networks within the current years, outdated specification cascades in need of nearly supplies by several applications. Single specific deficiency is that the absence of suitable approaches intended for providing quality of service (QoS) agreement to varied network applications. during this paper, we discover novel Software-Defined Networking (SDN) instruments to establishment QoS to network flows. This learning underwrites to delivering QoS provision to applications in various features. especially, we learn original communication mechanisms for giant data transmission within cloud computing setting. rather than employing a sole TCP track to transmission of data, we examine the way to tenancy the appliance found out several TCP pathways for an equivalent application to realize higher throughput.

**Index Terms - Quality of Service, Multipath TCP, Network Architecture, Software Defined Networking.**

## 1.Introduction

Providing Quality of Service wasn't one among the goals within the initial design of the web. However, Internet applications (e.g., multimedia streaming, online-gaming, teleconferencing, etc.) evolved over time and their need for QoS guarantee became clear. Someone can argue that over-provisioning network resources to satisfy QoS requirements is economically more feasible than replacing existing specification. However, over the years there are many efforts aimed toward providing QoS. Integrated Services (IntServ) and Differentiated Services (DiffServ) were the 2 main proposals, although they weren't successfully deployed on an outsized scale.

### 1.1 IntServ

IntServ provides Quality of Service guarantee by reserving resources at each router along the trail travelled by the packets of a flow. There are two parts of this architecture. First, the flow specification which describes the traffic flow and its requirements. The flow is defined as "distinguishable stream of associated datagrams that fallouts since one user activity and requires an equivalent QoS" [1]. Second, the Resource Reservation Protocol (RSVP) [2] which is that the signaling protocol used between hosts and routers to request reservation of resources so as to supply the requested QoS, routers got to implement traffic control. Although IntServ provides QoS guarantee, it's some drawbacks that prevented wide adoption of this architecture [3].

### 1.2 DiffServ

DiffServ was proposed to beat the difficulties adopting IntServ. It provides mechanisms for aggregating traffic flows into classes. The coarse-grained traffic classes improve the scalability, in contrast with IntServs fine-grained traffic flows. The classification is completed by utilizing Differentiated Services Code Point (DSCP) [4] field within the IPv4 and IPv6 headers. DSCP was introduced to exchange ToS field in IPv4. The classified packets are marked in order that they are often identified by routers and forwarded accordingly.

### 1.3 Qos Metrics

Quality of service requirements are typically stated in commission level agreements (SLAs) that specify the guaranteed network performance to be provided for clients' applications by service providers. Network performance is measured against a group of attributes that include:

• Guaranteed minimum bandwidth. Throughput achieved by traffic streams is affected by several factors like link capacity and network congestion. Providing guaranteed minimum bandwidth to certain traffic flows (e.g., real-time video streaming) ensures that such flows will deliver data as needed to the receiving end.

• Guaranteed maximum latency. End-to-end latency (delay) is that the whole period it takes aimed at one packet to be communicated from the sender to the receiver. It involves transmission delay, propagation delay, queueing delay and processing delay. voice IP (VoIP), teleconferencing and online Internet gaming are samples of network applications that increased latency affects their performance.

• Guaranteed maximum packet ratio. Network congestion can cause failure of delivering some packets. this will happen when buffers in network devices reach their maximum capacity. during this case, routers and switches will need to drop some packets. TCP, being a reliable transport protocol, ensures the integrity of transmitted data by employing receipt acknowledgements and retransmitting lost packets. However, dropped packets affect the performance of TCP protocol because it is taken into account a congestion signal (identified by retransmission timeouts and duplicated acknowledgements). In response to congestion signal, the TCP congestion control algorithm will reduce the sending rate of the TCP stream to avoid congestion.

# Ambient Assisted Healthcare systems with fog computing

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***Abstract*—** Recent trends in research & development are highly focused on building smart support systems for healthcare. Objective is to provide technology-assisted solutions at home environment to reduce dependency of users on external entities. Emergency health services are developed for patients suffering from critical diseases in their surroundings. Ambient Assisted Living (AAL) systems are developed to provide self-care support to people suffering with physical or mental weakness. Modern technologies like cloud computing, edge computing, Fog computing is playing crucial role in development of AAL systems. In this paper, existing AAL systems with fog computing techniques in healthcare domain are reviewed comprehensively. Comparative study has been carried out on fog computing methods used in healthcare domain nowadays. Observations from our study are discussed in this paper.

**Keywords—** *Fog Computing, Cloud Computing, Ambient Assisted Living, Smart Healthcare, Monitoring, Mobility Tracking*

## I. INTRODUCTION

Research and development in technologies like cloud computing, distributed computing and edge computing helps stakeholders to build smart & supportive environment for people. Healthcare domain is immensely benefitted through these technologies. Emergency health services are developed with cloud computing in recent past. Cloud computing can perform health related services more efficiently and remotely with pool of high-end resources and infrastructure at Cloud layer [1].

Evolution of intelligent devices and immense growth in smart healthcare demands formed some challenges for cloud computing based systems. Use of cloud computing for health emergency systems may generate some issues like:

*a) High latency*: Processes running outside edge network in cloud requires more processing time. Higher response may affect performance of healthcare services at time of emergency.

*b) High computational power:* Resources placed away from end users in cloud consumes more computational power.

*c) High-risk of data privacy violation:* Storing patient information at centralized data storage may cause privacy breach.

*d) High Failover time: Recovery* of cloud services required more time in case of major block or failure. It may affect continuous access of resources & services.

Fog can play a critical role to extend cloud by shifting intelligence and processing near to the user. Emergency support systems in health domain require techniques with minimal latency, localized data processing and reduced network bottlenecks. Fog computing approach can provide extended & optimized services in comparison with conventional cloud computing approach [8].

The remainder of the paper is organized as follows. In Section II, brief overview on fog computing & fog computing components is given. Section III includes review of literatures based on the related research work in identified domain. Discussion on scope and compatibility of fog computing for AAL-health emergency applications is represented in section IV followed by the conclusive remarks in section V.

## II. FOG COMPUTING

The Fog computing term referred as an extension of cloud computing services from the centralized environment to the edge [19].

Cisco [16], defined fog computing as a system-level horizontal architecture that distributes resources and services of computing, storage, control and networking anywhere along the continuum from Cloud to Things.

National Institute of Standards and Technology [19], defined fog computing as a layered model for enabling ubiquitous access to a shared continuum of scalable computing resources. The fog computing model facilitates the deployment of distributed and latency-sensitive applications where fog nodes resides between smart end-devices and centralized cloud services [17].

Nodes with storage, computation and networking abilities can become fog nodes. Fog nodes can be deployed physical or virtually anywhere between cloud and end-users. Fog nodes can provide real-time processing, user control, minimum response time and transient storage. Fog nodes can send aggregated data periodically to Cloud [16].

# Plant Diseases Recognition Techniques

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***Abstract-*** This review of article discusses about the mechanisms to early detect plant cereals' leaves diseases to ensure the quantitative and qualitative safety of the products using image processing and machine learning techniques. Hence, in this review, a number of machine learning and image processing techniques, such as K-nearest neighbor, Nave bayes, Radial basis function, Convolutional neural network, Self organizing map, Fuzzy inference system, Artificial Neural Network, Support vector machine, minimum distance criterion, least square support vector machine, Feed forward neural network, learning vector quantization, deep convolutional neural network approach and GLCM, First-level Haar wavelet and thresholding were used respectively.

***Keywords-*** Training**,** image processing, F1 score, classifier, performance, Precision, recall, accuracy, machine learning, image segmentation and image extraction.

## I. INTRODUCTION

The sole aim of this review is to identify techniques that can be used for protecting-at least minimizing, the severity of cereals' diseases to ensure the food security of the agrarian (people leading their life by agriculture) because 80 to 85% [5] of Ethiopia's society lives in the rural areas (are agrarian). The quality and quantity of the agricultural products must be maintained by taking care of the agricultural plants early from different diseases. It is common to see different agricultural plants' (plants used as a source of food) diseases in different parts of the country and in different seasons. However, there are no adequate ways to early detect the diseases and ensure the quality and quantity of the products. Hence, the objective of this review is to identify the existing techniques to early investigate agricultural plant diseases so that the techniques can be adopted or can pave a way to another techniques to early protect the cereals, such 'cactus'.

### 1. Agricultural Plants' Diseases Prediction Techniques

A research study was done by [5] to investigate Ethiopian Coffee plant diseases. It was conducted in such a way that, the authors collected a dataset (images) using a standard camera from the place where coffee plant is plenty to predict Coffee Leaf Rust, Coffee Berry Disease and Coffee Wilt Disease of coffee plant leaf diseases. For this purpose, the researchers have collected 9100 coffee plant leaf diseased images for both training and testing. They used 70% of the images for training and 30% of them for testing using MATLAB2013Ra. To investigate the diseases, preprocessing task, such as removing low frequency, background noise, normalize the intensity of the individual particles on the images, removing reflection and masking portion of the images were conducted.

Since image preprocessing is not enough to get good result during the classification stage, the researchers have used K-means technique for image segmentation and genetic algorithm was used to select the features (level co-occurrence matrix and color) to classify the types of Ethiopian coffee plant diseases. They also used Sobel edge detector to find the edges of the infected portions of the acquired coffee leaf images.

As it is stated above, the authors have used 70% of the image (dataset) for training their model during the experimentation step. Artificial Neural Network, K-Nearest Neighbor, Naive Bayes and combination of Radial basis function and self organizing map were used as classifiers and color and texture features were used as features of classification to classify the three types of coffee plant diseases in to three class labels.

Lastly, the authors have found that color features have good representing power than texture features and the combination of SOM and RBF has better classification performance (result) as can be seen below.

**Table 1. Classifiers' performance**

| S/No. | Classifier | Performance (%) |
|---|---|---|
| 1 | Hybrid of RBF and SOM (Radial basis function and Self organizing map). | 90.07 |
| 2 | Artificial Neural Network (ANN) | 79.04 |
| 3 | Nearest Neighbor classification (KNN) | 58.16 |
| 4 | Naive Bayes | 53.47 |

As stated in [1], the previous work was improved by 20% using different image processing and machine learning techniques. This study was done to investigate scorch, cotton mold, ashen mold, late scorch and tiny whiteness from a collected leaf images using digital camera. As visually identifying diseases is expensive, tiresome, time consuming, difficult and inefficient, machine learning was found to be the mere solution with the help of image acquisition, preprocessing, segmentation and feature extraction for early stages of diseases detection and treatment of the diseases.

To detect these diseases accurately and faster, the authors used K-means clustering to identify the infected objects, extracted the features set of the infected objects using color co-occurrence methodology for texture analysis. Artificial Neural Network classifier was used to detect and classify the type of the diseases by putting the leaves in infected or non-infected class labels.

# Improved Load Balancing in Cloud Computing Environments

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***Abstract*—**Recent enhancements in storage, computing and communication technologies have triggered several improvements in cloud computing technologies. Cloud computing technologies have gained a lot with help of improvements in security aspects and increased transparency in service level agreements. Efficient management of cloud computing environments depends on efficient utilization of cloud based resources and smooth execution of service level agreements. Ample research work on load balancing in cloud computing is going on. A novel load balancing technique in cloud computing environment is presented in this paper.

***Keywords*—***cloud computing, hybrid cloud, collaborated cloud, load balancing, task migration*

## I. INTRODUCTION

Technological advancements in cloud computing technology and communication technology has stimulated adoption of cloud computing in the Information Technology (IT) Sector. Various characteristics such as zero maintenance, continuous availability, and least cost are few driving forces behind wide acceptance of cloud computing in various IT and non-IT sectors. Reduced IT solution providers have already started delivering cloud based solutions for various problem domains. Moreover, several Internet of Things (IoT) based computing solutions also nowadays bank upon cloud computing for not only data storage but also computation.

On other side, increase in demand for cloud based IT solutions, has resulted into increase in requirement for cloud based resources such as storage and compute. Managing such increase in demand for cloud based resources is becoming challenging for the cloud service providers day by day. Due to uncertainty in various service request parameters such as – time of service utilization, service request arrival time, quantity of required resources, and time duration of the resource requirement – the puzzle of efficient resource management becomes very difficult for the resource managers. Moreover, the inappropriate resource management may result into violation in Service Level Agreement (SLA).

Various load balancing techniques exist for optimized resource management. One of the load balancing technique in cloud computing environments is migration of virtual machines over physical machines. On other side, few load balancing techniques rely on redirection of incoming requests to different virtual machines other than the overloaded virtual machine which is actually required to handle the incoming request.

Though such techniques are suitable for intra cloud load balancing, there is serious requirement of inter cloud load sharing techniques. Nowadays, cloud service providers have started joining hands by collaborating their respective cloud computing environments for the sake of optimized resource utilization, improved cost saving, reduced energy consumption and higher availability. Such collaborated clouds help service providers to withstand SLAs in better way and thereby generate more profit. A load balancing technique for collaborated cloud computing environments has been presented in this paper.

Related survey is presented in Section II. Suggested mechanism is presented in section III. Resultant outcomes are described in section IV.

## II. RELATED WORK

Load balancing plays vital role in harmonizing financial benefits and user contentment. The cloud computing environments incorporate several physical, logical and architectural components. The physical infrastructure consists of data centers having high-end compute and storage capabilities. Moreover, the collaborated cloud environments are connected by means of routers and switches. On other side, such huge physical infrastructure for continuous functioning and availability, requires enormous amount of uninterrupted energy supply.

In a work suggested by Azar et al., resource management is based on f-restricted algorithm. The technique incorporates first fit based algorithm [1]. A load balancing technique based on weighted signature is suggested by Ajit et al. works on reducing response time. The technique collects load assignment value for the available machines and accordingly associates virtual machines to the machines [2]. The honeybee theory based load balancing technique suggested by Vasudevan et al. assigns the available resources to cloud network for reducing the service makespan [10].

A load balancing technique suggested by Zhu et al. works on improved Particle Swarm Optimization in cloud computing environment [11]. A cloud resource management technique suggested by Kapur is based on Load Balanced Resource Scheduling for reserved and on-demand resources [7]. A Lyapunov optimized theory based technique is suggested by Deng et al. [4]. They have proposed an algorithm EcoPower which implements optimized power management and resource management. A load balancing technique suggested by Joshi et al. works on shifting of desired tasks from highly loaded

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# DYNAMIC LOAD BALANCING IN CLOUD COMPUTING PLATFORM

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**ABSTRACT**

*The cloud computing platform has played significant role behind the exponential growth of modern IT industry. More and more organizations & individuals from various sectors of society are directory or indirectly consuming cloud computing platform. Such rising demand for cloud based computing resources has generated requirement of optimized resource management and load balancing. Extensive research work is taking place for efficient resource management and load balancing. A dynamic approach for virtual machine load balancing is presented here. The load balancing mechanism presented here offers better efficiency due to its multi-threaded approach.*

**Key words:** load balancing, cloud computing, collaborated cloud, task migration.

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## 1. INTRODUCTION

Innovative headways in storage technologies, internet of things and communication technologies has given momentum to usage of cloud computing platform. Cost effectiveness, negligible maintenance and uninterrupted availability are some of the driving forces behind the fast growth and usage of cloud computing technologies. Moreover various open source cloud computing platforms also have started getting handsome attraction in the cloud computing market. Various emerging technologies such as edge computing and data analytic techniques such as machine learning and deep learning also are key players in growth of cloud computing.

On other side, the exponential demand for cloud based resources often creates problems on resource management. Utilization of cloud based resources in the most cost effective way is of course one of the primary requirement for service consumers. Moreover, cloud service providers also often stretch on optimum resource management by means of load balancing [9] for sake of meeting the Service Level Agreements.

Recent advancements in cloud load balancing are more towards collaborated clouds and load balancing in such cloud computing environments. An improved work on load balancing

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# Classification of Healthy and Diseased Cactus plants using SVM

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***Abstract-***Machine learning is very important technology that can support people in different disciplines (Agriculture, health centers, household, transportation, etc) and different levels of life. Machine learning increases accuracy. It uses various types of data (image, video, audio and text) for different purposes and applications. Our work mainly focuses on cactus diseases detection to early prevent the reduction of productivity (quantitatively and qualitatively) of the cereal. To do this, the researchers have used 500 unhealthy and 72 healthy cactus images. The images were enhanced, noises were removed and images were segmented to create good model using imadjust, guided filter and K-means clustering techniques respectively. These image preprocessing techniques were selected from many techniques after implementing each technique and measuring their performances. As part of creating the model, feature extraction techniques (Color histogram, Bag of features and GLCM) were applied to extract color, bag of features and texture and respectively. After testing the model applying these features, bag of features were found to be best for creating better model and they were selected as features of our model. We created our machine learning model using bag of features applying linear SVM. Other machine learning algorithms were used to train and test the model for detecting the diseases, but linear SVM was found with best performance (97.2%). In this task, 75% of each class were used for training and 25% were used for testing the model. Finally, the similarity for classification was checked using linear kernel, RBF kernel and Polynomial kernel and an average accuracy of 94% was achieved though linear kernel is the best classifying method with an accuracy of 98.951%.

***Keywords***: Machine learning, supervised learning, unsupervised learning, training, classification, feature, bag of features, algorithm, k-means, MSE, PNSR, and linear SVM.

## 1. Introduction

Machine learning is the semi-automated extraction of knowledge from data. It applies algorithms to the data using machines (computer) to provide the required knowledge and makes many more smart decisions in order to make the process successful [1]. Machine learning, as part of artificial intelligence, can also be defined as a method that computers can learn to make predictions based on data (statistical or image data). It gives computers the ability to learn without being explicitly programmed. Machine learning can be illustrated as a learning system that can distinguish spam or non-spam email messages, i.e. categorizing spam messages into spam folder and non-spam messages into non-spam container. Machine learning is frequently used in various fields, such as medical diagnosis, self driving cars, computational biology, astrophysics, public policy, stack market analysis etc. Machine learning is very important when there is shortage of skilled professionals to detect the phenomenon and assures the accuracy of the result (predicted outcome) because people may not be accurate, for example, in reading images of diseases. Generally, machine learning is preferable because [2] (1) it is much more accurate than human-crafted rules (since it is data driven) (2) humans are often incapable of expressing what they know (3) it does not need a human expert or programmer (4) it is automatic method to search for hypotheses explaining data (5) it is cheap and flexible (can apply to any learning task).

The aim of this work is to classify Cactus images as healthy or unhealthy to early detect the plant's diseases to assure the quality and quantity of its products. In this article, architectural model of the system (classifier) is proposed showing the necessary steps to achieve the goal. Therefore, in the following sections, image enhancement, noise removal, segmentation, features extraction and classification of the plants are done using different techniques for each task.

## 2. Architectural Design of the Proposed System

System architecture is the high level description of components of a system and their communication or it is building and/or designing the system structures [3]. As it can be seen in Fig 1, the architecture of the proposed system has two phases, namely,

 

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# Efficient Load Balancing in Cloud Computing

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*Cloud computing, load balancing, task migration, resource allocation.*

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**ABSTRACT**

*The cloud computing stage has instigated noteworthy job behind the exponential development of present day IT industry. An ever increasing number of associations and people from different areas of society are catalogue or in a roundabout way expending distributed computing stage. Such rising interest for cloud based figuring assets has created necessity of enhanced asset board and burden management. Broad research work is occurring for effective resource and workload allocation in this area. An improved version of the multi-threaded dynamic load balancing technique for cloud computing environment is suggested here. The results obtained by applying the suggested mechanism in open source cloud computing platform indicate noteworthy improvement in workload of overloaded virtual machines after execution of load balancing.*

## 1. Introduction

Cloud computing technology offers high availability, reliability, transparency and flexibility. Apart from the benefits and applications of cloud computing models available, the booming need for diversified cloud computing environments is creating various challenges for stake holders. Cost effective management of cloud computing based services and resources is one of the key factor for delivering efficient cloud based services. Efficient resource management and resource allocation is one of the critical operational task in administration of underlying physical and virtual cloud infrastructure [2].

With help of different approaches, noteworthy research work is being carried out in domain of load balancing in cloud computing platform. Ongoing progressions in cloud load balancing are more towards resource allocation and management in hybrid cloud computing environments. An enhanced load balancing technique of the suggested mechanism is presented here. Section 2 presents the related work in domain of resource allocation and management in cloud computing domain. The proposed mechanism is presented in section 3. Outcomes are presented in section 4.

## 2. Related Work

A TB-LB approach based technique using clustering and the features of three heuristic algorithms is proposed by R. Sajjan et al. [10]. The technique tries to keep the least makespan. A load balancing technique is suggested by Zhu et al. The technique is based on improved Particle Swarm Optimization [15]. A technique suggested by Vasudevan et al. is based on honey bee theory for assignment of existing resources to cloud network by means of bringing down the service request makspan [11]. An EcoPower algorithm is proposed by Deng et al. The algorithm is for accomplishing improved rules of power and resource management and works according to the Lyapunov optimization [14]. Efficient resource allocation may result into better performance to various cloud computing applications [6].

A load balancing technique suggested by Chien et al. depends on the completion time of processes for the sake of overall performance improvement [8]. For load balancing in cloud computing environment, N. Joshi et. al. have suggested a technique which is based on centralized load balancing aspect. In spite of migrating whole virtual machine, the suggested prototype mechanism is based on shifting of workload among machines in cloud environment [4]. A resource management mechanism based on control-based self-adaptive randomized optimization has been suggested by Papadopoulos [1]. Another technique suggested by Nan S. et al. is based on dynamic placement, optimized annealing and optimized resource utilization [12]. The mechanism operates for betterment of annealing algorithms for efficiently employment virtual machines.

In order to bring down the response time, a resource management strategy has been proposed by Ajit et. al.. The technique gathers workstations' load assignment value. The technique is based on weighted signature for mapping virtual machines to physical machines [3]. In an another load balancing technique which is suggested by Azar et al. is based on f-restricted algorithm and first fit based policy [13]. N. Joshi has proposed resource management techniques for dynamic load balancing for cloud computing environments [5]. Another load balancing technique is proposed by Kapur [9]. The technique works for the on-demand and reserved cloud resources.

Diversified methods have been made functional for efficient utilization of cloud resources and workload sharing. Few techniques are based on shifting of highly loaded virtual machine to other physical machines. Few practices work on shifting of inward requests to other virtual machines having lighter work load. Few techniques also offer load balancing in collaborated cloud computing environments. An enhanced version of load balancing mechanism suggested in [5] and [7] is suggested here. The mechanism is based on shifting of task from highly loaded virtual machine to lightly loaded virtual machine.

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# Performance Centric Model for Resource Sharing in Cloud

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**ABSTRACT**

*Progressions in storage and communication technologies have encouraged usage of distributed computing technologies such as cloud computing. Moreover, implementation and consumption of collaborated cloud computing based services also is increasing day by day. There is very high requirement of efficient resource management and utilization at service provider and consumer sides in collaborated cloud computing environments. An efficient technique for workload balancing in collaborated cloud computing environments is suggested here. The technique works on resource management in both intra cloud and inter cloud computing environments for reducing waiting time for load balancing. The technique yields significant reduction in waiting time.*

## 1. Introduction

Day by day, cloud computing technology is getting more and more attraction from nearly all sectors of IT industry. Not only IT industry but also large number of IT enabled service providers and end users also have started to bank upon the cloud computing based different types of services. Availability of cost effective and advanced computing power, progressive storage and communication technology are some of the many driving forces behind exponential growth of the cloud computing technology.

Reliance on cloud based solutions helps the individual users and organizations to bank upon the remote cloud infrastructure and thereby stay away from procurement of on premise costly computing infrastructure. It also saves cloud consumers from maintenance cost of on premise high-end servers and issues such as software licensing and updates.

However, increasing demand of various cloud computing based services requires efficient resource allocation and management failure in which may affect the quality of service level agreements. In order to keep the qualitative execution of service level agreements cloud service providers often join hands for formation of collaborated cloud computing environments. Such cooperative cloud computing platforms help in not only maintaining 24X7 availability but also offering fault tolerance.

Availability of cooperative cloud computing infrastructure can be utilized for efficient resource management by means of inter cloud load balancing. A novel load balancing approach for collaborated cloud computing environments is presented here. The technique presented here enables load balancing among overloaded nodes and under loaded nodes in cloud computing platforms.

Related work in domain of cloud load balancing is presented in section 2. The suggested load balancing mechanism is described in section 3. Section 4 represents experiment and results. Section 5 represents concluding remarks.

## 2. Related Work

With aid of genetic algorithm and fuzzy theory, S. Javanmardi et. al. have presented a hybrid job scheduling approach. The approach considers cloud load balancing and reduces total execution time and execution cost by modifying the genetic algorithm. The mechanism assigns jobs to resources with considering the VM MIPS and job length [8]. I. Gupta et. al. have proposed a hybrid meta-heuristic approach for workflow scheduling for IaaS cloud load balancing. The algorithm is based on hybridization of genetic algorithm and particle swarm optimization. The algorithm takes advantages of both the algorithms by avoiding slower convergence rate of GA and local optimum problem in PSO [5]. A new VM load balancing algorithm suggested for an IaaS framework by A. Manasrah. The technique is implemented in a virtual machine environment of cloud analyst to achieve better performance in terms of response and processing time [1].

R. Awatif et. al. have proposed an enhanced load balancing strategy by means of ensuring efficient response time with reduced cost. The suggested work is based on simulation work carried out within Cloud Analyst [9]. A. Tripathi et. al. have proposed a load balancing technique to form a new ACO method. The hybrid algorithm is combined with the setting of other parameters of the upgraded bee colony algorithm to form a new ACO method. The technique uses the Cloud Analyst [3]. N. Joshi proposed a dynamic technique for load balancing. The technique is based on job relocation among virtual machines having varying workloads [6]. A load balancing technique is suggested by S. Vasudeven et. al. The honeybee theory based technique assigns the available cloud resources to network for bringing down the service makespan [10].

For efficient task allocation, a Hybrid GA-PSO algorithm is proposed by A. Manasrah [2]. The technique is based on Hybrid GA-PSO algorithm for reducing makespan and cost. The technique aims to load balance the dependent tasks over heterogonous resources in cloud computing environments. H. Ji et. al. have proposed adaptive priority based workflow scheduling technique based on multi objective scheduling with varying objective weights to self-regulate task priorities to adapt to different objectives [4].

# Optimized Mechanism for Resource Sharing in Cloud

**N. A. Joshi**

***Abstract*: The cloud computing paradigm has settled to a stable stage. Due to its enormous advantages, services based on cloud computing are getting more and more attraction and adoption by diversified sectors of society. Because of its pay per use model, people prefer to execute various data crunching operations on high end virtual machines. Optimized resource management however becomes critical in such scenarios. Poor management of cloud resources may affect not only customer satisfaction but also wastage of available cloud infrastructure. An optimized resource sharing mechanism for collaborated cloud computing environments is suggested here. The suggested resource sharing technique solves starvation issue in inter cloud load balancing context. In case of occurrence of starvation problem, the suggested technique resolves the issue by switching under loaded and overloaded virtual machines between intra cloud and inter cloud computing environment.***

***Index Terms*: cloud collaboration, cloud computing, virtualization, resource allocation, load balancing.**

## I. INTRODUCTION

Technological progressions in domain of high end computing systems, communication systems and storage units have boosted up growth of multiple computing paradigms. Cloud computing is one such paradigm. Nowadays, many computing solutions are based on cloud computing in one or many aspects by means of utilizing some of the cloud based services. Among the various cloud services available, the IaaS is used often for processing data crunching operations. People often procure high-end virtual machines to execute large scale CPU-centric data processing jobs. Service providers justify the resource hungry jobs with help of collaborating with other cloud computing environments. Collaborated cloud computing platforms offer advantages such as better resource availability and fault tolerance [7].

Efficient cloud management in terms of allocation and sharing of cloud based resources is important while the requirement for cloud based resources is growing exponentially. Improper and imbalanced resource management and utilization often results in poor consumption and wastage of cloud resources causing dissatisfaction and poor return on investments. An improved resource sharing technique in domain of collaborated cloud computing environments is presented here. The suggested technique help to overcome issues such as starvation and on demand overburdening and under loading.

Comments about study on related work in cloud resource sharing are given in section 2. Section 3 represents the suggested mechanism. Implementation details are given in section 4. Outcomes are mentioned in section 5. Concluding remarks are presented in section 6.

## II. RELATED WORK AND CHALLENGES

A technique S. Gond et. al. is works on allocation of cloud resources on basis of teacher learning based optimization [10]. A load balancing technique suggested by Manasrah works on resource sharing for dependent jobs over heterogeneous infrastructure. The technique is based on genetic pso algorithm. The task allocation technique works on the hybrid genetic pso algorithm and aims for reducing makespan and allocation cost [3]. A workflow scheduling technique suggested by H. Ji et.al. works on multi objective scheduling. The technique is based on adaptive priority and works on varying objective weights. The technique self-regulates job priorities for adoption of multiple objectives. N. Joshi proposed a dynamic technique for load balancing. The technique is based on job relocation among virtual machines having varying workloads [8]. A load balancing technique suggested by A. Kaur et.al. is optimization based on hybridization of heuristic techniques with metaheuristic algorithm for attaining optimal performance on makespan and cost [1].

For workflow scheduling in IaaS cloud load balancing, I. Gupta et.al. have suggested a technique. The technique avoids slow convergence rate of genetic algorithm and problem of local optimization. The technique is based on meta-heuristic approach and hybridization of particle swarm optimization and genetic algorithm [6]. A collaborated cloud load balancing technique proposed by N. Joshi works on allocation of inter cloud resources [9]. S. Javanmardi et.al. have presented a hybrid job scheduling approach. The technique performs job allocation by considering job length and virtual machine MIPS. The approach is based on genetic algorithm and fuzzy theory and looks for reduces total execution time and execution cost in cloud load balancing by altering the genetic algorithm [11]. Another resource sharing technique proposed by A. Manasrah, is based on cloud analyst virtual machine environment. The technique works on achieving improved performance through processing time and response time [2]. A technique proposed by N. Joshi deals with collaborated cloud load balancing by means of shifting workload among virtual machines [9].

A load balancing technique suggested by A. Tripathi et.al. forms a new aco method is based on bee colony and implemented on cloud analyst [4]. Another load balancing mechanism suggested by R. Awatif et.al. works on the Cloud Analyst platform.

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# Priority Based Mechanism for Resource Sharing in Cloud

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***Abstract*: Cloud computing technologies are getting matured day by day. Revolutions in underlying software, virtualization and hardware technologies related to storage, processing and computing technologies has helped cloud computing service providers to win trust of concerned stake holders. However, the exponentially increasing demand of cloud based resources has made task of resource management and utilization more and more challenging. A novel load balancing technique in cloud computing environment is presented in this paper. The virtual machines are implemented on an open source cloud computing platform on open source operating system. A virtual machines' priorities based load balancing approach presented here indicates improvement in overall waiting time for load balancing. The mechanism prioritizes load balancing on same priority level virtual machines or lower priority level virtual machines.***

***Index Terms*: cloud computing, load balancing, priority based resource allocation, task migration.**

## I. INTRODUCTION

Modernization in virtualization, storage and Communication Technologies have directed Cloud computing towards new heights. Moreover, the paradigms of forth generation (4G) and fifth generation (5G) mobile communication technologies have started giving momentum in utilization of cloud based services [1]. On other side, improvement in back end cloud computing technologies and reduced prices for deployment prices are encouraging more and more users for adopting cloud based service deployment. Moreover, to meet the exponential growth of cloud computing based services, nowadays cloud service providers have started coming together for joining hands for establishment of collaborated cloud computing environments [4].

However, the exponential growth in demand of cloud computing is causing challenges for service providers for offering round of the clock quality and uninterrupted services. On other side, service consumers also need to see about efficient utilization of procured cloud based resources. Situations may arise such that few procured virtual machines may be heavily loaded facing pending workload while other procured virtual machines may be idle causing wastage of resources. Non uniform utilization of cloud based resources and virtual machines results into imbalanced return on investments and thereby violations in Service Level Agreements. Hence, appropriate resource allocation and management is required for performance centric resource utilization. Optimized resource management and utilization helps in energy saving, improved resource availability and satisfactory execution of service level agreements. An improved load balancing strategy in cloud computing environments is suggested here. A study on related load balancing work is presented in section 2. Section 3 describes the suggested novel load balancing technique. Implementation scenario is presented in section 4. Section 5 covers technique's working behavior.

## II. RELATED WORK AND CHALLENGES

M. Kumar et al. have suggested a priority based approach for selection of relevant virtual machine in cloud computing environment. The scheduling algorithm works as per the tasks' priorities and selects appropriate virtual machine based on three categorization levels. The suggested cloudsim simulation based algorithm works on virtual machines in a datacenter configured for Amazon EC2 [3].

An implementation of load balancing technique is available in [7]. The load balancing technique is based on DSBP and works with cloud collaboration for logistics. The simulation based approach focuses on load balancing of different data centers for information processing at various level of logistics. The technique may be useful in inventory management and vehicles' location management.

A three phase Dynamic Data Replication algorithms have been suggested in [2]. Objective of the overall mechanism is for optimized resource deployment. For the first two phases, the mechanism determines suitable service nodes for balancing workload of service nodes. The algorithm helps in enhancing availability, access efficiency and hierarchical load balancing.

An advanced load balancing technique is available in [9]. The technique is based on static variables. The technique works on improvement on the Weighted Round Robin scheduling algorithm for the sake of reducing response time and maximize fairness concept. The mechanism focuses on improvement of workload distribution through servers and quick services to urgent requests.

A Capacity Based Deadline Aware Load Balancing approach is available in [6]. The heuristic based simulative approach works on identifying virtual machine with respect to deadline constraints and overall cost for running tasks on virtual machines.

The approach also works on various QoS parameters such as turnaround time, response time and utilization. A dynamic round robin algorithm based scheduling approach has been suggested in [8].

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# Experimental Selection of Machine learning Techniques and Image features to Detect "Cactus" Diseases

**Hailay Beyene, Narayan A.Joshi.**

***Abstract:*** ***Image is a very important data in machine learning. In order to select better features, feature extraction techniques and classifiers, intensive experiments are taken place using data. In this work, best feature, feature extraction technique and machine learning classifier are selected experimentally. Hence, bag of features were the best features experimentally out of color, texture and bag of features. Of color histogram, bag of features and GLCM (Gray-level co-occurrence matrix), bag of features extraction technique is found to be the best one experimentally. Of the machine learning classifiers shown in the scatter plot and confusion matrix, linear support vector machine is selected and the achieved accuracy is 97.2%.***

***Keywords: Cactus, bag of features, GLCM, Color histogram, Confusion matrix***

## I. INTRODUCTION

The main purpose of this work is to experimentally select machine learning and feature extraction techniques to correctly classify whether the cactus image is healthy or unhealthy. To do this, features with good classification power are also selected experimentally so that the classification will be accurate or with better performance. Before doing all these, images were acquired, enhanced (their brightness was improved); noises were removed from every image and segmentation of image pixels was performed in both phases.

## II. ARCHITECTURAL DESIGN

The intention of this work is to propose a machine learning model that detects cactus plants as healthy or unhealthy to maintain the quality and quantity of the plant to get the usual benefits. To achieve an accurate classification result, different steps were performed as it is depicted in Fig 1. The proposed architecture consists of two phases, namely, Model creation and Testing. In the model creation phase, data (cactus image) is acquired, images are enhanced, important features are extracted and the model is created by training it by the extracted features. In the second phase, the same activities that are done in the model creation phase are done except the training step. In this phase, the extracted features of the new input image are compared with the features in which the model is created and classification is done if there is matching of the features.

## III. ALGORITHM

Although a number of algorithms were used for every activity in the architecture in Fig1, the following algorithm was used to extract bag of features and create the classifier because bag of features were found with better classification power than color and texture features.

```
Input: Segmented image
Output: Bag of features
Steps:
1.put the images in step 4 of  Image
segmentation in ImageSet of their respective
directories (subdirectories)
2.for each image I in the directory
   if I is RGB image
           extract bag of features (apply bag
of
           feature extraction technique)
     else if I is not RGB image
         change I into RGB image
    else
      continue reading an RGB image
end
3.put the features in a tabular array with
each images' labels
4.divide the features as training and
testing set in which each set contains
features and their labels.
5.use  SVM and train the model by training
set
6.end
```

**Algorithm 1: Bag of features feature extraction and Model creation**

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RESEARCH

# Analysis of Friction and Wear as a System Response Using Indigenously Fabricated Tribometer

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Keywords:

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A B S T R A C T

*In this paper, tribometric characteristics of the steel-brass and steel-aluminium tribopairs were studied under different interaction parameters through varying operating conditions. An indigenous tribometer was developed using ASTM G77 protocol to estimate friction and wear characteristics for steel-brass and steel-aluminium tribopairs. Results presented here show the importance of the tribotesting of tribological properties, namely friction and wear due to complex nature of system induced interdependencies. Stribeck curve was plotted by varying the speed at a constant load for a specific tribosystem using the indigenously developed tribometer. Finally, simplified tribosystem diagram has been proposed for a better understanding of friction and wear as a system response in the tribotesting.*



## 1. INTRODUCTION

Tribology is a science of concurrent studies of three properties in a mechanical system, namely, friction, wear, and lubrication. In order to improve the life of entire machine, and the efficiency of the mechanical process it is performing, the tribology-based concepts are applied in such a way that the friction between components remains optimally less, and also that negligible wear takes place of the sliding machine components. To achieve this lubrication is applied in various parts [1].

The journey of word tribology started when Peter Jost reported that the giant economic benefits could be reaped through proper application of lubrication in order to control friction and wear related issues in the machines [2]. One of the important aspects of tribology is its interdisciplinary nature, as it deals with interacting surfaces in relative motion, where the possibilities of wide variety of surfaces and multitude of influencing factors makes it a complex phenomenon. This stronger and complicated interplay and dependencies between constituent components gives rise to system approach in dealing with tribology [3]. In last five decades numerous experiments were carried out in variety of conditions based on this system approach or extension of it. The complex nature of friction and wear has been discussed by many researchers with respect to different tribosystems in the past [4]. In one such study, friction and wear were claimed as tribo-system generated responses which are

# Hydrodynamic journal bearing lubricated with a ferrofluid

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**Abstract**

**Purpose** – This paper aims to investigate the performance of a ferrofluid-based hydrodynamic journal bearing system.

**Design/methodology/approach** – This paper presents a new design of ferrofluid-based hydrodynamic journal bearing. An experimental set-up consisting of a magnetic shaft along with a brass bearing was modified and developed. A permanent magnet was used to make the selected shaft material magnetic. The load and speed were varied to conduct the analyses for different test conditions.

**Findings** – The paper provides information about a design of ferrofluid-based journal bearing and its improved performances. For moderate to higher loads at different shaft speeds, it was found that because of the magnetization effect, the maximum film pressure in case of a ferrofluid lubricant increased up to approximately 60 per cent, compared with that of the conventional lubricant-based journal bearing system. Besides, the temperature rise was found smaller for ferrofluid lubricants, thus making the system cooler while running.

**Originality/value** – This paper offers a new design of magnetic bearing system for the experimental analysis by utilizing a magnetic shaft with a non-magnetic bearing. The present ferrofluid-based bearing design is less complicated from manufacturing point of view.

**Keywords** Temperature rise characteristic, Ferrofluid lubrication, Hydrodynamic journal bearing, Pressure distribution

**Paper type** Research paper

## 1. Introduction

Hydrodynamic journal bearings are widely used in machinery, particularly in motor vehicle engines, high-speed turbines and gear pumps. It is well known that most journal bearing design applications utilize a lubricant fluid to decrease the friction between the surfaces. For successful operation, the bearing requires effective lubrication. This enhances the bearing lifetime and ensures a better performance. Ferrofluids are a colloidal suspension of fine iron oxide particles coated with surfactant in a non-conducting base fluid. These fluids can be positioned, shaped and controlled at a desire location which leads to the application of ferrofluids in sealing and lubrication of bearing systems. Some of the pioneering research articles in the area of ferrofluid-based lubrication were presented by Kuzma (1963), Neuringer and Rosensweig (1964), Shliomis (1972), Jenkins (1972) and Tarapov (1972).

Concerning ferrofluid lubrication in fluid film bearings, a number of articles on theoretical aspects have already been published: Tipei (1982), Sorge (1987) and Zhang (1991) have derived the Reynolds equation for theoretical pressure distribution considering a magnetic field that has a gradient only in the axial direction. Chandra *et al.* (1992) analyzed ferrohydrodynamic lubrication in journal bearings by considering cavitation boundary in journal bearings. It was shown that qualitative behavior of various bearing characteristics remained similar to that in the case of non-ferromagnetic fluid. Osman *et al.* (2001) obtained the pressure differential equation based on the momentum and continuity equation for a journal bearing lubricated with a ferrofluid. It was concluded that the magnetic lubrication provided higher load-carrying capacity, reduced side leakage and negligible effect on the friction force as compared with a conventional fluid-based bearing. Shah and Bhat (2004) discussed the squeeze film behavior in an infinitely long journal bearing using the ferrofluid flow models of Neuringer – Rosensweig and Jenkins and Shliomis models for uniform and non-uniform magnetic fields. It was established that the load-carrying capacity and squeeze time were more in the case of non-uniform magnetic field than in the case of uniform magnetic field. Later, Shah and Bhat (2005) also investigated the effects of slip velocity and ferrofluid lubricant described by a material parameter on a parallel plate porous slider bearing. They gave an important finding that the parallel plate slider bearing lubricated with ferrofluids can support a load, which is not possible in case of conventional lubricant. Urreta *et al.* (2009a, 2009b) conducted a theoretical analysis with numerical solutions of the associated Reynolds equation for the pressure distribution in a hydrodynamic journal bearing. This was based on viscosity modulation for the ferrofluid and

The current issue and full text archive of this journal is available on Emerald Insight at: **www.emeraldinsight.com/0036-8792.htm**

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*Article*

# Experimental Tribometric Characteristics Analysis of a Ferrofluid Based Journal Bearing System

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## Abstract

This paper presents the tribometric characteristics analysis of a journal bearing system lubricated with ferrofluid (FF) considering different shaft materials. Two magnetically permeable materials namely, EN-19 and mild steel were used to manufacture the journal. These journals were made magnetic by inserting neodymium magnet inside. It was seen that the magnetic shaft made from EN-19 offered a better dimensional accuracy in comparison with the magnetic shaft made from mild steel. Thus, magnetic shaft made from EN-19 was used in a brass bearing to evaluate various tribometric characteristics namely, fluid film pressure, fluid temperature rise, bearing vibrations, friction torque and wear at various conditions. The experimental results showed that the maximum pressure enhanced up to 84% in the case of FF based bearing system in comparison with conventional lubricant based system. Also, the film pressure was measured for newly acquired FF and the three years old FF to check the stability of the FF. It was found that almost no change in the pressure profile was observed. Further, the temperature rise was found to be less in FF based system while marginal difference in damping characteristic was observed. Moreover, tribometric characteristics such as friction and wear were also investigated and compared between FF based and oil based bearing system. A significant drop in friction torque was found in the case of FF based system. In addition, the wear loss due to the machine starts and stops was measured in lubricated condition for several systems using weight loss and stylus method. However, wear loss was found to be marginally increased in the FF based system, in comparison with the low viscous conventional fluid based system. It has been clearly established that the FF based system presented here, may turn out to be a better option from efficiency and stable system point of view.

## Keywords

ferrofluid, journal bearing, film pressure and temperature, friction and wear

## 1 Introduction

FF, in the focus of this analysis, is the fluid which can be effectively controlled, positioned or moved by a magnetic field of suitable strength. It is a colloidal suspension of ferric oxide particles having diameter ranging from 10 nm to 20 nm coated with a surfactant in an appropriate carrier fluid. The superior properties of the FF make it suitable for technical applications in everyday life. The stable suspension of FF was first synthesized by Papell in 1964 [1]. After stable synthesis by Papell, the area of FF proved to be a new emerging research field. Due to the smart rheological properties of the FF, there are various types of uses of FF in different areas namely, mechanical bearings, sealing, heat transfer, and medicines etc. Concerning the FF lubrication from bearings point of view, various researchers developed the theory of FF lubrication by incorporating magnetic force resulting from a magnetic field into the Reynold's equation [2-5]. Thereafter, many researchers, during the last three decades carried out a number of theoretical and experimental studies regarding FF lubrication. These researchers have shown that magnetohydrodynamic bearings have several advantages over conventional bearings. Most studies out of these, dealt with the theoretical aspects of FF lubrication.

Sorge [6] and Chandra [7] investigated the finite and infinitely long journal bearings respectively , considering cavitation boundary conditions which were not considered in the earlier studies conducted by Tarapov [3] and Tiepi [8] for the analysis of journal bearings. Chang et al. [9] embarked on the combined theoretical and experimental study of four-pocket journal bearings lubricated with FF. It was established

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# Investigate Effect of MIG Welding Process Parameters on Penetration using Taguchi Design

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***Abstract***

*Welding is a process for joining metals using a large variety of applications. Welding is the joining of metals at a molecular level. A weld is a homogeneous bond between two or more pieces of metal. The metals are heated to their melting point while being shielded from the air, and then a filler metal is added to the heated area to produce a single piece of metal. It can be performed with or without filler metal and with or without pressure. Several types of welding that are used today. The MIG welding parameters are the most important factors affecting the quality, productivity and cost of welding. These welding parameters are welding current, welding voltage, Gas flow rate, wire feed rate, etc. they influence penetration, and weld strength etc. during welding. The weld penetration were measured for each specimen after the welding operation is done on joined work piece. The analysis from DOE method can give the significance of the parameters which effect penetration. A plan of experiments based on Taguchi design will be used to acquire the data. The result computed will be in form of contribution from each parameter, through which optimal parameters will be identified for penetration.*

***Keywords:*** *MIG welding, Welding Parameters, Design of Experiments, Taguchi Design.*

## I. INTRODUCTION

Metal Inert Gas Or Gas Metal Arc Welding (GMAW), is a welding process in which a consumable metal electrode is used to produce the electric arc to join the metal pieces together in the environment of a shielding gas. Shielding gas protects the weld from atmospheric contamination. Constant voltage, direct current power source is used to produce the arc. This process can be semi-automatic or automatic. The MIG welding process is based on the principle that a consumable metal electrode is used to produce an arc in between the metal electrode and the work-piece. The arc so produced creates a large amount of heat and this heat is used to join the two metal pieces together.[1]

Erdal Karadeniz et al.[2] presented the effects of various welding parameters on welding penetration in Erdemir 6842 steel having 2.5 mm thickness welded by robotic gas metal arc welding were investigated. Erdemir 6842 steel plate was used as base metal in MIG welding process.The welding currents were chosen as 95, 105, 115 A, arc voltages were chosen as 22, 24, and 26 V and the welding speeds were chosen as 40, 60 and 80 cm/min for all experiments. it was obvious that increasing welding current increased the depth of penetration. In addition, arc voltage is another parameter in incrimination of penetration. However, its effect is not as much as currents. The highest penetration was observed in 60 cm/min welding current.

Izzatul Aini Ibrahim et al.[3] present Gas Metal Arc Welding (GMAW) process is leading in the development in arc welding process which is higher productivity and good in quality. The arc voltage and welding current were chosen as 22, 26 and 30 V and 90, 150 and 210 A respectively. The welding speed

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# Study of Influence of Machining Process Parameters on Surface Roughness Using Taguchi Design

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## ABSTRACT

Manufacturing is always the heart of majority of industries. Machining is an extremely important and anessential machining process which requires a lot of attention as in most of the cases it is required for an assembly purposes.The experiments were conducted in milling machine on Aluminum material by using face mill cutter and the surface roughness was measured using surface tester. The direct and interaction effect of the machining parameter onsurface roughness were analyzed using analysis of variance and taguchi method which helped to select the most and least influence parameter on response surface roughness.Surface roughness plays an important role in deciding the quality of machining.

**Keywords**: Milling Machine, Machining Parameters, Design of Experiments, ANOVA,Taguchi Design

## I. MILLING MACHINE

Milling is the process of cutting away material by feeding a workpiece past a rotating multiple tooth cutter. The cutting action of the many teeth around the milling cutter provides a fast method of machining. The machined surface may be flat, angular, or curved. The surface may also be milled to any combination of shapes. The machine meant for holding the workpiece, rotating the cutter, and feeding it is known as the machine.

# Multi-objective optimization in WEDM of Incoloy 800® Using Taguchi method and Grey Relational Analysis

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***Abstract***
*This research work addresses multi objective optimization based on Taguchi method and grey relational analysis for wire electro discharge machining of Incoloy 800®superalloy material. Influence of peak current, pulse on time and pulse off time are investigated for MRR, surface roughness and kerf width, during machining of Incoloy 800®superalloy. Taguchi L27 array is been selected for experimental design. Grey relational analysis is used along with Taguchi method to optimize the multiple performance characteristics. Through grey relational analysis, grey relational grade is obtained which is used as performance index of process parameters. ANOVA is also performed to determine significance of the all process parameters.*

***Keywords:*** *WEDM, grey relational analysis, Taguchi method, optimization*

## INTRODUCTION

In machining process whether it is conventional or unconventional, it has multiple process parameters which affect multiple performance characteristics in the work. It has also seen for some process parameter its lower value and for some process parameters its higher value is desirable to get optimum individual performance characteristics. But at the same time for other performance characteristics value of process parameter differ. Hence, investigation to find best relation between multiple process parameter and multiple performance characteristics is quite complex to learn. In this study, the effort has been made to use grey relational analysis to optimize wire electro discharge machining of Incoloy 800® superalloy.

## LITERATURE REVIEW

Muthu Kumar et al. [1] investigated effect of machining parameters on Incoloy-800 material on wire EDM. The process parameters considered in the work are gap voltage, pulse on-time, pulse off-time and wire feed to see multiple performance characteristics of material removal rate, kerf width and surface roughness based on Grey–Taguchi Method. Durairaj et al. [2]investigated effect of parameters which are gap voltage, wire feed, pulse on time, and pulse off time to attain the minimum kerf width (KW) and the best surface quality on wire EDM for SS304 Using Grey relational analysis and Taguchi technique. Lahane et al. [3] investigated machining of high speed steel through wire EDM using Taguchi method. Parameters were selected pulse on time, pulse off time, upper flush and wire feed to optimize process parameter MRR and wire wear rate [WWR]. They reported that pulse on time is most significant factor affecting MRR and WWR. Azhiri et al. [4] applied Taguchi, grey analysis and Adaptive neuro-fuzzy inference system (ANFIS) on wire EDM to optimize process parameter while using gaseous medium on silicon carbide and aluminium carbide metal matrix composite material. Kulkarni and Rodge [5] uses Taguchi orthogonal array for designing runs and evaluate optimum multiple performance characteristics such as Material removal rate, surface finish and kerf width. Lin [6] applies Taguchi method and gray relational analysis to find optimum process parameter for multiple performance characteristics in turning operation on lathe machine. In the study three process parameters speed, feed rate and depth of cut are selected for optimization tool life, cutting force and surface roughness as performance characteristics and get improved result for the same.

Vinod Kumar et al. [7] investigated effect of machining parameters on Nimonic-90 material which is a nickel based super alloy. The machining parameters selected were discharge current, pulse on time, pulse off time, servo voltage and wire feed to optimize cutting speed as machinability attribute. It is investigated that at low pulse duration the cutting speed increases slowly with increase in peak current but at high pulse duration cutting speed sharply increases with increase in peak current. Sivakiran et al. [8] revealed effect of machining parameters of EN-31 tool steel material on CONCORD DK7720C four axis CNC WEDM machine. The machining parameters selected were Pulse-on, Pulse-off, Bed speed and Current to optimize material removal rate. In this study, the settings of machining parameters were determined by using Taguchi experimental design method.

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# Colloidal PTFE dispersion in commercial engine oil: Lubrication by Pluronic adsorption at the interface

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ABSTRACT

PTFE particles with an average size of ~300 nm were dispersed in20w40 commercial engine oil using Pluronic® surfactant. The role of series of different Pluronics with varying molecular weight and HLB was investigated. The dispersion stability was checked by UV-Vis-NIR spectrophotometer and by force transducer. The result indicates significant dispersion stability for low molecular weight and low HLB Pluronic, attributed to faster diffusion at PTFE-oil interface and resultant steric stability. L92 based formulation with less than 10% sedimentation even after 48 hrs, was evaluated for further tribological tests, i.e. wear, friction and pressure profile. Hydrodynamic oil film pressure profile using journal bearing showed significant increase in the load carrying capacity owing to PTFE dispersion in engine oil. Four ball tester depicted decreases in wear scar diameter for L-92 stabilised dispersion. Plausible molecular mechanism is proposed based on adsorption of polymers bilayer around PTFE particles through tail-tail interactions between PEO chains.

## 1. Introduction

Nanofluid, a tailored colloidal formulation of nanoparticles (NPs) dispersed in a base fluid, is considered for various applications driven by few advantageous properties e.g., higher value of heat transfer coefficient and thermal conductivity as compared to the base fluid [1–6]. Nowadays, the nanofluids are immerging as replacement for conventional lubricant system due to superior performance in reducing the friction and wear for the interacting surfaces [7–12].In this context, the stability of NPs in base fluid using different stabilizers remains the key interest, being critical for the application in modulation of tribometric characteristics. Due to varieties of sizes, types and morphological structure of nanoparticles, a range of nanolubricants could be formulated by dispersing NPs is base fluids [11–14]. Few recent reports describe the application of nanofluids containing metal oxide nanoparticles dispersed in lubricant oil [15,16] and ionic liquid [17] for controlling the lubrication properties between the interacting sliding contacts. Although, various studies have reported significant improvement in the tribological properties for nanofluids comprising different NPs dispersed in base oil, it is still challenging to identify the suitable stabilizing additive. This is critical step as it imparts useful alterations in the physical properties of nanofluid and improves the performance of final dispersion. The main functional characteristics that must be addressed are: tuning their compatibility with base oil, their sizes and structures, as well as their bulk concentrations.

Polytetrafluoroethylene (PTFE) particles are widely used as additive in various lubricants to improve their tribology performance [18–20]. The dispersion of PTFE particles in engine oils reduces the friction parameters and wear. The literature includes various patents describing different concentrations of PTFE particles dispersed in lubricants using various stabilizing agents [21–28]. For such application, the size of PTFE particles ranges from 0.1 micron to 50 microns. In order to obtain enhanced tribological performance, the stability of PTFE particles in base fluid must be controlled. The PTFE particles are non-spherical in shape and sheet-like material, which localizes within cavities of sliding interacting surfaces. The coating with stabilizers on PTFE surface

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RESEARCH ARTICLE

# Performance assessment of conventional solar desalination system in Northern part of Gujarat

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## Abstract

Water distillation by utilising free energy from the sun is one of the significant techniques for getting freshwater from salty and seawater. For the remote areas and small societies where freshwater is distant, solar distillation is one of the best explanations for freshwater creation. The main objective of this study is to evaluate the performance of the flat plate collector–assisted conventional solar still incorporating mirror wall and heat storage material, which was tested at Anchor institute of solar energy studies, Mehsana (23.5275311° latitude and 72.3881041° longitude), Gujarat. Moreover, the study captures average productivity with and without FPC which was 1.5 L and 1.0 L respectively during the day time for the entire period of experiments. In this study, the water depth is varied from 1 to 5 cm inside the single basin solar still to obtain the optimum depth. It was observed that when mirror augmented still was operated with the FPC, 3.6L/day productivity was achieved with 30% instantaneous efficiency, at solar radiation of 1122 W/m$^2$ and ambient temperature of 24 °C. Also, the maximum productivity was observed at a water depth of 3 cm and 4 cm. Moreover, improvements in daily and yearly productivity were observed to be 51.515% and 56.6474% respectively, which were estimated on the basis of with and without FPC. An experiment was performed at Anchor Institute of Solar Energy, Mehsana located at the north part of Gujarat where the average annual rain was comparatively less compared to other regions, so this type of solar still can provide potable water to daily workers who work on site. Furthermore, economic study reveals 0.577 INR/litre cost of distiller output for conventional set-up and 0.477 INR/litre for the FPC assisted set-up.

**Keywords** Single basin solar still · Flat plate collector · Solar energy

## Nomenclatures

| | |
|---|---|
| CSS | Conventional solar still |
| CSS-FPC | Conventional solar still with flat plate collector |
| ETC | Evacuated tube collector |
| FPC | Flat plate collector |
| h | Heat transfer coefficient, W/m$^2$°K |
| $I(t)$ | Solar radiation, W/m$^2$ |
| $\dot{m}_{we}$ | Hourly distillate output, L |
| P | Pressure, N/m$^2$ |
| $\dot{q}_w$ | Evaporative heat loss, KJ |
| $T$ | Temperature, °K |
| V | Wind speed, m/s |

### Subscripts

| | |
|---|---|
| w | Water,- |
| we | Water evaporation,- |
| wr | Radiation |
| wc | Convection |

### Greek symbol

| | |
|---|---|
| $\sigma$ | Stefa-Boltzman constant, W/m °K$^4$ |
| $\varepsilon$ | Emissivity |

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# Numerical analysis of multiphase flow in chemical looping reforming process for hydrogen production and $CO_2$ capture

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## Abstract

The unsteady characteristics of bubble dynamics inside the air reactor within the first 0–40 s of reforming has always been studied for defining the design criteria of the reactor. In the study, a temporal aspect of the hydrodynamics and chemical kinetics in the reactor of a chemical looping reforming system in form of volume fraction contours of solid species and molar fraction of $H_2O$ has been numerically simulated by considering manganese (Mn) and iron (Fe) based metal oxides as oxygen carriers. The Finite Volume Method based approach has been employed to simulate the steam reactor model by encompassing it as a fluidized bed reactor. The granular flow under kinetic theory has been employed using a multiphase Eulerian-based approach for both gas and solid phases in the form of a shrinking core model. An influence of various operating parameters such as particle size of the oxygen carriers, steam inlet velocity, and temperature of the steam reactor on an overall conversion rate of iron-based oxide (FeO) and manganese-based oxide (MnO). The maximum steam conversion rate for FeO and MnO was observed at 32% and 34% at 0.6 m/s steam velocity, 48% and 60% at a maximum temperature of 1273 K, and 47% and 64% at a particle size of 100 μm, respectively.

## Keywords

bubble hydrodynamics
$CO_2$ capture
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$H_2$ production

## Article History

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## Research Article



## 1 Introduction

In the last few decades, hydrogen ($H_2$) has been considered as the green fuel on the Earth and a judicious alternative for fossil fuel as it produces only water without any greenhouse gases. Hydrogen is claimed to be used as an energy carrier for various energy systems in years to come. Hydrogen, as fuel, can be utilized to provide motive power for liquid propellant rockets, airplanes, boats, and cars, and stationary or portable fuel cell applications, internal combustion engines, and turbines with 20% more efficiency than the conventional fuels like natural gas and petrol (Momirlan and Veziroglu, 1999). The hydrogen production method has always been a vital aspect in environmental performance as well as energy efficiency of the process. Water and the Sun are abundant sources to produce hydrogen and electricity through the concentrated solar power (CSP) technique (Christopher and Dimitrios, 2012). The electrolysis of water by using the electricity from hydropower produces hydrogen with higher energy efficiency than electrolysis from solar-driven photovoltaic cells (Coelho et al., 2010). Also, water and biomass derivatives, like ethanol, sugar, and methane, attract many researchers to produce hydrogen from the photocatalytic hydrogen process by using solar energy (Shimura and Yoshida, 2011). The processes which are studied are energy sensitive and require high initial cost, and they are viable to produce greenhouse gases contributing to global warming. Over the last couple of decades, many researchers have worked on chemical looping reforming (CLR) systems for production of $H_2$ from the conventional fuels by non-conventional combustion methods that can also capture the carbon dioxide and eliminate the chances of formation of greenhouse gases like $NO_x$,$SO_x$, etc. (Fan et al., 2012). Various reducing gases like steam, natural gases were used to produce hydrogen through chemical looping and oxygen permeable ceramic membranes (Thursfield et al., 2012). CLR technique is a novel approach towards reforming of hydrogen from the high temperature steam by water-splitting

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# Hybrid Heat Transfer Search and Passing Vehicle Search optimizer for multi-objective structural optimization

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ABSTRACT

A novel hybrid optimizer called Multi-Objective Hybrid Heat Transfer Search and Passing Vehicle Search optimizer (MOHHTS-PVS) is proposed while its performance is investigated for the structural design. The HHTS-PVS optimizer combines the merits of Heat Transfer Search (HTS) and Passing Vehicle Search (PVS). The design problem is posed for weight minimization and maximization of nodal deflection subject to multiple constraints of trusses. In the proposed optimizer, HTS acts as the main engine and PVS is added as an auxiliary stage into it to overcome its limitations and enhance the performance while simultaneously creating harmony between global diversification and local intensification of the search. Five challenging structure optimization benchmarks are optimized having discrete design variables. For performance validation, four state-of-the-art optimizers are compared with the proposed optimizer. Pareto Front Hypervolume and Spacing-to-Extent test are performance indicators for all the test examples. HHTS-PVS achieved the best non-dominated Pareto fronts with continuous and well diverse solutions set. The statistical analysis is done by performing Friedman's rank test and allocating respective ranks to the optimizers. As per the outcomes, it is concluded that HHTS-PVS outperforms other optimizers and simultaneously shows its competency in solving large engineering design problems.



## 1. Introduction

Science and engineering design problems usually have multiple objective functions and are also challenging to get optimum solutions. Classical techniques of engineering optimization have limitations to solve problems that are non-linear, multi-modal, and non-differential [1–19]. In the past few decades, numerous nature-inspired meta-heuristics were developed such as a Genetic Optimizer (GA) inspired by Darwinian evolutionary theory [20], Particle Swarm Optimization (PSO) motivated by the searching destination of migrating birds [21], Ant Colony Optimization (ACO) inspired by searching behavior of ant for food [22], Simulated Annealing (SA) which mimics the atomic behavior during the annealing process of heat treatment [23], and many more.

Multi-objective Optimization problems are relatively complex due to multiple and diverse objectives [24]. Also, these design issues have more than one optimal solution often called a Pareto-optimal set, contrary to the single-objective problems that have one optimal solution. Design problems comprised of multi-objective optimization of truss often have conflicting objectives like weight minimization and maximum displacement of target nodes [25]. Meta-heuristics manifested their excellent performance while addressing such design issues as lots of multi-objective optimizers have been introduced in the last few years [26]. Some of the well-recognized optimizers are NSGA-II [27], MOPSO [28], multi-objective ant colony system (MOACS) [29], and multi-objective ant system (MOAS) [30]. However, these multi-objective meta-heuristics often fail in solving complex design tasks due to their likelihood of local optima trap, slow convergence rate, and necessity of problem-specific parameter tuning [31–33]. A well balanced between the exploration and exploitation of the search process decides an efficient optimizer [34].

Recently, a novel HTS optimizer was developed to solve challenging design problems, which mimics the conduction, convection, and radiation laws of thermodynamics and heat transfer [35]. In this optimizer, each molecule of substance attains

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INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY

RESEARCH ARTICLE

# Mathematical modeling and performance assessment of solar air collector

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## Abstract

**Background:** The use of solar air heater in drying has been increasing in recent years, because of their simplicity and economic configuration. **Methods:** Design and testing of the corrugated solar collector have been carried out in the present study. The overall system was designed and tested at Gujarat Power Engineering and Research Institute, Mehsana, India (GPERI, 23°31'37.4"N72°23'14.1"E). Exergetic efficiency, thermal efficiency, and temperature outlet at the same mass flow rate and solar irradiance were the major parameters for the present study. The designed system was tested by varying the mass flow rate of 0.1075, 0.215, and 0.3225 $m^3$/sec. **Findings:** It was found that the temperature of the corrugated collector was maximum at 92°C at solar radiation of 750 W/$m^2$. Whereas thermal efficiency was found to be 65.10% the same radiation. It was depicted from the tests that the corrugated plate performs more efficiently than a flat plate collector due to surface roughness. **Applications:** It is a good practice in a region where solar radiation is higher all year to implement this type of arrangement for the utilization of any solar gadget, and to enhance its performance efficiency. **Novelty:** it can be observed that collector outlet temperature in the semi-arid region of Gujarat was maximum at the minimum collector area. This should be the best design and thermal performance in a semi-arid climate.

**Keywords:** Solar air heater; Drying; Collector outlet temperature; Exergy analysis

## 1 Introduction

With the rapid rise in the population and the living standards, the world seems to engulf into a major crisis, called energy crisis. If this population growth continues at the same pace the condition would go from bad to worse. The reserves of conventional sources of energy like coal, petroleum, and natural gas are depleting at a very fast rate to fulfill the demand of the growing population [1,2].

The use of solar air heater has been increasing in recent years, because of their

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# Advancement in design and performance of different solar dryers: A review

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**Abstract.** Uncertainty in the price of the fossil fuels and also rapid depletion of them gives rise to the alternate energy sources. From many decades people uses the solar energy as a main source of energy especially in the drying of food items. Solar dryer is the device that can be used for drying of food items which is sustainable by small communities, gives hygenic and quality products. Mainly an indirect solar dryer and mixed mode solar dryer performance and design were studied from the literatures. The tunnel type dryer has the advantages of the direct sun light by ultra-violate stabilized cover and absorber plate is provided at the base. The no load performance index is the new terminology for checking the performance of the different dryer in the forced and natural convection mode. The drying of fish near to the coastal line of India is the major business for fisherman hence the drying done by open sun drying method in very unhygienic condition. By implementing solar dryer over that regions quality of dried fish will increase and the drying time will be decrease. The no load performance index (NLPI) of the mixed mode solar dryer was 0.633 which was highest among the rest of the dryer under the natural convection mode. The new mixed mode type solar dryer can be developed in which the absorber plate is attached with the tunnel type dryer.

**Keywords:** Indirect solar dryer, Mixed mode solar dryer, No load performance Index. Tunnel type dryer

## I. Introduction

In India during the whole year solar radiation is high, mostly in the western part solar radiation is high and relative humidity is low hence sun is the major source of energy. In the present scenario, the demand for the energy is increasing whereas the source and supply of the fossil fuel is depleted hence it is mandatory to developed the alternate source for fossil fuels for the developing countries like India. Renewable energy is the developing area for the alternate energy sources. As well as climate change is the major factor which is considered worldwide for use of renewable resources.

In India post harvesting losses are more due to the improper treatment of food items after the harvesting. After harvesting to preserve the food items for the long duration of time they are drying by the open sun drying method. India has a very large coastal line starting from the Bay of Bengal to veraval in Gujarat through which Fishing is a major industry in its coastal states, employing over 14 million people. The food items under the drying may also tend to reabsorption of the moisture under the cloudy condition and during the night which reduces the quality of the dried product (Chavda and Kumar, 2009) [1]. As shown in Figure 1The open sun drying method has the main disadvantages such as time consuming drying process, drying process may not be uniform, requirement of large drying area, contamination of food items by excreta, dust, insects, birds and cloudy and rainy weather condition can affect the drying process.

# Surveillance Video Synopsis Techniques : A Review

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This is the era of video surveillance, not just security. The arrival of inexpensive surveillance cameras and increasing demands of security has caused an explosive growth of surveillance videos, which are used by government or other organizations for prevention or investigation of crime. As browsing such lengthy videos is very time consuming, most of the videos are never watched and analyzed. The video synopsis is a technique to represent such lengthy videos in a condensed way by showing multiple activities simultaneously. The purpose of this paper is to explore development stages, various algorithms of it, framework and tools used to implement them, challenges and limitations of existing video synopsis techniques and its application in the field of surveillance video analysis.

Keywords: video synopsis, video abstraction, surveillance video, video summary, video indexing, background modeling, object stitching.

## 1. INTRODUCTION

Hampapur et al. [2005] stated that in the recent years, due to increased demand of ensuring high level security at public places like, airports, railway stations, banks, parking lots etc., a huge number of surveillance cameras are mounted all over the world and enormous volume of data is captured day and night. The development of smart cities brings in more responsibilities too and video surveillance and its investigation, for quick decision making, is one of them 1. The task of analyzing such large videos is a waste of manpower and very time consuming too. Sometimes, the important content might be missed by the viewer. Moreover, storage and retrieval of such infinite video sequences is also very difficult. The user has to browse through a long video to locate the salient parts of it. This led to the need to develop video summarization techniques for faster browsing of videos.

## 2. LITERATURE REVIEW

Li et al. [2001], Li et al. [2006] and Truong and Venkatesh [2007] explained about Video abstraction, the mechanism to produce a short summary of a long video and represent it in a compact way. Kansagara et al. [2014] classified video abstracts in two categories: Still image abstracts and moving image abstracts. The collection of key images extracted from the long video sequence is called still-image abstract or summary of video. The moving-image abstract or video skim, consists of a collection of image sequences, as well as the corresponding audio abstract extracted from the original sequence. [1] (normal) In video summary, generally only visual information is considered. The skimming is also classified in two types: Summary sequence, which provides users an impression about the whole video content and highlight, which includes only the most salient parts of the original video. Benjamin et al. [2010] outlined the approach of adaptive fast forwarding based on information in it. It allows browsing the video data quickly by skipping

[1] 1http://www.varindia.com/news/ip-based-cameras-and-video-analytics-set-to-take-the-next-leapsthash.eQbhvdnr.dpbs

Original Article

# Evaluation of hematological parameters in pulmonary tuberculosis patients

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## Abstract

**Introduction:** Tuberculosis (TB) is the most common infectious disease caused by mycobacterium tuberculosis. Apart from the lungs, tuberculosis also affects the bone marrow. There are significant hematological abnormalities that occur in association with tuberculosis. So we can use these hematological parameters as a marker for the diagnosis, prognosis, and response to therapy. **Aims:** To evaluate the hematological parameters in pulmonary tuberculosis patients. **Methods and Materials:** A total of 70 diagnosed tuberculosis patients and 70 healthy controls were selected by purposive sampling in this study. About 4 ml of venous blood was collected with proper aseptic precaution. 2 ml ethylenediamine tetra acetic acid (EDTA) tube blood was used for hematological analysis by using Siemens Advia 2120i 5-part hematology analyzer. Rest 2 ml blood was used for measurement of erythrocyte sedimentation rate (ESR) by Wintrobe's method. **Results:** The hemoglobin, packed cell volume (PCV), and blood indices values were significantly lower compared to healthy controls in both sexes. White blood cell (WBC) count, absolute neutrophil count, platelet count, and ESR values were significantly increased in tuberculosis patients as compared to healthy controls and were found to be statistically significant (*P*-value < 0.05). **Conclusions:** To measure hematological parameters in tuberculosis is a simple and cost-effective method to predict the course of the disease and monitor complications in developing countries like India.

**Keywords:** Anemia, leucocytosis, pulmonary tuberculosis, thrombocytosis

## Introduction

Tuberculosis (TB) is the most common infectious disease caused by mycobacterium tuberculosis. Although novel diagnostic modalities and treatments have developed, it remains one of the world's important public health problems.[1] It causes ill-health for approximately 10 million people each year and it is one of the most common causes of death across the world. In the last five years, it has been the leading cause of death from a single etiological agent, ranking above HIV/AIDS.[2] Pathogenesis of the disease is explained by cell-mediated immune response.[3] About 40% of the Indian population is infected with TB bacilli. Patients with cavitary lesions are the prime source of infection. Most of such patients are usually sputum smear-positive. Coughing produces very small droplets which are infective in nature and approximately 3000 droplet nuclei, and these remain in the air for a prolonged period of time. There is a crucial role of T-cells in immunity to mycobacteria, evidenced by the dramatically increased susceptibility of an individual with human immunodeficiency virus (HIV) infection.[4] To prevent and control this infection, early diagnosis and treatment should be done. However, monitoring TB patients during treatment is important for better outcomes.[5]

Apart from the lungs, tuberculosis also affects the bone marrow. There are significant hematological abnormalities that occur in association with tuberculosis. So we can use these hematological

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# Role of MDCT Scan in evaluation of neck mass lesions

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## Abstract

**Aim:** To localize and characterize neck lesions with respect to anatomical delineation, extension to adjacent structures and bony involvement.

**Materials and Methods:** For this prospective study the data was collected from patients attending department of radio-diagnosis at LG Hospital, AMCMET medical college, Maninagar Ahmedabad. Total 150 patients presented with symptoms of palpable neck mass and neck pain were recruited. Patients were evaluated with Multidetector CT (Mx Philips 16 slice) and patients who were diagnosed having neck mass on CT scan study. The pathological lesions were evaluated with respect to the density, size of the lesion, location of the lesion, enhancement pattern, presence of calcification, presence of fat, extension into adjoining structures and presence or absence of venous thrombosis and bony involvement.

**Results:** Most common benign neck mass was in the age group of 31-40 years. Incidence of malignant lesions was observed between 61-70 years (40%). Higher incidence among males was noted with a male to female ratio of 2:1. Necrosis was present in 67.6% of the malignant lesions. Bony involvement was seen in 34 cases (40.47%) of the malignant lesions. Vascular involvement in the form of jugular vein thrombosis was seen in 10.71% of malignant lesions. Extension into the adjacent space was seen in 43 (51.19%) of malignant lesions.

**Conclusion:** The most common space involvement was parapharyngeal space (24%) followed by pharyngeal mucosal space (18%). MDCT has 96% accuracy in diagnosing neck lesions. MDCT has 100% accuracy in predicting bony involvement in head and neck cancers.

**Keywords:** MDCT, head and neck cancers, benign and malignant lesions

## Introduction

The development of computerized tomography (CT) has been called the most important contribution to medical diagnostic techniques since Roentgen discovered the X-ray in 1895. By the introduction of cross sectional imaging a new dimension in evaluation of neck lesions has evolved. CT is useful in evaluation of head and neck lesions such as lesions of nasopharynx, base of skull, the larynx and neck areas. CT has added the horizontal plane in the evaluation of these lesions. The ease of obtaining CT scans and rapid scan acquisition are its advantages. The transaxial orientation of CT planes is particularly useful in certain

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**Original Research Article**

# A study of incidental appendectomy during diagnostic laparoscopy performed to evaluate the causes of lower abdominal pain

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## ABSTRACT

**Background:** Diagnostic laparoscopy is a minimally invasive method for the diagnosis of intra-abdominal diseases by direct inspection of intra-abdominal organs whenever there is a diagnostic dilemma even after routine diagnostic workup. Incidental appendectomy is defined as the removal of a clinically normal appendix during non-appendiceal surgery. The study is performed to evaluate the causes of lower abdominal pain during diagnostic laparoscopy and to determine the benefits of incidental appendectomy.
**Methods:** This study, performed at the department of surgery, B. J. medical college, Ahmedabad from May 2012 to October 2014 is a prospective study. Incidental appendectomy was performed during diagnostic laparoscopy in 30 patients with abdominal pain. Criteria such as symptomatology, aetiology of pain as found on laparoscopy, post-operative pain relief and complications were analysed.
**Results:** Nearly two third of the patients who presented with intractable lower abdominal pain were females. Mesenteric lymphadenopathy was the commonest per-operative finding affecting half of the patients, followed by adhesions present in about one quarter of the patients. Gynaecological conditions represented about one third of the cases. All, except one patient, had satisfactory pain relief and no complications of incidental appendectomy over a one year follow up.
**Conclusions:** We conclude that diagnostic laparoscopy is a very good and accurate tool to diagnose the causes of abdominal pain and should be routinely used where radiological investigations are inconclusive. Incidental appendectomy indeed has many advantages when performed in an appropriate age group and proper setting.

**Keywords:** Incidental appendectomy, Diagnostic laparoscopy, Lower abdominal pain

## INTRODUCTION

Laparoscopic surgery, also called minimally invasive surgery (MIS), band aid surgery or key hole surgery, is performed through small incisions (usually 0.5-1.5 cm) as opposed to the larger incisions needed in laparotomy.

Diagnostic laparoscopy is a minimally invasive method for the diagnosis of intra-abdominal diseases by direct inspection of intra-abdominal organs.[1] The main advantage of diagnostic laparoscopy over traditional open laparotomy is reduced morbidity, decreased postoperative pain, and a shortened length of hospital stay. Diagnostic laparoscopy is useful for making a definitive clinical diagnosis whenever there is a diagnostic dilemma even after routine laboratory and radiological workup.

Incidental appendectomy is the removal of a clinically normal appendix during another abdominal operation.[2] This procedure is intended to eliminate the cause of lower abdominal pain, to remove the risk of appendicitis in the future and to simplify any future diagnosis of abdominal pain.

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# Evaluation of Bacterial Co-Infections and Antibiotic Resistance in Positive COVID-19 Patients

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*ABSTRACT*

***Aim:*** *Due to the fact that patients with COVID--19 can have a bacterial co-infection, physicians should be careful when prescribing antibiotics, with rather considering the sensitivity and resistance of these drugs than various bacteria. Therefore, the main purpose of the present study was to evaluate bacterial co-infections and antibiotic resistance in positive COVID-19 patients.*

***Method:*** *This descriptive cross-sectional study was performed on 450 hospitalized COVID-19 patients who were selected by simple random sampling. Blood culture (BC) and endotracheal aspirate (ETA) were performed for all COVID-19 patients participating in the study. Antibacterial susceptibility was assessed using the standard Kirby-Bauer disk diffusion method on Mueller Hinton agar for all isolated strains in accordance with the Institute of Clinical and Laboratory Standards guidelines. Finally, susceptibility of all identified bacteria to 10 types of antibiotics was assessed.*

***Results:*** *Based on the results of endotracheal aspirate (ETA) culture, we found that 79 (17.5%) patients had COVID-19 and bacterial co-infection. Among COVID-19 patients with bacterial co-infection,* Klebsiella species *had the highest frequency (21.6%), followed by Methicillin-sensitive* Staphylococcus aureus *(MSSA) (19%),* Escherichia coli *(17.7%), Methicillin-resistant* Staphylococcus aureus *(MRSA) (15.2%),* Enterobacter *species (13.9%) and* Pseudomonas aeruginosa *(12.6%), respectively. Based on the results of the present study, it was found that the level of antibiotic resistance for different bacteria varied from 0-100%.*

***Conclusion:*** *The results of the present study indicate that patients with COVID-19 are susceptible to bacterial co-infection, which leads to the conclusion that excessive use of antibiotics is an important factor in the development of antimicrobial resistance. Therefore, caution is needed in prescribing different antibiotics*

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# Fetal kidney length as a parameter for determination of gestational age after 20th week in healthy women with uncomplicated pregnancy

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***Abstract*---Aim:** To check the accuracy of Fetal Kidney Length (FKL) in the estimation of Gestational Age (GA). **Materials and Methods:** The present prospective cross sectional study was conducted in Max Super Specialty Hospital, Mohali, Punjab, India. The subjects were selected from the patients visiting the department of Radio diagnosis on in-patient or out-patient basis. The study was carried out for the duration of 12 months after taking approval from the IEC. Healthy women with uncomplicated pregnancy after 20th week of gestation were included in the study. **Results:** Out of 203 patients included in the study, 3 (1.3%) were in the age group of < 20 years, 76 (37.7%) were in the age group of 20-25 years, 100 (49%) were in the age group of 25-30 years and 24 (12%) were in the age group of > 30 years. In the 203 pregnant patients, age group included in the study ranged from 18 to 36 years with the mean age of 26.46 years Age of second trimester patients (100 patients) ranged from 19 to 35 with the mean of 26.26 years. The age of third trimester (103 patients) patient ranged from 18 to 36 with mean of 26.67 years. The correlation of FKL GA was best with AC & CGA (r=0.954 & 0.953) and least with FL (r=0.887). The correlation of CGA with BPD, HC & AC was almost similar (r=0.986, 0.987, 0.985) and correlation of CGA with FL was least (r=0.939). **Conclusion:** FKL shows a strong correlation with GA

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RESEARCH ARTICLE

# Glycated hemoglobin and fructosamine level in complicated and non-complicated chronic alcoholic liver disease

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## ABSTRACT

**Background:** Chronic alcohol ingestion is one of the major causes of liver disease. Uncontrolled glucose concentration in chronic alcoholic liver disease will have poor prognosis. Hence, the study is undertaken to see markers of chronic glucose control, that is, serum fructosamine and glycated hemoglobin and their usefulness to show the severity of chronic alcoholic liver disease. **Aim and Objectives:** The study is conducted to check that between glycated hemoglobin and fructosamine which is better to check glycemic control and severity/prognosis of chronic alcoholic liver disease. **Materials and Methods:** 60 cases of chronic alcoholic liver disease patients of age group 20–70 years of both sexes with 30 age- and sex-matched healthy controls were taken. Cases were divided into non-complicated and complicated groups. Glycated hemoglobin was estimated by immunoturbidimetry method, serum fructosamine level was estimated by colorimetry using nitro blue tetrazolium, SGOT was estimated by method by IFCC and serum total protein was estimated by biuret method. **Results:** The mean concentration of HbA1c and serum total protein was decreased in both groups of cases compared to controls. The mean concentrations of serum fructosamine and SGOT were increased in both groups of cases. There was no significant difference in the mean value of serum total protein in non-complicated cases with controls. There was no significant difference in the mean value of HbA1c between non-complicated and complicated cases. SGOT was considered for correlation, it was found out that it had significant negative correlation with serum total protein, significant positive correlation with serum fructosamine, and no correlation with HbA1c. Significant negative correlation was found between serum total protein and serum fructosamine. **Conclusion:** This study shows that serum fructosamine is a better marker to monitor chronic glucose control and severity of chronic alcoholic liver disease compared to HbA1c.

**KEY WORDS:** Chronic Alcoholic Liver Disease; Glycated Hemoglobin; Serum Fructosamine; SGOT; Serum Total Protein

## INTRODUCTION

Chronic alcoholic liver disease is a disease of the liver that involves a process of progressive destruction and regeneration of the liver parenchyma leading to fibrosis and cirrhosis where clinical or biochemical features of liver disease persists for more than 6 months.[1,2]

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Liver is an important organ regulating glucose metabolism and maintaining plasma glucose level. Patients with chronic liver disease whose plasma glucose level is inadequately controlled often have poor prognosis and can develop complications.[3,4]

Complications of chronic alcoholic liver disease result from impaired hepatocellular function. They include variceal

National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

# Comparison of calculated low-density lipoprotein-cholesterol by Friedwald's equation and direct low-density lipoprotein-cholesterol by homogenous assay

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**Received:** March 11, 2022; **Accepted:** April 07, 2022

## ABSTRACT

**Background:** LDL cholesterol is a known atherogenic factor and basis for risk classification of coronary heart disease. Reference method for measurement is beta-quantitation which is laborious and time consuming. The other method for measurement is direct homogenous assay which is costly so most laboratories use Friedwald's formula for LDL measurement. **Aim and Objectives:** The aim of the study was to compare between calculated LDL by Friedwald's formula and direct LDL by homogenous assay in fasting lipid profile samples. **Material and Methods:** We have taken data of 208 fasting lipid profile from past records after obtaining Institutional Ethics Committee permission. Patients with TG > 400 mg/dl were excluded from the study. **Results:** In our study, Pearson's coefficient is 0.97 when TG < 200 mg/dl and Pearson's coefficient is 0.95 when TG > 200 mg/dl. There is a less difference in patient's risk classification by calculated LDL and direct LDL when TG < 200 mg/dl. **Conclusion:** Friedwald's formula is a cost-effective method for measurement of LDL in comparison to homogenous assays. We can use calculated LDL when TG < 200 mg/dl without any risk of patient's misclassification.

**KEY WORDS:** LDL-cholesterol; Friedwald's Formula; Homogenous Assay

## INTRODUCTION

Many studies established strong correlation between increased concentration of LDL-cholesterol and development of atherosclerosis.[1-4] According to the National Cholesterol Education Program Adult Treatment Panel-III (NCEP ATP-III), classification of patient into risk categories and treatment is based on total cholesterol and LDL-cholesterol.[4,5] The reference method for LDL-cholesterol measurement is beta-quantitation.[6] However, this method is not commonly used in laboratories as it requires ultracentrifugation and it is laborious, time consuming, and expensive.[6] Hence, we can use direct homogenous assay for LDL which do not require ultracentrifugation and less time consuming.[7] This direct homogenous method has disadvantage of high cost.[8] Therefore, most laboratories use formula described by Friedwald *et al*. which is based on total cholesterol, triglycerides, and HDL.[9] This formula has certain limitations that it is not valid for non-fasting samples, samples in which TG > 400 mg/dl.[6] Furthermore, this formula cannot be used in patients with Type III hyperlipoproteinemia.[6]

Considering this background, we have conducted study to compare LDL-cholesterol measured by Friedwald's formula and direct homogenous assays.

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## MATERIALS AND METHODS

We have taken data of 208 fasting lipid profile from past records at GBH hospital, Udaipur after obtaining Institutional Ethics Committee permission. In lipid profile, following parameters included:

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Public Health Section

# A Community-based Cross-sectional Study on Knowledge and Belief of Menstruation and Practices of Menstrual Hygiene among Adolescence Girls of Vadodara, Gujarat, India

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## ABSTRACT

**Introduction:** Women undergo menstruation as part of their normal physiological cycle. In Indian society, it is associated with taboos, myths, misbelieves and malpractice. Majority of adolescent girls are unprepared in terms of knowledge, attitude and hygienic practices for managing the menstrual cycle when they enter menarche. A better understanding of the scientific process of menstruation and good menstrual hygiene is very crucial for the health and well-being of adolescent girls. Unsafe practices are associated with unwanted outcomes.

**Aim:** To assess the knowledge, beliefs and sources of information adolescents have about menstruation, along with their management of menstrual hygiene.

**Materials and Methods:** The present school-based cross-sectional study was conducted in 2019 in Vadodara, Gujarat, India, among 240 adolescent girls of 14-17 years of age using multistage sampling methods. Data were collected by using pre tested, structured self-administered questionnaire after having informed consent.

**Results:** A total of 98 (40.8%) of girls were aware of menstruation before attaining menarche; 19.58% and 54.17% of girls did not knew about the cause and source of the menstrual bleeding, respectively; 55.42% girls used only sanitary pads whereas 43.33% used both old clothes and sanitary pads as the absorbents. A 46.25% changed absorbent frequently (≥4 times in a day). A 54.17% washed their genitals frequently. The most common method of absorbent disposal was disposal in a dustbin. Mother was the main source of information regarding menstruation.

**Conclusion:** Majority of adolescent girls were not having enough knowledge regarding menstruation and their menstrual practices are inexact. This is requisite for menstrual hygiene programme.

**Keywords:** Absorbent, Hygiene practices, Restrictions, Sanitary napkin, School girls

## INTRODUCTION

The World Health Organisation (WHO) defines an individual between 10 to 19 years of age as “adolescence” [1]. Adolescent girls account for about 20% of total female population globally. The adolescence phase is a transition period from childhood to adulthood. Hormonal changes in adolescent girls accelerate physical, cognitive, psychological and reproduction development [2,3]. Menstruation is a universal and normal physiological phenomenon for females, indicating their capacity for reproduction. The onset of menstruation is one of the vital events in a girl’s life. The onset of menstruation is called “menarche” indicating the beginning of reproductive life. The menarche occurs between 11 and 15 years of age. The onset of menstruation is susceptible period because of major body changes, psychological changes and changing social roles [4-7]. An adolescent girl is a vulnerable population, particularly in Indian society. Even though menstruation is a normal physiological phenomenon, it is associated with many social taboos, misconceptions, supernatural beliefs and malpractices within the community. Menstruation is still thought out as something unclean or dirty in Indian society [4,8,9].

A better understanding of the scientific process of menstruation and good menstrual hygiene is crucial for the health, wellbeing and dignity of girls and women. Though menstrual hygiene is an important sanitation issue, still girls are not freely talked about menstruation and sanitary menstrual practices in Indian society. Even, it can be a big taboo to talk about it in the family. The majority of adolescent girls are unprepared– in terms of knowledge, attitudes and hygienic practices for managing the menstrual cycle when they enter in menarche [3,6,10]. The issue of menstrual hygiene continues to be neglected in many parts of the world, especially in rural and urban slum areas. It is difficult for adolescent girl to maintain good hygiene in such social environment. An unhealthy menstrual practice has been associated with serious health problems ranging from genital tract infections, urinary tract infections, bad odour and long term complications of recurrent reproductive tract infections [6].

“Menstrual hygiene scheme” was launched in 2011 and scaled up in 2014 to promote the menstrual hygiene [11]. In spite of the fact that safe menstrual practices are not universal. There is limited information on menstrual hygiene practices and knowledge in the Gujarat region, which prompted this study. Aim of the study was to assess knowledge on menstruation and menstruation hygiene practices among adolescents in Vadodara, Gujarat, India. Findings of this study will provide valuable information to guide future research and develop appropriate interventions to promote menstrual hygiene.

## MATERIALS AND METHODS

The present community-based cross-sectional study was conducted among the school going adolescent girls of the rural and urban areas of the Vadodara district, Gujarat, India. The study was conducted among school going adolescent girls during a period of August to November 2019. Ethical approval was obtained from Sumandeep Vidyapeeth Institutional Ethics Committee (IEC) (Ethical approval No: SVIEC/ON/MEDI/SRP/19043).

**Inclusion criteria:** All school going menstruating girls between 14-17 years of age, were included in the study.

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# The Relationship Between Vitamin D Levels and Severity in Illness in COVID-19 Patients: A Cross-Sectional Study

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## Abstract

Introduction: The coronavirus disease 2019 (COVID-19) pandemic hit the world badly with high mortality. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection increased the COVID-19 burden among developed and developing countries due to the unavailability of proven treatment options. Vitamin D has many important anti-inflammatory, immunomodulator, and anti-viral functions. The present study was conducted to evaluate the relationship between Vitamin D in COVID-19.

Methods: A cross-sectional study was conducted at a tertiary care hospital in Patna, India. All the patients were enrolled during the period of 3.5 months. A chemiluminescence-based immunoassay analyzer was used to quantify Vitamin D among COVID-19 patients. The study compared Vitamin D deficiency and insufficiency among different groups, i.e., age, sex, BMI, comorbidity, etc. Diabetes and hypertension were evaluated as risk factors for mortality.

Results: A total of 225 patients were investigated. Of these, 13.6% had Vitamin D deficiency and 38.9% had insufficiency. Vitamin D level was statistically significant among different age groups, sex, and smokers. Patients aged >60 years were 23 times more likely to have a severe illness (adjusted OR (aOR) 23.53, 95%CI 4.67-118.61), whereas those aged 40 to 60 years were 11 times more likely to have a severe illness (aOR 10.86, 95%CI 2.39-49.31). Patients with many comorbidities, on the other hand, had a tenfold greater chance of severe COVID-19 (aOR 9.94, 95%CI 2.47-39.88). A deficiency of vitamin D increased the chance of a serious illness by nearly five times (aOR 4.72, 95%CI 1.31-17.03).

Conclusion: Vitamin D level was associated with severity of illness; it can be used to estimate the prognosis of COIVD-19 patients and aid in the modification of treatment protocols.

**Categories:** Preventive Medicine, Infectious Disease, Epidemiology/Public Health
**Keywords:** vitamin d supplementation, low vitamin d, vitamin-d deficiency, vitamin d level, covid 19

## Introduction

In December 2019, the World Health Organization (WHO), China Country Office, received news of a pneumonia epidemic in Wuhan, China, with an unknown etiology. Within a month or so, more cases of this novel coronavirus were identified in various countries worldwide. In March 2020, the WHO declared coronavirus disease 2019 (COVID-19) a pandemic [1]. The virus had infected at least 418 million worldwide as of February 20, 2022. Furthermore, it has cost the lives of 5.8 million people worldwide [2]. Due to the lack of a viable treatment, health experts worldwide were left with no therapeutic choices, and vaccines were designed with effectiveness and protection in mind; the virus continued to spread, infecting and killing more people.

Vitamin D is essential for immune system enhancement. We have witnessed a significant shift in our understanding of Vitamin D's medicinal benefits during the last several years [3]. The typical role of Vitamin D as an element of mineral breakdown and other diseases related to bones has been extended to contain a more extensive job for homeostasis and common bone problems like osteoporosis. In any case, it is the non-skeletal role of Vitamin D that has managed to pull in most consideration. Although much feedback regarding this vitamin has been available for a long time, our viewpoint on the non-classical capacity of Vitamin D comes from a few latest notions [4]. Firstly, we can consider the deficiency of Vitamin D among the majority of the population worldwide. This point has incited studies to investigate the effect of an imperfect or lower level of Vitamin D, linking it with many other severe health conditions like autoimmune disorders, cardiovascular disease (CVD), hypertension (HTN), and other diseases. Similarly, various studies

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# Assessment of Epidemiological Factors in a Cholera Outbreak in an Urban Area of Western India

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## ABSTRACT

**Background:** Cholera is a preventable disease, still it remains a major public health problem among developing countries like India. Access to safe water and a sanitary environment can easily control many gastrointestinal infections including Cholera. In the last week of June 2021 large number of acute diarrhoeal cases were reported which was higher than expected subsequently confirmed as an outbreak of Cholera.

**Objective:** The objectives of the study were to verify the diagnosis, identify risk factors and institute appropriate control measures to control the outbreak.

**Materials and Methods:** A cross-sectional study was undertaken to identify the time, place and personal distribution of the disease. Based on the findings of the study, sanitary survey and environmental examination a hypothesis was formulated. A case-control study was carried out to test the hypothesis.

**Results:** A total of 158 cholera cases were reported with one death. Male and females were affected equally. All age groups affected, 18.35% of the cases were reported among children aged 0-5 years old. It was a common source epidemic and water was source of infection. The water sample reported faecal contamination. Those households not using water purification methods were 1.454 times more affected (OR=1.454) than those using water purification methods.

**Conclusion:** The Vibrio Cholerae bacterium caused the cholera outbreak in Nadiad. Infection was caused by contaminated drinking water.

**Key words:** Cholera, Outbreak, Nadiad, Waterborne, Diarrhoea, faecal contamination

## INTRODUCTION

India made remarkable progress on the issue of clean water and sanitation after 1960. Despite many challenges, "Swachh Bharat Mission" leads to outstanding results in sanitation. According to the Sustainable Development Goal Index for 2019, India ranks 115 out of 162 countries. Clean water and sanitation are included in Sustainable Development Goal (SDG) Goal 6. In 2019, India achieved 56.6% of SDG-6 targets.[1,2]

Many acute diarrheal diseases in developed countries are controlled by access to safe water and sanitation. Cholera, once a public health problem now eliminated in high-income countries. Cholera, on the other hand, is a significant health problem in many developing countries, including India.[3]

Acute diarrhoeal disease was the eighth leading cause of death. There are 1.3 to 4 million cases of cholera and 21000 to 143000 deaths reported worldwide every year due to cholera. The real problem may be much higher because of the large number of cases under-report and lack of laboratory diagnosis facility at the primary care level.[4,5]

Cholera is a type of acute diarrheal disease caused by

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## ORIGINAL RESEARCH

# Study of fine needle aspiration cytology of lymph node lesions at tertiary care hospital

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## ABSTRACT

**Background:** Fine needle aspiration cytology (FNAC) is a simple and rapid diagnostic technique and because of early availability of results, simplicity, minimal trauma and complication, the aspiration cytology is now considered as a valuable diagnostic aid. It also helps in giving proper direction for appropriate investigations.

**Aims:** The aim of the present study was to study the lymph node lesions in various diseases by fine needle aspiration cytology, to categorize the various lymph node lesions into inflammatory or neoplastic lesions and to study lesions in various aspects like age, gender, etiological factors, etc.

Material and Methods: The present study of 'FNAC' was carried out in Cytopathology laboratory of Department of Pathology, tertiary care Hospital, during the January 2014 to July 2015.

**Results:** Aspirations were done at all ages, the mean age being 33.5 years. Maximum number of patients were male. Majority of the patients were in the age group of 21-30 years. Cervical lymph nodes were the commonest site involved in 354(64.36%) patients. Non-neoplastic lesions were diagnosed in 418(76%) and neoplastic in 132(24%). Reactive lymphadenitis being the commonest cytological diagnosis in 221 patients (40.2%).

Conclusion: FNAC used in conjunction with clinical findings, radiological and laboratory investigations can be a cost-effective method and it dramatically shortens period between patients' first visit to clinician and establishment of definitive diagnosis and institution of appropriate treatment.

**Keywords**: Fine needle aspiration cytology, Lymphnode, Malignancy

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## INTRODUCTION

Lymphadenopathy is one of the commonest clinical presentation of patients attending the outdoor department. The etiology varies from an inflammatory process to a malignant condition. It is imperative to establish a definitive diagnosis at the earliest to institute a meaningful treatment. The various modalities available for this are clinical evaluation, fine

# Spectrum of Chest Radiographic Findings in COVID-19 Positive Patients

**Authors:**

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**Manuscript Type:** Original Research; Thoracic Imaging

**Summary**

Chest x-ray findings in patients of COVID-19 are similar to those of CT, most commonly being bilateral peripheral consolidation or faint opacities. Chest x-ray findings have a lower sensitivity as compared to the initial RT-PCR testing.

**Key Results**

In patients with COVID-19 infection ,on initial and imaging follow-up, baseline chest x-ray was seen to have a sensitivity of 67%, as compared to a sensitivity of 78% for initial RT-PCR. Chest x-ray abnormalities preceded positive RT-PCR testing in10/100 (10%) patients.

Common chest x-ray findings were similar to the counterparts described for CT: bilateral, peripheral, consolidation and/or ground glass opacities/haziness.

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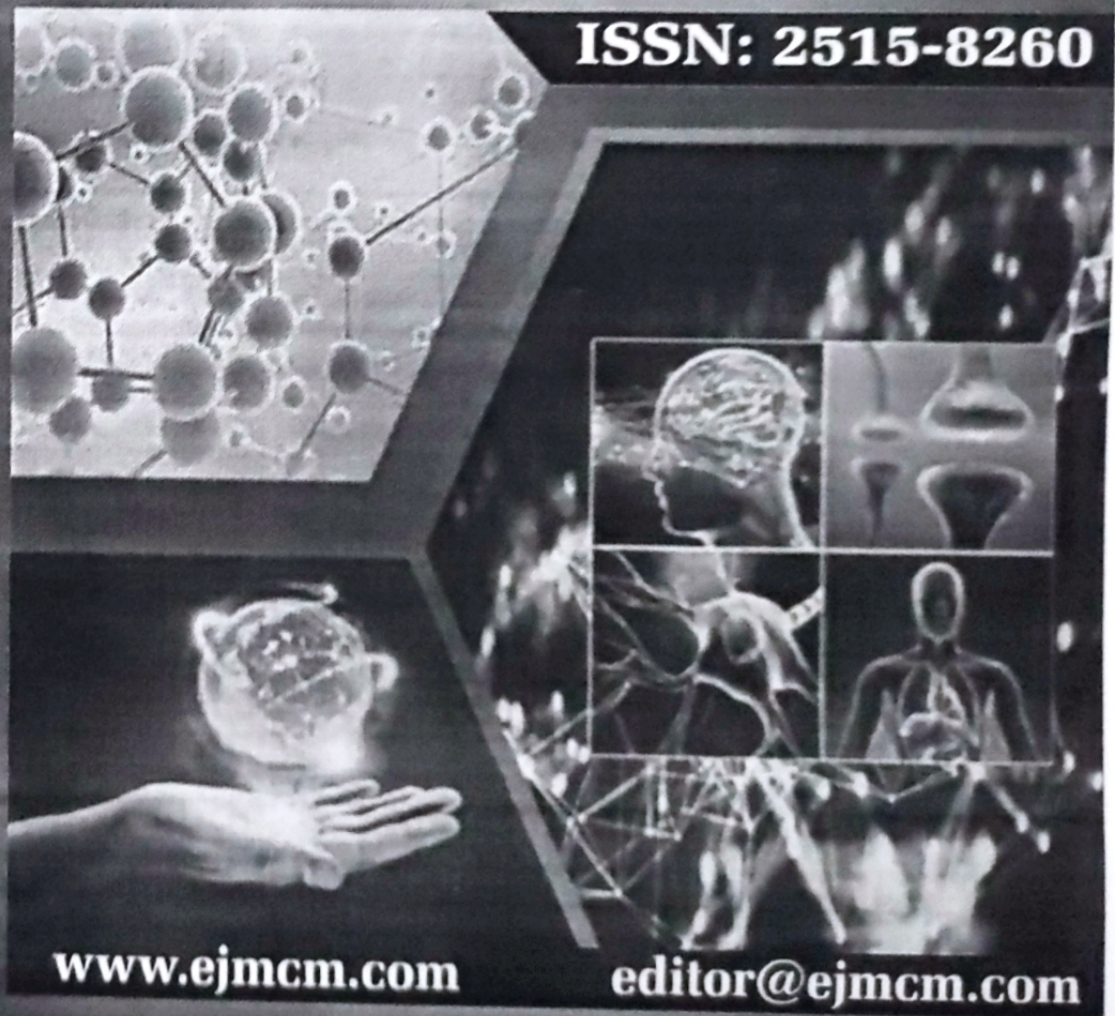

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*Original Research Article.*

# Evaluation of Demographic and Etiological Factors Among Chronic Kidney Disease Patients: An Institutional Based Study

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## ABSTRACT

**Introduction:** Chronic Kidney Disease (CKD) is becoming a worldwide health problem. There is an increasing incidence and prevalence of patients with kidney failure requiring replacement therapy, with poor outcomes and high cost. The aim of the current study was to evaluate demographic profile and etiological factors among chronic kidney disease patients admitted to a tertiary care centre who were clinically and laboratory proven cases of chronic kidney disease.

**Materials and Methods:** The present prospective study comprised of cases of chronic kidney disease admitted in Department of Medicine, Dr. N.D. Desai Faculty of Medical Science and Research, Nadiad, Gujarat, India. Selection of patients relied on clinically and laboratory proven cases of chronic kidney disease. All patients were investigated in form of routine laboratory investigations. The statistical operations were done through SPSS (Statistical Presentation System Software) and Graph pad for Windows.

**Results:** There were 64% male and 36% female patients suffering from chronic kidney disease. It showed that male patients were more involved in the chronic kidney disease. The etiological prevalence of the chronic kidney disease shows the higher prevalence of the Hypertension among these patients. The prevalence of age related factor also increased with the age. Second is the Lupus Nephritis, the auto immune disease causing the kidney disease. Membranous granulonephritis and autosomal dominant poly cystic kidney disease also cause the chronic kidney disease in the decreasing order.

**Conclusion:** The present study concludes that male patients are more involved in the chronic kidney disease. The study found that there was higher prevalence of the hypertension in chronic kidney disease patients. The other prevalent causes revealed are age related factors, Lupus Nephritis membranous granulonephritis and autosomal dominant poly cystic kidney disease.

**Keywords:** Autoimmune Disease; Cardiovascular Disease; Chronic Kidney Disease; Hypertension.

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## INTRODUCTION

Chronic Kidney Disease (CKD) is becoming a worldwide health problem. There is an increasing incidence and prevalence of patients with kidney failure requiring replacement therapy, with poor outcomes and high cost. There is an even higher prevalence of patients in earlier stages of CKD, with adverse outcomes such as kidney failure, cardiovascular disease, and premature death.[1] In India the projected number of deaths due to chronic diseases will rise from 3.78 million in 1990 (40.4% of all deaths) to an expected 7.63 million in 2020 (66.7% of all deaths).[2]

Patients with chronic kidney disease (CKD) share some of the predisposing risk factors and might be at increased risk for venous thromboembolism (VTE). The epidemiology of deep vein thrombosis and pulmonary embolism (PE), collectively referred as venous thromboembolism (VTE) and risk factors for VTE include major surgery, trauma, cancer, obesity, diabetes, and hereditary predisposition.[3] Even those patients who do not progress to end-stage renal disease (ESRD) requiring dialysis or transplantation have an increased risk of death from heart and cerebrovascular disease from any cause. The presence of CKD, whether it is manifested by proteinuria or reduced glomerular filtration rate (GFR), is now considered as an independent risk factor for cardiovascular disease events (CVD) in the most recent report from the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure (JNC VII) and in a position

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*Original Research Article.*

# Assessment of Lipid Profile in Chronic Kidney Disease Patients in a Tertiary Care Hospital Settings: A Prospective Study

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## ABSTRACT

**Introduction:** Cardiovascular disease (CVD) is the leading cause of mortality in chronic kidney disease (CKD) patients as it is characterized by specific metabolic abnormalities of plasma lipids both qualitatively and quantitatively. Therefore, early determination and management of the risk factors for CVD in CKD patients play pivotal role to develop more effective screening and treatment strategies. Henceforth, the present study was conducted to assess the lipid profile in chronic kidney disease patients in tertiary care hospital setting.

**Materials and Methods:** The present prospective and observational study comprises of cases of chronic kidney disease patients admitted in a tertiary care centre. All patients were investigated for routine laboratory investigations, serum electrolytes, serum lipid profile, thyroid profile, ultrasonography of kidney size and cortico-medullary differentiation, diabetic profile, and other investigations as and when required. The statistical operations were done through SPSS (Statistical Presentation System Software) and Graph pad for Windows.

**Results:** The number of patients in stage 3 and stage 4 were more as compared to stage 5 population. The data suggests that there is high level of serum triglyceride level along with the low level of the serum HDL cholesterol in all the stages of CKD patients. There was rise in triglyceride level and VLDL level in all the stages of CKD. While there is decrease in the HDL level in all the stages of the CKD. There was mildly reduction or near normal level of serum cholesterol and LDL cholesterol in the present study.

**Conclusion:** There is significant alteration in lipid profile in CKD patients characterized by higher level of triglyceride and VLDL level, with substantial lower level of serum HDL level. Total cholesterol and LDL cholesterol show minimal to low alteration. Such abnormalities in lipid profile leads to the more prevalence of atherosclerosis in CKD patients and increase risks of cardiovascular complications.

**Keywords:** Cardiac Disorders, Comorbidities, Renal Disease.

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## INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of mortality in chronic kidney disease (CKD) patients.[1] The Chronic Kidney Disease (CKD) is characterized by specific metabolic abnormalities of plasma lipids both qualitatively and quantitatively.[2] Most common lipid abnormalities encountered are increased serum triglycerides and decreased serum HDL cholesterol with small alteration of other lipoprotein fraction in serum and in dialysis patients there is more of a dyslipidemia rather than hyperlipidemia.[3] This may be a significant risk factor for vascular complications leading to increased morbidity and mortality in CKD patients. Dyslipidemia in CKD is one of the mechanism for the increased prevalence of the atherosclerosis. Data from the population-based Atherosclerosis Risk in Communities (ARIC) Study showed that risk factors for CHD in the general population also are associated with an increased risk for CHD among the population with CKD.[4]

Although in patients with CKD total and LDL cholesterol concentrations are usually within the target range or even lower, the serum concentrations of lipid subfractions may not fully reflect the CV risk attributed to lipid abnormalities. Compared to individuals with normal renal function, patients with CKD usually are characterized by a greater proportion of oxidized LDL particles, which are recognized by scavenger receptors and induce formation of foam cells in atherosclerotic plaques.[5,6] Furthermore, LDL particles in CKD patients tend to be smaller and denser, and, therefore, more atherogenic.[6,7]

Therefore, early determination and management of the risk factors for CVD in CKD patients play an important role to develop more

# Hematological Findings In Various Hemoglobinopathies : A 3 Years Study At Tertiary Care Centre

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## Abstract

**Introduction**: Hemoglobinopathies constitute a very important causative factor for anaemias of childhood. Two common hemoglobinopathies in India are Beta Thalassemia and Sickling disorders. **Objective**: The objective of this study is to know the hematological findings in various types of hemoglobinopathies & their distribution in various age and sex groups & communities, so that a solid conclusion can be made about screening of these hemoglobinopathies on high risk basis. **Material and Methods**: This is an observational study in 100 known patients of hemoglobinopathies who came to a tertiary care hospital from September 2015 to September 2018. Screening hematological tests for hemoglobinopathies such as complete blood count indices with Mentzer's Index, Sickling test & peripheral blood smears were performed on all the patients and analyzed. **Results**: All the patients were having characteristic hematological findings. Among the 100 patients there were 56 males and 44 females with age group ranging from 1 year to 32 years. 54% patients were having Beta Thalassemia, 40% patients were having Sickle cell disorder & 6% were having combination of both. Beta Thalassemia was most common in Bhanushali community and Sickle cell disorder was most common in Lohana community. **Conclusion**: Hemoglobinopathies can be diagnosed earlier with meticulous use of simple & cost effective hematological screening tests in high risk age groups and communities in developing countries like India.

**Keywords**: Beta Thalassemia, Mentzer's Index, Peripheral blood smear, Sickling Disorder, Sickling test.

## Introduction

Hemoglobinopathies constitute a very important causative factor for anemias of childhood. They mimic nutritional anemias and then prove deceptive and refractory to the usual corrective measures. The two common Hemoglobinopathies widely distributed across India are Beta Thalassemia and sickling disorders [1]. The former is more common in certain non-tribal ethnic groups and later amongst the tribal population.

Beta Thalassemia is considered the most common inherited autosomal recessive genetic disorder worldwide. It is characterized by partial or complete failure to synthesize the polypeptide chains of hemoglobin molecule. Different types of thalassemia's are associated with defects in any of the polypeptide chains (alpha, beta, gamma or delta). Beta Thalassemia is so common and produce severe anemia in their homozygous and

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Original Research Article

# Detection of anti DENV IgM and IgG antibodies by evaluating the rapid immunochromatographic technique in hospital at Himmatnagar, Gujarat

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ABSTRACT

**Background**: Infections arising out of dengue is a prime concern in the country. Himmatnagar too is not devoid of its devastating effects. In order to identify the existence of the virus of dengue, some serological tests are done in the labs. The effectiveness of rapid immunochromatographic test has been accessed in this study in identifying antibodies to Dengue virus (DENV).
**Materials and Methods:** In this study, the patients having the signs of infection of dengue were included and the serum samples of such patients were obtained for the purpose. The tests of the samples were performed with Panbio Dengue Duo Cassette for the ruling of antibodies of IgG and IgM. Further, for antibody capture test and the detection of the same, immunochromatrgraphic testings were taken into consideration.
**Result:** The exactness of index for the detection of IgG and IgM can be traced down with the results where the sensitivity lasted with figures like 79% and 83% along with specificity having a figure of 65% and 58% whilst the positive and negative predictive values remained 57 and 64 percent as well as 85 and 72 percent respectively. (Decimals either contracted or rounded off).
**Conclusion:** The device showcased approval to DENVs in perceiving the IgG and IgM antibodies but it cannot be suggested for confirmatory diagnostic test.



## 1. Introduction

Dengue is a virus borne illness which is arthropod. It is a distinct positive- marooned RNA virus of the family Flaviviridae; genus Flavivirus.[1] DENV has four serotypes, DENV 1,2,3 and 4 which are antigenically different and DENV 5 was discovered in Malaysia in 2013.[2] Primary infection is present as Dengue fever and Secondary infections as Dengue hemorrhagic fever. Primary and Secondary symptoms are caused by different serotypes.[3] IgM detection is done to identify primary symptoms and IgG antibodies are detected to confirm secondary symptoms. Our study is mainly focused to determine the performance of a brisk immunochromatographic test tool for the recognition of antibodies IgG and IgM to DENV at a centre in Himmatnagar.

## 2. Materials and Methods

The samples of serum were collected from suspected patients having positive dengue symptoms.

Two groups were made for the patients with positive indications. The groups were framed as Group-I and Group-II respectively. There were 120 patients in group I while the second group comprised of 80 patients. Serum samples were collected from each patient. Serum sample from group I patient were treated to evaluate IgM antibody with the orientation IgM assess. The patients of Group-II having a total of eighty tasters were treated with a declared IgG assess. The outcomes of group-I convalescents and group-II patients were compared. Comparison were made between rapid test to that of reference test and sensitivity score was

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Research Article

# CLINICOEPIDEMIOLOGICAL FEATURES OF COVID-19 PATIENTS OF SECOND WAVE AT A TERTIARY CARE TEACHING HOSPITAL IN GUJARAT, INDIA

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**ABSTRACT**

**Objective:** The studies describing the clinicoepidemiological features of coronavirus disease-2019 (COVID-19) patients of first wave are available but about second wave, very few studies have documented. This study was aimed to describe the clinicoepidemiological features and the causes of mortality of COVID-19 patients of second wave admitted in our center.

**Methods:** This retrospective, observational, and cross-sectional study was carried out among 200 randomly selected and confirmed COVID-19 indoor patients admitted between April 7, 2021 and July 3, 2021 in Dr. N. D. Desai Hospital, Nadiad. The demographic profile, clinical features, comorbidities, inflammatory markers, and causes of mortality in these patients were analyzed.

**Results:** A total 200 patients of COVID-19 of second wave were analyzed. Majority of them were males (64.5%) and the patients between 18 and 60 years of age constituted 60%. Hypertension (70.93%) and diabetes mellitus (46.51%) were common comorbidities followed by ischemic heart diseases and chronic kidney disease. The most common presenting features were fever (75.7%), cough (68.8%), and shortness of breath (60%). The median duration of hospital stay was 7 days [interquartile range, 4–12]. The patients needed any kind of mode of oxygen therapy were 82.5%. The most common cause of death was cardiac arrest (70.58%) followed by severe acute respiratory distress syndrome (ARDS) (35.29%).

**Conclusions:** In this retrospective study, most patients were young males with the age <60 years. The patients had one or more comorbidities, hypertension being the most common. Inflammatory markers were significantly higher in patients who died in our hospital.

**Keywords:** Coronavirus disease-2019, Clinicoepidemiological features, Comorbidities, Intensive care unit, Second wave, Wave-2, COVID-19 deceased, Mortality.

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## INTRODUCTION

Coronavirus disease-2019 (COVID-19) caused by the novel severe acute respiratory syndrome coronavirus 2 emerged in China in December 2019. It is still circulating and responsible for higher numbers of COVID-19-related infected cases and deaths globally, even in 2021 [1]. The world has recorded 111,102,016 confirmed cases and 2,462,911 deaths due to COVID-19 till February 22, 2021. In India, confirmed cases and deaths due to COVID-19 were 11,005,850 and 156,385 till February 22, 2021 [2,3].

COVID-19 shows variety of clinical features of asymptomatic carriers to severe pneumonia, acute respiratory distress syndrome (ARDS), multi-organ involvement, and death [4]. Earlier retrospective observational case series from India during the first wave of COVID-19 has been reported that almost half (42.9%) of the patients were asymptomatic [5]. Fever and dry cough were the most common symptoms [5,6]. Fewer patients have been required invasive mechanical ventilation support [5].

In India, during the second wave of COVID-19, gastrointestinal symptoms are adding in earlier clinical spectrum of COVID-19 [7]. Gastrointestinal manifestations are also more common in other countries [8]. Due to the high number of infections, the total death numbers are significantly higher, but no significant increase in percentage of the death rate in the second wave of COVID-19 as compared to first wave [8].

Research studies concerning the clinicoepidemiological features of COVID-19 during first wave are available in India [4,5]. However, studies regarding the clinicoepidemiological features, mortality rate, and cause of death of COVID-19 during second wave are sparse. Hence, the present study was aimed to describe clinical and epidemiologic profile of the COVID-19 patients admitted in our tertiary care teaching hospital between April 7, 2021 and July 3, 2021.

## METHODS

This retrospective, observational, and cross-sectional study was carried out in Dr. N. D. Desai Hospital, a tertiary care teaching hospital of Nadiad, Gujarat, India. The study was started after prior permission from the Human Ethics Committee (Dr. NDDFMSR/IEC/06/2021).

### Study population

The study was conducted among 200 randomly selected and confirmed COVID-19 indoor patients admitted between April 7, 2021 and July 3, 2021 at our hospital.

### Data collection method

Case record forms were filled with help of indoor case papers obtained from medical record section of our hospital.

### Inclusion criteria

We included confirmed COVID-19 patients admitted during second wave between April 7, 2021 and July 3, 2021.

### Exclusion criteria

Improperly maintained indoor case papers were excluded from the study.

### Study procedures

Total 200 indoor case papers of the COVID-19 patients of second wave were scrutinized. Case record forms were filled with help of indoor case

Letter to Editor

# A Patient with Recurrent Panniculitis and Systemic Inflammatory Response

Dear Editor,

A 35-year-old female presented with intermittent fever, weight loss, subcutaneous nodules, myalgia, polyarthralgia, recurrent oral ulcers, diffuse hair fall, and fatigue from 2 years. On examination, there were multiple nonulcerating subcutaneous nodules, 1–3 cm in size, distributed over all the four limbs and trunk, pedal edema, pallor, icterus, mild hepatosplenomegaly, and no lymphadenopathy. The investigations showed pancytopenia, hyperbilirubinemia (total bilirubin 3 mg/dl), transaminitis (200-IU/L), mild proteinuria (1+), and no hematuria or pyuria. Anti-nuclear antibody (ANA) was positive by enzyme-linked immunosorbent assay at 24 IU/L. A diagnosis of systemic lupus erythematosus (SLE) was made and she was referred to us.

At our center ANA by indirect immunofluorescence was negative. Serum acute phase reactants were markedly raised with erythrocyte sedimentation rate of 125 mm at 1 h, C-reactive protein 3.5 mg/dl, and ferritin >2000 ng/ml. Bone marrow examination was normal with no evidence of hemophagocytosis. Histopathology of subcutaneous nodules showed moderate to dense infiltrate of subcutaneous adipose tissue by lymphoid cells. The cells had irregular nuclear membrane with scanty cytoplasm and showed rimming around the adipocytes [Figure 1a]. On immunohistochemistry, these cells were positive for CD3 [Figure 1b], CD8, CD7, granzyme-B, and negative for CD20, CD4, CD56, and CD30. Ki67 positivity was seen in 50%–55% of cells (high proliferation index), thus confirming the diagnosis of subcutaneous panniculitis-like T-cell lymphoma (SPTCL). The patient was treated with oral prednisolone 40 mg, has a good response and is planned for chemotherapy.

SPTCL is a rare primary cutaneous T-cell lymphoma presenting as panniculitis composed of mature cytotoxic $\alpha\beta$ or $\gamma\delta$ T-cells. The subcutaneous nodules are typically painless. Pancytopenia, hepatosplenomegaly, icterus, and transaminitis can be seen in 20%–40% cases and may be associated with hemophagocytosis. Patients have a good prognosis with a 5-year survival of 85%.[1] Autoimmune disease can coexist in 20% and lupus-erythematous-panniculitis (LEP) is a close differential diagnosis. LEP clinically has lesions more common on the face, shoulder, breast, and buttocks. They can ulcerate (28%) and heal with lipoatrophy and scarring leaving behind the concavity of skin leading to cosmetic issues.[2,3] LEP is seen in 1%–3% of patients with SLE, frequently can be present with no or minimal signs of systemic inflammation, and can rarely be a presenting manifestation.[2-4] Histopathology lacks malignant cells with atypical features of the nucleus and cytoplasm described above in SPTCL and is characterized by lymphocytic lobular or mixed panniculitis with the frequent presence of germinal centers and plasma cells. Dermo-epidermal changes, lymphocytic vasculitis, and hyaline fat necrosis are other distinctive features.[5] Many times, the features of both these conditions can overlap/evolve making the final diagnosis difficult.[6] Panniculitis associated with the reaction to Mycobacterium leprae (erythema nodosum leprosum) has a similar presentation with panniculitis, fever, polyarthralgia, hand-feet edema, and systemic inflammatory response.[7,8] In the tropical areas where leprosy is more prevalent, it can be an important differential diagnosis clinically but can be easily differentiated by histopathology. Thus, rheumatologists evaluating the patients with recurrent panniculitis and systemic inflammatory response should consider a wide differential diagnosis including autoimmune, infectious, and malignant diseases.

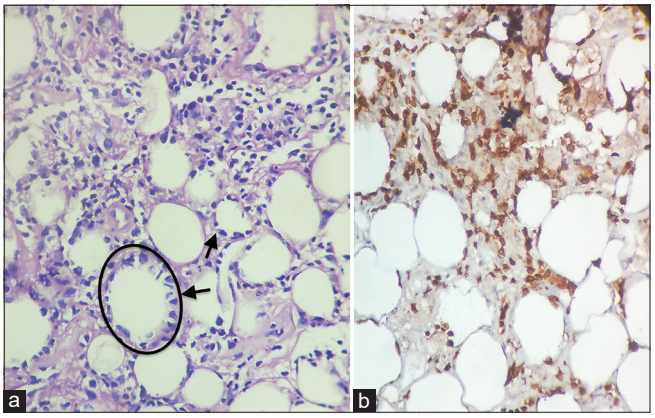


**Figure 1: (a) Skin and subcutaneous tissue histopathology showing atypical lymphocytes rimming the adipocytes (b) Immunohistochemistry showing CD3 positivity of the cells**

## *Declaration of patient consent*

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initial s will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

## *Conflicts of interest*

There are no conflicts of interest.

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Original Research Paper

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Dermatology

# DISABLING PANSCLEROTIC MORPHEA OF CHILDHOOD – A CASE REPORT

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**ABSTRACT**

**INTRODUCTION:** Disabling pansclerotic morphea (DPM) of childhood is a rare generalized type of localized scleroderma (LS) known to follow an aggressive course with pansclerotic lesions leading to severe joint contractures and consequent immobility. It is a chronic disease of unknown etiology, seen mostly in children less than fourteen years, involving sclerosis of all the layers of skin extending rapidly through the dermis and subcutaneous tissue to involve muscle, tendon and bone. It is distinguished from generalized scleroderma by its lack of systemic involvement. Mortality is due to complications of the disease such as bronchopneumonia, sepsis or gangrene. There is no specific laboratory finding. Treatment protocols are still evolving.

**CASE REPORT:** 14 years old boy presented with chief complains of tightness of the skin involving all the four limbs and trunk since 1 year. There was no history of Raynaud's phenomenon, or exposure to chemicals and dyspnea or dysphagia. On examination multiple sclerotic plaques with atrophy present on the trunk and all four limbs and a single non- healing, painful ulcer on the left foot and distal left leg. Skin biopsy showed thickening & homogenization of collagen bundles in dermis and subcutaneous issue. He was treated with oral steroids & methotrexate without any significant benefit.

**CONCLUSION:** Disabling pansclerotic morphea of childhood is exceedingly rare and severe form of Morphea. It can be very disabling and sometimes fatal. Treatment continues to present a therapeutic dilemma with only sporadic remission despite multimodality therapy. Early diagnosis is essential for initiation of proper therapy. An interdisciplinary approach is indispensable for proper management.

**KEYWORDS :** Disabling pansclerotic morphea of childhood, localized scleroderma, Dexamethasone pulse therapy, Methotrexate

## INTRODUCTION:

Morphoea is a term used in preference to 'localized scleroderma', encompasses a group of related conditions characterized by varying degrees of cutaneous fibrosis and in the later phase atrophy of skin. It can sometimes extend deeply into muscle and bone.

Localized scleroderma has a wide clinical spectrum, ranging from superficial, circumscribed sclerotic plaques to severe, generalized and pansclerotic forms. The numerous clinical variants include: plaque-type morphea-including superficial, guttate and nodular variants; generalized morphea; linear scleroderma-including "en coup de sabre" lesions and Parry-Romberg syndrome (progressive hemi facial atrophy); and deep morphea-including morphea profunda, eosinophilic fasciitis and disabling pansclerotic morphea of childhood (DPMC). [1,2]

DPMC is a chronic disease, of unknown etiology which is seen mostly in children less than fourteen years, involving sclerosis of all the layers of skin extending rapidly through the dermis and subcutaneous tissue to involve muscle, tendon and bone. It is distinguished from generalized scleroderma by its lack of systemic involvement. [3] Progression of DPMC is explosive, with severe disablement causing mutilating contracture deformities, increased susceptibility to recalcitrant ulcers and malignant transformation with development of non-melanoma cancers.[4]

In isolated cases, it is found in association with hypergammaglob ulinemia,[5] thrombocytopenia, squamous cell carcinoma[6] and a highly unusual pleomorphic acid fast bacterium[7]

Mortality in DPMC is due to complications of the disease such as bronchopneumonia, sepsis or gangrene. There is no specific laboratory finding for this disease and treatment protocols are still evolving.

## CASE REPORT:

A 14 years old boy presented with chief complains of tightness of the skin involving all the four limbs and trunk since 1 year. There was no history of sclerodactyly, Raynaud's phenomenon or exposure to chemicals and dyspnea or dysphagia. Family history was insignificant. On examination multiple, sclerotic and partially atrophic plaques of size ranging from 2 to 5 cm were present on the trunk, and both extremities.[Figure -1a,b,c,e,f] A single painful ulcer of size about 4× 2.5 cm with irregular borders, undermined edge and base covered with red granulation tissue was present over the left foot and distal left leg.[Figure -1d] Boy was severely handicapped with sclerosis involving all the four limbs. On general clinical examination no signs of visceral involvement was found. Patient's peripheral pulses were palpable and there was characteristic sparing of the tip of the fingers and face. Gait was difficult and there was a marked muscular atrophy of all limbs but the patient could write, hold objects in hands or care for himself unassisted. Laboratory investigations showed moderate hypochromic anaemia, thrombocytopenia and elevated ESR. Immunological profile showed no antinuclear, anti-centromere or anti scl-70 antibody. Culture of swab from the ulcer showed Staphylococcus aureus. On H&E stain, histopathology of the skin showed flattened and atrophic epidermis with loss of the rete ridges; homogenous and eosinophilic collagen deposition with diminished space in between seen extending from dermis up to subcutaneous tissue.[Figure-2] Patient was started on dexamethasone pulse therapy at every 28 days interval & intravenous antibiotics were started according to the culture sensitivity of swab. The patient received physiotherapy on a daily basis. The patient also received oral supplements of iron, folic acid, multivitamin and protein. During his two weeks stay, his wound improved but there was no response in the sclerosed skin. This therapy was given for 3 months then patient was shifted to tablet methotrexate 7.5mg/week.

## DISCUSSION:

Disabling pansclerotic morphea of childhood (DPMC) is exceedingly rare and severe form of Morphea. It can be very disabling and sometimes fatal.DPMC may resemble at onset the plaque-type morphea or linear scleroderma and hence the diagnosis of the complete form, with its ominous prognostic implications might be established only late, once that pansclerosis with joint ankylosis and muscle atrophy occur. [8]

Anemia, thrombocytopenia and eosinophilia present in our case are usually rare in plaque-type morphea, but are described relatively frequently in pansclerotic morphea. [9,10,11] These parameters correlate well with the activity of the disease, and may be used to monitor the evolution.

During the diagnostic work-up of DPMC, it is important to differentiate this aggressive form of localized scleroderma from

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INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# EPIDERMOLYSISBULLOSA PRURIGINOSA -A CASE REPORT

Dermatology

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## ABSTRACT

**INTRODUCTION:** Epidermolysisbullosa refers to group of inherited disorders involving formation of blisters following trivial trauma. Epidermolysis bullosa pruriginosa is a type of dystrophic epidermolysis bullosa caused by type VII collagen gene COL7A1 mutation, characterized by pruritus, nodular prurigo like lichenified lesions in early phase and violaceous linear scarring, trauma induced blistering, excoriation, milia, nail dystrophy in late healing phase, in some cases albopapuloid lesions can be seen on the trunk.

**CASE SUMMARY:** 27 years old male had an itchy, discrete, multiple papular and lichenified nodular lesions of varying sizes from 0.5-1.5cm, present over legs since the age of 12. No history of blistering after trauma, nail or mucosal involvement. No history of consanguineous marriage. His father and mother had similar lesions over the extremities. Histo-pathological examination of skin biopsy showed sub-epidermal blister with thickened stratum corneum in roof of blister. Within the blister, fibrin, plasma and few neutrophils were seen. Overlying epidermis showed mild acanthosis, focal thinning and lamellated compact orthohyperkeratosis. Papillary dermis thickened & showed abundant fibroplasia with increased number of thick walled capillaries & moderately dense mixed inflammatory infiltrate. Clinical features & biopsy findings suggestive of epidermolysisbullosa pruriginosa. Treatment with topical super-potent steroids and systemic antihistamine showed no response after 1 month.

**CONCLUSION:** Epedermolysis bullosa pruriginosa is a type of dystrophic Epidermolysis bullosa caused by type VII collagen gene COL7A1 mutation. It can be complicated by infection, deformities, squamous cell carcinoma which may metastasize eventually leading to death. Multidisciplinary approach with avoidance of trauma is required. Genetic counselling of parents is advisable.

## KEYWORDS

## INTRODUCTION:

Epidermolysis bullosa (EB) refers to a group of inherited disorders that involve the formation of blisters following trivial trauma.[1] Epidermolysis bullosa pruriginosa is a recently described variant, caused by Type VII collagen gene mutation, with distinctive clinicopathological features characterized by pruritus, nodular prurigo like lichenified lesions in early phase and Violaceous linear scarring, trauma induced blistering, excoriation, milia, nail dystrophy in late healing phase, in some cases albopapuloid lesions can be seen on the trunk.[2] Most cases are sporadic,[3] but a few show autosomal dominant or autosomal recessive pattern of inheritance.[2] Microscopic studies of EB pruriginosa show typical findings of dystrophic EB,[4] and it has been postulated that itching lesions of EB pruriginosa could represent an abnormal dermal reactivity of some subjects to their inherited bullous disorder. The study of the molecular basis of dominant dystrophic EB (classical) and EB pruriginosa shows that both diseases are caused by a missense glycine substitution mutation by different amino acids in the same codon of COL 7A (G2028R and G2028A).[5]

## CASE REPORT:

A 27 year old male presented with an itchy, discrete, multiple papular and lichenified nodular lesions of varying sizes from 0.5-1.5cm, present over legs since 12 years of age. There was no history of blistering after trauma, nail or mucosal involvement and no history of consanguineous marriage. Similar lesions were present over the extremities of his father and mother. Histo-pathological examination of skin biopsy showed sub-epidermal blister with thickened stratum corneum in roof of blister. Within the blister, fibrin, plasma and few neutrophils were seen. Overlying epidermis showed mild acanthosis, focal thinning and lamellated compact orthohyperkeratosis. Papillary dermis thickened & showed abundant fibroplasia with increased number of thick walled capillaries & moderately dense mixed inflammatory infiltrate. Clinical features & histo-pathological examination of biopsy findings suggest the probable diagnosis of epidermolysis bullosa pruriginosa. Topical super-potent steroids for local application twice a day and systemic antihistamine were given for 1 month, but treatment showed no response.

## DISCUSSION:

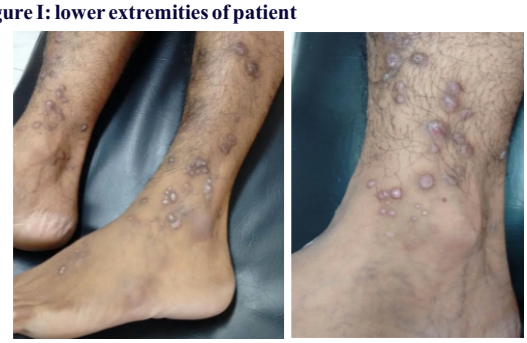
EB pruriginosa is a newly characterized variant of dystrophic EB.[2] Patients had multiple papular and nodular prurigo-like lesions, mostly on the shins, and also on other parts of the legs, forearms, elbows, dorsal aspect of the hands, shoulders, and lower back, developing since birth in some cases, and between 6 months to 10 years of age in others. The face and flexures were always spared, and nail dystrophy, albopapuloid lesions, blisters, and milia were other common but not invariable features.

Histopathology showed hyperkeratosis, mild acanthosis, dermal lymphohistiocytic infiltrate, and also subepidermal bullae in some areas. Ultrastructural studies showed a reduction of anchoring fibrils in lesional, perilesional, and non-lesional skin, similar to dominant dystrophic or localized recessive EB, and morphometry of anchoring fibrils alone could not distinguish between different subtypes of dominant dystrophic or localized recessive EB and EB pruriginosa.[2]

In our patient, pruritus was the most oppressive symptom. Clinical presentation and histopathology were consistent with the diagnosis of EB pruriginosa, however, there were no albopapuloid lesions or milia. The occurrence of the condition in father points strongly towards a genetic origin, but the exact mode of inheritance is hard to specify.

Epedermolysisbullosa pruriginosa is a type of dystrophic Epidermolysisbullosa caused by type VII collagen gene COL7A1 mutation. It can be complicated by infection, deformities, squamous cell carcinoma which metastasized to death. Multidisciplinary approach with avoidance of trauma required. Genetic counselling of parents is advisable.

**Figure I: lower extremities of patient**



Original Article - Retrospective Study

# Acute Fascial Space Infections of the Neck: A Retrospective Study of 1034 Cases in 17 Years at a Rural Setup

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## Abstract

**Aim:** The aim of this study was to provide insight about all the common fascial space infections of the neck, their presentation, their etiology, complaints, length of stay, and the treatment given. **Patients and Methods:** It was conducted in a tertiary center in Nadiad, Gujarat, India. A total of 1034 patients were treated for fascial space infections of the neck in the hospital from 2001 to 2017. There were 63.24% male and 36.75% female with age ranging from 21 days to 96 years having the mean age of 31.4 years. **Results:** Odontogenic infection with poor oral hygiene as a cause was found in most (78.43%) of the abscesses. Diabetes was the most common comorbid condition found in 98 (9.47%) patients along with HIV found in ten (0.96%) patients. Pain (99.41%), fever (86.07%), swelling (86.94%), and dysphagia/odynophagia (67.21%) were the most common presenting symptoms. Ludwig's angina and submandibular abscess were found to be the most common deep head-and-neck space infection making up for 52% cases. The most common group of microorganisms isolated were *Streptococcus* sp. (19.82%) and *Staphylococcus aureus* (18.66%). **Conclusion:** Treatment was given in the form of incision and drainage of the abscesses (83.69%) and systemic antibiotics (100%). The most common space infection among the deep neck infections is the submandibular space infection (52%). If the etiological factor was not removed which mostly was carious teeth, high chances of recurrence were found (27.27%). Four patients required tracheostomy, and there was one mortality in the entire series.

**Keywords:** Abscess, cervical fascia, Ludwig's angina, neck space infection, odontogenic infection

## Introduction

Acute cervical space infection occurring in the fascial spaces of the neck is a common occurrence in the rural areas where the dental hygiene is poor. Previously, tonsillar and paratonsillar areas were common sites from which infections used to spread to the deep neck spaces. With evolution of the antimicrobial therapy, the incidence of these infections has come down and odontogenic causes are now the most common source of deep neck space infections. Deaths and complications too have reduced due to timely intervention and availability of newer antimicrobial therapy with broad-spectrum coverage.[1] But still, some cases of deep fascial space infections prove challenging, especially in immunocompromised patients such as those suffering from HIV or diabetes where the spread is sometimes very rapid and can cause morbidity and mortality.[2] Treatment in the form of incision and drainage is carried out in most of the patients with the administration of broad-spectrum antibiotics. Other life-saving interventions such as tracheostomy may be required, when the airway is compromised.

The aim of this study is to give an insight into the retrospective analysis of 1034 cases of deep neck infections reported to our tertiary center where we have comprehensively studied the neck spaces involved, the causative organisms, the comorbid conditions, the treatment offered, complications encountered, and how we managed them.

## Patients and Methods

Medical records of a total of 1034 patients were reviewed for deep cervical fascial space infections at a tertiary center at

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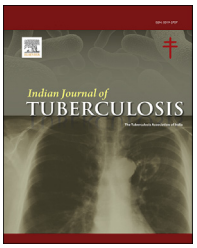

Original article

# A retrospective analysis of 1019 cases of tuberculous cervical lymphadenitis in a rural setup in 20 years

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ABSTRACT

*Background:* This article is to review cervical lymphadenitis due to tuberculosis (TB), their presentation, their aetiology, the methods used to diagnose them, the treatment modalities offered and the response to treatment.

*Methods:* 1019 patients were diagnosed and treated for TB of the lymph nodes of the neck from 1st November 2001 to 31st August 2020 at a tertiary ENT hospital, Nadiad, Gujarat, India. Study consisted about 61% males and 39% females with the mean age being 37.3 years.

*Result:* Commonest factor or habit among those diagnosed for tuberculous cervical lymphadenitis was consumption of unpasteurized milk. HIV and diabetes were the most common co-morbid conditions found with this disease. Swelling in the neck was most common clinical feature followed by loss of weight, formation of abscess, fever and fistula. Rifampicin resistance was found in 1.5% of patients among those tested for the same.

*Conclusion:* The most commonly affected site for extra pulmonary TB is posterior triangle of neck than the anterior triangle. Patients with HIV and diabetes are at higher risk for the same. Testing for drug susceptibility has to be done due to increased resistant of drugs for extra pulmonary TB. GeneXpert and histopathological examination are important for its confirmation.



## 1. Introduction

Tuberculosis is the most commonly found chronic infectious disease in developing countries like India which can cause a lot of morbidity and even mortality if not treated on time but if detected and treated in a timely manner, results in an uneventful recovery. It is caused by various strains of mycobacteria like *Mycobacterium Tuberculosis*.[1] The pulmonary form of tuberculosis is most common but we encounter a lot of

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# Facilitators and barriers to participation of the private sector health facilities in health insurance & government-led schemes in India

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ABSTRACT

*Background:* In India, policymakers are in an opined that expansion of public-funded health insurance is the key to achieve Universal Health Coverage (UHC). Despite untapped potential to be part of such government-run public-funded health scheme, many private service providers are reluctant to join in such scheme due to various reasons. This paper aims to evaluate facilitators, barriers and perception to participation of the private sector health facilities in Health Insurance & government-led schemes.

*Methods:* Present study was conducted in 83 private hospitals of Vadodara city. Sampling frame was formed & with the use of random number table, 83 hospitals were selected randomly. Data collection was done in pre tested, pre formed questionnaire & respondents were the medical superintendent or the person in-charge of the hospital.

*Results:* In the present study 30% & 26% of hospitals were enrolled for cashless private health insurance facility & government health schemes respectively. Social service, competition and increase clientele were the common reason sought for enrolment in government health schemes. Low & delayed reimbursement, bribe to clear payment, limited services covered, administrative issues were the common problems identified for non-enrolment. There was an association between a number of beds in the hospital & enrolment to government health scheme ($p < 0.05$). Availability of cashless private health insurance facility ($p < 0.01$) and satisfied with the current TPA model of health insurance ($p < 0.05$) were also found statistically significant.

*Conclusion:* Timely & rational increase in remuneration, expanding the scope of services and use of appropriate technology for ease in administration is the need of an hour to engage vast service providers under the ambit of public-funded health insurance.

## 1. Introduction

Accomplishing Universal Health Coverage (UHC) gained global push to inculcate in nation's health policy which is a reflection of world health assembly resolution (2005), World Health Theme 2018 and Sustainable Development Goal (SDG) objective 3.8.[1,2] The ultimate goal of UHC is to ensure that everyone should have access to essential healthcare services everywhere, without bearing financial hardship.[3] Nation like India with miserable national health spending requires an effective & efficient health financing tool to implement UHC.[4] Health insurance is one such model that works on pooling risk and resources which gives premium & business to the insurer, more clientele to service provider & quality services without out of pocket expenditure to an insured.

In India, policymakers are in an opined that expansion of public-funded health insurance is the key to achieve UHC.[5–7] In the last two decades, state and central governments in India funded several Health insurance schemes to circumvent impoverished people from catastrophic health expenditure.[8–10] National Rural Health Mission (NRHM) was launched in 2005 to narrow down systemic deficiencies in the Indian health system.[11] While health sector reforms brought by NRHM was focused towards strengthening public health system, subsequently launched public-funded health insurance schemes (E.g. Rashtriya Swashtya Bima Yojana (RSBY) & Ayushman Bharat at national level,

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RESEARCH ARTICLE

# Liver function tests in patients with chronic obstructive pulmonary disease in a tertiary care hospital

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## ABSTRACT

**Background:** Cases of chronic obstructive pulmonary disease (COPD) increasing day by day. Smoking is the major causative agent for COPD. The present study undertaken to estimate the deterioration of liver functions in COPD patients due to smoking. **Aims and Objectives:** This study aims to investigate various liver function tests (LFTs) such as total bilirubin, alanine amino transferase/serum glutamic pyruvic transaminase (SGPT), aspartate amino transferase/SGPT, alkaline phosphatase (ALP), serum ammonia, and serum albumin among COPD patients. To correlate LFTs with forced expiratory volume at end of 1 second ($FEV_1$) and $FEV_1$/Forced vital capacity (FVC) ratio. **Materials and Methods:** In our present study, we selected 86 cases of COPD in the age group of 41–60 years. All subjects were smokers and having $FEV_1$ <80% and $FEV_1$/FVC <70%. A control group consists of 55 healthy individuals. LFTs were studied. $FEV_1$ and $FEV_1$/FVC ratio were correlated with LFTs. Statistical analysis done using SPSS software 20.0 Windows version. **Results:** Mean level of SGPT among cases was 117 ± 10.23 IU/L against controls who had mean SGPT 11.16 ± 8.32 which was statistically significant ($P < 0.05$). Likewise, mean level of s. ammonia among cases was 154 ± 10.22 mcg/dl as compare to controls who had mean 24.43 ± 7.97 mcg/dl ($P < 0.05$). However, no significant difference was found in rest of the LFTs. Furthermore, there was no correlation between altered LFTs and severity of COPD. **Conclusion:** LFTs are significantly altered in COPD patients due to smoking. Corticosteroids treatment must not be initiated without investigating LFTs among COPD patients.

**KEY WORDS:** Liver Function Tests; Chronic Obstructive Pulmonary Disease; Forced Expiratory Volume 1; Forced Expiratory Volume 1/Forced Vital Capacity

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common non-communicable disease (NCD) which can be prevented. Usually, it is characterized by air hunger secondary to and airflow limitation, pathology lies in the airway and/or alveoli.[1] Cases of COPD in India are rising continuously and it is the second most common cause of NCD-related deaths in India. Above 30 years of age population have high prevalence of COPD.[2] Growth of India, in terms of urbanization and pollution, has put its people at risk of having COPD. COPD is diagnosed with the help of spirometry. Spirometry shows chronic airflow limitation even after giving the bronchodilators to COPD patients. COPD is now considered as multiorgan disease and liver damage is also likely. In recent times, deterioration of liver functions among COPD patients has been observed by many clinicians. It has been seen that COPD patients are more likely to have non-alcoholic fatty

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Original Article

# Depression among higher secondary students of science stream of private schools of Rajkot

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## Abstract

**Background:** Depression with the magnitude of 8 – 20% emerged as major mental health morbidity among adolescents due to its devastating consequences of suicidal tendencies, academic failure, poor social relationships, and substance abuse. The current study was carried out to estimate the magnitude of depression among the students of private higher secondary schools of science stream in Rajkot city, Gujarat. **Methods:** A cross-sectional study was conducted among the 1219 students of 11th and 12th standards of private schools of science stream in Rajkot city using a multistage sampling method. Students were screened using Patient Health Questionnaire-9 for Depression and categorized into no depression, mild, moderately severe and severe depression. Epi Info software version 7.1.5.2. from CDC, Atlanta, USA was used to analyze the data. **Results:** One-third (31.99%) of students had depression followed by Dysthymia (20.59%) and Suicidal risk in 1.64% of students. The prevalence of depression was higher in female students (37.28%) than males. Students of 12th standard (38.06%) were more depressed than 11th standard (25.98). The suicidal risk was found more among the students of 12th standard (2.47%) compared to 11th standard (0.82). The prevalence of Depression, Dysthymia and Suicidal risk were more in Muslim students than Hindus. According to severity, female students (13.98%), 12th standard students (11.53%), Muslim (19.73%) and students residing at a hostel (12.12%) were more depressed (moderate to severe) than their counterparts. **Conclusion:** In the present study, a significant proportion of students were found suffering from depression.

**Keywords:** Depression, dysthymia, patient health questionnaire-9, students

## Introduction

Adolescence is a state of great commotion with regard to behavioural and emotional aspects. The adolescent age group is defined as a period of life between the age of 10 and 19 years by World health organization (WHO).[1] Depression is a mental disorder that presents with symptoms like disturbed sleep and appetite, low self-esteem, poor concentration, guilt or low self-worth, loss of interest and pleasure, and depressed mood. Petersen *et al.* (1993) defined adolescent depression as depressed mood, depressive syndrome and clinical depression.[2] Dysthymia, also called Persistent Depressive Disorder, is defined as a persistent low-grade depression for at least the past two years with associated other symptoms of Depression (eating disorders, sleep disorders, low self-esteem, poor concentration, etc.).[3] Suicide risk is defined as thinking about ending oneself associated with a suicidal attempt ever in the whole life.[4]

Students of science streams of higher secondary private school are going through great mental stress because of a highly

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# A descriptive study of post-operative complications of transurethral resection of prostate

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***Abstract*---**Introduction: Because of the introduction of improved technology like diathermy and visual scopes, Transurethral resection of prostate (TURP) has become a comparatively safer treatment in recent years. However, there is a danger of developing TURP syndrome and electrolyte imbalance, particularly in individuals with high-risk cardiac disease. Aim: This study was performed for the identification of course, duration, and occurrence of complications in post-operative patients with TURP. Materials and Methods: A descriptive study comprising 52 patients was conducted at C.U. Shah Medical College and Hospital, Surendranagar, Gujarat, India from 8th February 2019 to 1st November 2020, covering 20 months. Results: The study focused on the distribution of patients as per age and post-op complications, co-morbid conditions, DRE grading, etc. Also, the study correlates the volume of the prostate with post-operative complications, prostate volume with S-PSA, etc. Furthermore, the


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**Original research article**

# A Prospective Study on Upper Limb Supraclavicular Brachial Plexus Block: Dexmedetomidine with Ropivacaine and Dexamethasone with Ropivacaine and Ropivacaine Alone

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**Abstract**

**Introduction:**

Pain is defined as "As unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage". Pain is an inevitable consequence of surgery. Surgical intervention done to reduce human suffering is associated with pain and distress to patients. Severe pain causes increased stress response to surgery, seen as a cascade of endocrine, metabolic and inflammatory events that may contribute to organ dysfunction, morbidity, increased hospital stay and mortality.

**Material and Methods:**

The present study from May 2020 to March 2022 was conducted on 60 cases prospectively in patients admitted to the, Department of anaesthesia ,Dr. N.D. Desai FMSR, Dharmasinh Desai University, College Road, Nadiad, Gujrat, undergoing elective upper limb surgery. The inclusion and exclusion criteria, 60 ASA physical status I or II patients of either sex, aged 18-60 yrs were randomly allocated in to 3 groups of 20 each.

Group I: Patients receiving 0.5% Ropivacaine (30ml) + Dexmedetomidine 50mcg (diluted to 2 ml).

Group II: Patients receiving 0.5% Ropivacaine (30ml) + Dexamethasone 8mg (2ml).

Group III: Patients receiving 0.5% Ropivacaine (30ml) + saline (2ml).

Under strict aseptic precautions, patients were given Ultrasound guided Supraclavicular brachial plexus block with any one of the study drugs .

**Results:**

Demographic data(age ,sex distribution ,weight) and surgical characteristics (duration of surgery and type of surgery) were similar in all the 3 groups.

ONSET OF SENSORY AND MOTOR BLOCKADE : The mean time for onset of sensory block in group I was 7.45±1.10 min and in group II was 10.15 ± 1.14 min and group III was 12.45±2.76 . The mean time for onset of motor block in group I was 10.60 ± 1.05 min and in group II was 14.95 ± 0.83 min and and group III was 16.05 ± 1.96.

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**Original research article**

# A Prospective Study is to Evaluate the Efficacy of two Types of Supraglottic Airway Devices- I-gel and cLMA.

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**Abstract**

One of the major responsibilities of an anesthesiologist is to provide adequate ventilation to the patient. Difficult airway has been responsible for as many as 30% of deaths attributable to anesthesia. The I-gel is the most recent development in supraglottic airway devices. The I-gel is a new single use non inflatable supraglottic airway device. The seal created is sufficient for both spontaneously breathing patients and for intermittent positive pressure ventilation. The Laryngeal Mask Airway (LMA) is extremely useful when used conservatively and has proved valuable as a rescue device in both elective and emergency situations, obviating the need for laryngoscopy and virtually requiring minimal training in its use.

**Methodology:** A study was conducted on 60 adult patients, of both sexes in a randomized prospective manner undergoing elective surgery belonging to ASA physical status I and II.

Group I (30 patients) for I-gel insertion

Group II (30 patients) for classic LMA insertion

Both the devices were compared in relation to the hemodynamic changes, ease of insertion and post-operative sore throat with classic LMA and I-gel in patients undergoing elective surgeries with spontaneous ventilation.

**Results:** There was no statistically significant difference between the two groups in terms of ease of insertion, number of attempts, hemodynamic changes andpostoperative sore throat and other complications.

**Conclusion:** Both I-gel and cLMA are easy to insert and provide an effective airway during spontaneous ventilation.

**Keywords:** Laryngeal mask airway, I-gel, Supraglottic airway device.

## Introduction

Cesarean section is the commonest operation performed by the gynecologist and one of the commonest surgical procedures in general. The dramatic increase in the number of women with a scarred uterus has led to greater attention being paid to the problems of the clinical management of pregnancy and delivery after previous Caesarean delivery (CD).[1] Pregnancy

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**Original research article**

# Type-2 Diabetes Mellitus Asymptomatic Patients Changes in ECG (Qt - Interval) with or without Microalbuminuria: A Hospital Based Study

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## Abstract

**Introduction:** QT interval abnormalities are the best predictors of cardiovascular deaths .Microalbuminuria is an independent marker for cardiovascular disease in diabetes mellitus. Hence QT interval abnormalities in diabetics with or without microalbuminuria were evaluated in this study.

**Material and Methods**: This study done in the Dept. of General Medicine at Dr. N. D. Desai Faculty of Medical Science & Research, Nadiad, and NAMO Medical college and research centre from( May 2021 to Dec 2021). Open label controlled study with 214 subjects of either sex. Group A healthy subjects (n=100), group B asymptomatic, type 2 diabetics with no clinical evidence of cardiac disease. Group B subdivided into B1 with microalbuminuria (n=62), B2 without microalbuminuria (n=52). Corrected QT interval (QTC), microalbuminuria, and blood pressure were measured for all subjects. QTC was calculated by using Bazzet's formula .QTC more than 440msec was considered prolonged.

**Results:** QTC was within normal range in diabetic patients(415+25msec). Highly significant ($p<0.0001$) prolongation was observed in diabetics, compared to healthy subjects. Both B1 ($p<0.0001$) and B2 ($p<0.001$) groups showed a significant increase in QTC than in healthy subjects. Among B1 and B2 groups QTC was not statistically significant.

**Conclusion:** QTC was more in asymptomatic type 2 diabetics irrespective of microalbuminuria compared to healthy individuals, though values were within normal range.This denotes high risk for future cardiovascular complications in diabetic patients.

**Keywords**: QT interval prolongation, Diabetes Mellitus, Microalbuminuria, Corrected QT interval, CHD(coronary heart disease),CAD(coronary artery disease)

## Introduction

Epidemiological data shows alarming values that predict a worrisome projected future for T2 diabetes mellitus. According to the International Diabetes Federation (IDF), in 2019, diabetes caused 4.2 million deaths; and 463 million adults aged between 20 and 79 years old were living with diabetes, a number that will likely rise up to 700 million by 2045. Diabetes was the underlying cause of at least 720 billion USD in health expenditure in 2019**.** Ninety percent of Diabetic patients have type 2 Diabetes mellitus and it has emerged as one of the 21st' century's

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***Original Research Article***

# Study of ectopic pregnancy in a tertiary care center, Maharashtra, India

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## Abstract

**Background:** Ectopic pregnancy (EP) is a life threatening emergency commonly being managed by primary care physicians where diagnosis is often being missed at the first contact.
**Objectives:** To study the etiological factors, clinical presentation and maternal outcome of cases of ectopic pregnancy.
**Materials and Methods:** This cross-sectional study was done among 50 confirmed cases of ectopic pregnancy at department of obstetrics & Gynecology in Government Medical College and Hospital, Latur, Maharashtra during October 2013 to September 2015. Data collection was done after ethical permission from institutional ethical committee and informed consent of clients. Inclusion criteria: All confirmed cases of ectopic pregnancy Exclusion criteria: All cases of intrauterine pregnancies.
**Results:** Highest number of participants (34%) belonged to 26-30 years age group and mean age was 27 years. Maximum participants (70%) were multipara. Present study noted 16% misdiagnosed cases of EP. Most common site of EP was noted at ampulla (68%). Tubectomy was the most common risk factor (28%), 'amenorrhea (80%)' was the most common clinical feature. Blood transfusion required in 78% cases and post-op wound infection in 12% cases.
**Conclusion:** The rising number of cases of EP poses a serious concern over maternal mortality. With advances in the field of medicine, more young women are adopting newer fertility control methods such as newer oral contraceptives, infrastructure contraceptive devices and various tubal surgeries to limit their families. Moreover, newer drugs for ovulation induction and tubal reconstructive surgeries have led to delayed conception with increased risk of EP.

**Keywords:** Ectopic pregnancy, pain in abdomen, salpingectomy, tubectomy

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*Original Research Article*

# To study the efficacy and safety between use of BICLAMP (bipolar coagulation forceps) in vaginal hysterectomy and conventional vaginal hysterectomy: A prospective study at tertiary care center, Maharashtra

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## Abstract

**Background:** Bipolar vessel sealing systems (BVSS) are accepted to be safe and efficacious with possible advantages over conventional methods, namely fewer requirement of post-operative analgesics, less blood loss, shorter operative time and minimum hospital stay.
**Objectives:** To compare the efficacy and safety between use of BiClamp (Bipolar Coagulation Forceps) in Vaginal Hysterectomy and Conventional Vaginal Hysterectomy.
**Materials and Methods:** This prospective study was done among 80 cases indicating hysterectomy for benign diseases admitted in OBGY unit were selected randomly out of which 40 cases underwent Conventional Vaginal Hysterectomy and 40 cases underwent BiClamp Vaginal Hysterectomy at department of obstetrics & Gynecology in Government medical college and hospital, Latur during November 2012 to September 2014.
**Results:** Mean duration of hospital stay required for participants of cases and control group was 2.6 days and 4.2 days respectively ($p<0.05$). Mean duration of operation of cases and control group participants was 70.9 min and 75.5 min respectively ($p<0.05$). Mean blood loss during operation noted among the cases and control group participants was 90.1 ml and 115.9 ml respectively ($p<0.05$). During operation, three suture material required in in 0.0% participants of cases group and 82.5% of control group respectively ($p<0.05$). Post- op complications like fever, bladder injury, bowel injury & hemorrhage noted only in participants of control group.
**Conclusion:** BiClamp Vaginal Hysterectomy post-operative pain was less, intraoperative blood loss was less, operative time was significantly shorter, duration of hospital stay was less and BiClamp Vaginal Hysterectomy was more Cost effective than the Conventional Vaginal Hysterectomy.

**Keywords:** BiClamp Vaginal hysterectomy, complication, conventional vaginal, hysterectomy, hospital stay, operative time

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# Early results of modified C4-C7 laminoplasty with C3 laminectomy for cervical spondylotic myelopathy in Indian population: An institutional experience

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## Abstract

**Introduction:** Laminoplasty is indicated in patients with cervical spondylotic myelopathy (CSM) who have multilevel cervical spinal cord compression and a neutral or lordotic cervical spine alignment. However, axial neck pain is a common complication post-surgery, which may be caused by surgical damage to the semispinalis cervicis (SSC) muscle attachment on the C2 spinous process. Modified C4-C7 laminoplasty with C3 laminectomy completely preserves the SSC insertion on C2 and reduces the incidence of axial neck pain at subsequent follow-ups.
**Aim:** Our study aims to evaluate the clinical and radiological outcome of C4-C7 laminoplasty with C3 laminectomy for CSM in the Indian population.
**Materials and Methods:** We performed a retrospective analysis of 21 patients who underwent the surgery for CSM with a minimum one-year follow-up. Clinical improvement is measured using the modified Japanese Orthopedic Association (MJOA) score and visual analogue scale (VAS). Radiographic parameters evaluated were the C2-C7 lordosis angle and the cervical range of motion (ROM).
**Results:** In our study, the mean age of the patients was 54±7.7 years, and follow-up period was 20.5±4.6 months. At a one-year follow-up, the mean pre-operative MJOA score improved from 9.5±1.9 to 14.9±1.1 ($p$<0.001). Pre-operative axial neck pain was present in nine patients with a mean VAS score of 4.9±0.8, which improved to 3.7±0.7 ($p$<0.001) at three-month follow-up. At the final follow-up, only four patients had axial neck pain with a mean VAS score of 1.1±1.4.
**Conclusion:** C3 laminectomy with C4-C7 laminoplasty is a safe, effective technique, which achieves good neurological improvement and reduces the incidence and severity of post-operative axial neck pain in the Indian population.

**Keywords:** Laminoplasty, neck pain, complications, outcomes.

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*Original Research Article*

# Dual mobility total hip arthroplasty in osteonecrosis of femoral head: Is it suitable for Indian population?

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## Abstract

**Background &Aim:** Dual Mobility Total Hip Arthroplasty (DMTHA) is a reasonable treatment option for osteonecrosis of femoral head (ONFH), especially in active young patients who are at an increased risk of dislocation post-surgery. Moreover, lifestyle a religious habits of Indian patients require extreme flexion and rotation, making DMTHA a lucrative treatment option. The aim of our study is to evaluate the short-term results of DMTHR for ONFH in the Indian population and their ability to resume their daily activities after the surgery.
**Material and Method:** The study is a retrospective analysis of 23 DMTHA in 17 patients who underwent DMTHA for ONFH between March 2018 to March 2020 and with a minimum follow-up of one year. Patients were evaluated clinically using Harris Hip Score (HHS) and Patient-Reported Outcome Measures (PROMs), such as the ability to squat and sit cross-legged. Radiological evaluation was performed to detect implant migration, loosening, periprosthetic osteolysis, or heterotrophic ossification.
**Result:** In our study, the mean age of patient was 36.7±9.1 years. The mean pre-operative HHS scores of 53.8±15.4 improved to 97.0±4.2 at one year post-surgery. 94.1% patients in our study could squat and sit cross-legged at a mean duration of 3.2 months post-surgery.
**Conclusions:** The use of DMTHA in Indian patients with ONFH showed good early clinical and functional results without major complications, and simultaneously meeting their high functional and cultural requirements.

**Keywords:** Total hip arthroplasty, dual mobility cup, dislocation, revision surgery

## Introduction

Osteonecrosis of the femoral head (ONFH) typically affects the young, active population resulting in substantial loss of function due to subchondral collapse, femoral head deformation, and articular incongruence [1, 2]. Although conservative treatments can be attempted in the early stages of the disease, total hip arthroplasty (THA) is indicated when the

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**Original research article**

# A Retrospective Study on Hyperthyroidism Associated with Intraocular Pressure and Dry eyes

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## Abstract

Graves' orbitopathy/ophthalmopathy (GO) also known as thyroid eye disease (TED), dysthyroid/ thyroid associated ophthalmopathy (TAO), is an autoimmune disorder representing the commonest and most important extrathyroidal manifestation of Graves' disease.

**Materials and Methods:** This is a retrospective study conducted over a period of 2 years. A total of 60 established cases of Hyperthyroidism of all Age group with either gender subjects who were diagnosed with Thyroid orbitopathy at Hospital were included in this study.

**Result:** A total of 60 patients were examined. Of the 60 cases analysed, female preponderance was noted and 41-60 years age group had highest incidence of thyroid orbitopathy. The most common presentation was found to be unilateral. Inferior rectus muscle was the commonest muscle involved with 48.3% followed by Medial rectus muscle 38.3%, Superior rectus muscle 23.3% and Lateral rectus muscle involved least with 11.6% in descending order. None of the patients reported loss of vision. Most common sign refractive error and least one was restrictive myopathy. The most common presenting eye sign was found to be decreased vision during the study period in patients of Hyperthyroidism which was found to be statistically significant. ($p<0.05$). Decreased vision was found to be the most common eye sign among all age groups which was statistically significant. ($p<0.05$) followed by Upper lid retraction.

**Conclusions:** Dry eye and increased IOP are commonly seen outcomes that should be managed diligently. This potentially sight- threatening condition is seen worldwide and has many functional and cosmetic consequences that need to be recognized. Hyperthyroidism was significantly associated with the severity.

**Key words:** Hyperthyroidism, Intraocular pressure, Thyroid eye disease

## Introduction

Graves' orbitopathy/ophthalmopathy (GO) also known as thyroid eye disease (TED), dysthyroid/ thyroid associated ophthalmopathy (TAO), is an autoimmune disorder representing the commonest and most important extrathyroidal manifestation of Graves' disease, but it may occur in patients without current or prior hyperthyroidism (euthyroid or ophthalmic Graves' disease) or in patients who are hypothyroid due to chronic autoimmune (Hashimoto's) thyroiditis. [1] Clinical symptoms and signs are usually mild, consisting of ocular irritation with redness and tearing, stare due to lid retraction and exophthalmos, and periorbital swelling. [2]

## ORIGINAL RESEARCH

# Analysis of Renal Dysfunction in Patients with Liver Cirrhosis: An Institutional Based Study

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**ABSTRACT**

**Introduction: Liver disease is a common disorder affecting multiple system. It accounts for approximately 2 million deaths every year worldwide and 1 million due to complications of cirrhosis. Current epidemiological trends show that common liver diseases in Asia–Pacific countries are alcohol-related liver diseases, non-alcoholic fatty liver disease (NAFLD), hepatitis B and C, etc. Most of them lead to cirrhosis of liver. Renal dysfunction is one of the most common complications of cirrhosis with high morbidity and mortality.**

**Materials and Methodology: This study was adopted to be conducted as hospital-based study was carried on 133 cirrhotic patients admitted in the Tertiary care centre. Patients details that includes their demographic data, clinical examination findings and results of laboratory investigations were collected. CTP (Child Pugh) score and MELD (Model for End Stage Liver disease) Score of patients were also briefed. End results for continuous variables were expressed as means and standard deviation. Categorical variables were described as percentages. Significant factors that were associated with the presence of renal dysfunction was analysed using binary logistic regression analysis Bivariate analysis was carried out using pearsons coefficient of correlation. Odds Ratio (OR) was enabled to ascertain the strength of relationship between two variables.**

**Results: A total of 133 patients were included in this study. Male patients were in majority constituting 85.3% (n=113) of the total population, the rest were females (14.7%). Mean age of patients in the study group was 51.32 years (+ 13.72). The most common aetiology of cirrhosis was found to be alcohol, comprising of about 74.5%. 22 patients had more than 1 aetiology for cirrhosis, the most common of which has combined alcohol and NASH (Non-Alcoholic Steato Hepatitis) related, observed in 9 patients.**

**Conclusion: The present study has found significant correlation between the severity of liver dysfunction and some parameters of renal dysfunction. However, there is no such significant association was observed between the distribution of various renal parameters among different aetiologies of chronic liver disease.**

**Keywords: Chronic Liver Disease, Alcohol Related Liver Disorders, Renal Failure, Hepato-Renal Syndrome.**

# A Study on Assessment of Services Rendered Under the Rashtriya Swasthya Bima Yojana Scheme in Jamnagar District: A Cross Sectional Study

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**Abstract :**

**Introduction:** In India, poverty is propagated due to sickness, 1% of the poor are estimated to fall below the poverty line tending to their illness, and an estimated 65% of the poor in India get further into debt. To reduce out of pocket (OOP) expenditure for health care and lessen a considerable financial burden on the poor, a national health insurance scheme, Rashtriya Swasthya Bima Yojana (RSBY) was launched in 1st April 2008. **Objectives:** The present study was conducted to assessment of services rendered under the RSBY scheme with the aims & objectives, 1. To describe the socio-demographic characteristic and health problems of the patients who availed the benefits of RSBY in last one year; 2. To assess the medical and other support services rendered under RSBY scheme by government and private empanelled hospitals; 3. To assess the attitude of beneficiaries towards RSBY scheme in terms of satisfaction with the treatment provided. **Method:** Total 176 household interviewed from study district. A pretested semi structured questionnaire was used to interview a respondent from the family. The data entry was done using EPI INFO and data analysis was done using EPI INFO, Microsoft Office Excel 2007 and MedCalc. **Results:** 59.7% beneficiaries were coming from less than 10 km from the hospital. Medical and surgical causes were the major problems. 89.8% of beneficiaries were asked to get medicine from outside. 76.7 % beneficiaries were provided free food during stay at the hospital. 87.5% of the patients got discharged summary. 92.6% of the patients responded that finger Print Verification was done on Discharge. 76.1% beneficiaries were not told about the amount left in the card at the time of discharge. **Conclusion:** Majority of the patients in private hospital availed surgical treatment. Patients in private hospital were more satisfied with the services rendered in RSBY.

**Key Words :** Health Insurance, RSBY, Service Satisfaction, Utilization

## Introduction :

Poverty is a relative phenomenon and multi-faced wretched state of deprivation of basic minimum needs, facilities and services. There are different levels to its adverse influence on individual, family and community.[1]

Poor health not only leads to financial bankruptcy but also gives many sufferings to the affected individual and their family. Health is a fundamental human right and it is the responsibility of the governments, both at the central and states, to provide health care to all people in equal proportions. Total health care boosts economic growth, reduces poverty and lowers mortality rates. The saga of success of many countries lies in their special effort to provide the entire population with good health care facilities.[2]

A World Bank study, reports that approximately one-fourth of the Indian population fall below the poverty line due to hospitalization costs. It has also been estimated that OOP expenditure on health care might have raised the proportion of the population in poverty by 2%.[3]

An estimated 150 million have been reported as spending more than 40% of their income on their health needs, which could contribute to the vicious cycle of poverty perpetuating poverty.[4] India spends about 4.3% of its Gross Domestic Product (GDP) on healthcare. However, 72% of this money is paid by individual households through (OOP) payments at the time of illness, representing one of the highest proportions of OOP in the world.[5]

In India, the government acts as both a financer as well as a provider of health care.[6] In India, poverty is

# Study of Self-Reported Morbidity Profile among the Rural Tribal Population in a District of Western India

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**Abstract :**

**Introduction:** India has a dual burden of both communicable as well as non-communicable disease. The morbidity pattern of a population is considered as a proxy measure to understand the country's health status. **Objectives:** To study the demographic profile of villages & compare it with national level. To assess the common morbidity pattern, its age-wise distribution and proportion of multi-morbidity in the community. **Methods:** The present cross-sectional study was a part of routine Rural Health Training Centre (RHTC) work. For present study, 5 out of 15 villages under the Primary Health Centre (PHC) Bahadarpur were included with purposive sampling. House to house visit were done. Data were collected by trained intern doctors posted at RHTC from November 2014 to January 2015. All villagers who were living in those villages for more than a year and fitting in the definition of a family were included in the study. **Results:** Oro-dental diseases, ophthalmic diseases, musculoskeletal diseases & non-communicable diseases were top in prevalence list. Prevalence of multi-morbidity for non-communicable diseases was 14.68%. In children below the age of five years most common morbidity was acute respiratory infection. Among children aged between 5 years to 14 years the most common morbidity was ophthalmic disease while among 15-60 years of age group & in geriatric population oro-dental disease was most common morbidity. **Conclusion:** The present study gave prevalence rates for various diseases. Acute respiratory infections are still major problem among children. Multimorbidity is a new phenomenon which was observed in rural tribal villages. Such community-based prevalence of different diseases will help to understand the changing disease pattern in the community.

**Key Words :** Disease Burden, Disease Pattern, Epidemiologic Transition, Morbidity, Non-Communicable Diseases (NCDs)

## Introduction :

According to the World Health Organization's Global Burden of Disease (GBD) study in 2017, infectious disease and maternal, neonatal & nutritional factors accounted for more than 10.3 million deaths worldwide (18.6%) out of a total 55.9 million. Non-communicable diseases, on the other hand, caused 41 million or 73.4% of deaths worldwide.[1] Given such mortality evolution, most developing countries are exhibiting a drastic change in their disease pattern with an increase in non-communicable deaths.[2] Modernization, improved sanitation and better housing conditions in developing countries have been compelling in controlling infectious diseases.[3] Omran in 1971 termed these changes a 'transition of epidemiology', whereby infectious diseases are being replaced by chronic diseases over time due to expanded public health care and sanitation.[4]

Although the transition of the disease pattern from acute communicable to chronic non-communicable disease is widely visible on the world map, there is substantial variation in the levels and patterns of mortality crosswise over nations and locales. These distinctions reflect disparities in the accessibility of fundamental necessities like food, safe

National Journal of Physiology, Pharmacy and Pharmacology

RESESRCH ARTICLE

# The effects of high heeled shoes walking in on energy expenditure and oxygen consumption in healthy young female

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## ABSTRACT

**Background:** Walking in high-heeled shoes is widespread dress behavior of women of modern society. It increases lower limb muscles activity and energy cost. The need to generate larger muscular forces during walking increases the metabolic demand, thus oxygen consumption ($VO_2$) is increased when wearing high heels. **Aims and Objectives:** To access effect of high-heeled shoes on Energy Expenditure (EE) and $VO_2$ in Healthy Young female. **Materials and Methods:** This cross-sectional study was conducted among fifty apparently healthy female students between the ages of 20 and 26 yrs. Resting arterial blood pressure and heart rate (HR), $VO_2$, heat production, and EE were recorded. Then, subjects walked barefooted a distance of 76.5 meters in 2 min. Following the barefooted walk, cardiac and metabolic parameter were recorded again. The subjects walked 76.5 meters in high-heeled shoes of 2, 4, and 6 inches. These parameters were recorded immediately after 76.5 meters of walking in high-heeled shoes. **Results:** The results from the present study indicate that walking a distance of 76.5 meters barefooted resulted in a significant increase only in mean arterial pressure, HR and rate pressure product. The EE and $VO_2$ after walking a distance of 76.5 meters in high-heeled shoes of 2, 4, and 6 inches heel heights was significantly higher than walking a distance of 76.5 meters barefooted. **Conclusion:** Walking barefooted required lesser effort than walking in high-heeled shoes of different heel heights. Effort should therefore be made to encourage women to reconsider the habitual use of high-heeled shoes.

**KEY WORDS:** Barefoot; Energy Expenditure; High Heeled Shoes; Oxygen Consumption

## INTRODUCTION

Walking with high-heeled shoes is widespread dress behavior among 37–69%of women of modern society.[1] Although it is uncomfortable and hazardous, most corporate women in managerial positions sacrifice comfort for high fashion with cost of pain and discomfort.[2]

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It causes hyperextension of back and neck which leads to elevation of the pelvis, the trunk is tilted forward and strain is put on the back muscles.[3] High heels are associated with higher vertical peak and anteroposterior ground reaction forces, increased knee moments peak, and smaller plantar flexion moments.[4-6] In high heels, the duration of the stance phase, stride length, and step angle were all dramatically reduced.[5,7,8] It shift the bodyweight on the forefoot and changes in the center of gravity which results in an increased risk of falling, back pain, neck pain, osteoarthritis, and foot deformities.[9] The prolonged position of the foot in plantar flexion causes impairment and pain, not only to the ankle and knee joints but also to the pelvis and spine. Moreover, walking with high-heeled shoes increases lower limb muscles activity

Original Research Article

# Socio-demographic and Clinical profile of HIV-TB co-infected adults and its association with tuberculosis treatment outcome, registered in various ART centres of Gujarat State

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## Abstract

**Background:** World's top most deadly infectious diseases are HIV and TB. TB-HIV co-infection results in more mortality rates. India is at 2nd number in comparison of estimated HIV associated TB cases. **Objectives:** To know about HIV-TB co-infected patients' socio-demographic and clinical profiles and establish links between these factors and treatment outcome. **Methods:** A prospective observational study was carried out, from 1st July 2017 to 31st October 2018, on HIV-TB co-infected adults residing in 30 Talukas of Gujarat state, by interview method using a questionnaire. The selection of talukas was made by the cluster sampling method. **Results:** The majority of the 211 HIV-TB co-infected adults studied were males (74%) and belonging to age ranged 21-50 years, representing the most socioeconomically productive segment of the population. Most came from lower socio-economic stratum (78%), and the majority were educated only till primary school (60%). The majority of patients were presented with one symptom of 4s complex (Current cough, Fever, Weight loss and Night sweat) (83%). The most common adverse effects observed were gastrointestinal(62%). Patients having adverse effects had significantly poor outcomes ($p<0.05$). **Conclusion:** TB-HIV co-infection was more common among males and the economically productive age groups. Approximately half of the patients experienced adverse effects during the treatment course, which were associated with poor treatment outcome

**Keywords:** HIV-TB co-infected, Socio-demographic profile, TB treatment outcome



### Introduction

The world's topmost deadly infectious diseases are HIV and TB. Worldwide, TB is the leading cause of death among people living with HIV[1]. TB-HIV co-infection results in more mortality rates. Around 25 per cent of all deaths among PLHIV are estimated to be due to TB[2]. TB occurs earlier in the course of HIV infection than other opportunistic infections[3]. The risk of having tuberculosis (TB) is estimated to be between 16-27 times greater in people living with HIV than among those without HIV infection[4]. The risk of death in co-infected individuals is twice that of HIV infected individuals without TB, even when antiretroviral (ARV) therapy is taken into account[3].

Globally, in 2018, 251,000 people who were co-infected with TB and HIV are estimated to have died. These deaths are in addition to the 1.2 million people who died from TB alone. India is at the second number (after South Africa) in comparison to estimated HIV associated TB cases[3]. Cases of HIV-infected people who go on to develop Tuberculosis (TB) is increasing in India, according to the India TB Report 2019. According to the 2019 report, amounting to a TB-HIV co-infection rate was 3.4 per cent in India which was 3 per cent in 2018[2]. This study was designed to obtain information about the socio-demographic and clinical profile of HIV-TB co-infected patients and to establish links, if any, between these factors and treatment outcomes.

### Materials & Methods

#### Study sample size

This prospective observational study was carried out on HIV-TB co-infected patients. Our sample size was 211. The sample size was calculated by cluster sampling. We selected 30 talukas of Gujarat state by cluster sampling.

After assessing exclusion criteria, all patients registered in various ART centres during the third quarter of 2017 (Jul - Sep) and the fourth quarter of 2017 (Oct-Dec) from these talukas were included in the study.

#### Study period

The study was carried out from July 2017 to October 2018

#### Inclusion criteria

HIV-TB co-infected patients who enrolled in the third quarter (Jul – Sep) of 2017 and fourth quarter (Oct-Dec) of 2017

#### Exclusion criteria

1. Patients with the age of below 15 years
2. Patients with drug resistance TB
3. Patients who were not willing to participate

#### Method of data collection

Data collection was started after obtaining clearance from the ethical committee of our institution. All study participants were communicated telephonically, and they were asked regarding socio-demographic profile, type of TB, adverse reactions, outcome etc.

All patients were asked every month from initiation of treatment up to the outcome of treatment. Data were analysed by Microsoft Excel 2010 and epi-info software.

#### Definitions

**Type of TB patients as per RNTCP guidelines**[5]

1. New patients: The TB patient has never had treatment with anti-TB drugs (ATT) or the TB patient who has taken the treatment

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Original Article

# EXPLORATORY STUDY ABOUT KNOWLEDGE, ATTITUDE AND PRACTICE ABOUT PHARMACOVIGILANCE AND ADR REPORTING AMONG RESIDENTS OF A TERTIARY CARE TEACHING HOSPITAL

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**ABSTRACT**

**Objective:** This study, aimed at investigating the knowledge and attitude of resident doctors about ADR reporting in a tertiary care teaching hospital.

**Methods:** This was a cross-sectional, observational, questionnaire-based study conducted in Shri Krishna Hospital and Medical Research Centre, 550 bed tertiary care teaching rural hospital attached to Pramukhswami medical college, Karamsad, Gujarat.

**Results:** 50 questionnaire forms were analysed, giving a response rate 86.20%. Of the respondents 56% were men, remaining were women. Mean age of the respondents was 25+1.05 y. All but one resident have heard the term 'pharmacovigilance,' but 34 out of 50 were able to define it accurately. Twenty participants preferred email for ADR reporting while 14 preferred direct contacts for ADR reporting. Telephone is liked by 9 participants. All residents admitted the importance of pharmacovigilance in unison. Majority of the residents (96%) were in view to teach pharmacovigilance actively to students. Seventeen out of 50 residents were aware about Pharmacovigilance Program of India, a program by Government of India for pharmacovigilance and ADR reporting. 28 residents did not know about any such program. Three residents opined that no specific national program is running and India is following a program undertaken by WHO. The most preferred method of ADR reporting by residents is email/website followed by direct contact. Twenty were in favour of the first method, while 14 preferred the later method. Nine residents selected the telephone method as method of ADR reporting.

**Conclusion:** Today's residents are future's consultants. So it is the need of the hour to stimulate residents to report ADRs.

**Keywords:** Pharmacovigilance, Tertiary care, Residents


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## INTRODUCTION

Pharmacovigilance as described by WHO is detection, assessment, understanding and prevention of adverse effects or any other drug related problem. Adverse drug reactions (ADRs) are associated with significant morbidity and mortality and are an important cause of hospitalizations. ADR is associated with a significantly prolonged length of hospital stay and almost 2-fold increased death [1].

Lazarous *et al.* estimated that ADRs were the fourth to sixth largest cause of death in the United States [2]. Another study by Arulumani *et al.* showed that ADRs were responsible for 3.4% of the hospital admissions and 3.7% developed ADRs during their hospital stay [3].

WHO has developed a system for reporting of ADRs by the establishment of the International Drug Monitoring Programme, coordinated by Uppsala Monitoring Centre, Sweden [4]. In India also National Pharmacovigilance Programme (NPP) was started in 2004 [5]. This programme is relaunched in 2010 as Pharmacovigilance Programme of India (PvPI), and is now coordinated by the Indian Pharmacopoeia Commission, Ghaziabad [6].

Still, pharmacovigilance is in its infancy phase in India and under-reporting is a major problem. Studies were done in other countries also reveal under-reporting of ADRs [7, 8]. Thus, to improve the ADR reporting rate, it is important to improve the awareness and practices of healthcare professionals regarding pharmacovigilance.

Though studies reporting the level of awareness and practices of pharmacovigilance have been done in other countries, [9-11] very few studies have focused this aspect in India. Hence, the present study is conducted to develop baseline data of awareness and practice of pharmacovigilance in health care professionals and medical students in a Tertiary Healthcare Teaching Hospital in Gujarat.

As resident doctors are the first one who are in contact with patients taking drugs, spontaneous reporting by them is an effective way to generate early signals of ADRs. Thus, awareness among them and their attitude towards pharmacovigilance are important determinants of ADR reporting rate. In order to improve the reporting rate, it is essential to improve the Knowledge, Attitude and Practice of resident doctors regarding ADR reporting and pharmacovigilance. The right time to do it is during the undergraduate and postgraduate education of doctors. This study, therefore, aimed at investigating the knowledge and attitude of resident doctors about ADR reporting in a tertiary care teaching hospital. This study would suggest possible ways of ADR reporting based on our findings. Department of Pharmacology in the medical college recently conducted two programs on ADR reporting and pharmacovigilance. These programs were attended by residents and consultants and other healthcare professionals of the hospital. Through this study, we also can measure the results of efforts taken by the department through responses of residents and consultants and nursing staff and others.

## MATERIALS AND METHODS

This was a cross-sectional, observational, questionnaire-based study conducted in Shri Krishna Hospital and Medical Research Centre, 550 bed tertiary care teaching rural hospital attached to Pramukhswami medical college, Karamsad, Gujarat. Approval from Institutional Ethics Committee was taken before starting the study. All Residents from

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**Original Research Article**

# Comparative study of nondescent vaginal hysterectomy and abdominal hysterectomy at tertiary care centre, Maharashtra

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## ABSTRACT

**Background:** Vaginal route of hysterectomy has distinct health and economic benefits in terms of less morbidity, better postoperative quality of life outcomes, reduced hospital stay and better patient satisfaction. Objectives of current study were to evaluate the appropriate route of hysterectomy (abdominal or vaginal) in terms of intra and post-operative complication, morbidity and blood loss.
**Methods:** This prospective study was done among 100 cases of hysterectomy of which 50 patients underwent NDVH and 50 underwent abdominal hysterectomy. This study included all emergency and booked patients having Size of uterus less than 12 weeks size, adequate uterine mobility, adequate access, adenomyosis, dysfunctional uterine bleeding, chronic PID & fibroid uterus.
**Results: S**tudy found statistically significantly higher number of the participants with parity 3 & 4 in both the study groups. Bulky uterus followed by 12 and 10 weeks uterus in statistically significantly higher number of the participants of both the study groups. Duration of surgery statistically significantly less in NDVH group compare to TAH group. Fibroid was the main indication of hysterectomy in both the groups. Hemorrhage was the main intra-operative complication in both the groups. Fever & respiratory tract infection was the main post-operative complications in both the groups.
**Conclusions:** Benefits of NDVH over TAH are Cosmetic advantage as less invasive, No discomfort of abdominal incision, shorter operative time, lesser blood loss, lesser intraoperative and postoperative complications, postoperative comfort is more, lesser requirement of postoperative analgesia, early ambulation and shorter hospital stay.

**Keywords:** Ambulation, Complication, Non-descent vaginal hysterectomy, Total abdominal hysterectomy

## INTRODUCTION

Hysterectomy is the most common operation performed by gynaecologist, next to caesarean section. The first abdominal hysterectomy was performed by Charles clay in Manchester in 1843. Vaginal hysterectomy dates to ancient times.[1] Traditionally, the uterus has been removed by abdominal route which gives the opportunity to inspect the ovaries and vaginal route was reserved for pelvic organ prolapse.[2] Currently, there are three main types of hysterectomy operations in practice for benign diseases; abdominal hysterectomy (AH), vaginal hysterectomy (VH) and laparoscopic hysterectomy (LH). AH remains the predominant method of uterine removal. This route is used for malignancies, bulky uteri or when there are adhesions and removal of uterus is not possible through vaginal route.[3] Overall mortality rates for AH or VH are 0.1-0.2%.[4] Vaginal route for non-descent uterus is

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**Original Research Article**

# A prospective study on feto-maternal outcome in patients with premature rupture of membranes at tertiary care center

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## ABSTRACT

**Background:** PROM is associated with increased risk of chorioamnionitis, unfavorable cervix and dysfunctional labour, increased cesarean rates, postpartum hemorrhage and endometritis in the mother. Possible neonatal outcomes in cases of PROM may include respiratory distress syndrome, hypothermia, hypoglycemia, intraventricular hemorrhage, broncho pulmonary dysplasia etc. Objective of this study the maternal and perinatal outcomes in premature rupture of membranes at term.
**Methods:** This prospective study was done among 100 pregnant women with premature rupture of membranes after 37 completed weeks visited at department of obstetrics & Gynecology in RCSM Hospital, Kolhapur during June 2014 and June 2015. Inclusion Criteria was Gestational age of >37 weeks confirmed by dates, clinical examination or ultrasound, cervical dilatation of <3 cms, Lack of uterine contractions for atleast 1 hour from PROM, Single live pregnancy in vertex presentation and PROM confirmed by Direct visualization or Litmus.
**Results:** Present study found highest number of cases among age group 20-24 years and mean age was 22 years. Almost 70% cases were un-booked. Average duration to PROM to hospital admission was 9.6 hours. Most common maternal outcome was febrile illness Most common perinatal outcome was birth asphyxia and 3 perinatal death.
**Conclusions:** Pregnancies complicated with PROM should have supervised labor preferably in an institution. Management of each case has to be individualised. A combined effort of obstetrician and neonatalogist is necessary. A good neonatal intensive care unit can be instrumental in reducing the perinatal morbidity and mortality.

**Keywords:** Fetomaternal Outcome, LSCS, Multigravida, PROM, Primigravida

## INTRODUCTION

The normal development, structural integrity and function of the fetal membranes are essential for the normal progress and outcome of pregnancy. One of the most important functions of the membranes is to remain intact till the labour starts in order to maintain the protective intrauterine fluid environment.[1]

Premature rupture of membranes (PROM) refers to a patient who is beyond 37 weeks' gestation and has presented with rupture of membranes (ROM) prior to the onset of labor. Preterm premature rupture of membranes (PPROM) is ROM prior to 37 weeks' gestation. Spontaneous premature rupture of the membranes (SPROM) is ROM after or with the onset of labor. Prolonged ROM is any ROM that persists for more than 24 hours and prior to the onset of labor PROM occurs in approximately 10% of pregnancy.[2,3]

PROM is characterized by rupture of membranes before the onset of true labour. This occurs in 5-20% of all labours. Indian studies report an incidence of PROM in 7-12% of all labours. 70% of the cases it occurs in pregnancies at term.[4] PROM is associated with increased risk of chorioamnionitis, unfavorable cervix and

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# Prevalence of Bacterial Agents Causing Lower Respiratory Tract Infections in Patients Attending Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat: A Cross-Sectional Study

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**Abstract**

*Aim:* The Current research was performed to find out the prevalence of bacterial agents responsible for LRTI and to find out the associated risk factors. *Material and Methods:* Present cross sectional study was performed in the department of Microbiology, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. Total 200 samples including expectorated sputum and Endotracheal tube (ET) aspirates were collected from both OPD and IPD patients with clinically diagnosed Lower Respiratory Tract Infection. Expectorated sputum was collected into a sterile container with a screw cap that is tightly secured following proper instructions given to the patient. ET aspirates were transferred to a sterile screw cap container with the cap tightly secured before transport. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. *Results:* Among the 200 samples processed, sputum and ET aspirates were 190 and 10 respectively. Out of these 38.5% samples acquiesced noteworthy development and rest of 61.5% demonstrated either no growth or modest growth which was measured as no growth. Gender and age wise allocation showed maximum number, (35.25%) of culturally confirmed LRTI cases were in the 61 – 71 years of age group. Klebsiella pneumoniae (55%) was the predominant pathogen, followed by Pseudomonas aeruginosa (20%), Acinetobacter spp (10%), Citrobacter freundii (8%), Staphylococcus aureus (2%), Streptococcus pneumoniae (3%). *Conclusion:* LRTIs are frequently analyzed clinically, but etiological analysis could be completed by culturing different samples from patients which will assist clinician to set up precise treatment.

**Keywords:** Kutch; Lower Respiratory Tract Infections; Risk Factors; Sputum.

## Introduction

Lower respiratory tract infections (LRTIs) are leading cause of illness and death in children and adults across the world. Acute LRTI comprise pneumonia, and other infections disturbing the airways such as acute bronchitis and bronchiolitis, influenza and whooping cough [1]. LRTIs are accountable for 4.4% of all hospital admission and 6% of all general practitioner consultation [2]. multiplicity of organisms are frequently caught up in etiology of LRTI. Gram positive bacteria like Staphylococcus aureus, Streptococcus pneumoniae etc. and Gram negative bacteria like Klebsiella spp., Pseudomonas spp., Hemophillus influenzae, Acinetobacter spp., have been recovered from LRTIs [3].

Clinically LRTI is defined as an acute ill health usually for a period of 1-3 wks, presenting with symptoms of cough, expectoration, dyspnoea, wheeze & chest pain/discomfort [4]. Various predisposing factors which may lead to LRTI are smoking, alcohol, immunosuppressive conditions. Diabetes mellitus, COPD, Bronchial asthma etc. [5]. The present study was performed to know the prevalence of bacterial agents causing LRTI and to find out the associated risk factors.

Original Research Article

# A community based cross sectional study of prevalence and risk factors of low birth weight

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## Abstract

**Introduction:** Birth weight is an independent and an important factor that affects mortality, morbidity and growth and development during infancy and later life. India is accounting for 40% of the global Burdon of low birth weight babies. Multiple causative factors identified to be responsible for low birth weight. **Aims & objectives:** 1. To estimate the prevalence of low birth weight babies. 2. To study the association of maternal factors with birth weight. **Method:**The present community based cross sectional study conducted to among the urban population of Rajkot city and identify the determinants of low birth weight. Sampling population was selected by multistage sampling method. Investigator collected history of low birth weight and other determinants by verification of records and examination by house to house visit. **Result:**The prevalence of low birth was found 19.6. The factors like sex of the baby, birth order, birth spacing, maternal age, maternal education, regular antenatal check-up and mother's weight gain during pregnancy were found significant determinants of LBW. **Conclusion:**The prevalence of low birth was high in urban area require multipronged strategy. The primary health care can diminish the determinant of the low birth weight by adequate birth interval, two-child norms, regular antenatal check-up, supplementary nutrition to mother, female literacy etc.

**Keywords:** Low Birth Weight, Maternal factor, Prevalence, Malnutrition.



## Introduction

World Health Organization defines low birth weight (LBW) as the birth weight less than 2500 grams irrespective of gestational age[1]. World health organisation estimate that each year around 25 million babies born with low birth weight globally, among these 95% are from developing countries. Lack of adequate maternal and child health services in such countries augment the problem. Southern Asia is the region with the highest incidence of low birth weight followed by Africa, Latin America and eastern Asia[2,3].

Every 7th child born is low birth weight globally, and every third Asian newborn is low birth weight. India, the second most populous country of the world; accounts for more than 40% of the global burden of low birth weight babies[3,4] As per the NFHS data, the prevalence of low birth weight in India was 18.2% and in Gujarat, it was 19.0%[5].

Birth weight is the most important determinant of perinatal survival, infant morbidity, and infant mortality. It also determines the nutritional status and growth and development in later life[2,3]. Low birth weight is the single most important determinant of the survival chance of the child. Unfortunately, many of them not survive up to their first birthday. The lower the birth weight, the lower is the survival chance. More than 80% of neonatal deaths are among LBW newborns, of which two-thirds are preterm and one third are term small-for-gestational-age. Infant mortality is 20 times and child mortality is 5-30 times higher among the low birth weight babies compared to its normal counterparts[6,8]. LBW is also an important marker of adverse health and development problems in early and later life, including delays in cognitive and behavioural development, growth retardation, neurological problems in childhood, and many chronic diseases[8].

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Malnutrition in its three categories, stunting, wasting and underweight is higher among the low birth weight babies compared to normal weight babies. The cycle of malnutrition started during the foetal period lead to malnutrition in childhood, adolescence and adult phase if not intervened. The maternal malnutrition is the important contributory factor for low birth weight. So, the malnutrition cycle never ends. Popularly say that "Malnutrition is found to start in the womb and ends in the tomb"[9,10].

Low birth weight, episodes of diarrhoea and the presence of developmental delay are often associated with malnutrition in most developing nations including India[11].

The problem of LBW is multifaceted. It includes socio-demographic characteristics, nutritional status of the mother, antenatal care, multiple pregnancies, obstetric complications, chronic maternal conditions and exposure to environmental factors, such as indoor air pollution, and tobacco and drug use etc[4,6].

LBW also reflects inadequate nutrition and ill-health of the mother. There is a strong and significant positive correlation between maternal nutritional status and the length of pregnancy and birth weight. A high percentage of LBW, therefore, points to the nutrition deficient health status of pregnant women, inadequate prenatal care and the need for improved care of the newborn[7].

To achieve the reduction of the prevalence of low birth weight babies to 30% in time of 2025 require evidence-based multifactorial intervention and national commitment[4].

The present study was undertaken to find out the prevalence of low birth weight babies and its association with socio-cultural and maternal risk factors in this area so that it will help to improve health policies and programmes to address this important health problem.

## Material and Methods

The present community-based cross-sectional study was conducted among the infant population of the urban area of Rajkot city. The study has been conducted over a period of four months in the year 2018. A Child less than 1 year of age (Infant) was the sampling unit. All infants whose parent was willing to participate in the study were included and those who were suffering from a terminal illness,

# The Clinical Spectrum of Paediatric Mesial Temporal Sclerosis: A Case Series

**Pooja Patel[1*], Deepika Bhil[2], Mukund Vaja[3], Sunil Pathak[4], Prerna Dogra[5], Nishi Ranawat[6], Kanika Mangla[7]**

## Abstract

Introduction : Childhood seizures are very distressing for the child and the family members. > 50% seizures are of focal origin and Mesial temporal sclerosis(MTS) is a common cause. Seizures are of short duration, often preceded by aura, oro-alimentary and manual automatisms and have associated aphasia, dystonia and paralysis. Febrile seizures, trauma, hypoxia, autoimmune phenomena and intracranial infections have been suspected as initial precipitating incidents (IPI's).

Materials and methods: Patients with MTS on neuroimaging were enrolled in the study. Their demographic, clinical, electrophysiological, neuro-radiological and treatment aspects were recorded and analyzed.

Results: Eleven patients had MTS. Mean age was 7.8 years at diagnosis. Six patients had Focal seizures, four Focal seizures with secondary generalization, and one Absence seizures at presentation. Five patients had history of IPI's. EEG suggestive of temporal lobe epilepsy in five patients. Seizure control with monotherapy is observed in seven patients, with two AED in two patients, one patient had intractable seizures and one lost to follow up.

Conclusion: Most of patients responded to medical management and achieved seizure control on AEDs. An optimal drug regime and timely referral for surgery are imperative to improve long-term neurodevelopmental outcome.



**Key Words:** Focal Epilepsy, Mesial Temporal Sclerosis, Initial Precipitating Incidents(IPI's), Refractory Seizures

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## Introduction

Seizures in childhood are not only distressing for the child and the family members but are also deleterious for the developing brain. Various studies in India reported incidence of epilepsy as 0.2 - 0.6/1000, while prevalence ranges from 3.0-11.9/1000 population. (1). The prevalence of childhood epilepsy is 5 %, more than half being focal origin. (2,3). One of the most common focal epilepsy syndrome is a temporal lobe epilepsy syndrome known as mesial temporal sclerosis (MTS). MTS is a commonly encountered cause of refractory focal epilepsy and refers to the gliosis and loss of neurons of hippocampus, subiculum, para hippocampal gyrus and medial temporal cortex. It is characterized by its high rate of epileptogenicity. Primary pathology causing MTS is probably the selective loss of inhibitory mossy cells and the gain of excitatory granular cells in the hilus. (4).

MTS characteristically presents with focal seizures preceded by an epigastric aura wherein the patient perceives a burning pain in the abdomen. Oro-alimentary and manual automatisms are typically noted. Seizures usually last for two minutes and may be associated with aphasia, dystonia and paralysis. (5). Seizures begin in childhood, in the first decade of life, but definitive diagnosis is often delayed till the second decade or later. (4). Febrile seizures, trauma, hypoxia, autoimmune phenomena and intracranial infections have been found to be related as initial precipitating incidents (IPI's), but strong causal association has not been established. (4).

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# Tobacco Consumption Pattern of Selected Districts of Gujarat

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## ABSTRACT

**Background:** Globally, among the leading preventable causes of premature deaths tobacco stands on the top. The consumption patterns of tobacco in various forms of chewing and smoking vary across different regions and socioeconomic levels.

**Objectives:** To study tobacco consumption pattern in two districts of Gujarat and compare among them.

**Methodology:** A cross sectional study was carried out on 504 participants during January 2015 to September 2016 among 15-64 years age group. A pre designed and pre tested Questionnaire was used to collect data on tobacco consumption pattern. Descriptive and analytical statistical methods were used for the data analysis.

**Results:** Smoking was reported among 11.51% and 18.25% in Gandhinagar and Mehsana district respectively. Out of which around 90% of them in both district were smoking daily. 34.52% of the studied population in Mehsana district was using smokeless tobacco as compared to Gandhinagar district (26.19%). Initiation of smoking was in later age as compared to smokeless tobacco.

**Conclusion:** Present study concludes that large number of people including younger population was using smokeless tobacco in both districts. Early initiation of use of smokeless tobacco suggests an urgent need for action.

**Key words:** Tobacco consumption, smoking, smokeless tobacco, COTPA act, Addiction

## INTRODUCTION

World is changing very fast & it has radically changed the manner in which we live and the manner in which it has influenced our lifestyle, habits, health and fitness.

Since ancient time tobacco is used in different forms like smoking, chewing and snuffing. Tobacco leaves contain nicotine which is highly addictive alkaloid. During its combustion, it releases thousands of hydrocarbons into the body parts of the smoker. These substances have been linked to coronary and peripheral arterial diseases, emphysema, chronic bronchitis, peptic ulcer disease, and cancers of the lungs, oral cavity, and gastrointestinal tract. Tobacco is considered as the only industry that kills most of its loyal customers.

Globally, among the leading preventable causes of premature deaths tobacco stands on the top.[1] According to World Health Organization (WHO) Tobacco kills up to half of its users. Tobacco kills more than 8 million people each year. More than 7 million of those deaths are the result of direct tobacco use while around 1.2 million are the result of non-smokers being exposed to second-hand smoke. There are currently about 1 billion smokers in the world out of which 80% live in low- and middle-income countries. [2,3] Current smokers are estimated to consume about 6 trillion cigarettes annually.[4]

Original Research Article

# A Study on Awareness and Use of Personal Protective Equipment (PPE) Among Factory Workers Of GIDC Dared, Jamnagar city, Gujarat

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## Abstract

**Background:** The proper use of safety measures by workers is an important way of preventing and/or reducing a variety of health hazards that they are exposed to during work. There is a lack of knowledge about hazards and personal protective equipment (PPE) and the use of PPE among the workers in industries of Dared GIDC is limited. **Objectives:** We designed a study to assess workers' awareness of hazards and PPE, and the use of PPE among the workers of industries of Dared GIDC and to find a possible correlation between awareness and use of PPE among them. **Methodology:** A cross-sectional study was conducted from September 2018 to November 2018.Total 640 subjects were selected by simple random sampling after conducting a pilot study, who provided data via the completion of a structured questionnaire. **Results:** As there are more chances of accidents in industrial set up, injuries due to accidents can be prevented by proper use of PPE during work. But the results indicate that only 45.16% workers knew about health hazards related to their occupation. Only 43.75% workers knew that these hazards could be prevented by use of PPE. Out of all only 38.6% workers were actually using PPE. **Conclusion:** The workers using PPE were those who were aware of hazards and PPE. There is a gap between being aware of hazards and use of PPE at work.

**Keywords:** PPE, Factory workers, awareness



## Introduction

Hazard exists in every work place in different forms.[1] Workplace injuries are a leading cause of substantial disabilities globally.[2] There exist various kinds of physical, chemical, and biological hazards in the workplace. To protect workers from these hazards, it is not controversial that environmental management measures to remove or reduce these harmful factors and to improve the quality of workplaces through an engineering approach are fundamental solutions.[3] Safe practices depend on having an appropriate attitude toward the health risks associated with exposure to mechanical activities, which in turn depends on knowledge about the danger and harmful effects of mechanical activities. Surprisingly, in most developing countries, health and safety considerations at industrial facility are not a priority, and the use of safety measures is considered a burden.[4] Millions of workers are occupationally exposed to industrial hazards in the world, but little is known about their knowledge of and attitude towards those effects. There is a great concern that workers should be aware of the adverse effects of various hazards if not handled properly as they are exposed to the same with no control over the length and frequency of exposure.[5]

The use of appropriate and good quality personal protective equipment in workplaces cannot be over emphasized. One has to identify the roles of the employer of labour and those of the employee in reducing workplace hazards and consequently achieving a healthy workplace environment. Indeed protection of workers from workplace hazards is crucial to reduce mortality and morbidity in the workplace.[6] Besides other control measures it becomes important to assess compliance of the employer/employee with personal protective equipment (PPE). Personal Protective Equipment (PPE) or Personal Protective Devices (PPDs) are designed to protect employees from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards.[6]The type of Personal Protective Equipment include safety helmet, face mask, head cap, safety shoes, goggles, gloves, fire resistant coat, ear muffs and ear plugs, dust mask, safety belts, paper nose mask for protecting head, face, eyes, hands and arms, feet and whole body.[7] Without the proper use of PPE many workers are affected by disabling work related injuries. To avoid these types of accidents PPE should be reliable and smart.[1] It is mandatory for employers to protect their employees from work place hazards that can cause injury. Controlling a hazard at its workplace is the best way to protect the employees. First step in the effective use of PPE is hazard assessment. The employees have to identify physical and chemical hazards in work place. The lists of potential hazards are impact, penetration, compression, chemical, heat/cold, harmful dust, light (optical radiation) and biologic matters.[1]

**Several questions are therefore raised**

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Original Research Paper

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Pharmaceutical Science

# PREVENTION OF PHENYTOIN PRECIPITATION IN INFUSION FLUIDS

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**ABSTRACT** **Introduction:-** Phenytoin sodium only remains in solution when the pH is considerably alkaline (pH 10-12) but there are reports of loss of clarity when added in intravenous infusion fluids . Phenytoin precipitation is reported to occlude implanted central venous access devices and can cause irritation and tissue necrosis. Phenytoin precipitation can be prevented to avoid complications with the help of pH adjustment. **Objectives:-** To prevent phenytoin sodium precipitation in infusion fluids by pH adjustment with sodium hydroxide. **Materials And Methods :-** Physical stability of admixtures was tested in case of Phenytoin sodium in 100 ml 0.9 % w/v Normal Saline and after addition of different volumes of 5% and 10 % sodium hydroxide. Physical stability was determined with visual inspection and pH measurement. **Results:-** Clear fluid was found on addition of 10% sodium hydroxide. It increases approximately 3- 4 pH when added to infusion fluid. **Conclusion:-** 1 ml of 10% Sodium hydroxide can be used to prevent phenytoin sodium precipitation in infusion fluids.

**KEYWORDS :** Phenytoin, Precipitation, Infusion fluids, Normal Saline

## INTRODUCTION:-

Phenytoin sodium only remains in solution when the pH is considerably alkaline (pH 10-12) but there are reports of loss of clarity when added in intravenous infusion fluids (pH 4-7) [1].Parenteral Phenytoin Sodium is indicated in management of generalized tonic clonic seizures, complex partial seizures, for prevention of seizures after head trauma and in neurosurgery[2]. Phenytoin precipitation is reported to occlude implanted central venous access device when given in glucose 5% and can be cleared by local instillation of sodium bicarbonate 8.4% to increase pH of medium.[3]

It is important to prevent the precipitation of Phenytoin Sodium often administrated in infusion fluids to avoid untoward complications ranging from irritation to tissue necrosis[4] . One particular possibility could be pH adjustment of the infusion fluids.[5]

### Objectives:-

1. To check whether phenytoin sodium precipitates in 0.9%w/v Normal saline.
2. To prevent phenytoin precipitation by adding Sodium hydroxide in Infusion fluids.

## MATERIALS AND METHODS :-

### MATERIALS :

Phenytoin sodium ampoules(50mg/2 ml)[Zydus Neurosciences, India]; 0.9% w/v Normal Saline infusion fluids (100 ml)[Denis Chem Lab, India]; 5% and 10% NaOH solution prepared in laboratory; Acid buffer 4.0, Neutral buffer 7.0 and Distilled water.

### METHOD :

***Preparation of Admixtures:-***

***1.Admixture Of Phenytoin Sodium In Infusion Fluid:-***

Phenytoin Sodium was added in 100 ml Normal Saline in gradually escalating doses i.e 2,4,6,8,10,12 and 14 ml (maximum 350mg/100 ml ) at room temperature. Its physical stability was evaluated at regular time intervals.

***2.Addition of Sodium Hydroxide in Infusion Fluids:-***

5% and 10% of Sodium Hydroxide in volumes 0.5 ml and 1 ml were added to four different 100 ml Normal Saline infusion fluids . Then, six ampoules of Phenytoin sodium i.e 300mg/2ml was added and evaluated for physical stability.

***a)Admixture Physical Stability Evaluation:-***

*i.Visual Observation:-*

Visual inspection of solutions was done after admixture preparation at regular time intervals.

*ii.pH measurement:-*

pH of admixture was determined using pH meter[Device was calibrated with buffers before use].

## RESULTS:-

1. Admixture of Phenytoin and Normal Saline

Table 1 outlines the results of this admixture. On addition of lower doses, no changes are seen. As the dose range escalates, there is loss of clarity of Normal Saline and formation of white, insoluble, clump like precipitates [Fig.1].

**Table 1 : Effect Of Mixing Phenytoin In 0.9% Normal Saline**

| | Phenytoin Sodium Volume (in ml) | Time Interval(in mins) | | | | |
|---|---|---|---|---|---|---|
| Sr.No. | | 0 | 5 | 10 | 20 | 30 |
| 1 | 2 | NP | NP | NP | NP | NP |
| 2 | 4 | NP | NP | NP | NP | NP |
| 3 | 6 | NP | NP | NP | NP | NP |
| 4 | 8 | NP | NP | NP | P | P |
| 5 | 10 | NP | NP | P | P | P |
| 6 | 12 | P | P | P | P | P |
| 7 | 14 | P | P | P | P | P |

**Figure 1 :-** Presence Of Precipitation After Addition Of 7 Ampoules Of Phenytoin Sodium In 100 ml of NS. White Insoluble Clump Like Precipitates Are Seen.

2. Addition of Sodium Hydroxide with Normal Saline

I. Visual inspection:-

Table 2 discusses the effect of addition of NaOH to Normal Saline and Phenytoin Sodium. The clarity of infusion fluid on addition of NaOH can be well compared[Fig.2].

**Table 2: Effect Of NaOH On Phenytoin In 0.9% Normal Saline**

| Sr. No. | Strenght of NaOH | Volume of NaOH | Observation |
|---|---|---|---|
| 1 | 5% | 0.5 ml | Precipitation Present |
| 2 | 5% | 1 ml | Minute precipitates seen |
| 3 | 10% | 0.5 ml | No precipiates |
| 4 | 10% | 1 ml | No precipitates |

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Original Article

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# Retrospective Analysis of Patients with Bleeding Disorder Visited in Tertiary Care Hospital

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## Abstract

**Background:** Hemostasis is the procedure by which bleeding is stopped after injury to vasculature. There is an increasing incidence of patients with bleeding disorders among general population. Hence; the present retrospective was planned for assessing the patients with bleeding disorder Visited in Tertiary Care Hospital. **Subjects and Methods:** Data of a total of 53 consecutive patients who were referred to the Department of General Medicine, GMERS Medical College & Hospital, Himmatnagar, Gujarat, (India) with abnormalities in prothrombin times, partial thromboplastin times, or closure times were included in the present study. Complete demographic, clinical and past medical history of all the patients were obtained from their record files. Patients with incomplete record files were excluded from the present study. Out of these 53 patients, 49 patients underwent further specific diagnostic testing. **Results:** 18 patients had low von Willebrand factor levels, while 8 patients had platelet aggregation disorders. Hemophilia was found to be present in 12 patients. Factor VII deficiency was found to be present in 7 patients while factor XI deficiency was found to be present in 4 patents. **Conclusion:** The laboratory investigation starts with the performance of the "hemostasis screen". Therefore; adequate hematological investigations should be carried out in all suspected patients for reaching the final diagnosis.

**Keywords:** Bleeding, Disorder, Platelet.

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## Introduction

Hemostasis is the procedure by which bleeding is stopped after injury to vasculature. It is a delicate multiphase process that involves interactions between the blood vessels, platelets and coagulation factors. Patients with a bleeding diathesis remain a diagnostic challenge in medicine.[1,2] Many healthy individuals consider their bleeding and bruising excessive, whereas patients with mild to moderate abnormalities may not recognize subtle symptoms as abnormal. Distinguishing between these two groups of patients requires skill and experience and often cannot be done with certainty.[3,4] On the other hand; patients with profound coagulation disorders and obviously abnormal bleeding symptoms may not volunteer information unless specifically questioned. In the present scenario, there is an increasing incidence of patients with bleeding disorders among general population.[5-7] Hence; under the light of above mentioned data, the present retrospective was planned for assessing the patients with bleeding disorder visited in hospital.

## Subjects and Methods

Data of a total of 53 consecutive patients who were referred to the Department of General Medicine, GMERS Medical College & Hospital, Himmatnagar, Gujarat, (India) with abnormalities in prothrombin times, partial thromboplastin times, or closure times were included in the present study. Ethical approval was obtained from institutional ethical committee before the starting of the study. Complete demographic, clinical and past medical history of all the patients were obtained from their record files. Patients with incomplete record files were excluded from the present study. Out of these 53 patients, 49 patients underwent further specific diagnostic testing. Results of further test were also obtained from their record file. All the results were summarized in Microsoft excel sheet followed by analysis with SPSS software.

## Results

In the present study, initially 53 patients were included. Among these 53 patients, 49 patients underwent further specific diagnostic testing. So, final sample size for the present study was 49 patients. Among these 49 patients, 18 patients had low von Willebrand factor levels, while 8 patients had platelet aggregation disorders. Hemophilia was found to be present in 12 patients. Factor VII deficiency was found to be present in 7 patients while factor XI

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# Evaluation of Prevalence of Patients with Chest Pain Visited in a Tertiary Care Hospital of Gujarat

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## Abstract

**Background:** Chest pain is a commonly occurring symptom affecting between 20 and 40% of the general population during their lifetime. Hence; the present study was planned for assessing the prevalence of patients with chest pain visited in hospital. **Subjects and Methods:** A total of 718 patients were analyzed Clinical and past medical history of all the patients was obtained. Categorization of the etiologies of all the patients with chest pain was done into following categories: Cardiovascular cause, Respiratory cause, Psychiatric cause, gastrointestinal cause, and Unknown. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. **Results:** Prevalence of chest pain in the present study was 29.67 percent. Cardiovascular cause was the main reason (27.70 percent patients) for the admission of patients with chest main. Respiratory cause was the next major cause responsible for chest pain in 25.82 percent of the patients. **Conclusion:** Cardiovascular, respiratory and psychiatric causes are the reasons for admission of patients due to chest pain.

**Keywords:** Chest Pain, Prevalence.

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## Introduction

Chest pain is a commonly occurring symptom affecting between 20 and 40% of the general population during their lifetime. Approximately 1.5% of the general population consults a primary care physician each year because of chest pain symptoms. In the UK, a presenting complaint of chest pain makes up 1% of all primary care consultations.[1-3] Furthermore, more than 5% of visits to emergency departments, and up to 40% of emergency admissions, are due to chest pain. Chest pain management is one of the biggest challenges in the emergency department (ED). This symptom accounts for 5 to 20 % of all ED admissions, being the second most common reason to present to the ED in the United States of America.[4-6] Causes of chest pain vary from musculoskeletal chest pain to potentially life-threatening emergencies. Therefore, accurate and fast risk stratification is paramount in the acute management of these patients, mainly to identify those patients with immediate risk of complications, as those with an acute coronary syndrome.[7]

Hence; under the light of above mentioned data, the present study was planned for assessing the prevalence of patients with chest pain visited in hospital.

## Subjects and Methods

The present present study was planned for assessing the prevalence of patients with chest pain visited in Department of General Medicine, Dr. N.D. Desai Faculty of Medical Science and Research, Nadiad, Gujarat, India. A total of 718 patients were analyzed.

**Inclusion criteria for the present study included:**

- Patients within the age group of 20 to 60 years,
- Patients who gave the informed consent,
- Patients with negative history of any known drug allergy

Clinical and past medical history of all the patients was obtained. Categorization of the etiologies of all the patients with chest pain was done into following categories:

- Cardiovascular cause,
- Respiratory cause,
- Psychiatric cause,
- Gastrointestinal cause, and
- Unknown

All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test was used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

## Results

In the present study, a total of 718 patients were analyzed. Chest pain was present among 213 patients. Prevalence of

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RESEARCH ARTICLE

# Correlative study of prostatic-specific antigen, digital rectal examination, prostatic volume, and prostatic biopsy in patients of enlarged prostate for accurate diagnosis and management outcome

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## ABSTRACT

**Background:** Prostate is an exocrine gland in male which is derived from Greek word *prostates* which means "one who stands before" or "protector" or a "guardian." Its anatomical, chemical, and physiological functions digger among species. Differentiation of benign and malignant condition on sole clinical basis is difficult. Furthermore, there are various conditions in which serum prostate-specific antigen (PSA) is raised such as UTI and prostatitis. Our intent to conduct this study was to correlate clinical examination, Sr. PSA, and ultrasound to find prostatic volume to arrive at accurate diagnosis. **Aims and Objectives:** Our aim was to improve the accuracy of diagnosing prostatic disease and to effectively predict the nature of the disease; mainly benign or malignant (which is not accurate with a single investigation). **Materials and Methods:** The present study was conducted at C.U. Shah Medical College, Surendranagar, between December 2011 and September 2013. It was prospective observational study for which ethical clearance was obtained from the Institutional Ethics Committee. One hundred patients presenting to the outpatient department were enrolled in this study. Patients detailed presenting history with origin duration and progress, history, and personal history digital rectal examination (DRE) were recorded in pro forma. Serum PSA of all the patients was sent. After which, transurethral ultrasound (TRUS) was performed and a biopsy was taken and sent for histopathology. Comparison of all modalities was done and conclusion was made on basis of final diagnosis. **Results:** A total of 100 number of cases of enlarged prostate were studied who were admitted in the surgery department of our hospital. In our series, maximum patients with symptoms with enlarged prostate were in the age group of 40–60 years (54%). In our study, out of 100 patients, 52 (52%) were having obstructive symptoms, 28 (28%) were having irritative symptoms, and 20 (20%) patients were having both obstructive and irritative symptoms. On the basis of DRE, 76 (76%) cases were diagnosed as benign prostatic hyperplasia (BPH), 15 (15%) as Ca prostate, and 9 (9%) as prostatitis. On combination of DRE and PSA, 73% of cases had BPH, 21% Ca prostate, and 6% as prostatitis. With the help of DRE PSA and TRUS, 71% of patients were diagnosed as having BPH, 15% Ca prostate, and 14% as prostatitis. Final diagnosis was made on combination of all four modalities, that is, DRE PSA TRUS and TRUS-guided prostatic biopsy. About 66% of cases had BPH,13% had CA prostate, and 21% had prostatitis. **Conclusion:** The diagnosis of CA prostate was more accurate on the basis of all four modalities rather than considering only DRE and PSA which were sensitive but less specific.

**KEY WORDS:** Serum Prostatic-Specific Antigen; Prostate; Digital Rectal Examination; Transurethral Ultrasound; Biopsy

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Original Article

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# Morphological Variations of Distal End of Femur: A Cross-sectional Study

Anatomy Section

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## ABSTRACT

**Introduction:** Apart from intercondylar notch and trochlear groove, the intercondylar line also contributes to knee joint instability. Knowledge of morphological variations of these anatomical landmarks can help in diagnosis as well as planning the treatment. As of now, very limited data is available on morphological variations of trochlear groove and intercondylar line.

**Aim:** To find out normal morphological patterns of shapes of intercondylar notch, depth of trochlear groove and intercondylar line and finding out the prevalence of different patterns.

**Materials and Methods:** In this cross-sectional study, 68 dried human femurs were examined grossly for five months by naked eye from the collection of Anatomy department, Dr. ND Desai faculty of medical science and research for the shape of intercondylar notch, depth of trochlear groove and intercondylar line. All morphological patterns were tabulated and prevalence of each was calculated using excel worksheet.

**Results:** Morphological patterns noted in shapes of intercondylar notch were A shaped (35.29%), Inverted V shaped (5.88%), M shaped (2.94%) and inverted U shaped (55.88%) with highest prevalence of inverted U shape. Three forms of trochlear groove noted were as follows: shallow (29.41%), intermediate (58.82%) and deep (11.76%) with highest prevalence being intermediate type. Intercondylar line was found in straight (36.76%), oblique (50%) and convex (13.23%) forms with highest prevalence of oblique form.

**Conclusion:** The results of the study show that there are considerable variations in the morphology of distal end of femur. Knowledge of these morphological variations may help in making knee prosthesis, diagnosis of osteoarthritis and cruciate ligament surgeries.

**Keywords:** Intercondylar line, Intercondylar notch, Trochlear groove

## INTRODUCTION

The distal end of femur is widely expanded to form two large condyles. Posteriorly they are separated by a deep gap called intercondylar fossa/intercondylar notch [1]. Shape of intercondylar notch assumes great importance as edge of the medial condyle tends to be straight in osteoarthritis patients [2]. Intercondylar fossa is limited from behind by an intercondylar line. On the floor of the fossa near the intercondylar line, there is a flat posterosuperior impression for the proximal attachment of the anterior cruciate ligament. The trochlear groove is transversely concave, vertically convex and bears a groove for the posterior surface of patella. It extends anteriorly on both condyles, more on the lateral. The trochlear groove helps to stabilise the patella. An abnormally shallow groove predisposes to instability [3]. Knee joint includes both tibio-femoral and femoro-patellar articulations. Any deviation in normal morphology of lower end of femur may increase the chances of ligament injury and knee joint instability.

Majority of researches on lower end of femur are largely focused on knee joint instability based on intercondylar notch shapes, morphology and anterior cruciate ligament tear but trochlear groove and intercondylar line are rarely studied [4,5]. As the intercondylar line serves as attachment landmark for anterior cruciate ligament and trochlear groove lodges the patella in femoropatellar articulation, variations in their anatomy may disturb the knee joint mechanics [6,7]. Nowadays majority of the studies are done based on imaging [8,9] but that may not be suitable for surface studies due to poor resolution. So we conducted this study on dry human femur to estimate the prevalence of different morphological variations of intercondylar notch, trochlear groove and intercondylar line. To the best of our knowledge, this is the first attempt to establish morphological patterns of lower end of femur in Gujarat.

## MATERIALS AND METHODS

In this cross-sectional study, 68 dry human femurs from Department of Anatomy, Dr. ND Desai Faculty of Medical Science and Research Nadiad, Gujrat, India were examined from December 2020 to April 2021 by naked eye for the following parameters:

1. Shape of intercondylar notch
2. Depth of trochlear groove
3. Intercondylar line

**Inclusion criteria:** Only intact femur without any damage and femur with complete skeletal growth were included.

**Exclusion criteria:** Damaged and distorted femur and femur with incomplete skeletal growth was excluded.

### Study Procedure

Posterior surfaces of femoral condyles were placed on the flat surface to examine the shape of intercondylar notch. Patellar groove and intercondylar lines were examined by placing the inferior surface of femoral condyles on the flat surface [Table/Fig-1-3].

Patellar groove was considered shallow when deepest point of the groove located towards distal end of lateral margins of patellar articular surface, intermediate when deepest point of groove located at the level between distal and mid points of lateral margins of patellar articular surface and deep when deepest point of groove located at the level of midpoint of lateral margins of patellar articular surface or higher [Table/Fig-2]. Intercondylar line was considered straight when extends uniformly from one condyle to other without a bend, oblique when form a slope and convex when curved upwards [Table/Fig-3].

## STATISTICAL ANALYSIS

All morphological patterns were tabulated and prevalence of each was calculated using excel worksheet.

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REVIEW ARTICLE

# Age, marital status and sexual offences: A "Law Triangle" for women in India

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**Abstract**
The Indian legislature discriminates women based on age and marital status when quantum of punishment for sexual offences is in question. These two major factors frequently affect the criminalization of an accused by providing windows to escape in cases of sexual offences pertaining to marital relationship. The current ambiguities between the acts and Indian Penal Code in relation to age of consent, marital rape needs to be addressed at earliest. The paper outlines the revolutionary picture of changes in "Age of consent" and describes how multiple marriage acts contradict the content of S.375 IPC. It further argues on the role of the POCSO act with few conflicting verdicts in similar type of cases under the same. The paper reviews the legal aspects of marital rape and discusses how marital rape is still a "permitted offence" even after the recommendations of its deletion by the Justice Verma committee as well as United Nations. It also highlights the parliamentary debates on existence of marital rape. Recent changes in relation to S.375 and S.377 IPC in the context of marital rape are also discussed. It is high time India reconsider these laws that are still popular for their orthodox nature and contradictory content.

**Keywords**
Age of a girl; Marital Rape; Sexual offences; Domestic Violence; Indian Laws

## Introduction

The Indian Legislature discriminates women based on age and marital status when the quantum of punishment for sexual offences is in question. These two major factors frequently affect the criminalization of an accused by providing windows to escape in cases of sexual offences in marital relationship. The roots of these affecting factors can be traced to the era of inception of Indian Penal code. This review basically focuses on divergent laws in India with special reference to S.375 of Indian Penal code (further will be cited as "IPC"), S.377 IPC, The Criminal Law (Amendment) Act 2013, The Hindu Marriage Act 1955, The Special Marriage Act 1954, The Child Marriage Restraint Act 1929, The Prohibition Of Child Marriage Act 2006, The Protection Of Children From Sexual Offences Act 2012 and The Protection Of Women From Domestic Violence Act 2005.

## 'Age of consent' and related amendments

Age of consent for sexual intercourse under "S.375 (5th clause) I.P.C." and age mentioned in the "Exception to S.375, I.P.C" was 10 years in the initial version of Indian Penal Code. In 1891, Indian penal code was amended to revise the age of consent from 10 years to 12 years and likewise the code defined "rape" as sexual intercourse with a married or unmarried girl (even with her consent) under 12 years of age.[1] The Age of consent act was applicable not only on unmarried girls but also on married girls ignoring the discrimination on the grounds of marriage. The law did not interfere directly with institution of child marriage in India, but only with premature consummation of it.[2] Since then, there remains a great controversy with respect to age of consent for sexual intercourse. Later on the age limit for "consensual sex" and "under the exception to sec.375 IPC" was changed to 14 years and 13 years respectively in 1925, 16 years and 15 years in 1940, and remained as such under the second last version of section 375 IPC in its 6th clause.[3] The same clause was later amended again and under the "criminal law amendment act, 2013" the age altered for two more years to turn out to be 18 years.[4] These incremental changes in the clauses of IPC S.375 reflect a logic that certain age for a girl should be regarded as immature to give consent for sexual intercourse.

### Marriage related acts and S.375 IPC – Connect and disconnect

Multiple acts are enforced to condemn and criminalize child marriages in India. Basically, all acts define certain boundaries in terms of age of bridegroom and bride as well as prescribe conditions for solemnization of marriages and cover other legal aspects of marriage. "The Hindu Marriage Act, 1955" and "The Special Marriage Act, 1954" prescribe the age 21 years for male and 18 years for female to get married.[5,6] Moreover, "The Child Marriage Restraint Act, 1929" which is an act to restrain the solemnisation of child marriages defines child is a person who,

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ORIGINAL ARTICLE

# A population based cross sectional study of perception towards snakes and management of snakebites

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**Abstract**

Considering few of the oldest myths and primitive medical writings, snakebite must have been one of its first kinds of poisoning known to mankind. India is known for its mythological concepts and traditional methods of treatment in regards to snakes and snakebites. Aim of this study was to evaluate awareness of the urban and rural population towards snakes and snakebite management. The present study was a cross sectional study conducted on urban and rural population in Gujarat state. Total 240 adult participants, 120 from urban areas and 120 from rural areas, were included in the study. Data was collected by personal interview of an individual with predefined data collection sheet which was comprised of three parts i.e. demographic information of participants, identification of snakes in terms of venomicity and pre-defined questionnaire. Prevalence of belief in regards to mythological significance of snakes is higher in rural in comparison to urban population. As far as identification of nature of snakes is concerned study found below average knowledge with marginally higher in rural areas. Both the population considers medical measures as an ultimate management for snakebites. However, perception in relation to first aid measures, identifying nature of snakes, do's and don'ts with a snake as well as with a case of snake bite need a serious attention especially towards usage of traditional methods.

**Keywords**

Snake; Snakebite; Population; Perception; Traditional Methods.

## Introduction

As far as mythology is concerned; India remains the country where the snakes are worshiped as God in one or the other way. In terms of zoology, India possesses around 250 types of snake species out of which 52 species are known to be venomous. Considering all the facts and different aspects, this reptile stands as one of the venerable species of animal on earth.

Snakebite must have been one of the first kinds of poisoning known to mankind for it appears in some of the oldest myths and earliest medical writings.[1] A study estimated that globally, at least 421,000 envenomings and 20,000 deaths occur each year due to snakebite. The figures may be as high as 1,841,000 envenomings and 94,000 deaths. The highest burden exists in South Asia, Southeast Asia, and sub-Saharan Africa.[2] The actual global incidence of envenomations and severity of them remain mostly misunderstood, except for a few countries where these accidents are rare or reported correctly.[3] Envenoming is a disease of the poor and the negative association between deaths due to snakebite and government expenses on health corroborates that the burden of mortality is highest in those countries least able to deal with the substantial financial cost of snakebite.[4]

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The majority of snakebites and consequent mortality is recognized to only 5 species in India, which includes King Cobra (Ophiophagus hannah), Common Cobra (Naja naja), Russel's Viper (Vipera rusellii), Common Krait (Bungarus caeruleus), and Saw Scaled Viper (Echis carinata) and in Gujarat-Saurashtra region there are four species of venomous snakes found excluding king Cobra.[5]

Traditional methods of treatment for snakebites remain an area of choice for the researchers especially in India. Traditional methods include making local incisions or punctures at the bite site, sucking the venom out of the wound, electric shock, tying tight tourniquets around the limb, application of chemicals, herbs etc. Delay or denial in the administration of antivenom due to this contributes a good portion in total mortality statistics from snakebites. According to WHO guidelines for snake bite management, most of the traditional, popular, available and affordable first-aid methods have proved to be useless or even frankly dangerous.[6]

Aim of this study was to evaluate awareness of the urban and rural population towards snakes and snakebite management. Objectives of the study were based on assessing knowledge, attitude and perception towards snakes, medical management of snakebites as well as traditional methods of snakebite treatment.

## Material and Methods

The present study was a cross sectional study conducted on urban and rural population in Gujarat state. The study had been approved by local ethical committee. Total 240 participants were included in the study out of which 120 participants

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ORIGINAL ARTICLE

# Trend of researches in Forensic Medicine and Toxicology: An Indian scenario

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**Abstract**

Research in medical field is a momentous pillar on which the entire health system lies on. If one compares the researches in forensic medicine and toxicology with other clinical specialties, the difference lies with the need and nature of researches. Aim of this study was to analyse the trend of researches in the field of forensic medicine and toxicology in India. Objectives of the study were to quantify the researches in terms of specialty areas as well as to explore the scope for further studies. Materials for the present study comprised of 1192 research articles published in the Indian journals from 2013 to 2017. Each article was analysed through its title and abstract available online. Each article was classified according to the area and topics covered. Identification of an individual was the most researched area of forensic medicine in India. The least researched area was the teaching learning aspects of the subject itself. As far as most repetitive researched studies are concerned, trends of poisoning followed by pattern of injuries due to road traffic accidents have their places at the top. More emphasis should be given to researches based on current medico legal issues of the community instead of giving attention to what is already there in literature. Repetition of researches should be aimed at creating novelty on particular aspect. Meta-analysis should be incorporated to coalesce the findings of researches and to develop methodological standards that can be suitably applied to local populations

**Keywords**

Research trend; Forensic Medicine; Toxicology; India

## Introduction

According to Cambridge dictionary, research is a detailed study of a subject, especially in order to discover new information or reach a new understanding.[1] Research remains the most integral part of mankind irrespective of the field it involve. Research in medical field is a momentous pillar on which the entire health system lies on. It is not hyperbole if it is said that every other day something new emerges out of the efforts made by medical fraternity. However, India, though possesses a large number of medical institutes and biodiversity of the population, is short of quality research publications.[2] It was observed that the problems with researches depends on working conditions of researchers, budgetary restraints and the conception of research it self.[3]

The subject, forensic medicine and toxicology, deals with the application of knowledge of medicine to aid in the administration of justice. Research in this field serves the legal system directly or indirectly. If one compares the researches in this subject with that of the researches in other clinical specialty, the difference is lying with the need and nature of the research itself. Etio-pathologic research in this field has limited value and instead it comprised of research regarding ante or post mortem findings, the methods of deriving scientific opinion, the reconstruction of event in question as well as researches that deals with the current medico legal issues. It was observed that the research output of forensic medicine has sometimes been regarded as insufficient and as of poor quality and it may not be because of lack of scientific competence but is a result of the questions asked, the available methods and specific aims.[4]

Aim of the present study was to analyse the trend of researches in the field of forensic medicine and toxicology in India. Objectives of the study were to quantify the researches in terms of areas covered as well as to assess the scope for further studies.

## Material and Methods

The present study is Internet based 5-years retrospective study. Materials for the present study were comprised of the research articles published in the Indian journals within the time frame of 2013 to 2017.

Inclusion criteria for the articles: (1) Articles published in the Indian Journals that are indexed in Scopus and/or PubMed (Medline) (2) Coverage years for the journal within the indexing agencies must include the study period (2013 to 2017). (3) Scope for the journal should prioritize to publish researches in relation to forensic medicine and toxicology. (4) Journals listed in the UGC (University Grant commission, India) approved list of journals.

Exclusion criteria for the articles: (1) Articles published in the journals that did not fulfil the aforementioned criteria. (2) All review articles, case reports, case series, editorials, letter to editors etc. The Journals included in this study are Journal of Indian Academy of Forensic Medicine, Journal of South India Medicolegal Association, Journal of Punjab Academy of Forensic Medicine & Toxicology, Indian Journal of Forensic Medicine & Toxicology, Medico legal update and Anil Aggrawal's Internet Journal of Forensic Medicine and

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Original Research Article

# Prevalence of extended spectrum B lactamase producing *E.coli* and *Klebsiella SPP* isolated in a tertiary care hospital, Gujarat

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## Abstract

**Background:** Antibiotic resistance among gram negative bacilli is a rapidly expanding problem due to the organism's ability to mutate and to acquire the transmit plasmid and other genetic elements encoding resistance genes. **Objective:** This study was conducted to know the prevalence of ESBLs in *E. coli* and *Klebsiella spp*. isolates obtained from clinical samples. **Material and Methods:** A detailed history was taken and Performa was filled for each patient documenting age, sex, history of illness was obtained. Study was conducted at microbiology Department, Gujarat Adani Institute of Medial Sciences, Bhuj from May 2014 to Dec 2015. Total 2500 clinical samples like Urine, Sputum, Blood, Pus, CSF, Pleural fluid were collected in sterile containers. Samples from which *E.coli* and *Klebsiella spp* were isolated were considered for this study. Detection of ESBL was done as per CLSI guidelines. **Results:** Total 2500 clinical samples were tested for culture and sensitivity during August 2015 to July 2017. Out of this 500 samples showed growth of E. coli and Klebsiella spp. Among 500 isolates coli had 268 and from them 189 were ESBL positive. Similarly 232 were isolates from Klebsiella spp and among them 185 were positives for ESBL. **Conclusion:** In the present study, ESBL prevalence was 49.99% (*E. coli* = 50.53% and *K. pneumoniae* = 49.46%). A moderately high prevalence of ESBL producing *E. coli* and *K. pneumoniae* was observed and confirmed in the urine, sputum, pus, CSF and Blood. A strict hospital infection control policy and a prudent anti-microbials use regimens are to be adopted by the physicians.

**Key words**: Bhuj, *E.coli*, extended spectrum B lactamase, Gram negative bacilli

## Introduction

Antibiotic resistance is one the biggest threat that the world is facing currently. Antibiotic resistance among gram negative bacilli is a rapidly expanding problem due to the organism's ability to mutate and to acquire the transmit plasmid and other genetic elements encoding resistance genes [1]. The first report of plasmid encoded B lactamases capable of hydrolysing the Extended spectrum cephalosporins was published in 1983 [2].

B lactam antibiotics are one of the most commonly used antimicrobials against bacterial infection. In recent years emergence of resistance of these antimicrobials agents due to production of B lactamases has become serious global health concern. It leads to antibiotic ineffective, increase severity of illness and cost of treatment [3]. These enzymes are numerous and they mutate continuously in response to overuse or misuse of B lactam antibiotics and have lead to the development of extended spectrum B lactamases (ESBL). Risk factors for infection with ESBL producing organism are prolong antibiotic usage, ICU stay, Recent invasive procedures, Pressure sores, anaemia, permanent urinary catheter [4]. This study was conducted to know the prevalence of ESBLs in *E. coli* and *Klebsiella spp.* isolates obtained from clinical samples.

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## Material and Method

**Study setting, duration and type of study-** Study was conducted at microbiology Department, Gujarat Adani Institute of Medial Sciences, Bhuj from May 2014 to Dec 2015.

**Sampling method and sample size calculation-** Total 2500 clinical samples like Urine, Sputum, Blood, Pus, CSF, Pleural fluid were collected in sterile containers.