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Premolarisation of Mandibular Molar - “Two are better than One”: - A Case Report

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Abstract

Bicuspidisation or Premolarisation is a surgical technique of sectioning the mandibular molar roots with their respective crown portions followed by rehabilitation with fixed prosthesis in the individual segments. This not only eliminates the furcation involvement but also facilitates effective oral hygiene maintenance. The present case report demonstrates the successful management of left mandibular first molar with furcation involved by endodontic treatment and bicuspidisation followed with subsequent prosthodontic rehabilitation. It gives a better alternative to salvage a periodontally compromised tooth rather than opting for extraction.

Keywords: Bicuspidisation; furcation defects; hemisection; mandibular molar.

INTRODUCTION

The treatment and long-term retention of mandibular molar teeth involving furcation has always been challenging to clinician. The treatment may involve combining Restorative dentistry, Endodontic and Periodontics, so that the teeth are retained in whole or in part. [1]

The furcation is an area of anatomic morphology that may be difficult or impossible to debride by routine instrumentation. [2,3] Routine home care methods might not keep the furcation area free of plaque. [4]

The progress of inflammatory periodontal disease, if untreated, results in attachment loss sufficient enough to affect the furcation of the multi-rooted teeth. Thus, tooth resection procedures are used to preserve as much tooth structure rather than sacrificing the whole tooth. [5]

The term root resection signifies the excision and removal of any segment of the tooth or a root with or without its accompanying crown portion. Various resection procedures described are: root amputation, hemi-section, and bisection/bicuspidation.[6]

Bicuspidization is a surgical procedure carried out on the mandibular molars. It can be defined as the process of splitting of a two rooted tooth into two separate portions. The procedure is most likely to be performed on mandibular molars with buccal and lingual class II and class III furcation involvements and converting them into two premolars. Diagnosing furcation defects is of paramount importance to execute an effective treatment strategy. In Grade III furcation, the Nabers probe passes through and through the furcation from the buccal to the lingual side, but the furcation is not clinically visible. Endodontic therapy is performed initially, and during the open flap debridement procedure, the bicuspidation is done. The tooth is restored with a post endodontic restoration, keeping in mind that the restoration allows for optimal plaque control in the space between the separated roots.[7]

Weine [8] listed the following indications for tooth resection.

Periodontal indications

- Severe vertical bone loss involving only one root of multi-rooted teeth.
- Through and through furcation destruction.

- Unfavorable proximity of roots of adjacent teeth, preventing adequate hygiene maintenance in proximal areas.
- Severe root exposure due to dehiscence.

Endodontic and Restorative indications

- Prosthetic failure of abutments within a splint: If a single or multirooted tooth is periodontally involved within a fixed bridge, instead of removing the entire bridge, remaining abutment support is sufficient, the root of the involved tooth is extracted.
- Endodontic failure: Hemi section is useful in cases in which there is perforation through the floor of the pulp chamber, or pulp canal of one of the roots of an endodontically involved tooth which cannot be instrumented.
- Vertical fracture of one root: The prognosis of vertical fracture is hopeless. If vertical fracture traverses one root while the other roots are unaffected, the offending root may be amputated.
- Severe destructive process: this may occur as a result of furcation or sub-gingival caries, traumatic injury, and large root perforation during endodontic therapy.

Contraindications

1. Strong adjacent teeth available for bridge abutments as alternatives to hemi section.
2. Inoperable canals in root to be retained.
3. Root fusion-making separation impossible.

CASE REPORT

A 42 year old woman reported to the Dental outdoor with intermittent pain on the lower left side of the mouth. On examination, the tooth was sensitive to percussion. A probing depth of 7mm was found. On radiographic examination, bone loss was present in the furcation on mesial and distal surface of the tooth. An apical lesion was visible on the mesial root. (Figure 1a,b)

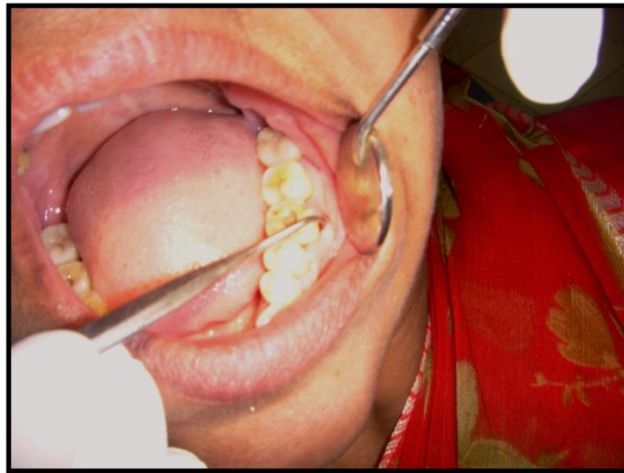


Figure.1a Preoperative intraoral image

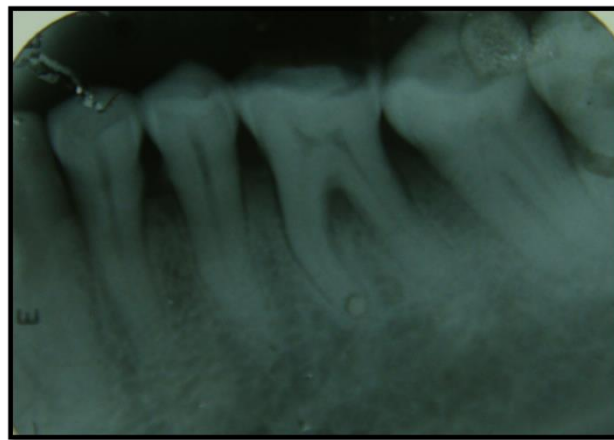


Figure 1b. Radiograph showing radiolucency in the furcation area

The patient was repeatedly requesting for tooth extraction. After properly explaining about the importance of retaining tooth and treatment options like tunneling, bicuspidisation with open flap debridement, patient was convinced for the bicuspidisation followed with prosthodontic rehabilitation. In order to save the tooth, root canal was done using the step back technique and canals were obturated with lateral condensation method. (Figure 2)



Figure.2 Endodontic treatment done

Under local anesthesia a full thickness flap was reflected with crevicular incision extending from distal surface of the left mandibular 2nd premolar to the of the left mandibular 2nd molar (figure. 3)

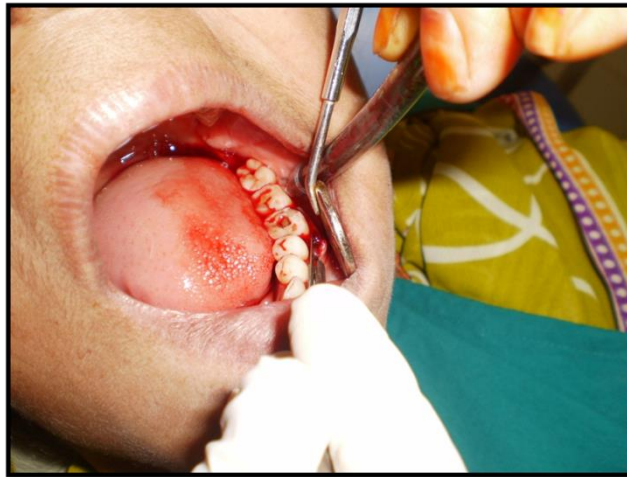


Figure.3 Crevicular incision given with full thickness flap reflection

A long shank tapered fissure carbide bur was used to make vertical cut to separate the crown. All faces of the mesial and distal roots were smoothed with an air-rotor. The flap was repositioned and sutured with 3/0 silk sutures.(Figure4. a,b)



Figure 4a.Intraoperative picture showing thebisected halves



Figure 4b. Flap repositioned and sutures given.

One week after surgery the sutures were removed and patient was sent to the Department of Prosthodontics for crown preparation on the newly made premolars. On examining after six months, there was uneventful healing with good maintenance.

DISCUSSION

The management of deep pocket in posterior teeth with furcation involvement, most often poses a challenge. Nonsurgical management alone is less likely to eliminate the plaque and plaque retentive factors completely due to inadequate accessibility and the anatomically complex furcation area.[9] Various surgical procedures proposed for the treatment of furcation involved tooth are tunnelling, hemisection, bicuspidisation, root resection, etc. The appropriate selection of treatment procedure largely depends on amount of bone loss, angulation and position of tooth in the arch, length, divergence and curvature of roots and feasibility of endodontic management, and patients oral hygiene maintenance .

Bicuspidiatzion or root separation is the splitting of a two rooted tooth into two separate portions. The process is mostly performed on mandibular molars with buccal and lingual Class II and Class III furcation involvements. After sectioning of the teeth, both the roots were retained. In the present case report, this decision was based on the extent and pattern of bone loss, root trunk and root length, ability to eliminate the osseous defect and endodontic and restorative considerations.

In this case, radiographic and clinical parameters were satisfactory; hence, bicuspidisation technique seemed to be the most suitable option. The mandibular molar was vertically sectioned through the furcation, retaining both halves which were then treated as bicuspids. This separation tends to successfully reduce / eliminate plaque retentive (i.e.furcation) area, facilitate effective oral hygiene maintenance and prevent further attachment loss. During the treatment, occlusal contacts were repositioned in a more favorable position. Lateral forces were reduced by decreasing the cuspal inclines and eliminating the non-working contacts.

Similar studies by Dalvi et al.showed a successful result after bicuspidisation followed with bone graft and platelet rich fibrin membrane and subsequent prosthetic treatment. [10]Farshchian and Kaiser have reported the success of a molar bisection with subsequent bicuspidisation.

Its success depends on: i) Stability/adequate bone support of individual tooth sections; ii) Absence of severe root flutings; iii) Adequate separation of the roots, to create an acceptable embrasure for effective oral hygiene.[11]

The advantage of root resection is retention of some or the entire tooth.[12] It may be performed on endodontically treated teeth or vital teeth.[13] However, the failure of endodontic therapy can eventually cause failure of the procedure. Hence, to avoid subsequent unfavourable event, it is advisable to have endodontic therapy completed before resection. In our present case too endodontic treatment was performed prior to the bicuspidization.

Buhler observed 32% failure rate in root resection cases and the main etiology being endodontic pathology, root fracture and not the periodontal complications.[14] In this case, six months follow up showed a good prognosis with healthy periodontal status and absence of mobility. Hence, with appropriate case selection, root canal treatment followed by bicuspidisation can be a good, absolute and biological cost saving option with good chances of success.

CONCLUSION

With recent advancements in dentistry, bicuspidisation has received good acceptance as a conservative and reliable dental treatment. Hence, it may be an apt alternative to extraction and should be well discussed with the patients during consideration of treatment option.

BIBLIOGRAPHY

1. Mehmet Dalki, AltugClingir,, BedriBeydemir. Bicuspidiation : A case Report. Gulhane Tip Dergisi 2008; 50:42-45
2. BowerRC:Furcation morphology relative to periodontal treatment . Furcaztion root surface anaztomy.JPeriodontol 1979; 50:366
3. Mealy BL, BeybayerMF ,ButzinCA,et al: Use of furcal bone sounding to improve accuracy of furcation diagnosis.JPeriodontol 1994;65:649
4. Kalkwarf K, Kaldahl W, Patil K, et al: Evaluation of furcation region response to periodontal therapy .JPeriodontol 1988;59:794

5. Basaraba N. Root Amputation and tooth hemisection. *Dent Clin of N Amer* 1969;13 : 121
6. Parmar G, Vashi P. Hemisection : A Case report and review. *Endodontology* 2003;15:26-29
7. Muhamad Abu –Hussein, Nezar Watted, Aaldeen Abdulgani : Bicuspidation of Mandibular Molar; A Clinical Review ; Case Report . *IOSR Journal Dental and Medical Sciences* :2015 :Vol 14 , Issue 6 Ver 1 :77-85
8. Weine FS. *Endodontic Therapy*, 5th Edition
9. Flores MT, Andersson L, Andreasen JO, Bakland LK, Malmgren B, Barnett F, et al. Guidelines for the management of traumatic dental injuries. I. Fractures and luxations of permanent teeth. *Dent Traumatol.* 2007 Apr;23(2):66-71.
10. Dalvi A, Sachdeva S, Saluja H, Haridas A. Art of salvaging: Bicuspidation and bone grafting with platelet rich fibrin in mandibular left first molar – A case report. *Matthews J Case Rep.* 2017;2(2):032-6.
11. Farshchian F, Kaiser DA. Restoration of the split molar: Bicuspidation. *Am J Dent.* 1988;1(1):21-2.
12. Newell DH. The role of the prosthodontist in restoring root-resected molars: A study of 70 molar root resections. *J Prosthet Dent.* 1991;65(1):7-15.
13. Smukler H, Tagger M. Vital root amputation: A clinical and histological study. *J Periodontol.* 1976;47(6):324-30.
14. Bühler H. Evaluation of root-resected teeth. Results after 10 years. *J Periodontol.* 1988 Dec;59(12):805-10.

Psychosomatic Disorders Affecting the Oral Cavity: A Review on Etiopathogenesis and Treatment Modalities

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Abstract

Psychosomatic disorders are bodily expression affecting both mental and physical well-being of an individual. These are caused due to emotional feelings that have been suppressed for long periods and thus disturb the normal functioning of organ system. These disorders may not present in the same way in every individual. In oral cavity these may show various clinical presentations ranging from simple ulcers to autoimmune diseases. The occurrence and severity of these oral disorders have a direct correlation with the psychological status of the patient.

Thus, management in such cases requires the amalgamation of both psychotherapy and pharmacotherapy. The aim of this article is to review the psychosomatic disorders that affect the oral cavity and the measures needed for stress management.

Keyword : Autoimmune disease ,Ulcers , psychotherapy.

INTRODUCTION

The basic concept in psychosomatic medicine was first introduced by Freud; who used the term

Conversion Hysteria. This term describes the reaction in which emotional conflicts are converted in to bodily or somatic symptoms.

Conversion Symptom is the preferred term used. About one-third of people around the world reported feeling stressed and worried according to Gallup 2019.(1)

India ranked 14 in stress statistics among 74 countries. While in happiness statistics index India has been ranked 126 out of 146 countries as per world happiness index for 2023.(2,3)

Stressed statistics of India for the year 2022, according to their age criteria as per A. Minhas 2023 is for 16 to 24 years old 25%, for 25 to 34 year old 23%, for 35 to 44 years old 21%, for 45 to 54 years old 22%, for 55 years old and above 24%.(4)

Oral cavity is directly or symbolically related to major human instincts and passions. It represents the organ for expression of certain instinctual cravings and is charged with high psychological potential.(5,6) Thus oral symptoms are common psychosomatic manifestations.(7)

Leading 15 stress situations listed in Social Readjustment Rating Scale:(SRRS)(8)

1. Death of spouse
2. Divorce
3. Marital separation
4. Jail term
5. Death of close family member
6. Personal injury or illness
7. Marriage
8. Fixed at work
9. Marital reconciliation
10. Retirement
11. Change in health of family member
12. Pregnancy

13. Sex difficulties

14. Gain of new family member

15. Business readjustment

Most widely recognised diseases due to psychological factors are gastric ulcer and ulcerative

Colitis, other conditions being cardiospasm, migraine and variety of skin diseases. Relatively little study has been carried out on relationship of emotional factors on oral diseases.(9)

Relationship Between Stress and Body Response

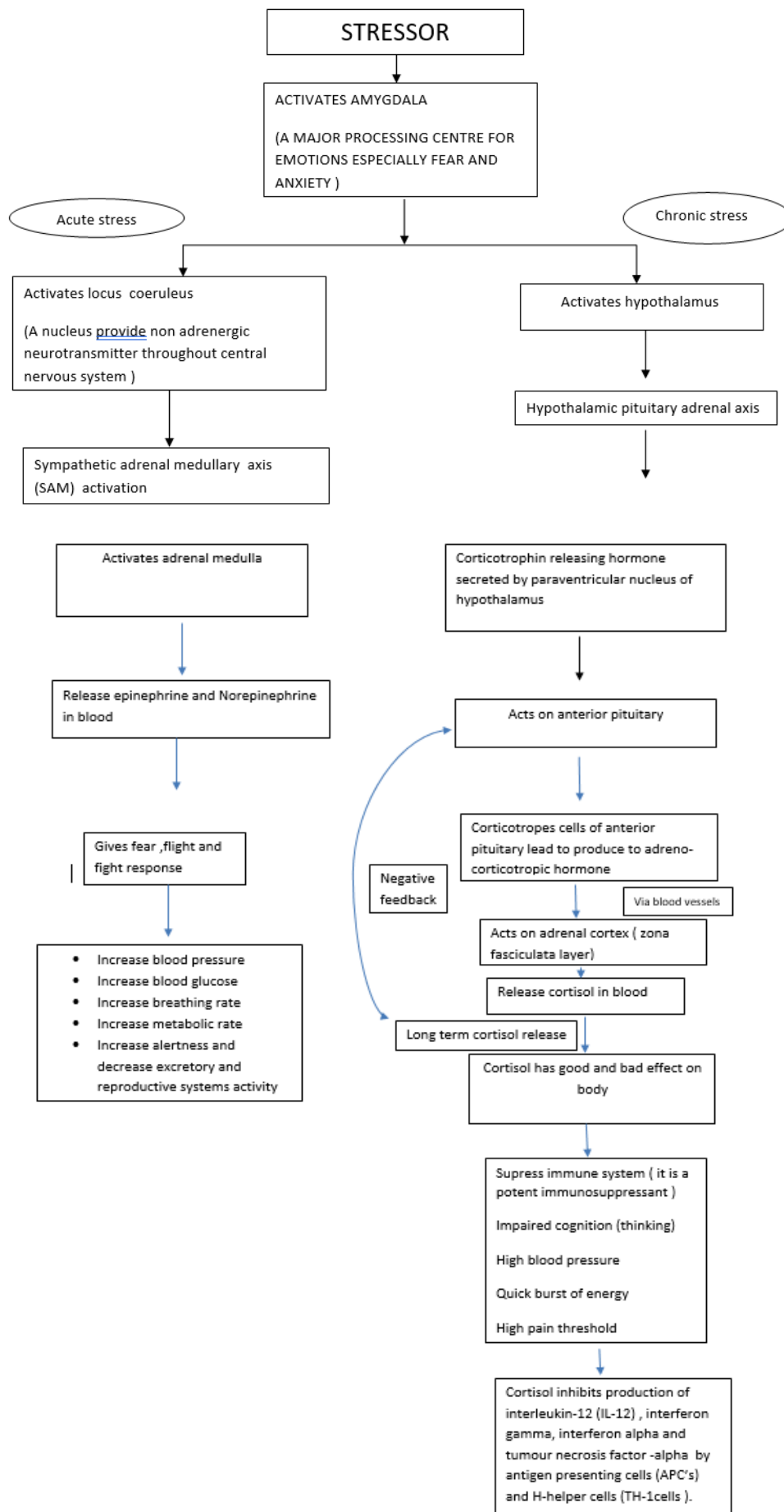
Stress is a physiological and psychological response to challenging or threatening situations, which triggers the body's "flight or fight" mechanisms characterized by heightened alertness and the release of stress hormones. Stressor is a stimulus or situation that causes stress. It occurs in two forms:

1. External stressor include major life change, relationship difficulties toxic environment, injury or illness, financial stress, work pressure.
2. Internal stressor include negative self-talk, rigid thinking, unrealistic expectations, lack of acceptance and control, pessimism, perfectionism.(10)

Types of Stress (11)

Acute stress : It is our own body's brief and immediate response to a new challenge, event or demand. And it triggers flight or fight response.

Chronic Stress : If acute stress isn't resolved and lasts for longer period of time, it becomes chronic stress. This stress is constant and doesn't go away.



Flowchart1(12)

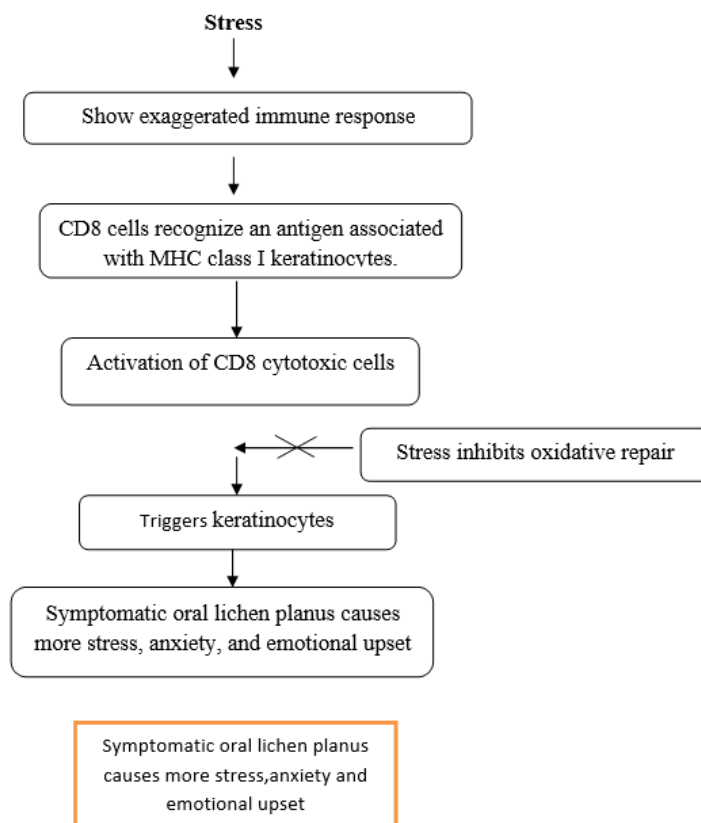
Stress triggers a cascade of response in the body and disturbs the homeostatic mechanism . It causes both hormonal and hemodynamic disturbances .(13,14)

Chronic stress is likely to contribute to the progressive long term development of oral disease through two pathways:

1. Stress motivates individuals to cope in unhealthy way that fosters oral diseases (e.g.: alcohol and tobacco , substance use).
2. Chronic stress contributes to high allostatic load that leads to dysfunction of physiological systems critical to homeostasis and affects underlying mechanism of disease progression.

Common Oral Disease Affected by Stress Oral Lichen Planus

World Health Organization defines oral lichen planus as a potentially precancerous condition . It is an immune mediated mucocutaneous , chronic inflammatory disease characterized by bilaterally white striations or plaque on buccal mucosa , tongue or gingiva, it is found commonly in adults (50-55 years of age) and predominately affects women usually by a 1.4: 1 ratio over men , thought to affect 0.5 to 1.0% of world population(15,16) . Among Indians prevalence is 1.5%. stress and anxiety exacerbates oral lichen planus psychologically skin is an erogenous zone and channel for emotional discharge so that troubled skin could be manifestation of unexpressed anger or an inner conflict due to internal stress.(17,18).



Flowchart 2

Pourshahidiet al.(2011) Simarpreet v. sandhu et.al (2014) and Michalina szymczakpaluchet al. (2023)explain the relationship between incidence of oral lichen planus with stress and depression and also proved that various mental stress control methods can have additional positive effect in successive treatment of oral lichen planus. (19,20,21)

The above mentioned studies concluded that patients do perceive a relationship between stressful life event and onset of oral lichen planus. Also, the use of mental stress control methods as an additional therapy had a positive effect on treatment of oral lichen planus, then using standard pharmacological therapy alone. So, stress management and behaviourcounselling should be a part of management protocol of oral lichen planus.

Recurrent Aphthous Stomatitis (RAS)

RAS is a small, shallow, painful, well circumscribed round shaped ulcers of oral mucosa. It is due to stress , nutritional deficiency and immune response of oral epithelium . It affects approximately 20% of the general population, With a range of 5% to 66%.Highest prevalence of 66% was found by ship et al . on dental and medical students due to stress. (22,23,24)

Lakshmi Kavitha Nadendla et al (2015)conducted a study on 60 patients with RAS , and finds a positive association between salivary cortisol levels , stress and anxiety in RAS patients during inactive stage , Gallo Cde et al(2009), Albanidou – farmaki et al (2008), MC Cartan et.al(1996), revealed that the stress plays an important role in the onset and manifestation of RAS , Liftialayyinatussyifa et al. in 2023, reveals that several cases of RAS are caused by psychological stress and eliminating the stress causing variables is one of the key therapies for these disease . Some patients needcounselling with experts in stress management in addition to system treatment.(25,26,27,28)

The above mentioned studies conclude that there is a strong relation between stress and cortisol level which ultimately leads to more incidence of RAS. Thus beside traditional pharmacological treatment, above findings suggest that counselling and stress management is also needed.

Bruxism

Bruxism is a repetitive muscular activity of the jaw characterized by grinding or clenching the teeth either during sleep or as an unconscious habits during waking hours, associated with rigidity, bracing or thrusting of the mandible.Its aetiology is multifactorial , but stress is one of the main factor associated with bruxism (29) .

Diana Vladutu et al in 2022, determine the prevalence of possible bruxism in 328 students of craiova and its association with stress and other manifestations of the TMJ disorders and he found than sleep bruxism present in 16.28 % , awake bruxism present in 68.99% and 14.73% of participants presented a combined form . so, he revealed that bruxism especially awake bruxism , has increased in prevalence among young students and it has been associated with increased level of stress (30).

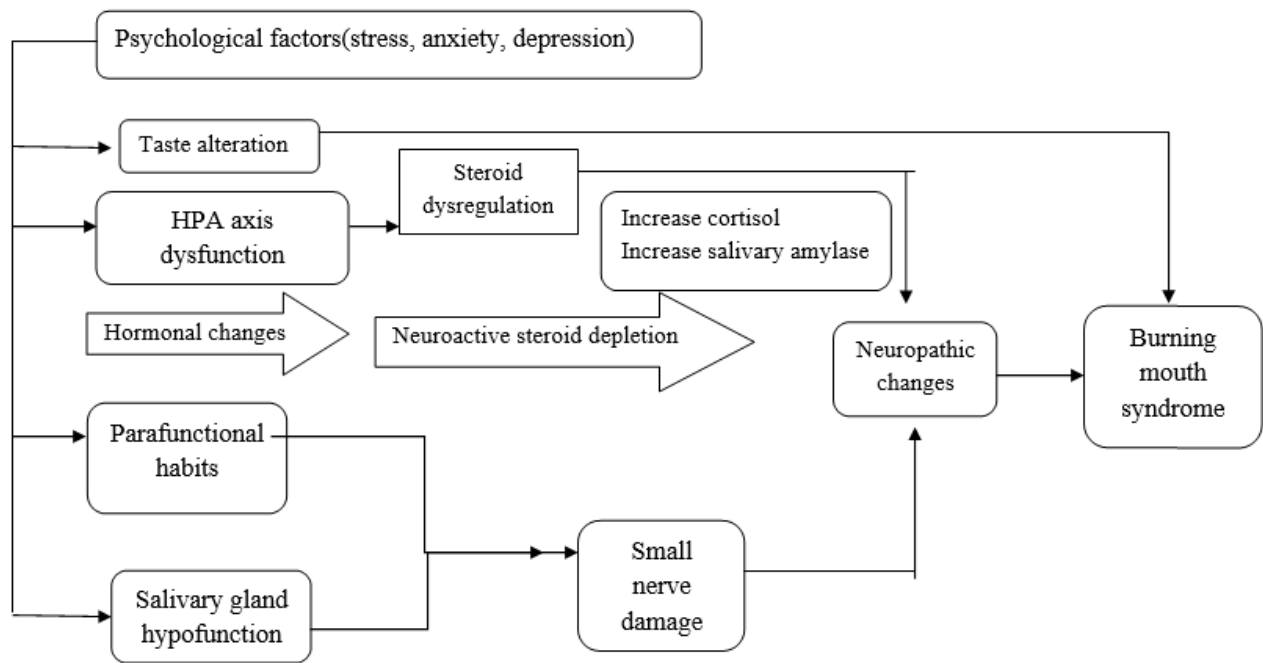
Victoria dos santoschemelo et al (2020) and Daniele manfredini et al (2009) showed that 97% of people present with bruxism have higher stress level , therefore stress and bruxism are positively related (29,31) .

In 2022, Sona .J .Lal et al said , awake bruxism has been related to stress . Psychotherapeutic approaches can be implemented to foster calmness, patient counselling leads to a decrease in tension and also create awareness of the habit. This will increase voluntary control and thus reduce parafunctional movements (32).

Number of studies regarding psychological stress has been published but none of them proved the exact nature (33).

Burning Mouth Syndrome

Also termed as glossodynia or glossopyrosis, is a chronic orofacial pain disorder that is characterized by generalized or localized burning sensation without the presence of any specific mucosal lesions. Women are at 7 time's higher risk of burning mouth syndrome thanmen. Factors contributing to aetiology are hormonal, allergic disorders, salivary gland hypofunction , chronic low grade trauma andpsychiatric abnormalities . Stress and Anxiety exacerbate the condition by increasing the level of cortisol , leading to hormonal imbalance (34,35).



Flowchart 3

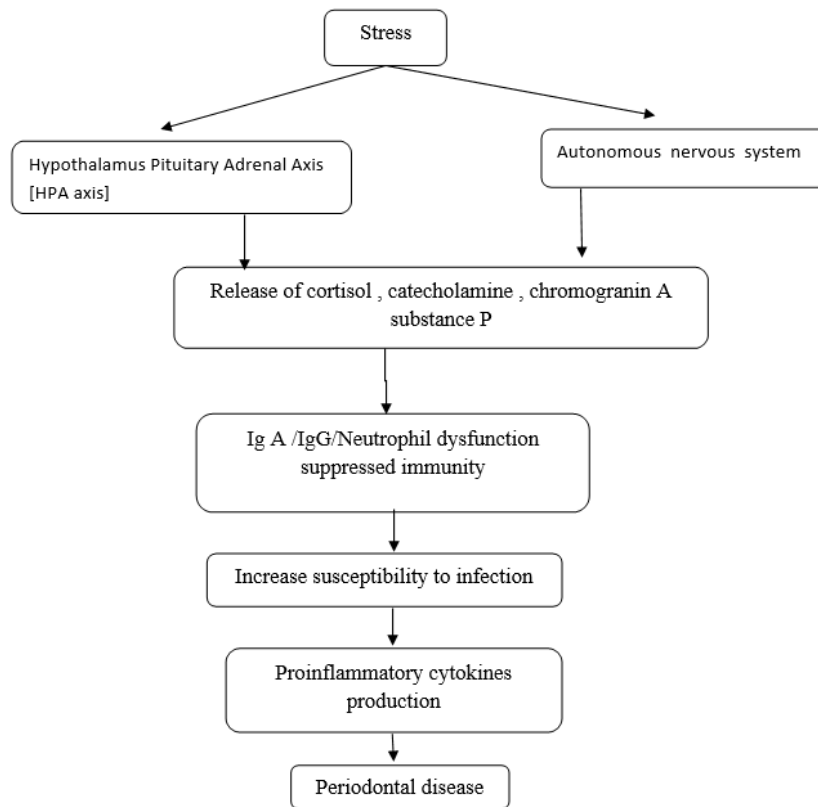
A Greater number of cases of BMS are undoubtedly based on psychogenic factors, the most common being is emotional conflicts, sexual maladjustment, cherophobia.

Fahimeh Rezazadehf et al (2021) and Andreluis Porporatti et al(Nov 2023)found that stress was significantly increased in burning mouth syndrome group presented 25.73% higher cortisol levelsand 40.62% higher alpha – amylase levels than controls, Ewa Ferensztajn et.al (Nov ,2013),R. Arvindhan et al (2014),Andre luis Porporatti et al(Nov 2023) , observed that the psychiatric aspect of burning mouth syndrome is significant , the most frequent comorbidities are stress and anxiety disorders and number of psychotropic drugs play an essential role in its treatment . Variety of drugs has been used including, antidepressants, anticonvulsants and antipsychotic drugs, among them olanzapine brought about a rapid and

significant reduction of symptoms. The causes of BMS are multifactorial and remains poorly understood still it is considered to be a neuropathic condition with central and peripheral components.(37,38,39,40)

Chronic Periodontitis

It is an infectious disease in inflammation within the supporting tissues of the teeth , progressive attachment loss and bone loss (Carranza 11th edition).It is formerly known as “adult periodontitis” or “chronic adult periodontitis ”.It is a multifactorial disease caused by hormonal changes,endocrinal influences, immunodeficiency disorders , stress and psychosomatic disorders, genetic disorders and other systemic conditions . It is more prevalent in adults mostly among males. Psychological stress represents a risk indicator for periodontal disease and should be addressed before and during the treatment.(41,42)



Flowchart 4 (43)

In 2020, Julita Maria F Coetho et.al. Conducted a study on 621 individuals and he observed that the frequency of these outcomes among those exposed to stress was 15 -36 % higher than those without the condition of stress and he reaffirmed the need to prevent and control stress. Sathesh Mannem et.al (2012) ,Sachin Goyal et.al. (2013),Joanna Hudson et.al (2021)and Federica Romano et.al (2023) also observed that chronic periodontitis showed a significant co-relation with hypercortisolaemia and stress. Mohammad Tariq et.al (2012) Archika Sudhanshu et.al(2017) said that host modulation therapy and yoga accelerates the treatment outcomes by combating the stress which is a major factor affecting the treatment of periodontitis.(44,45,46,47,48,49,50)

A Typical Facial Pain

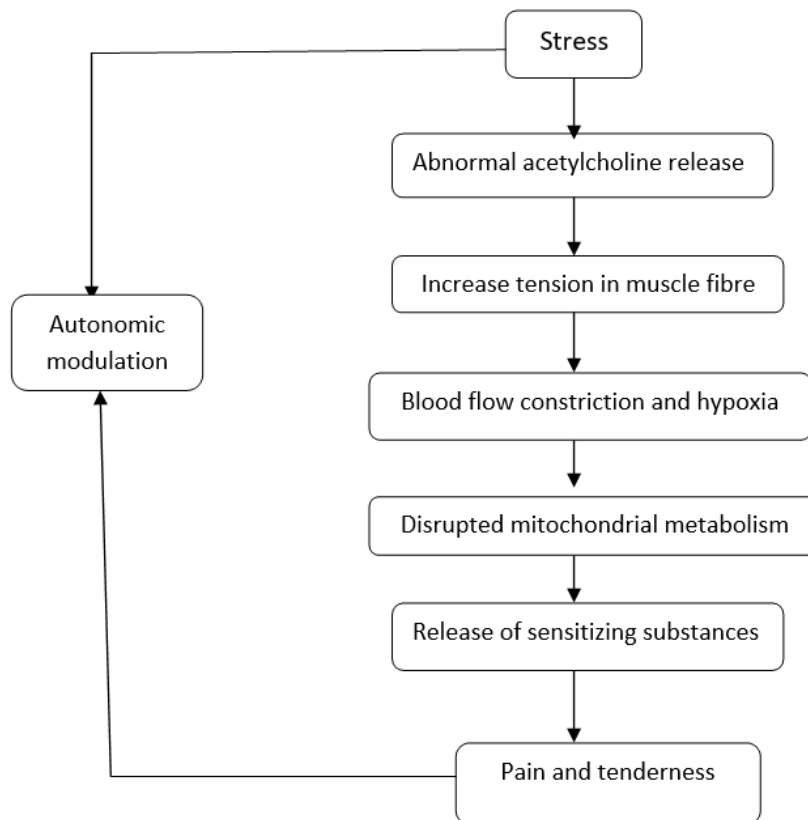
It is characterized by chronic or constant pain present from last 4-5 months without any underlying abnormality. Clinically seen as continuous or daily pain with varying intensity (dull and aching) confined to a particular facial area .Burning sensation may be present . Female are more prone to symptoms than male. The condition is believed to be psychogenic in origin with stress

and anxiety playing a leading role in the aetiology. People suffering from myofascial pain demonstrate depressive symptoms, decrease performance in activities and reduced quality of life (51,52).

One of the important atypical facial pains is MPDS (Myofascial Pain and Dysfunction Syndrome)

Myofascial Pain and Dysfunction Syndrome (MPDS)

Myofascial pain and dysfunction syndrome (MPDS) also termed as temporomandibular or masticatory arthralgia . It is a condition in which there is spasm of masticatory muscles rather than temporomandibular joint (TMJ). Pain clinically diagnosed on the basis of laskin's four cardinal sign i.e., unilateral pain, muscle tenderness , clicking noise in Temporomandibular joint and limitation in jaw function. It has a multifactorial aetiology and contributory factors include mild occlusaldisturbance, hypermobility of joint, emotional upset, and stress. Stress either from social or domestic sources increases the muscular fatigue which further leads to muscle spasm .In 2009, Luciana pinenta e silva machadoetal conclude that women is affecting more than men.(53,54,55)



Flowchart5(56)

Jones et al (1997) , Korszun et.al (2002), GM Vedolin et.al (2009) , Lakshmi Kavithanadendla et al (2013), Yoshihara et.al (2005) , Muhammad Kashif et.al (2021) , and many more noticed higher salivary cortisol level in response to stress and anxiety in MPDS patients and observed that external stressors have potential impact on masticatory muscle tenderness.(57,58,59,60,61,62) According to LG Mercuri et.al (1979) when exposed to stress, patients respond with increased masticatory muscle activity , rather than general increase in body muscle tone . Such activity whether centrally generated or peripherally manifested as parafunctional habits , or both can result in muscular fatigue and spasm , leading to myofascial pain dysfunctional syndrome. Andrew Lalchheeanawma et.al (2019), reveals that depression is said to be associated with chronic myofascial pain due to its dual neuronal connection , both believed to be influenced by serotonin and norepinephrine, therefore conclude that treatment goals should be based on the emotional symptoms along with physical symptoms(63,64).

Uma Shankel Pal et.al (2014), Abdul Ahad Khan et.al (2018) and Chris Penlington ,et.al (2022) shows that psychological therapies help in management of myofascial dysfunction syndrome which leads to reduce pain , disability and distress. Nowadays, special role is attributed to psychological therapies including stress management, biofeedback, cognitive behavioural therapy, Raj – yoga meditation, pranayama , antidepressants, and TENS (transcutaneous electric nerve stimulation) in combination with conventional therapies, non-invasive treatment modalities showed promising results in myofascial dysfunctional syndrome (65,66,67).

Management of Stress

Psychosomatic disorders directly affect the quality of life interfering with normal functions .Since these disorders relate the mind and body, treatment involve both psychological and pharmacological therapies.

PSYCHOLOGICAL THERAPIES (68,69)

1. Cognitive Behavior Therapy (CBT)

It is the best treatment for patients suffering with stress, anxiety and depression and also helpful in other mental and physical problems. It helps patients to change their thoughts and behaviour which are putting negative effect on their life and helps in boosting happiness.

2. Mindfulness Training

In the form of yoga and meditation, mindfulness training can lead to stress reduction and help the patient to focus attention to present moment and away from what may have happened in past.

3. Psychodynamic Psychotherapy

It is a method of verbal communication in which with the help and guidance of a therapist the patient is able to express the feelings and handle difficulties in more adaptive manner.

4. Hypnosis

It is a technique by which the conscious control of mind is suppressed and the subconscious mind is controlled by the hypnotist, which helps in achieving a state of relaxation. In this relaxed state patient's feelings and emotions are discussed.

5. Acupuncture and Progressive Muscle Relaxation

It also helps in relieving stress, anxiety and depression.

6. Pharmacotherapy (70)

Four major classes of medications are commonly used in treatment anxiety disorders.

1. Selective Serotonin Re-Uptake Inhibitor

It relieves anxiety symptoms by blocking the re-absorption or re-uptake of serotonin by certain nerve cells in brain, leaving behind more serotonin available to improve mood.

2. Serotonin Neuroepinephrine Re-Uptake Inhibitors

They increase the level of neurotransmitters serotonin and norepinephrine in the brain through their re-absorption into brain cells.

3. Benzodiazepines

It is used for short term management of anxiety and stress effectively causing muscle relaxation.

4. Tricyclic Antidepressants

The purpose of tricyclic antidepressants is same as benzodiazepines but less risky in long term use.

CONCLUSION

In today's world stress is showing significant detrimental effect on oral health. Management of such disease is strenuous job for clinicians. These diseases are either manifested or predisposed due to emotional stress apart from the known etiological factor, once diagnosed that there is an underlying emotional cause a positive psychological approach should be implied along with regular treatment modalities along with long follow up studies are required to formulate effective management of these diseases.

BIBLIOGRAPHY

1. Stress statistics 2024: How common is stress and who's most affected?(internet).10January 2024.Available from:<https://www.singlecare.com/blog/news/stress-statistics/>
2. Level of Stress in 74 Countries Ranked, India is #14 (internet). 12 January 2024. Available from : <https://amritt.com/the-india-expert-blog/level-of-stress-in-74-countries-ranked-india-is-14/#:~:text=Bloomberg%20has%20ranked%20the%20incidence,74%20countries%20of%20the%20world>
3. India ranks 126th in World Happiness Index 2023 amidst rising mental health concerns (internet).12 January 2024. Available from : <https://m.economictimes.com/news/new-updates/india-ranks-126th-in-world-happiness-index-2023-amidst-rising-mental-health-concerns/articleshow/103727303.cms>
4. People feeling more stressed or anxious during last 12 months in India as of May 2022, by age(internet) 12 January 2024. Available from: <https://www.statista.com/statistics/1320246/india-people-feeling-more-stressed-by-age/>
5. Suresh KV, Ganiger CC, Ahmmad YAR, et al. Psychosocial characteristics of Oromucosal Diseases in Psychiatric Patients: Observational Study from Indian Dental College, North American Journal of Medical Sciences. 2014;6(11): 570-74 <http://www.najms.org/text.asp?2014/6/11/570/145471>

6. McCarthy PL, Shklar G. Disease of Oral mucosa. 2nd ed. Philadelphia: Lea and Febiger; 1980.p.417-29.
7. Aditya A, Lele S- Association between Psychosocial disorders and oral health. J Dent Allied Sci.2015;4:84-8,<http://www.jdas.in/text.asp?2015/4/2/84/171525>
8. Holmes TH, Rahe RH. Social readjustment rating scale. Journal of Psychomatic research.1962.2;150-251
<https://www.ncbi.nlm.nih.gov/pubmed/6059863>
9. Salleh MR. Life events, stress and illness. Malays J Medi Sci. 2008;14(4):9-18,
<http://www.ncbi.nlm.nih.gov/pmc/articles/pmc3341916>
10. <https://narrativecounselling.com/specialist-areas/stress-management/>
11. Aziz M , Sultan S ,2017;(10-11),<https://www.slideshare.net/SanaSultan5/stress-71458603>
<https://thewrightinitiative.com/misc/what-are-long-term-effects-of -stress.html>
12. Reetu K, ranabir S. Stress and Hormones. Indian J Endocrinol Metab. 2011;15(1):15-22
<http://www.ijem.in/text.asp?2011/15/1/18/77573>
13. Segerstorm SC, Miller GE, Psychological Stress and the Human Immune System: Ameta analytic study of 30yrs of inquiry . Psychol bull. 200;130(4):601-30.
<http://www.ncbi.nlm.nih.gov/pubmed/15250815>
14. Sandhu SV, Sandhu JS, Bansal H, Dua V. Oral lichen planus and stress: An appraisal. Contemp Clin Dent. 2014 Jul;5(3):352-6. doi: 10.4103/0976-237X.137946. PMID:25191072; PMID: PMC4147812,<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4147812/#ref2>
15. Chainani-Wu N, Silverman S Jr, Lozada-Nur F, Mayer P, Watson JJ. Oral lichen planus: patient profile, disease progression and treatment responses. J Am Dent Assoc. 2001 Jul;132(7):901-9. doi: 10.14219/jada.archive.2001.0302. PMID: 11480643,<https://pubmed.ncbi.nlm.nih.gov/11480643/>
16. Gupta S, Jawanda MK. Oral Lichen Planus: An Update on Etiology, Pathogenesis, Clinical Presentation, Diagnosis and Management. Indian J Dermatol. 2015 May-Jun;60(3):222-9. doi: 10.4103/0019-5154.156315. PMID: 26120146; PMID: PMC4458931.
<https://pubmed.ncbi.nlm.nih.gov/26120146/>
17. Sugeran PB, Savage NW, Walsh LJ, Zhao ZZ, Zhou XJ, Khan A, Seymour GJ, Bigby M. The pathogenesis of oral lichen planus. Crit Rev Oral Biol Med. 2002;13(4):350-65. doi: 10.1177/154411130201300405. PMID: 12191961.
<https://pubmed.ncbi.nlm.nih.gov/12191961/>
18. Ebrahimi H, Pourshahidi S, Andisheh Tadbir A. Evaluation of the relationship between oral lichen planus and stress. Journal of Dentistry. 2011 Mar 1;12(1):43-7.
https://scholar.google.com/scholar_lookup?journal=Shiraz+Univ+Dent+J&title=Evaluation+of+the+relationship+between+oral+lichen+planus+and+stress&author=S+Pourshahidi&author=H+Ebrahimi&author=TA+Andisheh&volume=12&publication_year=2011&pages=43-4&PI
19. Sandhu SV, Sandhu JS, Bansal H, Dua V. Oral lichen planus and stress: An appraisal. Contemp Clin Dent. 2014 Jul;5(3):352-6. doi: 10.4103/0976-237X.137946. PMID: 25191072; PMID: PMC4147812.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4147812/>
20. Szymczak-Paluch M, Kłosek S. Stress control as a method to reduce perceived pain in oral lichen planus. Postepy Dermatol Alergol. 2023 Apr;40(2):241-245. doi: 10.5114/ada.2023.127641. Epub 2023 Jun 1. PMID: 37312924; PMID: PMC10258711.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10258711/>
21. Ship JA, Chavez EM, Doerr PA, Henson BS, Sarmadi M. Recurrent aphthous stomatitis. Quintessence Int. 2000 Feb;31(2):95-112. PMID: 11203919.<https://pubmed.ncbi.nlm.nih.gov/11203919/>
22. Albanidou-Farmaki E, Pouloupoulos AK, Epivatianos A, Farmakis K, Karamouzis M, Antoniadis D. Increased anxiety level and high salivary and serum cortisol concentrations in patients with recurrent aphthous stomatitis. Tohoku J Exp Med. 2008 Apr;214(4):291-6. doi: 10.1620/tjem.214.291. PMID: 18441503.
<https://pubmed.ncbi.nlm.nih.gov/18441503/>
23. Ship II, Brightman VJ, Laster LL. The patient with recurrent aphthous ulcers and the patient with recurrent herpes labialis: a study of two population samples. J Am Dent Assoc. 1967 Sep;75(3):645-54. doi: 10.14219/jada.archive.1967.0276. PMID: 4292069<https://pubmed.ncbi.nlm.nih.gov/4292069/>
24. Nadendla LK, Meduri V, Paramkusam G, Pachava KR. Relationship of salivary cortisol and anxiety in recurrent aphthous stomatitis. Indian J Endocrinol Metab. 2015 Jan-Feb;19(1):56-9. doi: 10.4103/2230-8210.131768. PMID: 25593827; PMID:

- PMC4287781.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4287781/#:~:text=In%20conclusion%2C%20the%20present%20study,in%20the%20investigation%20of%20RAS>
25. Gallo Cde B, Mimura MA, Sugaya NN. Psychological stress and recurrent aphthous stomatitis. *Clinics (Sao Paulo)*. 2009;64(7):645-8. doi: 10.1590/S1807-59322009000700007. PMID: 19606240; PMCID: PMC2710437.<https://pubmed.ncbi.nlm.nih.gov/19606240/>
 26. McCartan BE, Lamey PJ, Wallace AM. Salivary cortisol and anxiety in recurrent aphthous stomatitis. *J Oral Pathol Med*. 1996 Aug;25(7):357-9. doi: 10.1111/j.1600-0714.1996.tb00278.x. PMID: 8890048.<https://pubmed.ncbi.nlm.nih.gov/8890048>
 27. Syifa et al. Recurrent aphthous with psychological stress predisposing factor – a case report. *Odonto: Dental Journal*, v.10, special issue1, n.0, p.61-68, October 2023 https://www.google.com/url?sa=t&source=web&rc=t-j&opi=89978449&url=https://jurnal.unissula.ac.id/index.php/odj/article/download/33454/9114&ved=2ahUKEwj_rfGRyNmDAxW-7TgGHc27BBM4ChAWegQIEhAB&usq=AOvVaw1FYsvvbbMbSSfIJO0TTnFT
 28. Chemelo VDS, Né YGS, Frazão DR, de Souza-Rodrigues RD, Fagundes NCF, Magno MB, da Silva CMT, Maia LC, Lima RR. Is There Association Between Stress and Bruxism? A Systematic Review and Meta-Analysis. *Front Neurol*. 2020 Dec 7;11:590779. doi: 10.3389/fneur.2020.590779. PMID: 33424744; PMCID: PMC7793806<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7793806/>
 29. Vlăduțu D, Popescu SM, Mercuț R, Ionescu M, Scriciu M, Glodeanu AD, Stănuși A, Rică AM, Mercuț V. Associations between Bruxism, Stress, and Manifestations of Temporomandibular Disorder in Young Students. *Int J Environ Res Public Health*. 2022 Apr 29;19(9):5415. doi: 10.3390/ijerph19095415. PMID: 35564810; PMCID: PMC9102407.<https://pubmed.ncbi.nlm.nih.gov/35564810/#:~:text=Bruxism%2C%20and%20especially%20awake%20bruxism,with%20increased%20levels%20of%20stress>
 30. Manfredini D, Lobbezoo F. Role of psychosocial factors in the etiology of bruxism. *J Orofac Pain*. 2009 Spring;23(2):153-66. PMID: 19492540 <https://pubmed.ncbi.nlm.nih.gov/19492540/>
 31. Lal SJ, Weber, DDS KK. Bruxism Management. [Updated 2022 Oct 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482466/>
 32. Shetty S, Pitti V, Satish Babu CL, Surendra Kumar GP, Deepthi BC. Bruxism: a literature review. *J Indian Prosthodont Soc*. 2010 Sep;10(3):141-8. doi: 10.1007/s13191-011-0041-5. Epub 2011 Jan 22. PMID: 21886404; PMCID: PMC3081266. <https://pubmed.ncbi.nlm.nih.gov/21886404/>
 33. Kamala KA, Sankethguddad S, Sujith SG, Tantradi P. Burning Mouth Syndrome. *Indian J Palliat Care*. 2016 Jan-Mar;22(1):74-9. doi: 10.4103/0973-1075.173942. PMID: 26962284; PMCID: PMC4768453. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4768453/>
 34. Scala A, Checchi L, Montevocchi M, Marini I, Giamberardino MA. Update on burning mouth syndrome: overview and patient management. *Crit Rev Oral Biol Med*. 2003;14(4):275-91. doi: 10.1177/154411130301400405. PMID: 12907696. <https://pubmed.ncbi.nlm.nih.gov/12907696/>
 35. Kim, Moon-Jong & Kho, Hong-Seop. (2018). Understanding of Burning Mouth Syndrome Based on Psychological Aspects. *The Chinese journal of dental research : the official journal of the Scientific Section of the Chinese Stomatological Association (CSA)*. 21. 9-19. 10.3290/j.cjdr.a39914. https://www.researchgate.net/publication/323613919_Understanding_of_Burning_Mouth_Syndrome_Based_on_Psychological_Aspects/citation/download
 36. Rezazadehf, Fahimeh & Farahmand, Farzane & Hosseinpour, Hamidreza & Shahriarirad, Reza & Eghlidi, Amirhasan. (2021). The Association between Emotional Stress, Sleep Disturbance, Depression, and Burning Mouth Syndrome. *BioMed Research International*. 2021. 1-6. 10.1155/2021/5555316. https://www.researchgate.net/publication/350080082_The_Association_between_Emotional_Stress_Sleep_Disturbance_Depression_and_Burning_Mouth_Syndrome
 37. Porporatti AL, Schroder AGD, Lebel A, et al. Is burning mouth syndrome associated with stress? A meta-analysis. *J Oral Rehabil*. 2023;50:1279-1315. <https://onlinelibrary.wiley.com/doi/10.1111/joor.13536>
 38. Ferencztajn E, Łojko D, Rybakowski J. Zespół pieczenia w jamie ustnej (burning mouth syndrome)--

- konceptjepatogenetycznej i terapeutycznej [Burning mouth syndrome: pathogenic and therapeutic concepts]. *Psychiatr Pol.* 2013 Nov-Dec;47(6):973-88. Polish. PMID: 25007531. <https://pubmed.ncbi.nlm.nih.gov/25007531/>
39. Aravindhan R, Vidyalakshmi S, Kumar MS, Satheesh C, Balasubramaniam AM, Prasad VS. Burning mouth syndrome: A review on its diagnostic and therapeutic approach. *J Pharm Bioallied Sci.* 2014 Jul;6(Suppl 1):S21-5. doi: 10.4103/0975-7406.137255. PMID: 25210377; PMID: PMC4157273. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4157273/>
 40. Newman MG, Takei HH, Klokkevold PR, Newman and Carranza's, clinical periodontology, third south asia edition, New Delhi; RELX India Private Ltd; Elsevier Inc. 2019.P.231-41
 41. Halawany, Hassan & Anil, Sukumaran. (2015). Is Psychological Stress a Possible Risk Factor for Periodontal Disease? A Systematic Review. *Journal of Psychiatry.* 18. 10.4172/Psychiatry.1000217. https://www.researchgate.net/publication/276758945_Is_Psychological_Stress_a_Possible_Risk_Factor_for_Periodontal_Disease_A_Systematic_Review
 42. Akcali, Aliye & Huck, Olivier & Tenenbaum, H & Davideau, Jean-Luc & Buduneli, Nurcan. (2012). Periodontal diseases and stress: A brief review. *Journal of oral rehabilitation.* 40. 10.1111/j.1365-2842.2012.02341.x. https://www.researchgate.net/figure/Stress-pathways-and-potential-effects-on-periodontal-diseases-Stress-related-mediators_fig2_230654427
 43. Coelho JMF, Miranda SS, da Cruz SS, Trindade SC, Passos-Soares JS, Cerqueira EMM, Costa MDCN, Figueiredo ACMG, Hintz AM, Barreto ML, Seymour GJ, Scannapieco F, Gomes-Filho IS. Is there association between stress and periodontitis? *Clin Oral Investig.* 2020 Jul;24(7):2285-2294. doi: 10.1007/s00784-019-03083-9. Epub 2019 Oct 25. PMID: 31654249. <https://pubmed.ncbi.nlm.nih.gov/31654249/>
 44. Mannem S, Chava VK. The effect of stress on periodontitis: A clinicobiochemical study. *J Indian Soc Periodontol.* 2012 Jul;16(3):365-9. doi: 10.4103/0972-124X.100912. PMID: 23162330; PMID: PMC3498705. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3498705/>
 45. Goyal S, Gupta G, Thomas B, Bhat KM, Bhat GS. Stress and periodontal disease: The link and logic!! *Ind Psychiatry J.* 2013 Jan;22(1):4-11. doi: 10.4103/0972-6748.123585. PMID: 24459366; PMID: PMC3895311. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3895311/>
 46. Hudson J. How mental health affects oral health. *BDJ Student.* 2021;28(3):21-3. doi: 10.1038/s41406-021-0225-3. Epub 2021 Aug 31. PMID: PMC8407107. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8407107/>
 47. Romano F, Bebars A, Ortu V, Bottone M, Giraudi M, Mariani GM, Baima G, Aimetti M. Effect of psychosocial stress and coping strategies on non-surgical periodontal therapy in patients with generalized stage III/IV periodontitis: a longitudinal intervention study. *Clin Oral Investig.* 2023 Jul;27(7):3479-3487. doi: 10.1007/s00784-023-04956-w. Epub 2023 Mar 24. PMID: 36961591; PMID: PMC10329596. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10329596/>
 48. Tariq M, Iqbal Z, Ali J, Baboota S, Talegaonkar S, Ahmad Z, Sahni JK. Treatment modalities and evaluation models for periodontitis. *Int J Pharm Investig.* 2012 Jul;2(3):106-22. doi: 10.4103/2230-973X.104394. PMID: 23373002; PMID: PMC3555006. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3555006/>
 49. Sudhanshu A, Sharma U, Vadiraja HS, Rana RK, Singhal R. Impact of Yoga on Periodontal Disease and Stress Management. *Int J Yoga.* 2017 Sep-Dec;10(3):121-127. doi: 10.4103/0973-6131.213468. PMID: 29422742; PMID: PMC5793006. <https://pubmed.ncbi.nlm.nih.gov/29422742/>
 50. Quail G. Atypical facial pain--a diagnostic challenge. *Aust Fam Physician.* 2005 Aug;34(8):641-5. Erratum in: *Aust Fam Physician.* 2005 Sep;34(9):729. PMID: 16113700. <https://pubmed.ncbi.nlm.nih.gov/16113700/>
 51. Friction JR. Atypical orofacial pain disorder; a study of diagnosis subtypes. *curr rev pain;*4:142-7
 52. Glick M. *Buket's oral Medicine* 12th Ed. Shelton, Connecticut: people's Medical publishing House USA, 2015.
 53. Mortazavi H, Javadzadesh A, Delavarian Z, Mahmoodabadi RZ. Myofascial Pain dysfunction syndrome. *Iranian journal of otorhinolaryngology.* 2010;10(61):131-36. DOI:10.22038/IJORL.2010.368

54. Machado LP, Nery Cde G, Leles CR, Nery MB, Okeson JP. The prevalence of clinical diagnostic groups in patients with temporomandibular disorders. *Cranio*. 2009 Jul;27(3):194-9. doi: 10.1179/crn.2009.029. PMID: 19697648. <https://pubmed.ncbi.nlm.nih.gov/19697648/>
55. Myofascial pain (internet).16 january 2024. Available from; https://www.physio-pedia.com/Myofascial_Pain#cite_ref-gerwin_16-1
56. Jones DA, Rollman GB, Brooke RI. The cortisol response to psychological stress in temporomandibular dysfunction. *Pain*. 1997 Aug;72(1-2):171-82. doi: 10.1016/s0304-3959(97)00035-3. PMID: 9272801. <https://pubmed.ncbi.nlm.nih.gov/9272801/>
57. Korszun A, Young EA, Singer K, Carlson NE, Brown MB, Crofford L. Basal circadian cortisol secretion in women with temporomandibular disorders. *J Dent Res*. 2002 Apr;81(4):279-83. doi: 10.1177/154405910208100411. PMID: 12097314. <https://pubmed.ncbi.nlm.nih.gov/12097314/>
58. VEDOLIN, G.M., LOBATO, V.V., CONTI, P.C.R. and LAURIS, J.R.P. (2009), The impact of stress and anxiety on the pressure pain threshold of myofascial pain patients. *Journal of Oral Rehabilitation*, 36: 313-321. <https://doi.org/10.1111/j.1365-2842.2008.01932.x>
59. Nadendla LK, Meduri V, Paramkusam G, Pachava KR. Evaluation of salivary cortisol and anxiety levels in myofascial pain dysfunction syndrome. *Korean J Pain*. 2014 Jan;27(1):30-4. doi: 10.3344/kjp.2014.27.1.30. Epub 2013 Dec 31. PMID: 24478898; PMID: 24478898; PMID: 24478898; PMID: 24478898. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3903798/>
60. Yoshihara T, Shigeta K, Hasegawa H, Ishitani N, Masumoto Y, Yamasaki Y. Neuroendocrine responses to psychological stress in patients with myofascial pain. *J Orofac Pain*. 2005 Summer;19(3):202-8. PMID: 16106713. <https://pubmed.ncbi.nlm.nih.gov/16106713/>
61. Kashif M, Tahir S, Ashfaq F, Farooq S, Saeed W. Association of myofascial trigger points in neck and shoulder region with depression, anxiety and stress among university students. *J Pak Med Assoc*. 2021 Sep;71(9):2139-2142. doi: 10.47391/JPMA.375. PMID: 34580502. <https://pubmed.ncbi.nlm.nih.gov/34580502/>
62. Mercuri LG, Olson RE, Laskin DM. The specificity of response to experimental stress in patients with myofascial pain dysfunction syndrome. *J Dent Res*. 1979 Sep;58(9):1866-71. doi: 10.1177/00220345790580090401. PMID: 290651. <https://pubmed.ncbi.nlm.nih.gov/290651/>
63. Lalchhuanawma, Andrew & Sanghi, Divya. (2019). The Link Between Emotional and Psychological Distress with Myofascial Pain Syndrome. *American Journal of Sports Science*. 7. 177-181. 10.11648/j.ajss.20190704.18. https://www.researchgate.net/publication/337825401_The_Link_Between_Emotional_and_Psychological_Distress_with_Myofascial_Pain_Syndrome
64. Pal US, Kumar L, Mehta G, Singh N, Singh G, Singh M, Yadav HK. Trends in management of myofascial pain. *Natl J Maxillofac Surg*. 2014 Jul-Dec;5(2):109-16. doi: 10.4103/0975-5950.154810. PMID: 25937719; PMID: 25937719; PMID: 25937719; PMID: 25937719. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4405950/>
65. Khan AA, Srivastava A, Passi D, Devi M, Chandra L, Atri M. Management of myofascial pain dysfunction syndrome with meditation and yoga: Healing through natural therapy. *Natl J Maxillofac Surg*. 2018 Jul-Dec;9(2):155-159. doi: 10.4103/njms.NJMS_25_17. PMID: 30546229; PMID: 30546229; PMID: 30546229; PMID: 30546229. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6251288/>
66. Penlington C, Bowes C, Taylor G, Otemade AA, Waterhouse P, Durham J, Ohrbach R. Psychological therapies for temporomandibular disorders (TMDs). *Cochrane Database Syst Rev*. 2022 Aug 11;8(8):CD013515. doi: 10.1002/14651858.CD013515.pub2. PMID: 35951347; PMID: 35951347; PMID: 35951347; PMID: 35951347. <https://pubmed.ncbi.nlm.nih.gov/35951347/>
67. Fava GA, Sonino N. Psychosomatic assessment. *Psychother Psychosom*. 2009;78:333-41. <https://www.ncbi.nlm.nih.gov/pubmed/19713727>
68. Kanedia S, Parvathi DM, Giri OP, Ravindra SV, Giri VP, Parmer SS, Vishwakarma K. Psychosomatic disorders pertaining to dental practice. *Int. Arch BioMed Clin Res*. 2015;1(1):3-5. <http://iaber.org/backIssue.aspx?id=2&volume=1&issue=1&type=2>
69. Cleare, Anthony, C.M Pariente, A.H Young, Anderson IM, Christmas D, Cowen PJ et al. Evidence based guidelines for treating depressive disorders with antidepressants: a revision of the 2008 British association for psychopharmacology guidelines. *Journal of Psychopharmacology*. 2015;29(5):425-525. <https://www.ncbi.nlm.nih.gov/pubmed/25969470>

Association Between Active Parental Smoking and Gingival Pigmentation in Children

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Abstract

Aim: The goal of this study is to enhance the capacity to develop and evaluate tobacco control and prevention programme by assessing association between parental ETS and gingival pigmentation in children.

Material & Methods: A cross sectional study was conducted among 60 patients attending various departments at Ahmedabad Dental College. The labial gingival pigmentation was assessed via oral photograph according to a modification of Hedin's scale defining the degree of melanin pigmentation by the single trained calibrated investigator. Data on sociodemographic variables and parental smoking behavior was obtained through pretested structured questionnaires and was completed by the same investigator. The association was determined by using odd ratio and the data analyzed by using chi square test at 5% level of significance.

Result: An interview determined that 40% of children had at least one smoking parent. Gingival pigmentation was observed in 65% of total cases.

Conclusion: Association between parental environmental tobacco smoke exposure and gingival pigmentation in children can be useful in terms of parental educational interventions targeting smoker parents and substantially reduce exposure of children to secondhand smoke. This will blink a red light in the minds of unaware active parent smokers.

Clinical Significance: Association between parental smoking and gingival pigmentation in children helps in educating smoker parents the harmful effects passive smoking has on their child's oral health.

Keywords: Environmental Tobacco Smoke, Parental smoking, Melanin pigmentation, Gingiva, Child, Cross Sectional Study.

INTRODUCTION

Tobacco use is a significant preventable cause of disability, and premature death at a worldwide level. The adverse effects of exposure to Environmental Tobacco Smoke (ETS) are well known which include asthma, lower respiratory tract infections and effusions of middle ear.

Environmental tobacco smoke (ETS) is generated by the combustion of tobacco products. It is composed of side stream smoke (SS), emitted from the smoldering tobacco between puffs and exhaled mainstream smoke (MS) from the smoker. When a cigarette is smoked roughly half of the smoke generated is SS and the other half MS.

AIM & OBJECTIVE

To establish association between gingival pigmentation in children and active parental smoking.

MATERIAL & METHODS

Subjects & Sample Size: A cross-sectional study was conducted amongst 68 randomly selected patients attending various departments at Ahmedabad Dental College & Hospital and nearby colleges in Ahmedabad and Gujarat. 34 samples were parents who smoke and 34 samples selected were parents who do not smoke. Informed consent was obtained from all the patients.

Images of oral cavity were acquired in a standardized manner. Evaluation was carried out by the single trained calibrated investigator. Smoking status of parents of children was obtained via interview.

SUBJECT SELECTION CRITERIA:

1. Children between the ages of 6 to 18 years.
2. Exposure to active parental smoking in form of cigarette or bidi at home or at work place.
3. The child should be a non- smoker¹.

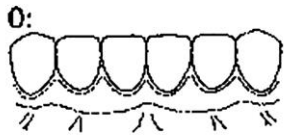
EVALUATION OF MELANIN PIGMENTATION

Gingival pigmentation was assessed in the oral photographs, which were reproduced in a computer display. These reproductions exhibited size similar to that of the actual mouth. Brownish or black pigmentation in gingiva was classified according to extent of pigmentation unit in the labial aspect of anterior teeth (Fig 1. The current technique is subjective as to date, no objective method for evaluation of gingival pigmentation has been developed.)

Gingival pigmentation was classified according to modification of melanin index categories³:

0, no pigmentation; (Fig:1) **1**, solitary unit(s) of pigmentation in papillary gingiva without formation of continuous ribbon between solitary units; and (Fig :2) **2**, At least 1 unit of formation of continuous ribbon extending from 2 neighbouring solitary units. (Fig :3)

Consequently, the reliability of this method was evaluated on the basis of inter examiner agreement: 2 examiners independently reviewed identical photographs. Examiners were trained and calibrated using typical photographs. Photographs in which visible pigmentation in the gingiva of children is apparent or lacking are presented in Fig .Gingival pigmentation of haemoglobin, melanoid, and carotene was obviously distinguishable from melanin pigmentation.⁸ Several factors such as amalgam restoration adjacent to gingiva, melanoma, and long-term usage of antimalarial drugs² and minocycline are potential confounders in terms of exposure to tobacco smoke; however, none of these parameters was applicable in this study. Status of parental smoking was withheld from the examiners³. The current investigation was approved by the Ethics Committee of Ahmedabad Dental College.



Classification according to extent of brownish or black pigmentation in labial gingiva of anterior teeth: 0, no pigmentation; (Fig 1)

1, solitary unit(s) of pigmentation in papillary gingiva without extension between neighboring solitary units; (Fig 2) and

2, formation of continuous ribbon extending from neighboring solitary units (Fig 3).

STATISTICAL ANALYSIS

Images were obtained with a digital camera (Nikon CoolPix L5, 7.0 MP). Analyses was carried out using data sets that consisted of scores of gingival pigmentations assessed by the 2 examiners on the basis of parental smoking status, gender, and age with inter examiner agreement. ORs of parental smoking with respect to gingival pigmentation were calculated. Statistical analyses were conducted with software (SPSS Version 17.0).

RESULTS

Gingival pigmentation was detected in 65% of total cases. Amongst these 40% were children of smokers. Distribution of age of parents amongst the non smoking parents was 8.97 ± 1.38 and that of smoking parents was 8.97 ± 1.38 and that of smoking parents was Grade -0 that is no pigmentation in 5(14.7%), Grade -1 that is solitary pigmentation in 17(50.0%) and Grade -2 that is continuous pigmentation in 12(35.3%) while the distribution of score of gingival pigmentation in children of non smoking parents was Grade -0 was observed in 11(32.4%), Grade -1 was observed in 18(52.9%) and Grade -2 was observed in 5(14.7%). Odds ratio of gingival pigmentation to parental smoking status was 2.774.

Prevalence of gingival pigmentation in children was not statistically significant in correlation with their smoker parents.

DISCUSSION

Examiner detected gingival pigmentation in 65% of total of children. The, subjective evaluation of gingival pigmentation in children

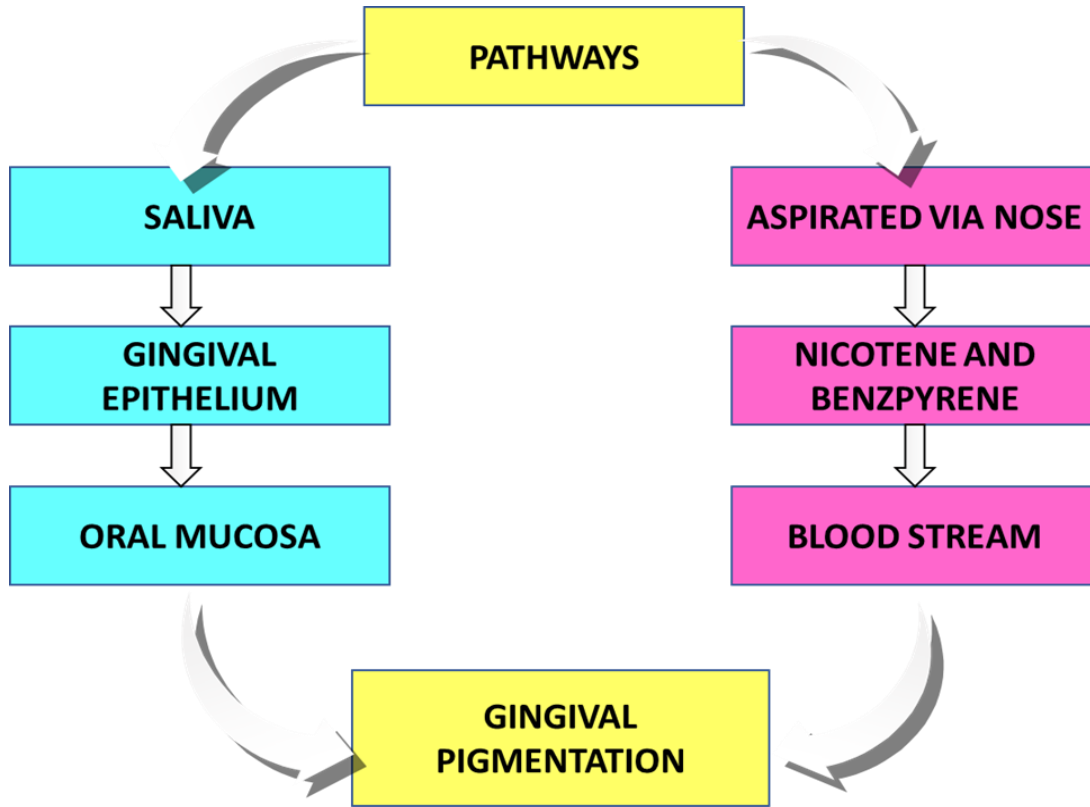
was sufficiently reliable so as to permit assessment of the association between gingival pigmentation in children and passive smoking. Two pathways by which stimulatory substances in ETS enter melanocytes in gingiva of children exist. One route involves penetration through oral mucosa for the patients who are mouth breathers; the second route is characterized by delivery via the bloodstream through nose⁵. Stimulatory agents of pigmentation in ET Scan be introduced to saliva and might reach melanocytes through gingival epithelium⁶. Gingival pigmentation was often observed in labial areas where ETS may not overlap directly⁷. Furthermore, the majority of ETS is aspirated through the nose⁸. Thus, indirect stimulation by nicotine and benzpyrene in ETS of gingival pigmentation via the bloodstream may afford a more plausible explanation.

The effect of parental smoking on gingival pigmentation in children was apparent; however, because the percentage of smoking parents of children who displayed solitary pigmentation was higher, that is 50% than that of children who presented with the more distinct form of continuous pigmentation that is 35.3% the effect in terms of extent of pigmentation was not clear. Additional studies using quantitative analyses with respect to effect of ETS and gingival pigmentation could establish greater detail regarding the association between melanin pigmentation in human gingiva and passive smoking.

Gingival pigmentation might be suggestive of parental smoking; however, gingival pigmentation was frequently observed in children, although prevalence of the symptom was higher in children with smoking parents in comparison with nonsmoking counterparts. Melanocytes normally occur in the gingiva of

all humans⁹. Moreover 80% of Asian population showed ethnic pigmentation¹⁰. Therefore, clinicians should not use gingival pigmentation as an indicator of parental smoking. The present investigation suggested an association between excessive pigmentation in the gingiva of children and passive smoking.

PLAUSIBLE MECHANISM



Patient Consent Form in Gujarati (Regional Language)

સમંતિપત્ર

હું

અનેએમનીટીમનેમારાબાળકનામોઢાનુંચેકઅપ્પઅનેફોટોગ્રાફલેવામાટેનીપરવાનગીઆપુંછું.
મેઆપેલદરેકમાહિતીનીજાણકારીતેમનીસ્ટડી/રિસેર્યમાંવાપરવામાટેનીઅનુમતિઆપેલછેઅનેઆપેલમાહિતીએકદમસા
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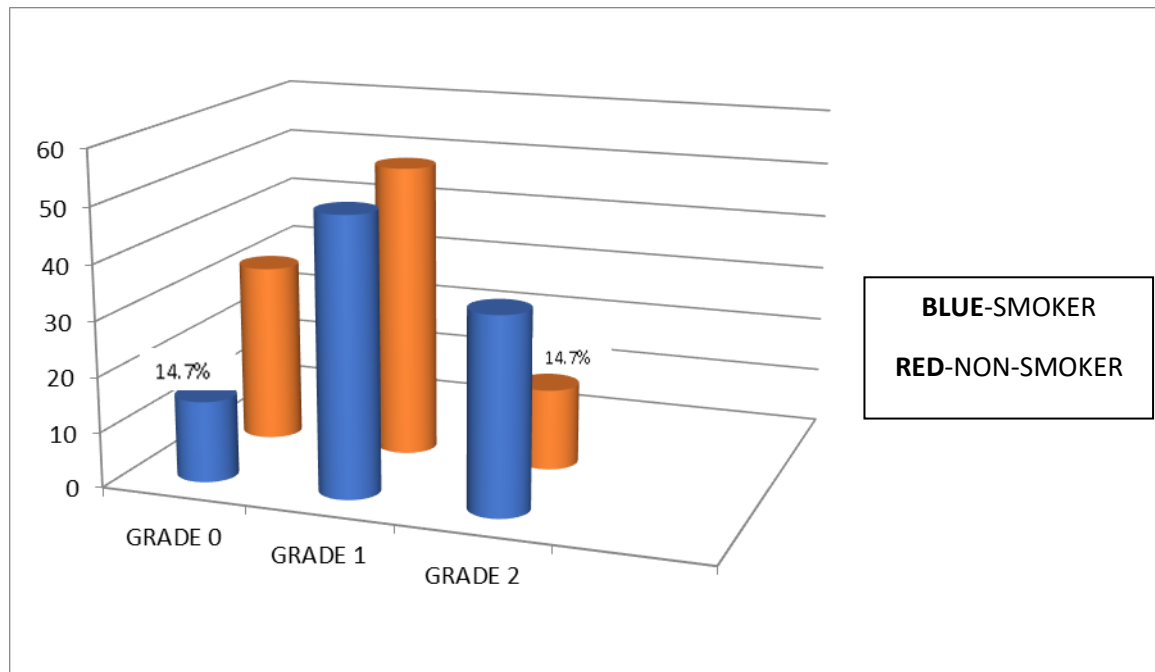
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BIBLIOGRAPHY

1. 15 March 2005, WHO survey
2. Dencker L, Lindquist NG, Tjalve H. Uptake of ¹⁴C-labelled chloroquine and an ¹²⁵I-labelled chloroquine analogue in some polypeptide hormone producing cell systems. *Med Biol.* 1976;54 :62 – 68.
3. Main JHP. Two cases of oral pigmentation associated with quinidine therapy. *Oral Surg.* 1988;66 :59 –61
4. Cale AE, Freedman PD, Lumerman H. Pigmentation of the jawbones and teeth secondary to minocycline hydrochloride therapy. *J Periodontol.* 1988;59 :112 –114.
5. Hedin CA, Axell T. Oral melanin pigmentation in 467 Thai and Malaysian people with special emphasis on smoker's melanosis. *J Oral Pathol Med.* 1991;20 :8 –12.
6. Hedin CA. Smoker's melanosis. Occurrence and localization in the attached gingiva. *Arch Dermatol.* 1977;113 :1533 –1538
7. Hanioka T, Tanaka M, Tamagawa H, Shizukuishi S. Epidemiologic study of melanin pigmentation in the attached gingiva in relation to cigarette smoking. *J Dent Health.* 1993;43 :40 –47
8. Ünsal E, Paksoy C, Soykan E, Elhan AH, Ahin M. Oral melanin pigmentation related to smoking in a Turkish population. *Community Dent Oral Epidemiol.* 2001;29 :272 –277.
9. Çiçek Y, Ertas Ü. The normal and pathological pigmentation of oral mucous membrane: a review. *J Contemp Dent Pract.* 2003;15 :76 –86.
10. Hedin CA 1991

FIGURES AND LEGENDS

DISTRIBUTION OF SMOKING PARENTS BY SCORE OF MELANIN PIGMENTATION IN CHILDREN



TABLES

DISTRIBUTION OF GENDER AND AGE BY PARENTAL SMOKING STATUS

SMOKING STATUS OF PARENTS	GENDER n=68 (%)		TOTAL	AGE MEAN±SD
	MALE	FEMALE		
NON-SMOKING	19(55.9)	15(44.1)	34	8.97±1.38
SMOKING	21(61.8)	13(38.2)	34	9.47±1.44
TOTAL	40(58.8)	28(41.1)	68	18.44±2.82

ODDS RATIO OF GINGIVAL PIGMENTATION TO PARENTAL SMOKING STATUS

	GRADE 0		GRADE 1		GRADE 2		TOTAL
	n	%	n	%	n	%	
SMOKER	5	14.7	17	50.0	12	35.3	34
NON-SMOKER	11	32.4	18	52.9	5	14.7	34

$\chi^2 = 5.16, df = 2, p = 0.075$ (NS)

ODDS RATIO OF GINGIVAL PIGMENTATION TO PARENTAL SMOKING STATUS

	CASES (WITH PIGMENTATION)	CASES (WITHOUT PIGMENTATION)
SMOKER PARENT	29(a)	5(b)
NON-SMOKER PARENT	23(c)	1(d)

ODDS RATIO = 2.774

FIG:1



FIG: 2



FIG:3



Comparative Evaluation of Effectiveness of Different Antiseptic Agents into Reducing Microbial Load in Dental Chair Water Supply

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Abstract

Background: Dental unit water system harbor bacterial biofilms, which can be a source of microbial contamination via ultrasonic scalers and dental hand pieces and thus may be a potential source of contamination in the dental operator.

Aims and objective: The aim of the study was to investigate the microbial load in dental unit water tubing and to study the effect of incorporating antiseptic (chlorhexidine) into the water source for the dental unit, and its effect on the microbial load.

Material and Methods: 20 dental unit waterlines were divided into 4 groups. Group 1 (control group) dental chair supplied with centrally RO treated water through self-contained water system, Group 2 dental chair supplied with distilled water through self-contained water system, Group 3 water lines stagnated with 30 ml of 0.2% Chlorhexidine overnight in tubing system. Group 4 dental chair supplied with 1:10 dilution of 0.2% Chlorhexidine through self-contained water system. Sample of 100 ml were collected and used as the definitive measure of total microbial contamination.

Results: Out of 4 groups studied chlorhexidine 1:10 dilution showed maximum reduction in microbial load followed by stagnant chlorhexidine followed by distilled water and normal water.

Conclusion: Use of chlorhexidine either incorporating in water system or tubing reduces the contamination level (< 200 CFU mL⁻¹), which is also recommended by the American Dental Association that water for dental procedures should not contain more than 200 CFU mL⁻¹ of aerobic bacteria.

Keywords: dentistry, dental unit waterlines, scaling & root planning microbiological load.

INTRODUCTION

Effective infection control is one of the cornerstones of good practice and clinical governance. Due to increased scientific knowledge of dental unit waterlines (DUWL) biofilms and their associated risks, contamination of dental unit waterlines has become a prominent infection-control issue. The perceived threat to public health from DUWL contamination comes from opportunistic and respiratory pathogens such as *Legionella* spp (causative agent of the pneumonia, legionnaires' disease), *Mycobacteria* spp and *Pseudomonads*. These organisms can be amplified in the biofilm to reach infective concentrations, with the potential for inhalation or direct contamination of surgical wounds.¹

Dental equipment manufacturers have in turn responded with a variety of approaches to this complex problem. There is a plethora of automated flushing systems, filters, water disinfectants, independent bottle water systems, and even fully detachable autoclavable DUWL in the market.²

Dentists have a duty to care for their staff and patients. It is deemed ethically unacceptable to knowingly expose patients to contaminated water. Guidelines on preventive measures for reducing DUWL contamination have been issued by government agencies such as the CDC Atlanta, USA, the mainstay of which is flushing of dental units³.

Dental water may be ingested, inhaled in the form of aerosols or directly contaminate surgical wounds. The ADA recommended to their members that dental unit water should comply with drinking water standards and contain <200 CFU mL⁻¹ of bacteria (equivalent to that permitted for drinking water as per WHO guidelines)⁴. Separate sterile water

supplies are advised for surgical procedures. Devices used to deliver the sterile water must be sterilized before use for invasive procedures⁵.

The study will examine to investigate the microbial load in dental unit water tubing and to study the effect of incorporating antiseptic (chlorhexidine) into the water source for the dental unit, and its effect on the microbial load.

MATERIALS AND METHOD

This study was conducted in department of Periodontics & Implantology, Jaipur dental college, Jaipur, Rajasthan. 20 dental units for which tubing had been changed 8 months prior were selected for the study (acc. To ADA specification 2000)⁷. These 20 dental units were divided into 4 groups.

Group 1 (control group) dental chair supplied with centrally RO treated water through self-contained water system.

Group 2 dental chair supplied with distilled water through self-contained water system.

Group 3 water lines stagnated with 30 ml of 0.2% Chlorhexidine overnight in tubing system.

Group 4 dental chair supplied with 1:10 dilution of 0.2% Chlorhexidine through self-contained water system.

A total number of 20 patients were randomly selected from the outpatient department of periodontics.

Inclusion criteria were,

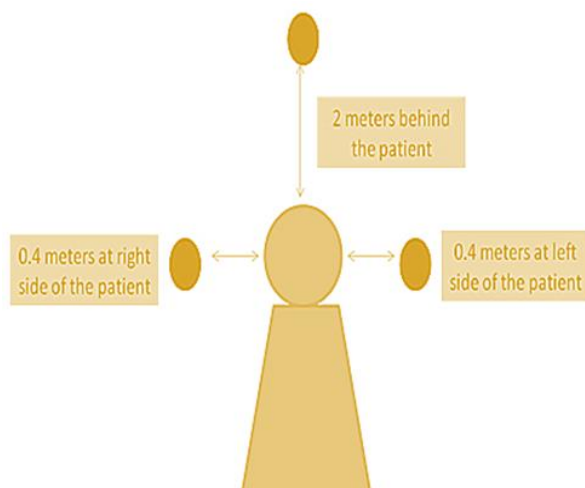
- 1) a minimum number of 20 teeth present,
- 2) age ranging between 18 and 60 years,
- 3) systemically healthy patients,
- 4) a minimum oral hygiene score of 3–4 (Oral Hygiene Index Simplified),
- 5) pocket probing depth of ≥ 5 mm, and
- 6) nonsmokers and nonalcoholic patients.

Exclusion criteria were,

- 1) patient on systemic antibiotics in the past 6 months,
- 2) undergone oral prophylaxis within the last 3 months, and
- 3) pregnant or lactating women.

The patients were informed of the protocol and the written consent was obtained from the patients. Before starting the treatment, care was taken to maintain a clean sterilized environment with fumigation in the working room. A standardized location was used to

place the nutrient agar (enriched with 5% sheep blood) plates to collect the airborne particles during the treatment. Two agar plates were used for each patient (one plate was kept at the center of the operatory room 20 min before the scaling procedure, and the other plate was kept 40 cm away from the working area near the patient's chest for 20 min during the scaling). The same clinician performed all the treatment procedures on all days and only one patient was carried out in a day to allow the operatory room to be free of aerosols.



The water sample collection was performed in morning prior to starting clinical work. Before treatment, group 3(0.2% Chlorhexidine overnight in tubing system) lines were flushed with water for 2 minutes to remove residual disinfectant from the lines. Water samples of 100 ml were collected in separate sterile containers using aseptic techniques from each scaler unit for microbial count. These were labeled and quantified for total mean CFU mL⁻¹.

Total viable counts were carried out on decimal dilutions of the water samples of DUWL and were used as the definitive measure of total microbial contamination. Water samples of appropriate dilutions (for aerobic 1:10 dilution and anerobic without dilution) were plated on Columbia blood agar for oral aerobes (incubated for 37°C for 2 days) and oral anaerobes (incubated anaerobically at 37°C for up to 10 days under a gas phase of 80% [vol/vol] CO₂-10% [vol/vol] H₂-10% [vol/vol] N₂). 6 and CFU counts were determined by digital colony counter.

STATISTICAL ANALYSIS

Statistical analyses were carried out using SPSS (STSC Inc., Rockville, Md.). Bacterial loads in different groups were compared using a two-way analysis of variance (ANOVA) on log-transformed viable counts. Where significant differences (P<0.05) were indicated by ANOVA. Individual groups were then compared by the least-significant-difference method.

RESULT

20 DUWS samples taken during the study were grouped as Group 1. (Control group) dental chair supplied with centrally RO treated water through self-contained water system, Group 2. Dental chair supplied with distilled water through self-contained water system, Group 3. Water lines stagnated with 30 ml of 0.2% Chlorhexidine overnight in tubing system. Group 4. Dental chair supplied with 1:10 dilution of 0.2% Chlorhexidine through self-contained water system.

S.No.	Groups	Colony count (in CFUs)		F value	P value
		Mean	SD		
1	Group 1	48	2.933	399.54	0.0001
2	Group 2	38.8	2.234		
3	Group 3	16.2	0.815		
4	Group 4	11.8	1.012		

The geometric mean for aerobic microbial count for group 1,2,3,4 was 48×10^1 , 38.8×10^1 , 16.2×10^1 and 11.8×10^1 CFU ml⁻¹ respectively. There was no significant difference when group 2 was compared with control (p=0.03) but there was significant difference found in group 3 and group 4 with control (p=0.002).

S.No.	Groups	Colony count (in CFUs)		F value	P value
		Mean	SD		
1	Group 1	26.2	0.815	457.17	0.0001
2	Group 2	18.2	1.084		
3	Group 3	11.6	0.836		
4	Group 4	7.18	0.679		

The geometric mean for anaerobic microbial count for group 1,2,3,4 was 26.2×10^1 , 18.2×10^1 , 11.6×10^1 and 7.2×10^1 CFU ml⁻¹ respectively. There was no significant difference when group 2 was compared with control (p=0.04) but there was significant difference found in group 3 and group 4 when compared with control (p=0.003).

DISCUSSION

Group 1 (Control-Tap Water)

In the present study, the mean aerobic bacterial contamination level was 4.8×10^1 CFU mL⁻¹ and mean anaerobic bacterial contamination level was 2.6×10^1 CFU mL⁻¹, the mean CFU's was found to be higher than the recommended level by ADA7 (<200 aerobic CFU mL⁻¹).

The bacteria in water interact with tubing system to form a biofilm. Bacteria adhere more readily to hydrophobic plastic tubing of the dental unit (William J et al 1994) thereby enhancing microbial growth.

The Result of the present study goes in accordance with the study done by Kettering et al. 19977 & Blake et al. in 1963, in which it was found that the dental units with the tap water showed CFU's in the range 5,00,000 to 5,000,000 while chlorhexidine solutions demonstrated no bacterial growth.

Another study done by Puttajah et al. 2001, in which comparison was made between three suction line cleaning agents, it was found that chlorhexidine solution containing dental units had bacterial growth in comparison to dental units containing sodium hypochlorite, while the units containing tap water showed the highest bacterial growth.

The contamination could be due to microorganism sloughing off into the flowing water, from the microbial growth along the inner surface of water tubing thereby a source of contamination for the patient. 11

Group 2 (Distilled Water)

The mean aerobic bacterial contamination level was 38.8×10^1 CFU ml⁻¹ and mean anaerobic bacterial count was 1.8×10^1 CFU ml⁻¹.

The aerobic microbial load was higher in present study than studies done by Williams, et al 199612.

The present study does not go in hand with the Study done by Williams et al and Kettering et

al. 19977 who also compared distilled water to normal water and found significant decrease in aerobic microbial load in distilled water when compared to normal water.

According to the study done by Reinhardt et al 1982 who used sterile and non-sterile water to examine the incidence of bacteremia after scaling found higher number of gram-negative bacteria in the non-sterile water. this can explain the lower number of microbial count in distilled water, as the opportunistic pathogens like pseudomonas species and klebsiella species which are gram negative microorganisms proliferate in lesser amount in distilled water.

The bacterial count in the present study was low as compared to the Distilled water as it is considered to be the purest form of water.

Group 3 (Chlorhexidine 0.2% Stagnant Overnight)

In the present study, the mean contamination level < 200 CFU /ml for aerobic and < 12 CFU ml-1 for anaerobic. The results were found to be in accordance to the study done M Ozcan et al¹³ 1982, who used chlorhexidine stagnant in tubing overnight, which has been shown to effectively reduce microbial load.

Study goes in accordance to the study done by J. Kettering et al⁷ who also compared chlorhexidine (0.2% stagnant overnight) to tap water and found significant decrease in aerobic and anerobic microbial load.

Micro Organism in the dental unit waterline is derived from incoming water source & from microbial growth coating the water tubing. Planktonic organism is frequently released into the flowing water source. (Tall B D et al. 1995).

The reduction in the bacterial count could be due to the antibacterial activity exerted by the CHX on the dental tubing. It has been shown that CHX has an affinity for bacteria probably because of an interaction between the positively charged groups on the bacterial cell wall (phosphate groups).

The interaction increases the permeability of the bacterial cell wall and thus permits the

agent to penetrate into the cytoplasm and cause the death of the microorganisms.

CHX is indicated to limit the operatory contamination by oral bacteria.

Group 4 (Chlorhexidine 1:10 Dilution)

The bacterial contamination level <150 CFU mL-1 for aerobic and < 7 CFU mL-1 for anaerobic, when CHX 1:10 dilution was used. A significant decrease in the CFUs was noted when compared to control.

Our study does not go in hand with the Study done by James T. Walker et al⁶ which did not find any significant reduction in microbial load when comparing with control.

Since the main water was treated with CHX, reduction is attributed to antimicrobial property of chlorhexidine which might have reduced the biofilms and eliminate the planktonic bacterial count.

CHX is referred to as a gold standard. Its superior antiplaque effect can be explained in terms of its superior degree of persistence of anti-bacterial effect (both bactericidal and bacteriostatic).

SUMMARY

Out of 4 groups studied chlorhexidine 1:10 dilution showed maximum reduction in microbial load followed by stagnant chlorhexidine followed by distilled water and normal water. Substantial decrease in microbial load is seen by incorporating an antimicrobial like chlorhexidine in to the water, or water tubing.

CONCLUSION

Use of chlorhexidine either in container or tubing reduces the contamination level (< 200 CFU /ml), which is also recommended by the American Dental Association that water for dental procedures should not contain more than 200 CFU/ml of aerobic bacteria. For routine use in dental colleges, clinics 1.10 dilution chlorhexidine is advocated. Chlorhexidine overnight stagnant in tubing can also be used for decreasing microbial load, with an added advantage of cost effectiveness.

BIBLIOGRAPHY

1. Pankhurst Cl et al. Microbial Contamination Of Dental Unit Waterlines: The Scientific Argument. *Int Dent J* 1998;48:359-68.
2. ADA Council on Scientific Affairs. Dental Unit Waterlines: Approaching The Year 2000. *J Am Dent Assoc* 1999;130:1653-64.
3. US Department Of Health And Human Services. Recommended Infection Control Practices For Dentistry. *Mmwr* 1993;42: (No.Rr-8) 7.
4. Shearer Bt. Biofilm and The Dental Office. *J Am Dent Assoc* 1996;127: 181-189.
5. Waggoner M B. The New CDC Surgical Water Recommendations: Why They Should Be Implemented and What They Require. *Compend Contin Educ Dent* 1996;17: 612-614.
6. James T. Walker et al. Microbial Biofilm Formation and Contamination Of Dental-Unit Water Systems In General Dental Practice. *Applied and Environmental Microbiology* 2000; Vol. 66, No. 8, P. 3363-3367.
7. J.Kettering et al. Comparison of Methods For Reducing Dental Unit Water- Line Bacteria and Biofilm. *Journal of Dental Research* 1977;76, Abstract # 3371, 435.
8. Blake, G. C et al. The Incidence and Control of Bacterial Infection in Dental Spray Reservoirs. *Br. Dent. J* 1963;19:413-416.
9. Mayo, J. A et al. Bacterial Biofilm: A Source of Contamination in Dental Air-Water Syringes. *Clin. Prev. Dent* 1990;12: 13-20.
10. 10 Puttajahr et al. Comparison of Microbial Contamination Control between Three Dental Suction Line Cleaning Agents. *Journal of Dental Research* 1999;78:Abstract # 600, 180.
11. Wirthlin Mr et al. Formation and Decontamination of Biofilms in Dental Unit Waterlines. *J Periodontol* 2003;74(11):1595-1609.
12. Wiluams et al. Microbial Contamination of Dental Unit Waterlines: Current Preventive Measures and Emerging Options. *Compendium of Continuing Education in Dentistry* 1996;17: 691.
13. M. 0 Z Can, Y. The Effect of Disinfectant Agents in Eliminating the Contamination of Dental Unit Water. *Journal of Oral Rehabilitation* 200;30: 290-294.

Comparison of Postoperative Pain and Evaluation of Success of Endodontic Treatment with Truss Access Preparation: A Case Series

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Abstract

This article outlines a clinical case series of new minimally invasive access cavity preparation techniques to improve tooth fracture resistance and prolong its survival. Root canal treatment was performed in patients with an ultraconservative approach for access opening of the molar in two visits, and high-strength direct composite restoration was performed. It can be concluded that truss access cavity improves the fracture resistance of endodontically treated teeth.

Keywords: access cavity preparations, conservative access cavity design, minimally invasive access cavity design, truss access cavity preparations.

INTRODUCTION

Endodontic access cavity preparation is the first and most important step for successful endodontic treatment resulting in removing caries, deroof the pulp chamber, discovering all

canal orifices, and having direct access without destroying healthy tooth structure. ⁽¹⁾ Endodontic treatment consists of three major factors: cleaning and shaping, disinfection, and

three-dimensional obturation of the root canal system. ⁽²⁾ Recently, with all these advances, a minimally invasive access cavity has been proposed in endodontics with the goal of preserving the pericervical dentin. ⁽³⁾ Traditional Endodontic Access Cavity weakens the tooth structure especially because of pathology. Various treatment modalities can be used from simple direct restoration with or without a post and core, inlay, onlay, and full-coverage crowns. ⁽⁴⁾ The conservative access cavity is a narrowed form of conventional cavity starting from the central fossa and expands adequately to detect the opening of the canal orifice. ⁽⁵⁾ Ultraconservative access

cavities aim to preserve as much tooth structure as possible, which generally impairs the visibility and comfort of clinicians. For ninja or point access, access is gained through the central fossa or deepest part of the occlusal surface and advanced apically with a minimal increase in dimension. ⁽⁶⁾ The truss access or orifice-directed access targets only the canal orifices, and the dentinal bridge is preserved. ⁽⁷⁾ This design can be modified further to access each canal through a separate hole. However, the truss access is not standardized and has been presented in the endodontic literature with different sizes. ⁽⁸⁾

CASE REPORTS



Case Report 1: (a) Pre-operative radiograph, (b & c) Truss access cavity preparation design, (d) Working length radiograph, (e) Master cone radiograph, (f) Post-obturation photograph



Case Report 2: (a) Pre-operative radiograph, (b) Truss access cavity preparation design, (c) Working length radiograph, (d) Master cone radiograph, (e) Post-obturation photograph

DISCUSSION

The choice of access cavity design in endodontic treatment is a critical factor that can significantly impact the long-term prognosis of the tooth. The truss access cavity, as a conservative approach, has shown promising benefits in preserving tooth structure and providing cuspal protection, leading to increased fracture resistance compared to traditional access cavity designs. This approach can be particularly beneficial in mandibular first molars, which are more susceptible to fracture and often require cuspal protection. However, it is essential for clinicians to be aware of the potential challenges and drawbacks associated with the truss access cavity. Inaccuracy and gauging during cavity preparation, the risk of missing canals, and the

need for precise radiographic assessment are all factors that need to be carefully considered. Clinicians should have sufficient clinical experience and training before attempting the truss access approach to minimize these risks. Radiographic evaluation, along with a thorough clinical examination, is crucial in determining the feasibility of using the conservative access design for each individual case. If difficulties arise during treatment, the clinician should be prepared to switch to a more traditional access cavity to ensure proper canal identification and preparation. Striking the right balance between preservation and accessibility is essential when planning the access cavity design. By considering the needs of the operator, the restoration, and the tooth, clinicians can make well-informed treatment

decisions and aim for the best possible outcome for their patients.

Minimally invasive endodontics, when combined with proper treatment planning and assessment, can significantly contribute to the long-term survival and success of endodontically treated teeth. It is an evolving field in dentistry that seeks to optimize treatment outcomes while preserving as much healthy tooth structure as possible. As technology and techniques continue to advance, the clinician's role in providing effective and conservative endodontic treatment becomes even more crucial in achieving favorable results for their patients.

CONCLUSION

It can be concluded that truss access cavity may improve the fracture resistance of endodontically treated teeth compared to traditional access cavities. Minimally invasive access cavities can be more challenging to perform, and there is a higher risk of ineffective canal instrumentation and procedural errors. There are certain limitations associated with minimally invasive access cavities. Factors such as tooth position, patient's mouth opening ability, degree of

calcification in the tooth, and the possibility of file breakage can impact the feasibility and success of this technique. Additionally, in minimally invasive access cavities, the pulp chamber is not completely deroofed, which may require more meticulous instrumentation and copious irrigation with sodium hypochlorite to ensure proper disinfection. All these factors can make the procedure more time-consuming and may require additional training for clinicians to master the technique effectively.

Outcome and Follow-up: The prognosis for the current case was good.

Conflicts of Interest: The authors have declared that no competing interests exist.

Human Ethics: Consent was obtained or waived by all participants in this study.

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Article Type: CASE REPORT

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BIBLIOGRAPHY

1. Gutmann J, Fan B. Tooth morphology, isolation, and access. In: Hargreaves KM, Berman LH, Rotstein I, editors. *Cohen's Pathways of the Pulp*. 11th ed. St Louis, MO: Elsevier; 2016. p. 142–4
2. Lang H, Korkmaz Y, Schneider K, Raab WH. Impact of endodontic treatments on the rigidity of the root. *J Dent Res*. 2006 Apr;85(4):364-8. doi: 10.1177/154405910608500416.
3. Clark D, Khademi J. Modern molar endodontic access and directed dentin conservation. *Dent Clin North Am*. 2010 Apr;54(2):249-73. doi: 10.1016/j.cden.2010.01.001.
4. Tang W, Wu Y, Smales RJ. Identifying and reducing risks for potential fractures in endodontically treated teeth. *J Endod*. 2010 Apr;36(4):609-17. doi: 10.1016/j.joen.2009.12.002.
5. Zhang Y, Liu Y, She Y, Liang Y, Xu F, Fang C. The Effect of Endodontic Access Cavities on Fracture Resistance of First Maxillary Molar Using the Extended Finite Element Method. *J Endod*. 2019 Mar;45(3):316-321. doi: 10.1016/j.joen.2018.12.006.
6. Plotino G, Grande NM, Isufi A, Ioppolo P, Pedullà E, Bedini R, Gambarini G, Testarelli L. Fracture Strength of Endodontically Treated Teeth with Different Access Cavity Designs. *J Endod*. 2017 Jun;43(6):995-1000. doi: 10.1016/j.joen.2017.01.022.
7. Barbosa AFA, Silva EJNL, Coelho BP, Ferreira CMA, Lima CO, Sassone LM. The influence of endodontic access cavity design on the efficacy of canal instrumentation, microbial reduction, root canal filling and fracture resistance in mandibular molars. *Int Endod J*. 2020 Dec;53(12):1666-1679. doi: 10.1111/iej.13383.

8. Moore B, Verdelis K, Kishen A, Dao T, Friedman S. Impacts of Contracted Endodontic Cavities on Instrumentation Efficacy and Biomechanical Responses in Maxillary Molars. *J Endod.* 2016 Dec;42(12):1779-1783. doi: 10.1016/j.joen.2016.08.028.
9. Abou-Elnaga MY, Alkhawas MB, Kim HC, Refai AS. Effect of Truss Access and Artificial Truss Restoration on the Fracture Resistance of Endodontically Treated Mandibular First Molars. *Journal of endodontics.* 2019; 45(6): 813-7
10. Rezaei Dastjerdi M, Amirian Chaijan K, Tavanafar S. Fracture resistance of upper central incisors restored with different posts and cores. *Restor Dent Endod.* 2015 Aug;40(3):229-35. doi: 10.5395/rde.2015.40.3.229.

Prevalence of Periodontal Disease in Various Abo Blood Groups – An Epidemiological Study

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Abstract

Background: Periodontal disease is considered to have a multifactorial etiology. It is interesting to emphasize the significance of genetic factors in patients with periodontal disease and to find out whether any innate factor is also associated with it². If such a relationship is found, it can be concluded that the presence of particular blood group antigen can increase the susceptibility to the disease.

Material & Method: The study included patients who fulfilled all the inclusion criteria which were required to be the part of the study. The nature and design of the study was explained to the patients and written consent was obtained for their participation. Patients blood group typing was done using the ABO blood group kit. The patients were then screened using the gingival index and probing depth.

Results: Chi square (χ^2) test and Fisher's two-way analysis of variance were the statistical design utilized. The results showed 'O' blood group was more prevalent among healthy subjects and A in gingivitis, while O was more prevalent in Periodontitis subjects. A statistically significant association was found between "ABO" blood group system and probing depth in group III.

Conclusion: The present study hereby concludes that an association exists between blood group and periodontal disease.

Keyword: Blood group, ABO, Periodontitis, Gingivitis.

INTRODUCTION

ABO blood grouping was first described by Karl Landsteiner in 1900, based on the presence or absence of specific antigens on the human red blood cells (RBC) membrane. Blood type is classified as group A, B, O or AB depending on whether the RBC membranes contain antigen A, antigen B, neither antigen, or both antigens respectively. The discovery of ABO system and findings of red cell agglutination in serum and recognition of blood groups laid the scientific basis for safe practice of blood transfusion. ABO blood grouping influences other physiological characteristics. For example, group A has been associated with increased risks of gallstones, colitis, and certain tumor types, whereas non-O blood groups have been associated with cardiovascular diseases, including ischemic heart disease and atherosclerosis.¹

Periodontal disease (PD) comprises a group of heterogeneous conditions involving inflammation of the alveolar bone, periodontal ligament, and gingiva. In addition to the infectious etiology, increasing evidence suggests that PD may involve a chronic immune-inflammatory response. PD has been associated with various environmental and host factors, including diabetes mellitus and smoking habit. So Periodontal disease is considered to have a multifactorial etiology, genetic factors play an important role.¹

Hence, it is interesting to emphasize the significance of genetic factors in patients with periodontal disease and to find out whether any innate factor is also associated with it². However, if such a relationship between the blood group and periodontal disease can be established, it can be concluded that the presence of particular blood group antigen have somehow increased the susceptibility to the disease^{2,3}

Ford⁴ (1942), believed blood groups phenomenon to be an example of balanced polymorphism, which indicates that natural selection takes an interest in blood group differences and hence different combinations of genotypes will have slightly

different survival values. There are however, many ways in which health and survival values can be influenced by the blood group system.

Weber and Pastern¹⁴(1927) were the first to study the association of "ABO" blood groups with periodontal disease and **Polevitzky¹⁵ (1929)** was second to study the association. **Kaslick¹⁶ et al (1971)** studied the association between Juvenile periodontitis and "ABO" blood groups. They found significantly less patients with blood group "O" and more patients with blood group "B"

Therefore, the aim of the present study is to find out the prevalence of periodontal disease among different blood groups using ABO system and to correlate periodontal disease with different blood groups.

Materials and Methods

1425 patients, both males and females in age group of 25 – 65 years were selected from the outpatients who visited the department of periodontics, Jaipur dental college, Jaipur.

The nature and design of the study was explained to the patients and written consent was obtained for their participation. They were checked for their blood group using the blood group kit (sparz clone) followed by periodontal examination to categorize as healthy, chronic gingivitis and chronic periodontitis groups. Patients who had not received any periodontal treatment in the past 1 year and with no significant systemic disease were included in the study.

Chronic smokers and alcoholics, pregnant women and those who were on oral contraceptives were excluded from the study subjects who were on antibiotics /analgesic therapy for medical reasons were also not included in the study.

Clinical Procedure

The blood grouping for the study subjects was done by using slide agglutination method (Visual method) using spanz clone blood group kit. The right index finger of the patient was wiped with sterilized cotton and pricked with a sterile lancet. Two drops of blood were placed on the same slide with distance apart, to which a drop of anti A and

anti B serum was added prior and waited for agglutination (clumping) to take place. If agglutination (Clumping) occurs with antiserum A then the blood group is "A". If agglutination (Clumping) occurs with antiserum B then the blood group was identified as "B". If agglutination (Clumping) occurs with both anti-A and anti-B serum the blood group was "AB". If No agglutination (clumping) occurs with both anti A and anti B serum the blood group was "O".

A drop of antiserum D was placed on another slide to which One drop of blood was added and allowed for agglutination (clumping) to take place. If agglutination (Clumping) occurs when anti-D sera is added blood is Rh+ve and if no clumping is seen blood is Rh-ve.

After determining the blood group, patients were screened for gingivitis using gingival index (loe and silness) and were examined for periodontal status (probing pocket depth) using Williams graduated periodontal probe.

Patients were divided as per the following criteria:

Group I:

Patients having clinically healthy gingiva with gingival score of 0.1 - 0.4 (Loe and Silness).

Group II:

Patients having generalized chronic gingivitis with gingival score 1.1 - 2.0 (Loe and Silness)

Group III:

Patients having chronic generalized periodontitis, with $\geq 30\%$ sites with probing depth of ≥ 4 mm.

RESULT

The percentage and frequency distribution of ABO blood group among the various age groups showed that 425 subjects belonged to age group 25-35years. The study population was divided into group I (healthy) group II (gingivitis) and group III (periodontitis) according to the clinical parameters namely gingival index (Loe and Silness) and pocket depth.

Comparison of mean percentage value of probing depth and ABO blood group in group III (periodontitis) was statically significant ($p < 0.05$).

When comparing the percentage and frequency distribution of ABO blood group in group I (healthy), group II (gingivitis) and group III (periodontitis), group I (healthy) subjects with blood group O 42.78% (148) showed a significant

relationship ($p < 0.05$). In the group II (gingivitis) subjects with blood group A 41.89% (191), showed a significant relationship ($p < 0.05$). In group III (periodontitis) subjects with blood group O 43.18% (269), showed a significant relationship ($p < 0.05$)

The Rh factor distribution status was compared among 1425 subjects in the study group. Among 346 subjects in group I (healthy) 317 were Rh +ve and 29 were Rh-ve. In group II (gingivitis) 412 were Rh+ve and 44 were Rh-ve. 549 subjects in group III (periodontitis) were Rh+ve and 74 were Rh-ve. No relative significance was found regarding the distribution of Rh factor ($p > 0.05$).

Statistical Analysis

Statistical analysis was done in P.C statistical package SPSS 7.2

Chi square (χ^2) test

This test was used to find the association between the "ABO" blood groups with Group I (Healthy), Group II (Gingivitis), Group III (Periodontitis).

Two way analysis of variance

The purpose of two-way ANOVA is to find out whether data from several groups have a common mean. In two-way ANOVA the groups have two categories of defining characteristics instead of one.

DISCUSSION

The ABO blood group system and Rh system distribution show marked variation around the world. In the present study maximum subjects belonged to blood group O 37% (528), followed by blood group A 31% (443), blood group B 19% (266) and blood group AB 13% (188). Similar results were obtained in the study done by **L. Beckman (2008)**³. However in the studies done by **Nanu A et al (1997)**⁴, **Afzal M et al (1977)**⁵ the maximum number of subjects belonged to blood group O followed by blood group B, A and AB.

Studies have been done to explore the ABO blood group and the incidence of oral and dental disease. The earliest investigation done was by **Suk et al (1930)**⁶ who did not find any correlation between blood groups and caries. However **Aitchison and Carmichael (1962)**⁷ revealed a relationship between the patient's susceptibility to caries and their blood group. **Nikawah et al (1991)**⁸ found that denture wearers of blood group O were found to be

more susceptible to denture stomatitis. *Gheisari R et al (2008)*⁹ found that the Maxillofacial deformities were the least with blood group A and were greater with blood group B, suggesting ABO blood group as one of the etiologic factors for these deformities.

In this study the mean gingival index and ABO blood group did not show any statistically significant relationship in group I, group II and group III. Similar results were obtained in the study done by *Ali S. T. Al Ghamdi (2009)*¹⁰. Mean of probing depth and ABO blood group showed a statistical significant relationship in group III. This finding is contradictory to that of the study done by *Ali S.T. Al Ghamdi (2009)*¹⁰. They did not find any relationship between periodontitis and probing depth. Also *Turgut Demir et al (2009)*¹¹ did not find statistically significant difference in the reproduction of the pathogenic bacteria in different ABO blood groups.

The relationship between gingival index and gender was not significant in group I, group II and group III ($p>0.05$). These findings are in par with those of *Turgut Demir et al(2009)*¹¹. Males showed a higher mean gingival index and mean pocket depth when compared with the females, These results are similar to those of the study done by *Ali S. T. Al Ghamdi (2009)*¹⁰.

In the present study blood group A and gingivitis showed a statistically significant relationship. ($p<0.05$). This is similar to the studies done by *Koregol AC (2010)*¹² and *Turgut Demir(2007)*¹³ who have shown statistically significant relationship between blood group A and gingivitis. These findings were however contradictory to those of *Daryl E. Malena (1972)*¹⁴, *kaslick(1971)*¹⁵ and *Tendon(2009)*¹⁶.

Blood group O showed a significant relationship ($p<0.05$) in periodontitis patients. This result goes in hand with the studies done by *Ghalyani Estaheni(2000)*¹⁷, *Turgut Demir(2007)*¹³ and *Koregol AC (2010)*¹², who found a significant correlation of blood group O with periodontitis.

Differential secretion of blood group antigens ABO (H) in the tissue may be a factor influencing the development of systemic oral diseases. Differentiation and maturation of cells in the stratified epithelium influence the expression of different histo-blood group antigens. Basal cells express A/B precursor carbohydrate chains, whereas A and B antigens are more commonly found in the spinous cell layer. Expression of blood group antigens also depends on the differentiation patterns of keratinized versus non-keratinized epithelium. Keratinized squamous epithelium rarely expresses A and B antigen, with most spinous cells expressing the precursor H antigen. In non keratinized epithelium, including the buccal mucosa, most spinous cells express A and B antigens, rather than precursor H antigen. In the oral tissues, the presence of A/B transferases and their substrates determines the expression of A/B antigens.

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FUTURE CONSIDERATION

Knowledge of the ABO blood groups of patients and their association, if any, with the severity of periodontal disease may be important in the development of early treatment strategies, and it would help to target non-responding areas to periodontal therapy of highly susceptible individuals.

CONCLUSION

Considering the current observations, the conclusion drawn are:

- 1) The prevalence of subjects with blood group 'O' were more in group I(healthy)
- 2) Blood group A showed a statistically significant in groupie (gingivitis)
- 3) Maximum number of patients blood group 'O' were found to be more in group III (periodontitis).
- 4) A statistically significant association was found between "ABO" blood group system and probing depth in group III.

BIBLIOGRAPHY

1. Lindhe J, Karring T, Lang NP. *Clinical periodontology and implant dentistry*, Blackwell Munksgaard. 2003.
2. Newman MG, Takei HH, Carranza FA. *Clinical Periodontology*. 9. W.B.Saunders Co.; Philadelphia, London, New York, St Loise, Sydney, Toronto: 2002.
3. L. Beckman **Racial & ethnic distribution of ABO blood types**, a contribution to the physical anthropology and population genetics 2008.
4. Nanu A, Thapliyal RM. Blood group gene frequency in a selected north Indian population. Indian J Med Res. 1997 Sep;106:242-6.
5. Afzal M, Ziaur-Rehman, Hussain F, Siddiqi R.J Pak Med Assoc 1977; 27:426-8.
6. Suk V. Über die beziehung zwischen gesunden Zähnen und den Zerfall und die Pflege der Zähne bei den weissen. Spisy lék Fak Masaryk Univ. 1930:125. (Cited by Pradhan et al, 1971)
7. Aitchison J, Carmichael AF. The relationship between the ABO blood mutations and dental caries. Dent Pract. 1962;13:93–95.
8. Nikawa H, Kotani H, Sadamori S, Hamada T. Denture stomatitis and ABO blood types. J Prosthet Dent 1991;66:391-4.
9. Gheisari R, Ghoreishian M, Movahedian B, Roozbehi A. The association between blood groups and maxillofacial deformities. Indian J Plast Surg 2008;41:138-40.
10. Ali S. T. Al Ghamdi, Association Between ABO Blood Groups and Severity of Chronic Periodontitis. JKAU: Med. Sci., Vol. 16 No. 3, pp: 31-41
11. DEMIR Turgut . Effects of different blood groups on the reproduction of periodontal pocket bacteria, International dental journal 2009, vol. 59, 83-86
12. Koregol AC, Raghavendra M, Nainegali S, Kalburgi N, Varma S. ABO blood groups and Rhesus factor: An exploring link to periodontal diseases. Indian J Dent Res 2010;21:364-8
13. Demir, Tezel, A., Orbak, R., Kavrut, F. The Effect of ABO Blood Types on Periodontal Status, Eur J Dent. 2007 July; 1(3): 139–143.
14. Daryl E. Malena . ABO Phenotypes and Periodontal Disease .J DENT RES 1972 51: 1504
15. Kaslick RS, Chasens AI, Tuckman MA, Kaufman B. Investigation of periodontosis with periodontitis: literature survey and findings based on ABO blood groups. J Periodontol. 1971 Jul;42(7):420-7.
16. S. Tandon , O. P. Tandon , I. D’Silva , A. Kaur. Association of periodontal disease with ABO blood groups .Biomedicine 2009; 29 (2): 154-158
17. Ghalyani Esfahani P.,Bahmani Mohammad Ali,Bani Talebi M. Study Of The Frequency Of Gingivitis And Periodontitis In Four Different Types Of Blood Groups In Young Adults. Majallah-I-Dandanpizishki Fall 2000; 12(34):47-54.

Table-1: - Comparison of mean of gingiva index (Leo & Silness) and ABO blood Group Among Group I (healthy), Group II (Gingivitis) and Group III (Periodontitis)

Gingival Index %	Blood Group				p-value
	A	B	AB	O	
Group I	38.5	31.4	36.7	34.4	>0.05 (NS)
Group II	19.3	13.3	18.9	17.5	>0.05 (NS)
Group III	21.2	24.9	22.3	27.9	>0.05 (NS)

Table-2: - Comparison of mean of probing depth and ABO Blood Group among Group II (Periodontitis)

	Blood Group				p-value
	A	B	AB	O	
Group I	38.5	31.4	36.7	34.4	>0.05 (NS)
Group III (PD) mm	47.9	41.7	42.9	53.9	<0.05 (S)

Table-3: - Percentage and frequency distribution of ABO blood Group among Group I (healthy), Group II (gingivitis) and Group III (Periodontitis)

	Blood Group				Significance χ^2 test	Total
	A	B	AB	O		
Group I	81	68	49	148	<0.05 S	346
%	23.41 %	19.65 %	14.16 %	42.78 %		
Group II	191	87	67	111	<0.05 S	456
%	41.89%	19.08 %	14.69 %	24.34 %		
Group III	171	111	72	269	<0.05 S	623
%	27.45 %	17.82 %	11.55 %	43.18 %		
Total	443	266	188	528		

Table-04: - Frequency distribution of ABO blood Group and Rh factor in Group I (Healthy), Group II (Gingivitis) and Group III

	Blood Group								p-value
	A		B		AB		O		
	Rh+	Rh-	Rh+	Rh-	Rh+	Rh-	Rh+	Rh-	
Healthy %	72	9	65	3	45	4	135	13	>0.05 (NS)
Gingivitis %	173	18	79	8	61	6	99	12	>0.05 (NS)
Periodontitis %	151	97	97	14	64	8	237	32	>0.05 (NS)

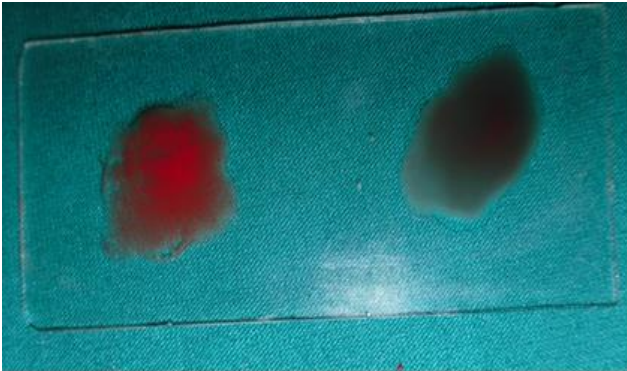
Fig 1: ARMAMENTARIUM



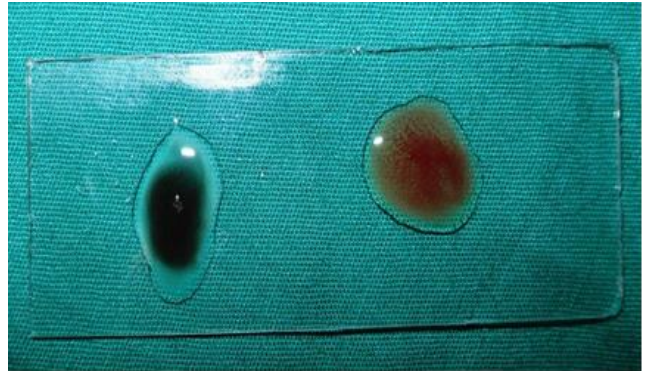
Fig 2: FINGER PRICK METHOD



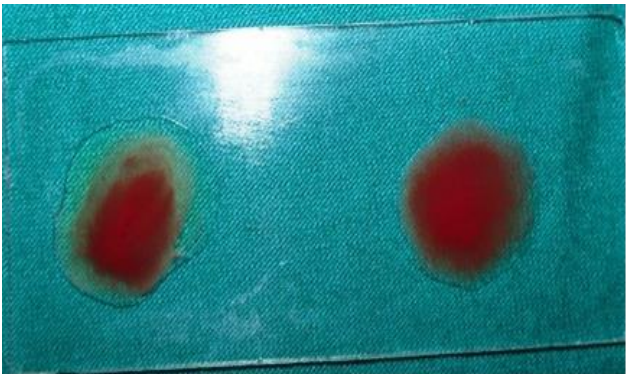
**Fig 3: AGGLUTINATION WITH ANTISERA A
BLOOD GROUP A**



**Fig 4: AGGLUTINATION WITH ANTISERA B –
BLOOD GROUP B**



**Fig 5: AGGLUTINATION WITH ANTISERA A
AND ANTISERA B –BLOOD GROUP AB**



**Fig 6: NO AGGLUTINATION WITH ANTISERA
A AND ANTISERA B –BLOOD GROUP O**

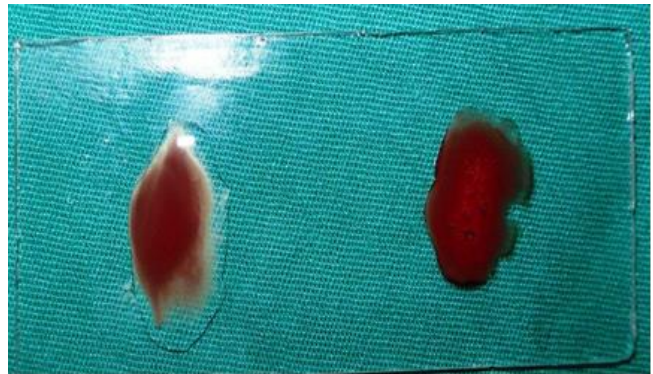


Fig 7: CLINICALLY HEALTHY GINGIVA



Fig 8: GINGIVITIS INDEX



Fig 9 - PROBING DEPTH



Strengthening Public Health: An Assessment of Hand Washing Practices among Primary School Students in India

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Abstract

Background: Hand washing is a fundamental practice for preventing infectious diseases, especially in primary schools where children are vulnerable. This cross-sectional study aims to comprehensively assess hand washing practices, identify influencing factors, and evaluate existing initiatives in primary schools across diverse regions of India.

Methods: A representative sample of 162 students (classes 1-5), were participated in this study. Data were collected through age-appropriate questionnaires, on-site observations, and facility assessments. Statistical analyses, including chi-square tests, were employed to examine associations between variables.

Results: Within school hours, 70% of participants reported consistent hand washing, dropping to 45% outside school hours. Good knowledge of hand washing techniques (45%) and awareness of its importance (60%) were noted, with 20% recognizing barriers. Factors significantly influencing handwashing included the availability of soap ($p = 0.001$), accessibility of facilities ($p = 0.003$), and participation in educational programs ($p = 0.015$). Gender, but not age, showed a significant association ($p = 0.045$) with handwashing practices. Facility assessments indicated 40% reported excellent conditions, while 60% were accessible.

Conclusion: This study provides insights into handwashing practices in Indian primary schools, offering a foundation for evidence-based interventions. Addressing knowledge gaps, enhancing facilities, and implementing tailored strategies can foster a culture of consistent hand hygiene, contributing to improved public health outcomes.

Keywords: handwashing, hygiene practices, primary schools, educational interventions, public health,

INTRODUCTION

Handwashing stands as a foundational and economically viable practice with a crucial role in impeding the dissemination of infectious diseases. This significance is particularly accentuated in the unique environment of

primary schools, where young children represent a demographic highly vulnerable to communicable illnesses. The act of handwashing involves the thorough cleansing of hands with soap and water, serving as a

frontline defense against the transmission of pathogens.^{1,2} In the context of primary schools, where students often engage in close contact activities and share communal spaces, the risk of infections spreading rapidly is elevated. Young children, with developing immune systems and sometimes limited adherence to hygiene practices, are more susceptible to contracting and transmitting infectious diseases. Hence, instilling proper hand washing habits becomes paramount as it not only protects the individual but also contributes significantly to the collective health of the school community.³

The importance of hand hygiene in reducing the transmission of pathogens is well-established in global public health literature.⁴ Proper hand washing can significantly decrease the incidence of respiratory and gastrointestinal infections, contributing to the overall well-being of students, teachers, and the broader community.^{5,6}

In the Indian context, where densely populated communities and diverse socio-economic conditions prevail, the risk of infectious diseases is heightened, necessitating a thorough understanding of hand washing practices in primary schools.⁷ Despite the acknowledged significance of hand hygiene, there is a paucity of comprehensive studies addressing the specific challenges and opportunities for promoting effective hand washing in the Indian primary school setting.

The World Health Organization (WHO) emphasizes the importance of integrating hygiene practices into the educational curriculum and ensuring the provision of adequate handwashing facilities in schools.⁸ However, the extent to which these recommendations are implemented and their impact on the day-to-day practices of students in Indian primary schools remains an area requiring in-depth exploration.

This study seeks to bridge this gap by conducting a detailed assessment of hand washing practices in primary schools across India. By examining the current state of hand hygiene, identifying influencing factors, and

evaluating the efficacy of existing initiatives, the findings of this research aim to inform evidence-based interventions that can enhance hand washing practices in primary schools, contributing to the broader goal of disease prevention and health promotion.

MATERIALS AND METHODS

In this cross-sectional study, we aimed to assess hand washing practices in primary schools across various regions of India. Recognizing the crucial role of hand hygiene in preventing the spread of infections, especially in the school setting, our study focused on understanding the current state of hand washing practices, identifying influencing factors, and evaluating the effectiveness of existing initiatives.

1. Study Design: We conducted a cross-sectional study, selecting a representative sample of primary schools to ensure diversity in geographical and socio-economic factors. The study included 162 students from classes 1 to 5

Ethical Considerations and Informed Consent: Prior to data collection, consent was obtained from school authorities, teachers, and parents/guardians. Ethical approval was secured from the institutional review board.

2. Data Collection:

3. Questionnaires: Age-appropriate questionnaires were meticulously designed to capture a comprehensive understanding of hand washing practices among the 162 students involved in the study. The questionnaires were structured to gather information on various dimensions, including:

- **Hand washing Frequency:** Participants were asked about the frequency with which they engaged in hand washing activities, both inside and outside school hours.
- **Knowledge:** Assessments were made regarding participants' knowledge of proper hand washing techniques, the importance of hand hygiene, and its impact on health.
- **Perceptions:** The questionnaires delved into participants' perceptions of the

existing hand washing facilities, the perceived barriers to consistent hand washing, and attitudes towards hygiene practices.

Prior to administration, the questionnaires were pilot-tested to ensure clarity, relevance, and cultural appropriateness. Responses were anonymized to encourage honest and unbiased feedback.

3.2 Observations: Trained observers conducted on-site visits to primary schools, carefully assessing various aspects of hand washing practices. This involved a systematic approach to observe and document the following:

- **Hand washing Facilities:** Observers examined the type, number, and condition of hand washing facilities available within the school premises.
- **Soap Availability:** The presence and accessibility of soap in proximity to the hand washing stations were noted.
- **Hygiene Practices:** Observers recorded the actual hand washing behavior of students during critical times, such as before meals or after using the restroom. This included assessing compliance with recommended hand washing protocols.

The observational data collection process adhered to a standardized protocol to ensure consistency across all schools. Observers were trained to be discreet, minimizing any impact on the natural behavior of students.

Facility Assessment: A structured checklist was systematically employed to assess the condition and accessibility of hand washing facilities in each school. The checklist covered the following key elements:

- **Physical Condition:** The structural integrity, cleanliness, and maintenance of hand washing stations were evaluated.
- **Accessibility:** The proximity of hand washing facilities to classrooms and common areas, ensuring easy access for students.
- **Amenities:** The availability of soap, water, and drying facilities at each hand washing station was documented.

The facility assessment was conducted in collaboration with school authorities to ensure access to all relevant areas

4. Variables:

4.1 Dependent Variables: Data on the frequency and adequacy of hand washing practices were collected, along with factors influencing these behaviors.

4.2 Independent Variables: Demographic information, including age and gender, was collected. Additionally, the availability and condition of hand washing facilities and the presence of educational programs were considered.

5. Data Analysis:

All the obtained data were statistically analyzed using SPSS software Version 21.0

Descriptive Analysis: Frequencies and percentages were calculated for hand washing practices, and demographic characteristics were summarized.

Inferential Analysis: Statistical tests, such as chi-square tests, were used to identify associations between variables.

RESULTS

Descriptive Analysis:

Hand washing Practices

Table 1 reveals that 70% of participants reported always engaging in hand washing inside school hours, while 45% maintained this frequency outside of school hours. These findings suggest a positive influence of the school setting on hand hygiene practices. However, the lower frequency reported outside school hours underscores the importance of interventions that extend beyond the school premises to promote consistent hand washing behaviors in various settings.

Knowledge and Perceptions

In Table 2, the majority of participants exhibited good to excellent knowledge of proper hand washing techniques (45%) and recognized the importance of hand hygiene (60%). Nevertheless, the data also indicate that 20% acknowledged perceived barriers to consistent hand washing.

Inferential Analysis:

Factors Influencing Hand washing Practices

Table 3 underscores the significant role of specific factors in shaping hand washing practices. Participants in schools with readily available soap exhibited more consistent hand washing ($p = 0.001$). Similarly, accessibility of hand washing facilities ($p = 0.003$) and participation in educational programs ($p = 0.015$) were associated with improved hand hygiene practices.

Demographic Factors

In Table 4, while age did not show a statistically significant association with hand washing practices ($p = 0.102$), gender emerged as a significant factor ($p = 0.045$). This suggests the potential effectiveness of gender-specific interventions in promoting uniform hand washing practices among students.

Facility Assessment:

Condition and Accessibility of Hand washing Facilities

Table 5 provides insights into the condition and accessibility of hand washing facilities. Notably, 40% reported the physical condition of hand washing stations as excellent, while 60% were accessible to classrooms and common areas. However, attention should be given to the small percentages reporting fair or poor conditions (10% and 5%, respectively), indicating the need for targeted improvements to maintain high standards of hygiene infrastructure.

DISCUSSION

In the realm of public health, promoting proper hand hygiene practices is fundamental to preventing the spread of infections, particularly in high-risk environments such as primary schools. This cross-sectional study aimed to conduct a comprehensive assessment of hand washing practices in primary schools across diverse regions of India. Recognizing the critical role of hand hygiene in curbing the transmission of infections, the study focused on understanding the current state of hand washing practices, identifying influencing factors, and evaluating the effectiveness of existing initiatives.

Hand washing Practices The observed hand washing practices indicate a positive influence

within the school setting, with 70% of participants reporting consistent engagement in hand washing during school hours. However, a notable decrease to 45% outside of school hours signals the need for interventions beyond institutional boundaries. This aligns with the broader global health agenda emphasizing the extension of hygiene practices into various contexts.^{9,10}

Knowledge and Perceptions: The study revealed that participants exhibited commendable knowledge of proper hand washing techniques (45%) and recognized the importance of hand hygiene (60%). However, the acknowledgment of perceived barriers by 20% of participants emphasizes the multifaceted nature of promoting consistent hand washing. This underscores the importance of tailored educational initiatives to address these barriers and enhance accessibility to hand washing facilities.^{11,12}

Factors Influencing Hand washing Practices: Statistical analyses established a significant association between hand washing practices and key factors, including the availability of soap, accessibility of hand washing facilities, and participation in educational programs. These findings resonate with existing literature emphasizing the crucial role of infrastructure and educational initiatives in fostering positive hand hygiene behaviors.^{13,14}

Demographic Factors: While age did not emerge as a statistically significant factor, gender exhibited a notable association with hand washing practices. This highlights the necessity for gender-specific interventions, recognizing the potential variations in hygiene behavior based on demographic characteristics.¹⁵ Such tailored approaches have been successful in promoting uniform adherence to hand hygiene practices in diverse cultural settings.¹⁶

Condition and Accessibility of Hand washing Facilities: The facility assessment provided nuanced insights into the condition and accessibility of hand washing facilities. While 40% reported the physical condition of stations as excellent, and 60% were accessible to

classrooms and common areas, attention is warranted for the 10% and 5% reporting fair or poor conditions, respectively. These findings underscore the need for targeted improvements to sustain high standards of hygiene infrastructure in primary schools.¹⁷

Several strengths characterize the design and implementation of this study, enhancing the credibility and reliability of its findings. First and foremost, the utilization of a cross-sectional study design allows for a comprehensive assessment of hand washing practices in primary schools across diverse regions of India. This design facilitates the collection of data at a single point in time, providing a snapshot of the current state of hand hygiene within the selected schools. The inclusion of a representative sample of primary schools ensures the generalizability of findings, considering the geographical and socio-economic diversity inherent in the Indian context. Additionally, the multi-faceted data collection approach, combining age-appropriate questionnaires, on-site observations, and facility assessments, ensures a comprehensive exploration of hand washing practices and associated factors, adding robustness to the study's methodology. These methodological strengths collectively contribute to the study's capacity to generate meaningful insights and inform evidence-based interventions for improving hand hygiene in primary schools.

Public Health Implications:

The findings of this study hold significant public health implications, particularly in the context of primary schools in diverse regions of India. Understanding the dynamics of hand washing practices and associated factors within the school environment provides a foundation for targeted interventions to enhance public health outcomes.

1. **Disease Prevention:** Effective hand hygiene is a cornerstone in preventing the transmission of infectious diseases, especially in settings where individuals come into close contact, such as primary schools. By identifying areas of improvement in hand

washing practices, public health interventions can be tailored to reduce the incidence of infections among students.

2. **Health Promotion in Schools:** The school setting offers a unique opportunity for health promotion initiatives. The study underscores the need for comprehensive hygiene education programs that go beyond theoretical knowledge and actively promote positive hand washing behaviors. Implementing such programs can instill lifelong habits that extend beyond the school years.

3. **Infrastructure Enhancement:** The assessment of hand washing facilities reveals critical insights into the condition and accessibility of hygiene infrastructure. Public health efforts can be directed towards targeted improvements in infrastructure, ensuring that hand washing stations are not only available but also well-maintained and easily accessible to all members of the school community.

4. **Demographic Tailoring:** The significant association between gender and hand washing practices highlights the importance of tailoring interventions to specific demographic groups. Public health campaigns can incorporate gender-specific strategies to address variations in hand hygiene behavior among students. This personalized approach may contribute to more equitable health outcomes.

Future Directions:

1. **Longitudinal Studies:** To gain a deeper understanding of the sustained impact of interventions, future research could adopt a longitudinal approach. Long-term studies tracking hand washing practices and associated factors over an extended period would provide insights into the durability of behavior change and the lasting effects of interventions.

2. **Qualitative Exploration:** Complementing quantitative findings with qualitative exploration could offer richer insights into the cultural and contextual factors influencing hand hygiene. In-depth interviews and focus group discussions with students, teachers, and parents could provide a nuanced

understanding of attitudes, beliefs, and social norms related to hand washing .

3. Multi-Stakeholder Collaboration: Future interventions should involve collaboration between public health authorities, school administrators, parents, and local communities. Engaging all stakeholders in the design and implementation of hand hygiene initiatives can enhance the sustainability and effectiveness of interventions.

4. Technological Solutions: The integration of technology, such as mobile applications or interactive platforms, could be explored to reinforce hand hygiene practices. Gamified educational modules or real-time monitoring systems may provide innovative ways to engage students and promote sustained behavior change.

5. Economic Evaluations: Conducting economic evaluations of hand hygiene interventions could further inform decision-

makers about the cost-effectiveness of various strategies. Understanding the economic impact of interventions can guide resource allocation and prioritize initiatives that yield the greatest public health benefits.

Conclusion

This study contributes substantially to the understanding of hand washing practices in primary schools in India. The nuanced findings inform evidence-based interventions encompassing educational initiatives, infrastructure enhancements, and demographic-specific strategies. By addressing these facets, primary schools can play a transformative role in cultivating a culture of consistent hand hygiene, ultimately contributing to the overall health and well-being of students.

BIBLIOGRAPHY

1. Toney-Butler TJ, Gasner A, Carver N. Hand Hygiene. [Updated 2023 Jul 31]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470254/>
2. Mathur P. (2011). Hand hygiene: back to the basics of infection control. *The Indian journal of medical research*, 134(5), 611–620. <https://doi.org/10.4103/0971-5916.90985>
3. Centers for Disease Control and Prevention (CDC). Handwashing: Clean Hands Save Lives [Internet]. Atlanta (GA): CDC; [date unknown] [cited 2023 Nov 20]. Available from: <https://www.cdc.gov/handwashing/handwashing-school.html>
4. Magiorakos, A. P., Leens, E., Drouvot, V., May-Michelangeli, L., Reichardt, C., Gastmeier, P., Wilson, K., Tannahill, M., McFarlane, E., & Simon, A. (2010). Pathways to clean hands: highlights of successful hand hygiene implementation strategies in Europe. *Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin*, 15(18), 19560.
5. Aiello, A. E., Coulborn, R. M., Perez, V., & Larson, E. L. (2008). Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. *American journal of public health*, 98(8), 1372–1381. <https://doi.org/10.2105/AJPH.2007.124610>
6. Khan, K. M., Chakraborty, R., Brown, S., Sultana, R., Colon, A., Toor, D., Upreti, P., & Sen, B. (2021). Association between Handwashing Behavior and Infectious Diseases among Low-Income Community Children in Urban New Delhi, India: A Cross-Sectional Study. *International journal of environmental research and public health*, 18(23), 12535. <https://doi.org/10.3390/ijerph182312535>
7. Tulchinsky, T. H., & Varavikova, E. A. (2014). Expanding the Concept of Public Health. *The New Public Health*, 43–90. <https://doi.org/10.1016/B978-0-12-415766-8.00002-1>
8. World Health Organization (WHO). WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care Is Safer Care. [Online]. Available: <https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene>.

9. Toney-Butler, T. J., Gasner, A., & Carver, N. (2023). Hand Hygiene. In StatPearls. StatPearls Publishing.
10. Clancy, C., Delungahawatta, T., & Dunne, C. P. (2021). Hand-hygiene-related clinical trials reported between 2014 and 2020: a comprehensive systematic review. *The Journal of hospital infection*, 111, 6–26. <https://doi.org/10.1016/j.jhin.2021.03.007>
11. Gould, D. J., Moralejo, D., Drey, N., Chudleigh, J. H., & Taljaard, M. (2017). Interventions to improve hand hygiene compliance in patient care. *The Cochrane database of systematic reviews*, 9(9), CD005186. <https://doi.org/10.1002/14651858.CD005186.pub4>
12. Martos-Cabrera, M. B., Mota-Romero, E., Martos-García, R., Gómez-Urquiza, J. L., Suleiman-Martos, N., Albendín-García, L., & Cañadas-De la Fuente, G. A. (2019). Hand Hygiene Teaching Strategies among Nursing Staff: A Systematic Review. *International journal of environmental research and public health*, 16(17), 3039. <https://doi.org/10.3390/ijerph16173039>
13. Mbakaya, B. C., Lee, P. H., & Lee, R. L. (2017). Hand Hygiene Intervention Strategies to Reduce Diarrhoea and Respiratory Infections among Schoolchildren in Developing Countries: A Systematic Review. *International journal of environmental research and public health*, 14(4), 371. <https://doi.org/10.3390/ijerph14040371>
14. Mbakaya, B. C., Lee, P. H., & Lee, R. L. (2017). Hand Hygiene Intervention Strategies to Reduce Diarrhoea and Respiratory Infections among Schoolchildren in Developing Countries: A Systematic Review. *International journal of environmental research and public health*, 14(4), 371. <https://doi.org/10.3390/ijerph14040371>
15. Barcenilla-Guitard, M., & Espart, A. (2021). Influence of Gender, Age and Field of Study on Hand Hygiene in Young Adults: A Cross-Sectional Study in the COVID-19 Pandemic Context. *International journal of environmental research and public health*, 18(24), 13016. <https://doi.org/10.3390/ijerph182413016>
16. Goerig, T., Dittmann, K., Kramer, A., Diedrich, S., Heidecke, C. D., & Huebner, N. O. (2018). Infection control perception and behavior: a question of sex and gender? Results of the AHOI feasibility study. *Infection and drug resistance*, 11, 2511–2519. <https://doi.org/10.2147/IDR.S178922>
17. Ministry of Human Resource Development, Government of India. Swachh Bharat: Swachh Vidyalaya - National Guidelines. Available from: https://www.education.gov.in/sites/upload_files/mhrd/files/upload_document/Eng_Swachch-Bharat-Swachch-Vidhalaya.pdf

TABLES

Table 1: Hand washing Practices

Frequency of Hand washing	Inside School Hours (%)	Outside School Hours (%)
Always	70	45
Often	20	30
Rarely	8	15
Never	2	10

Table 2: Knowledge and Perceptions Regarding Hand washing

Aspect	Excellent (%)	Good (%)	Fair (%)	Poor (%)
Knowledge of Proper Hand washing Techniques	45	35	15	5
Understanding of the Importance of Hand Hygiene	60	25	10	5
Perceived Barriers to Consistent Hand washing	20	35	30	15
Positive Attitudes Toward Hygiene Practices	70	25	3	2

Table 3: Factors Influencing Hand washing Practices

Variable	P-value
Availability of Soap	0.001*
Accessibility of Hand washing Facilities	0.003*
Participation in Educational Programs	0.015*

*Statistically significant

Table 4: Demographic Factors and Hand washing Practices

Demographic Characteristic	P-value
Age	0.102
Gender	0.045*

*Statistically significant

Table 5: Condition and Accessibility of Hand washing Facilities

Aspect	Excellent (%)	Good (%)	Fair (%)	Poor (%)
Physical Condition of Hand washing Stations	40	45	10	5
Accessibility to Classrooms and Common Areas	60	30	8	2
Availability of Amenities (Soap, Water, Drying)	50	40	7	3