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Unilateral Marginal Mandibular

Highlights

Humans Dental Arch Shapes

Parathyroid Preservation during

Discovering Thoughts, Inventing Future

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CONTENTS OF THE ISSUE

- i. Copyright Notice
- ii. Editorial Board Members
- iii. Chief Author and Dean
- iv. Contents of the Issue

- 1. Humans Dental Arch Shapes. *1-3*
- 2. Parathyroid Preservation during Total Thyroidectomy and its Outcome. *5-8*
- 3. Unilateral Marginal Mandibular Nerve Palsy in a Case of Submandibular Space Abscess – A Rare Case Report with Review of Literature. *9-13*
- 4. Gingival Diseases: World and Indian Scenario a Background Check. *15-19*

- v. Fellows
- vi. Auxiliary Memberships
- vii. Process of Submission of Research Paper
- viii. Preferred Author Guidelines
- ix. Index



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Humans Dental Arch Shapes

By Ganesh P. Pokhariyal

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Abstract- The dental arches for humans change their shape from a parabola to an ellipse at canine. This was shown by the change in the value of discriminant $B^2 - 4AC$ in the general second degree equation. In the present study the change for the dental arch shape has been alternatively suggested through the change in the value of eccentricity e , which is 1 for parabola and less than 1 for ellipse. The range of values between 0 and 1 for e can then be possibly assigned to different races or ethnic groups, through corresponding data values.

Keywords: *human, dental arch, parabola, ellipse and eccentricity.*

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Keywords: human, dental arch, parabola, ellipse and eccentricity.

I. INTRODUCTION

The dental arch shapes for humans and other mammals have been studied using the theory of conic sections. Attempts to provide mathematical description of dental arch shapes began during the first quarter of twentieth century (Bookstein 1984; Lestrel 1989). Mc Conail and Scher (1949), Scott (1957), Musich and Ackerman (1973) suggested Catenary curve as ideal curve for the dental arch. Lu (1964) claimed that the dental arch could be satisfactorily described by a fourth degree polynomial equation. Ramsden (1964) concluded that a parabola best represents an anterior curvature of the dental arch, although an arch that fitted a precise pattern was to be regarded as an exception rather than rule.

Currier (1969) found that the buccal surfaces of the maxillary arch conform more closely to an ellipse than to a parabola, but neither of these curves exhibited a significant fit to the lingual curves of the arches. Ridge (1981) reviewed the literature dealing with dental arch form and suggested that ideal arch as being constructed upon an equilateral triangle with slight modification. Ferrario et al (1994) used mixed elliptical plus parabolic model and concluded that shape of dental arch changes from an ellipse to a parabola at canine. Pokhariyal (1997) used a general second degree equation for the entire dental arch, with boundary condition at the canine, where parabola changes to an ellipse.

Pokhariyal et al. (2004) considered a general second degree equation

$$Ax + Bxy + Cy^2 + Dx + Ey + F = 0, \quad (1)$$

for the entire dental arch. The value of discriminant $B^2 - 4AC$ equal to zero gives parabola, while less

than zero gives ellipse, the change of shape of dental arch at canine was verified by substituting the value of coordinates of the conic from parabola to an ellipse. The shapes were simulated for the data values from different ethnic groups, gender and the total sample and all shapes confirmed the change of parabola to ellipse at canine. This argument has been based on elementary knowledge of geometry, which suggests that the general second degree equation provides a mechanism for shifting from one curve to another at a point by fulfilling the required conditions. It was further shown that the inner region of the dental arch remained parabolic throughout, without changing from parabola to ellipse at canine.

II. ALTERNATIVE REPRESENTATION

In this study, an alternative definition for all conics is provided from the basic concepts of geometry, which can then be used to represent dental arch shape for humans, that change from one conic to another. "A conic is the set of points located in a plane such that the undirected distance of each point from a fixed point divided by its undirected distance from a fixed line is the same constant". The fixed point is called the *focus*, the fixed line is known as the *directrix* and the constant e is referred to as the *eccentricity*.

The equation of the conic with eccentricity e , a focus at $(p, 0)$ and directrix along the y -axis is

$$(1 - e^2)x^2 + y^2 - 2xp + p^2 = 0. \quad (2)$$

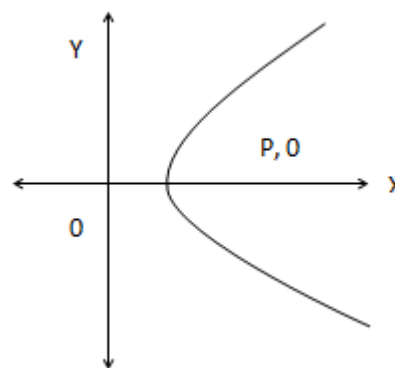


Figure 1a : Conics with y -axis as directrix

Similarly the equation of conic with eccentricity e , a focus at $(0, p)$ and directrix along the x -axis is

$$(1 - e^2)y^2 + x^2 - 2py + p^2 = 0. \quad (3)$$

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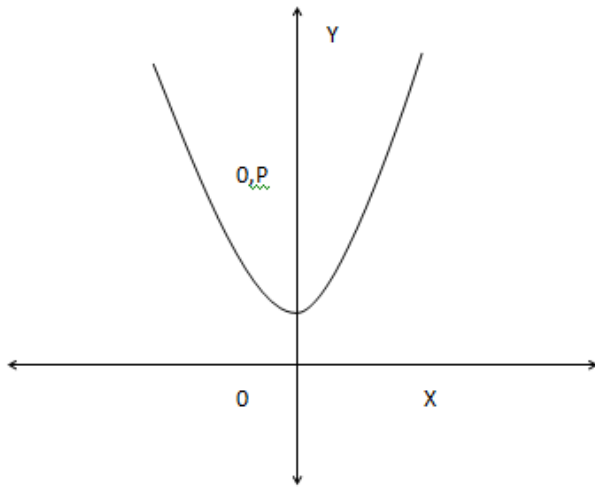


Figure 1b : Conic with x-axis as directrix.



Figure 2a : Human dental arch.

According to the value of eccentricity e , the conics are classified in a manner that for ellipse e lies between 0 and 1 . The extreme values 0 and 1 give circle and parabola respectively.

The change of the shape at canine for human data values can thus be confirmed for the collected data values from the subjects, using these conditions.

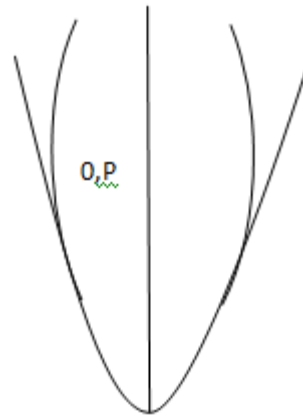


Figure 2b : Change of parabola to ellipse at canine.

III. DISCUSSION

The dental arch shape can therefore be determined through change in the value of discriminant or eccentricity at the canine from parabola to ellipse. Hence, there seems to be no need to make ad-hock assumptions about the dental arch shape. There can be infinite numbers between 0 and 1 , so each Individual can have unique value of e for their dental arch shape. Thus, in the classification of dental arch shapes (that change at canine) for different races, ethnic groups and gender, the values of eccentricity can be computed. The range of values between 0 and 1 can then be assigned to these groups, through the analysis of the respective data values.

It is understood that dental arch portion which is parabolic (up to canine) influences the shape of small part of upper portion of chin and lips. It is considered that middle and upper base of the face is governed by the dental arch which is ellipse. Thus, one could possibly link the facial base with the corresponding values of e for different racial and ethnic groups. Such findings can then be used for relatively accurate arch-

wire construction and preparation on dental prostheses. In future, the study of change in dental arch shape can also be extended to other mammals.

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Parathyroid Preservation during Total Thyroidectomy and its Outcome

By Sharfuddin Mahmud, Manilal Aich, Shahjahan Sarker, Md. Siddikur Rahman, Md. Abul Kashem, Md. Shaikhul Islam, Md. Abu Bakar Siddik, Mohd. Rafiul Alam & Mohana Hossain

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Abstract- Objectives: To know the incidence of hypocalcaemic tetany at post surgical state of total thyroidectomy.

Methods: It was a cross sectional observational study among 50 patients who underwent total thyroidectomy in the Dept. of Otolaryngology and Head Neck Surgery, Sir Salimullah Medical College and Mitford Hospital & Dhaka Medical College Hospital during the period from January 2014 to December 2014.

Results: In this study out of 50 patients 14 (28%) were male and 36 (72%) were female. Male to female ratio is 1:2.57. Maximum patients (34%) were in 4th decade. Among them 29 (58%) for multinodular goiter, 19(38%) patients for papillary thyroid carcinoma, 1 (2%) patients for medullary thyroid carcinoma and 1 (2%) and for Graves disease. 12 (24%) patients were presented along with cervical lymphadenopathy.

Keywords: *arathyroid glands, total thyroidectomy, hypocalcaemic tetany.*

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Keywords: arathyroid glands, total thyroidectomy, hypocalcaemic tetany.

I. INTRODUCTION

In the past century, a lethal outcome occurred in more than 40% of patients undergoing thyroidectomy and morbidity levels were also consequently very high. Through the contribution of several pioneers in thyroid surgery such as Billroth, Halsted and Kocher, thyroid surgery has become a relatively safe operative procedure.¹ Nonetheless, there are still many complications related to thyroid surgery. Among them hypoparathyroidism is perhaps the most distressing. Parathyroid preservation during thyroidectomy is not only desirable, but essential for the effective management of surgical diseases of the thyroid gland.¹ Most individuals possess at least two pairs of parathyroid glands. To the unaided eye, the glands are

a yellow brown orange colour. At operation brown fat, yellow fat, sequestered thyroid tissue, thymus, lymph node and autonomic ganglia may all mimic these appearances.² Each weighs about 50 mg.³ The lowest post-operative serum-calcium level that can be regarded as normal has not been agreed. Wade(1960) thought that any patient with a serum-calcium level between 8 and 9 mg/100 ml was in need of treatment, and those with a level below 7.5 mg/100 ml were in need of urgent treatment.⁴ Biochemical monitoring of serum calcium and PTH levels can assist in initiating early management for postoperative hypocalcemia and reducing hypocalcaemic symptoms during the early weeks after surgery.⁵ The reasons for postoperative hypoparathyroidism are devascularizations of parathyroid glands during surgery owing to the close proximity to the thyroid capsule, the accidental removal of one or more parathyroid gland (s), destruction of the parathyroid glands as a result of lymphadenectomy or hypoparathyroidism due to hematoma formation.⁶

Permanent and transient hypoparathyroidism can be reduced by identification of the parathyroid glands, dissection close to the thyroid gland, preservation of the blood supply to the parathyroid glands and avoiding manipulation of parathyroid glands.⁷ Ligation of the inferior thyroid artery preferably should be performed close to the thyroid capsule to minimize the risk of postoperative hypoparathyroidism.⁸ Vascular injury probably far more important than inadvertent removal. The incidence of permanent hypoparathyroidism should be less than 1% and most cases present dramatically 1 – 5 days after operation; however very rarely onset is delayed 2 – 3 weeks or a patient with marked hypocalcaemia remain asymptomatic.⁹ The incidence of temporary hypoparathyroidism is approximately 10 – 20 percent and is often an inevitable consequence of total thyroidectomy and this may be reduced by sound anatomical knowledge, surgical technique and experience.¹⁰ Removal of a single parathyroid gland is not associated with postoperative hypocalcemia, resection of at least 2 parathyroid glands increases the risk of transient and permanent hypoparathyroidism.¹¹ Careful examinations of the surgical specimen intraoperatively decreases the incidence of inadvertent parathyroidectomy during thyroidectomy, ligation of the superior thyroid artery after identifying and saving its

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anastomotic vessel to inferior thyroid artery and ligation of the inferior thyroid artery close to the gland if at all possible.¹²

II. RESULTS

Table -I : Age and sex distribution of the sample (n=50)

Age	Sex		Total
	male	female	
10-20yrs	0	3	3
21-30yrs	4	9	13
31-40yrs	5	12	17
41- 50 yrs	2	5	7
>50yrs	3	7	10
Total	14	36	50

Table -II : Case diagnosis of sample underwent total thyroidectomy (n=50)

Diagnosis	Number of patients	Percentage(%)
Multinodular goiter	29	58
Papillary thyroid carcinoma	19	38
Medullary thyroid carcinoma	1	2
Graves disease	1	2
Total	50	100

Table-III : Clinical presentation of study population (n = 50)

	Frequency	Percentage
Only thyroid swelling	38	76.0
Thyroid swelling with nodal metastasis	12	24.0
Total	50	100.0

Table-IV : Level of lymph node involvement (n=12)

Levels	Rt. Side	Lt. side	Total(%)
II	4	2	6 (54.54)
III	8	2	10 (90.90)
IV	7	1	8 (72.72)
V	4	0	4 (36.36)
VI	3	1	4 (36.36)

Table- V : Frequency of hypocalcaemia on the basis of extent of surgery (n = 50).

Surgery	No. of patients	No. of Hypocalcemia	Percentage (%)
Total thyroidectomy	33	6	18.18
Completion thyroidectomy	5	2	40
Thyroidectomy and neck dissection	12	7	58.33

Table-VI : Incidence of hypocalcaemia in parathyroid identified and not identified during thyroid surgery (n = 50).

Group	Hypocacaemia	No Hypocacaemia	Total Patient	Percentage of Hypocalcaemia
Group A (Parathyroid Identified)	10	32	42	23.8%
Group B (Parathyroid not Identified)	5	3	8	62.5%
Total	15	35	50	

Table- VII : Time interval for development of hypocalcaemia after thyroid surgery.

Time interval	No. of patients	Percentage (%)
1 st POD	1	6.66%
2 nd POD	10	66.73%
3 rd POD	3	20%
4 th POD	1	6.66%

Table- VIII : Type of hypocalcaemia after thyroid surgery (n = 15).

Type	No. of patients	Percentage (%)
Temporary hypocalcaemia	12	24
Permanent hypocalcaemia	3	6
Total	15	30

III. DISCUSSION

In this series 50 patients were included in the study those who had undergone total or completion thyroidectomy with or without neck dissection. Among them 14 (28%) were male and 36 (72%) were female. Male to female ratio is 1:2.57 (Table-I). Similar sex distribution has been found in another study where male 22% and female 78% and male to female ratio was 1:3.57.¹³

In our study out of 50 patients 29 (58%) were multinodular goiter, 19 (38%) patients were papillary thyroid carcinoma, 1 (2%) patients were medullary thyroid carcinoma and 1 (2%) and were Graves disease (Table - II). In a study shows that indication of thyroidectomy in thyroid cancer 52% case and Benign multinodular goiter 48%.⁷

Regarding clinical presentation of the study population thyroid swelling was present in all cases (100%). Out of them 12 (24%) patients were presented along with cervical lymphadenopathy (Table-III). Lymph nodes involvement was most common in level III (90.9%) and level IV (72.72%). Clinically no palpable lymph nodes were found in level I. Unilateral lymphadenopathy was 9(75%), whereas bilateral involvement was 3 (25%) (Table- IV). Result correspond with the other study which showed in level III 82% and in level IV 75%.¹⁵

In our study most hypocalcaemia developed in patients underwent thyroidectomy with neck dissection (58.33%); it was followed by completion thyroidectomy 40% and total thyroidectomy 18.18% (Table- V).

The difference between thyroidectomy with neck dissection and thyroidectomy alone in the development of hypocalcaemia was statistically significant. $\chi^2=6.03$, $P < 0.05$ i.e. in case of more extensive disease, the chance of developing hypocalcaemia is significantly more. In one study shows that hypoparathyroidism occurs more frequently in patients with large extension and invasive thyroid cancer and when total thyroidectomy is associated with central and lateral neck dissection.¹⁴

In this study (Table- VI) it is found that occurrence of hypocalcemic tetany is more in the group where parathyroid was not identified preoperatively.

The difference in the development of hypocalcaemic tetany between identification and not identification of parathyroid gland was statistically significant ($\chi^2 = 4.79$, $p < 0.05$).

So it can be concluded that there is a significant association between development of hypocalcaemia and not identification of parathyroid preoperatively which coincides with other study.¹⁶

In our study it is found that maximum patients 10 (66.73%) were developed hypocalcemic tetany in second postoperative day (n= 15), 3(20%) cases developed hypocalcaemia in 3rd post operative day (Table-VII). One study shows that symptoms of hypocalcaemia usually appear 24-48 hours after surgery.¹³ This finding is similar to that of the current study.

A study conducted at King Abdul Aziz University, Jeddah, Saudi Arabia in 2005 revealed transient hypocalcaemia occurred 6.9% to 42% and permanent hypocalcaemia 4% to 29%.¹⁸

One study shows that post operative hypocalcaemia is the most common complication with incidence ranging from 1.6 to 50%.¹³

The result in this series showed that temporary hypocalcaemia occurred in 24% cases and permanent hypocalcaemia occurred in 6% cases (Table- VIII), which is within the range of other study.

IV. CONCLUSION

In this study we suggest that inferior thyroid artery should be ligated close to the thyroid capsule and at least two parathyroid gland should be identified and preserved. In the context of our country, now a days most of our thyroid surgeons are expert enough to identify and preserve recurrent laryngeal nerve and external branch of superior laryngeal nerve but identification and preservation of parathyroid gland during thyroid surgery is not well practiced. Even if all the parathyroid glands cannot be completely accounted for, the surgeon should make an attempt at identifying and preserving parathyroid glands without damaging their blood supply. Proper knowledge and expertness regarding parathyroid preservation can alleviate sufferings of the patient due to iatrogenic morbidity.. Now a days it is more concern all over the world.

Magnification during surgery is helpful in preservation of parathyroid gland.

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Unilateral Marginal Mandibular Nerve Palsy in a Case of Submandibular Space Abscess - A Rare Case Report with Review of Literature

By Jyoti Ranjan Das, Ajay Manickam, Jayanta Saha & Sumit Kumar Basu

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Abstract- Deep Neck space anatomy is complex and unique. Infection of any part of these spaces can lead to life threatening condition. In most cases, source of infection is odontogenic in nature. Infection of lower molar teeth leads to submandibular infection which can result in complication like Ludwig's angina, necrotizing cervical fasciitis of head and neck region, mediastinitis. It is highly unusual for paralysis of facial nerve or its branch to occur from submandibular space infection. Here, we report a case of marginal mandibular nerve paralysis as a result of submandibular space abscess originating from mandibular second molar and third molar which is considered rare.

Keywords: deep neck space, odontogenic infection, submandibular area, marginal mandibular nerve paralysis.

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Unilateral Marginal Mandibular Nerve Palsy in a Case of Submandibular Space Abscess – A Rare Case Report with Review of Literature

Jyoti Ranjan Das ^α, Ajay Manickam ^σ, Jayanta Saha ^ρ & Sumit Kumar Basu ^ω

Abstract- Deep Neck space anatomy is complex and unique. Infection of any part of these spaces can lead to life threatening condition. In most cases, source of infection is odontogenic in nature. Infection of lower molar teeth leads to submandibular infection which can result in complication like Ludwig's angina, necrotizing cervical fasciitis of head and neck region, mediastinitis. It is highly unusual for paralysis of facial nerve or its branch to occur from submandibular space infection. Here, we report a case of marginal mandibular nerve paralysis as a result of submandibular space abscess originating from mandibular second molar and third molar which is considered rare.

Keywords: deep neck space, odontogenic infection, submandibular area, marginal mandibular nerve paralysis.

I. INTRODUCTION

Life-threatening infections of the head and neck are much less common since the introduction of antibiotics and mortality rates are lower. The widespread use of antibiotics has also altered their clinical presentation. But increasing number of patients with severe immunosuppression condition like diabetes mellitus, immuno suppressant drug, radiotherapy and the complex anatomic features of the head and neck can lead to life-threatening complications. Common source for head and neck space infection is odontogenic infection¹. Most infections are however polymicrobial in nature². Notable aerobic species include streptococcus viridans, staphylococcus aureus, staphylococcus epidermidis. Anaerobes probably play a significant role in these abscess. S.viridans is the most common organism isolated³. Currently isolated anaerobes include streptococcus, fusobacterium, bacteroides⁴. This infection can spread to any part of neck. Infection in second and third molar tooth drain to submandibular space usually presents with clinical symptoms like fever, swelling, pain, trismus and varying degree of toxic systemic symptoms. Complication can lead to Ludwig's angina, neurovascular complications including carotid artery aneurysm, Lemierre's syndrome, Horner syndrome, mediastinitis, Necrotising cervical fasciitis which are potential lethal entities⁵. But unilateral palsy of any branch of facial nerve secondary to space

infection has been rarely reported in literature. Here we report a case of 40 year diabetic male presented with Right side submandibular space abscess and right side marginal mandibular branch of facial nerve palsy as complication.

II. CASE REPORT

A 40 year male came to our ENT emergency with complains of swelling over right side submandibular region, fever, difficulty in opening of mouth for last 10 days. Swelling was sudden in onset and progressive in nature associated with pain. He was also complaining of pain in oral cavity and difficulty in opening of mouth. Due to above symptoms, he was having difficulty in food intake. He was a known case of diabetic mellitus for last 6 years and on oral anti diabetic drug. But for last two weeks he was not taking medication regularly. There was no history of tuberculosis or any other previous illness or any head and neck surgery. On examination patient was febrile. There was swelling of about 6x4 cm size over right side submandibular area with overlying skin erythematous. There was no evidence of any sinus or ulcer. There was trismus and halitosis. Superiorly swelling was extended to right side mandible and inferiorly to a level around 5cm from midline at the level of hyoid bone. On palpation, surface temperature was raised. It was tender, fluctuant (Figure 1). There was no cervical lymph node enlargement. On facial nerve examination there was only deviation of angle of mouth to left side while other test like frowning of forehead, closure of eyes, whistling etc. was normal (Figure 2). Informed consent was taken that patients clinical photograph will be included without hiding his identification. Intraoral examination was compromised due to limited mouth opening. Detail ear and nose examination was done. Both ears were within normal limit. Nose on anterior rhinoscopy examination was normal. Other systemic examination was within normal limit. Patients CBG was measured which was 325mg/dl. Patient was immediately admitted. Intravenous antibiotic covering both aerobic and anaerobic infections, normal saline fluid, antipyretics, were started. Regular insulin subcutaneously was started and continued. Depending on sugar level insulin dose was regulated. All routine investigations were done. Complete hemogram report

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showed TLC 15600, ESR 46, RBS 306 mg/dl. CT scan of neck was done which showed hypodense SOL with rim enhancement measuring 58x35x42 mm is seen in right submandibular region (Figure 3). There was evidence of air pocket with the lesion. Incision and drainage of abscess was done and pus was sent for culture and sensitivity. Regular dressing of incised area was done. He showed a gradual recovery over next 3-4 days. On 4th day, patient was able to open mouth. On examination of oral cavity, there was a right side 2nd molar and 3rd molar tooth dental caries (Figure 4). Culture and sensitivity report showed mixed organisms consisting of streptococcus viridians, streptococcus pyogens, staphylococcus aureus and bacteroids. The healing of the wound was satisfactory. Patient was discharged after 7 days. On post-operative visit after 10 days, there was improvement in paralysis of lower part of face. Wound site was healthy. Patient was sent to dental surgery department for dental caries, and the 2nd molar and 3rd molar teeth were removed. Patient has been advised to come for regular follow up.

III. DISCUSSION

Head and neck space anatomy is complex. Knowledge of all neck spaces is important in the understanding of spread of infection. Several reports have indicated that the origins of most DNIs are odontogenic infections. Consistent with this finding, the submandibular space is frequently involved in these infections⁶.

The submandibular space is limited above by the oral mucosa of the floor of the mouth and below by the superficial layer of the deep cervical fascia as it extends from the mandible to the hyoid bone. Mylohyoid muscle divides the submandibular space into the *sublingual or superior space*, containing the sublingual glands, the deep smaller portion of the submandibular gland, and Wharton's duct, and the *sub maxillary or inferior space*, containing the larger superficial portion of the submandibular space and its lymph nodes. These spaces communicate freely around the posterior border of the mylohyoid muscle. The sub maxillary space may be further divided into a central sub mental space, between the anterior bellies of the digastric muscles, and lateral sub maxillary spaces⁷.

The mylohyoid muscle also plays a key role in determining the direction of spread of dental infections. It attaches to the mandible at an angle, leaving the apices of the second and third molars below the mylohyoid line and the apex of the first molar above. Most apical molar infections perforate the mandible on the lingual side, so if the tooth apex is above the mylohyoid line it will involve the sublingual space. If it perforates below the mylohyoid line it involves the submylohyoid space⁸. Patients with submandibular infection generally presented with fever, trismus,

swelling over neck submandibular region, difficulty in opening mouth and taking food. Complication can lead to Ludwig's angina, neurovascular complications including carotid artery aneurysm, Lemierre's syndrome, Horner syndrome, mediastinitis, Necrotising cervical fasciitis⁹.

Unilateral palsy of branch of facial nerve secondary to space infection as seen in our case has been rarely reported in literature. This complication can be explained on the basis of anatomical landmarks and compression, especially in association with local inflammation. Facial nerve after entering posterior surface of parotid gland divides into upper and lower division. Upper division gives rise to frontal, zygomatic, buccal branches and lower division give rise to marginal mandibular nerve¹⁰.

Marginal mandibular nerve runs inferior to angle of mandible. It dips down into neck and runs superficial to submandibular gland. The nerve runs just deep to platysma and superficial to deep fascia. It runs inferior to greater cornu of hyoid bone then curves upward and crosses mandible for a second time close to facial artery and vein¹¹. Generally lower division branches of facial nerve i.e. marginal mandibular nerve and cervical branches are thinner and more delicate. Hence neuropraxia is seen particularly with these branches¹².

If abscess develops in submandibular region, it can cause marginal mandibular nerve palsy. Ischemic neuropathy arising from the local toxic effects of infection and from the compression of the nerve due to expanding abscess is suggested mechanism¹³. A person with palsy of this marginal mandibular branch of the facial nerve presents a very conspicuous deformity on opening the mouth, smiling or grimacing¹⁴. Surgical incision and drainage is indicated in face of worsening symptoms despite administration of antibiotics¹⁵. In our case a diabetic patient presented with fluctuant, tender, erythematous swelling over right side submandibular region with dental caries, trismus and right side mandibular nerve palsy. As uncontrolled diabetic can cause immunosuppression, swelling in this case had a rapid course with marginal mandibular nerve palsy. Incision and drainage of the submandibular abscess was done. During the procedure care was taken to avoid the injury to the marginal mandibular nerve. A rapid partial recovery of the paralysis was seen within 10 days after the surgical drainage. This suggested that the marginal mandibular nerve palsy could have resulted from compression effect or ischemic neuropathy due to inflammatory process arising from space infection. It also showed that this neck space infection can be avoided if comorbid condition like diabetic mellitus is controlled.

The Authors Declare there is No Conflicts of Interest

IV. CONCLUSION

Submandibular space infection is most commonly seen in immunocompromised patient with dental infection. It can cause many complications. But Unilateral palsy of branch of facial nerve secondary to this infection as seen in our case is not very common and not frequently mentioned in literature .Hence this case is reported.

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Figure 1: Right side submandibular abscess



Figure 2 : Right side mandibular nerve palsy

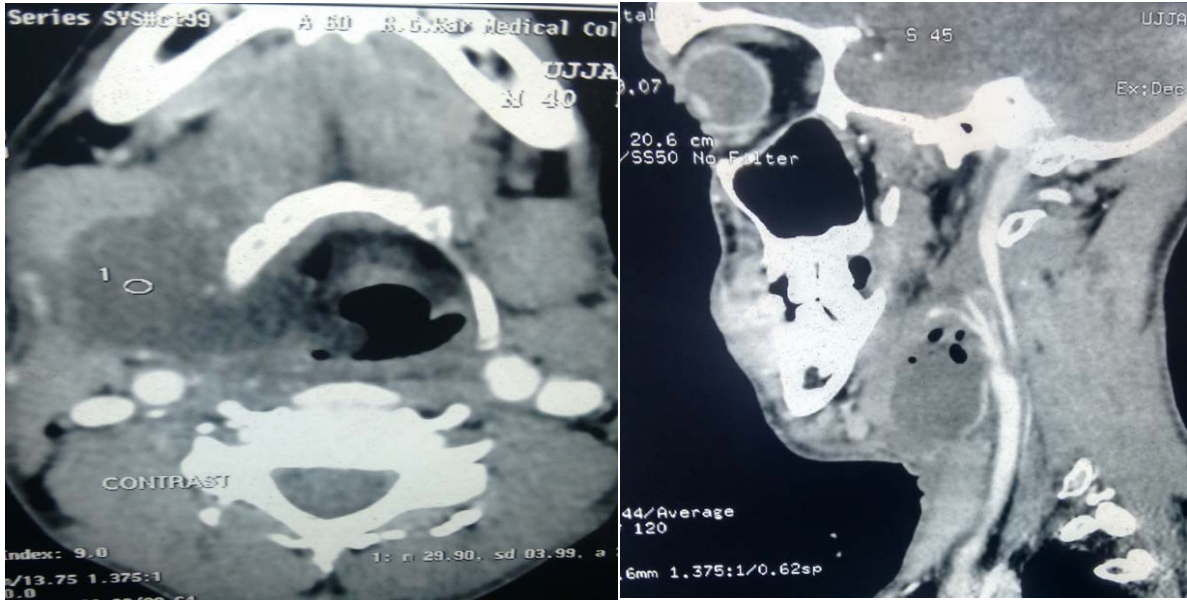


Figure 3 : CT scan neck showing submandibular abscess



Figure 4 : dental carries of right side 2nd and 3rd molar teeth



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Gingival Diseases: World and Indian Scenario a Background Check

By Dr. Dharendra Kumar Singh & Dr. Ipsita Jayanti

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Abstract- Gingivitis is nothing but the inflammation of gingival soft tissue. Various forms of gingivitis have been described in various literatures. Although the clinical signs of gingivitis are easy to detect, it is not clear how much inflammation a person must have to be considered a gingivitis case. The prevalence and incidence of gingival diseases in individuals of different ages and socio-economic strata gives us a clear view of the association and distribution of etiological factors causing gingival and periodontal diseases.

Current article summarizes the present World and Indian scenario of gingival diseases that will definitely help the dental professionals in their future diagnosis and treatment plan of periodontally compromised patients.

Keywords: *Gingival diseases; Epidemiology; Oral Hygiene Practices.*

GJMR-J Classification: *NLMC Code: WU 240*



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Gingival Diseases: World and Indian Scenario a Background Check

Dr. Dharendra Kumar Singh ^α & Dr. Ipsita Jayanti ^σ

Abstract- Gingivitis is nothing but the inflammation of gingival soft tissue. Various forms of gingivitis have been described in various literatures. Although the clinical signs of gingivitis are easy to detect, it is not clear how much inflammation a person must have to be considered a gingivitis case. The prevalence and incidence of gingival diseases in individuals of different ages and socio-economic strata gives us a clear view of the association and distribution of etiological factors causing gingival and periodontal diseases.

Current article summarizes the present World and Indian scenario of gingival diseases that will definitely help the dental professionals in their future diagnosis and treatment plan of periodontally compromised patients.

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I. INTRODUCTION

Epidemiology is the basic science of preventive and social medicine. Epidemiology has evolved rapidly during the past three decades.

Modern epidemiology has entered the most exciting phase of its evolution. By identifying risk factors of chronic disease, evaluating treatment modalities and health services, it has provided new opportunities for prevention, treatment, planning and improving the effectiveness and efficiency of health services. This trend is bound to increase in view of the increasing importance given to the pursuit of epidemiological studies.

Epidemiology is derived from the word epidemic (epi=among; demos=people; logos=study), which is an old word dating back to the 3rd century B.C. In the United States, Winslow and Sedgwick both lectured on epidemiology in the early 1920s. In 1927, W.H.Frost became the first professor of epidemiology in US. The science of epidemiology originally referred to the study of epidemics. And epidemic is a frequency of case occurrence beyond that which is usual for the particular season, place, and population group (Santwell, 1973).

Parkin (1873) defined epidemiology as that branch of medical science which treats epidemics and McMahon (1960) defined it as the study of the distribution and determinants of disease frequency in man. John M.Last in 1988 defined it as the study of the distribution and determinants of health related states or

events in specified populations, and the application of this study to the control of health problems.

According to the International Epidemiological Association, epidemiology has three main aims i.e., to describe the distribution and magnitude of health and disease problems in human populations; to identify etiological factors (risk factors) in the pathogenesis of disease and to provide the data essential to the planning, implementation and evaluation of services for the prevention, control and treatment of disease and to the setting up of priorities among those services. But the ultimate aim of epidemiology is to lead to effective action in order to eliminate or reduce the health problem or its consequences and to promote the health and well-being of society as a whole.

It helps to channelize the public health policies to serve the various groups of population, age, sex, occupation, rural and urban and to meet the felt needs of these groups in society they serve and to appraise their action and finally evaluate periodically to improve their social policy from time to time.

Epidemiology of Gingival Disease: A gingivitis case clearly involves a person with gingivitis. The more difficult part involves deciding when a person has gingivitis. Although the clinical signs of gingivitis are easy to detect, it is not clear how much inflammation a person must have to be considered a gingivitis case. An universally accepted threshold for the amount or severity of gingival inflammation that must be present in an individual does not exist. So the next question arises that "HOW MUCH GINGIVITIS IS PRESENT?"²

According to data from NHANES III,¹ 54% of the non institutionalized civilian U.S population of age 13 years and older had gingival bleeding in at least one gingival site. Gingival bleeding was most prevalent in the 13 to 17 year old age group (63%) and declined gradually through the 35 to 44 year old group. The prevalence increased again at the 45 to 54 year old group but remained fairly constant in older groups. On an average per person, 10% of all sites had gingival bleeding. A study of U.S school children of age 14 to 17 years reported that the prevalence of gingival bleeding was 61.5%, essentially identical to the prevalence reported by NHANES III study. Both surveys used the NIDCR gingival sweep method for eliciting gingival bleeding. If the prevalence of gingival bleeding from NHANES III data is recalculated using only periodontal sites without attachment loss (<1 mm), the prevalence

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of one or more sites per person with gingival bleeding decreases from 54% to 47%. This indicates that about 7% of the people had bleeding only in sites with attachment loss. Throughout the globe, dental plaque growth and inflammation of gingival tissues are ubiquitous and strongly linked, irrespective of age, gender (or) racial / ethnic identification. More than 82% of US adolescents have overt gingivitis and signs of gingival bleeding with similar (or) higher prevalence of gingivitis being reported for children and adolescents in other parts of the world.

Various epidemiological studies have been conducted among school going children in India. **Mehta and Sanjana (1956)²** and **Sanjana et al (1956)³** examined and re-examined about 1640 school children of Bombay city in the age group of 11-17 years using Russell's index to study the prevalence of gingivitis. They reported that prevalence of gingivitis was 93.7% and it increased with age and a marked increase in intensity of gingival disease in the age group 6-7 years. There was no change noticed in 10-18 years age group. **Shick H.S. (1960)⁴** conducted a study to evaluate the prevalence of gingivitis in two municipal schools in Bombay examined 807 children-age group 5-19 years (lower middle class) using PMA index. He reported 74.59% of gingivitis. 12.26% of the study population had mild gingivitis and 62.32% had severe gingivitis. In the study conducted by **Nanda R.S. et al (1969)⁵** where they used the Ramfjord's method of periodontal examination and examined 1253 school children aged between 4-17 years in Lucknow, they concluded that male children had more gingivitis than female children and the prevalence of gingivitis increased with age. They also evaluated that the highest prevalence was found in the 12-14 years age group. **Nagaraj Rao et al (1980)⁶** conducted a study among 500 school children of 5 - 10 years of age in Udupi and reported that oral hygiene status was poor in all children and 28% of the study population had marginal gingivitis and 7.2% had chronic generalized gingivitis. Poor oral hygiene was found to be main factor for the increase in prevalence of gingivitis. **Mathur SK and Roy RK (1981)⁷** examined 1200 children aged 3-14 years from urban and rural Lucknow and reported that 100% of children had plaque and gingivitis and that the rural children had more severe gingivitis when compared to that of the urban children.

a) *Epidemiological Studies Conducted Among Pregnant Women*

Samant Asha (1976)⁸ conducted a study in Chandigarh on 40 women in each of the three trimester of pregnancy, and on 40 non-pregnant women of comparable age, socio-economic status and dietary habits and concluded that the severity of gingivitis increased in significant proportion during pregnancy.

Dixit J et al (1980)⁹ studied the occurrence and severity of gingivitis in 80 pregnant and 40 non-pregnant

women in the age group 20 - 40 years in Lucknow. They found a significantly higher severity of gingivitis in pregnant subjects as compared to non-pregnant and also noted an increase in severity in the 2nd trimester. **Uma R (1989)⁴** stated that pregnancy gingivitis is a condition not seen in every pregnant woman. Even if the oral hygiene is good, gingiva in most cases will exhibit an elevated tendency to bleed after tooth brushing. A pregnant woman is anxious about the health of her child and herself. This alertness to total health proves an unusual opportunity to the patients to learn certain principles which can be applied for the future care of the child. The gingiva that is already slightly inflamed now appears excessively enlarged and the severity is believed to be the greatest between 2nd and 3rd trimester of pregnancy.

b) *Epidemiological Studies Conducted Among Adult Population*

Sharma (1953)⁴ examined 1158 patients in the age group 15 to 50 years and found that the incidence of high oral hygiene index was more in early age group and decreased with advancing age. **Mehta et al (1953)⁴** examined 2219 male subjects in 18-55 years age group from low socio economic status in Bombay and Ratnagiri district and concluded that the incidence of periodontal disease among Indians is very high, severity of disease increased with age, papillae and margins do not show much difference in the severity of the disease and the extent of involvement of upper and lower marginal gingival and papillae is much the same.

Studies on descriptive epidemiology of gingival disease⁴

Prevalence of gingivitis: A number of surveys on the prevalence and severity of gingivitis has been conducted. **McCallin (1933)** conducted a survey in New York among 4,600 children in the age group 1-14 year and concluded that the percentage of persons affected with gingivitis was about 98.0%. In another survey conducted by **Messner et al in 1938**, among 1,438,318 children in 26 states of United States of 6-14 years age group concluded that about 3.5 - 8.6% suffered from gingivitis.

Surveys on prevalence of gingivitis conducted in India⁴

Marshall - Day and Tandon (1940) conducted a survey on 756 middle class children in Lahore of approximately 13 years of age among which 68.0% were affected with gingivitis. **Marshall - Day (1940)** conducted a survey in fluoride endemic area in Northern India in 203 individuals of age group 5-18 years and concluded that about 59.6% had gingivitis. In 1944, **Marshall - Day** in their survey conducted among 200 boys in Kangra district of India of approximately 13 years of age, concluded that 81.0% of them had gingivitis. **Marshall - Day and Shourie (1944)** concluded that about 80.0% of children out of 613 children from low and middle class of 5-15 years age group, had gingivitis. **Marshall - Day**

and Shourie (1947) did a study on 1054 children from low to middle class male school children in Lahore, India, in the age group of 9-17 years and concluded that about 99.4% had gingivitis. Marshal - Day and Shourie (1947) again conducted a study among 179 girls of high socioeconomic level in Lahore, India, in the age group of 9-17 years and concluded that 73.3% of them had gingivitis. A study conducted by Greene (1960)¹⁰ among 1613 school boys in low socio-economic area of India (11-17 years), concluded that 96.9% had gingivitis.

c) *Necrotizing Gingivitis and Noma (Cancrum Oris)*

Noma is confined to children. However the prevalence estimates vary considerably depending on country and region. Sheiham¹¹ estimated the prevalence of necrotizing gingivitis among Nigerian children aged 2-6 years to range between 1.7% and 26.9% depending on location. Enwonwu¹² evaluated the prevalence of necrotizing ulcerative gingivitis to be 15.3% among rural Nigeria children aged 0-10 years with most cases seen from 2 to 6 years of age. Taiwo¹³ observed necrotizing ulcerative gingivitis in 27.4% of the children under the age of 12 years attending a dental clinic in Nigeria with estimates ranging from 2.4% of the children with good oral hygiene to 66.7% of children with poor oral hygiene. A large epidemiological study conducted among children in Senegal showed an overall prevalence of necrotizing ulcerative gingivitis among 0-14 year old children of 2.1% with the majority of cases observed among 1 - 9 years. Olsson¹⁴ did not observe a single case of ANUG among 1700 Ethiopians aged 6-54 years.

d) *Is more or Less Gingivitis Present Now than Previously?*

Although it is generally believed that the prevalence of gingivitis is declining in the United States, the epidemiologic data needed to make that claim do not exist. Because of difference in populations, sampling methods, and periodontal measurement methods, comparisons of results between those surveys are difficult, if not impossible, to make. Even if results from these studies could be compared, they do not support the view that the prevalence of gingivitis is declining.

e) *Does my Patient With Gingivitis Fit the Typical Profile?*

It is observed that gingivitis is more prevalent among certain groups. Adolescents have a higher prevalence of gingivitis than pre-pubertal children or adults. The rise of sex hormones during adolescence is suspected to be the cause of the increased prevalence. (Studies shows that the increased level of testosterone in boys and estradiol and progesterone in girls were associated with increased level of the periodontal pathogens *Prevotella intermedia* and *Prevotella nigrescens*). Hormonal effects also may be responsible for the increased prevalence during pregnancy and

among women. Males in all age groups are more likely to have gingivitis than females. Males with gingivitis have more involved sites than females especially in younger age groups (13-17 years.) Poorer plaque control among males could likely explain much of their higher prevalence and extent of disease.

f) *Why Do Patients Have Gingivitis, And What Puts Them At Risk?*

It is clear from experimental and epidemiologic studies that microbial plaque is the direct cause of gingivitis. The cause-and-effect relationship between plaque and gingival inflammation was demonstrated in a classic study by Loe et al. (1965). Because bacterial plaque is the cause of the most common form of gingivitis, factors that influence the oral hygiene status of individuals would likely influence the prevalence of gingivitis eg. poor oral hygiene, tooth brushing frequency. Although smoking is one of the most important risk factors for adult periodontitis, its role in gingivitis is unclear.

g) *National Oral Health Survey (Dental Council Of India: 2002 -2003)¹⁵*

i. *Oral Hygiene Practices Across Age Groups*

About two-thirds of 12, 15, and 35-44 year olds and one-third of 65-74-year-old respondents across both sexes, and more in urban, had used toothbrush to clean teeth in the country. Nearly three-fourths in most of the states and union territories reported the use of toothbrushes for cleaning teeth. About 90 percent, across ages, both sexes, and more in rural, had cleaned teeth once a day. Only 8-9 percent, irrespective of age, across both sexes and more in urban, had cleaned teeth twice a day in the country as well as in most of the states and union territories.

About two-thirds of respondents, across both sexes and more in urban, had used tooth paste, while a quarter of them, across ages and both sexes and more in rural, reported the use of tooth powder in the country.

h) *Dental Problems and Treatment Aspects Across Age Groups*

More and more respondents, across both sexes and more in urban, reported oral health problems with the increase in ages. More in Assam than in other states and union territories reported the occurrence of oral health problems. More than 50 percent of respondents, across both sexes and more in urban, reported less than half an hour to reach dental care facility places in the country as well as in states and union territories.

i) *Awareness of Dental Health Problems Across Age Groups*

More and more respondents reported knowledge of oral health problems, factors responsible for problems and their preventive measures with increase in age of respondents in the country as well as

in each of the states and union territories. The majority of respondents, irrespective of age, across both sexes and more in rural, reported oral health problems such as dental decay, followed by gum disease and foul breath in the country as well as in each of the states and union territories.

j) *Tobacco Smoking And Chewing Habits Across Age Groups*

About 23-24 percent, males with higher percentage across age groups, reported smoking tobacco in the country. 40-45 percent, males with higher percentage, across age groups were smoking bidi, followed by the habit of smoking cigarettes while was more males and more in urban across age groups. About 76-86 percent of smokers, more females, across places of residence and age groups in country as well as in the states and union territories, reported smoking less than 10 times in a day. A high percentage reported chewing paan or paan masala in Orissa than in other states and union territories. 42-52 percent reported chewing paan or paan masala over the last 5-10 years.

II. PERIODONTAL STATUS

a) *Bleeding, calculus and pockets*

The prevalence of periodontal disease increased as 12 year and higher age groups were surveyed. In children aged 12 years, the prevalence was 57 per cent while the prevalence peaked at 89.6 per cent in the 35-44 year age group. The prevalence was lower in 65-74 year age group (79.9 per cent), possibly due to the presence of a high number of edentulous or partially edentulous subjects in the age group. Calculus was more prevalent than bleeding across age groups from 12 years to 65-74 year age groups. Periodontal pockets were recorded in the higher age groups of 35-44 and 65-74 years and both shallow (4-5 mm) and deep (6 mm) pockets were markedly more prevalent in the older adults (65-74 years). In states, periodontal-disease prevalence was generally high across states and appeared very high in the majority of states in the 35-44 year age group (ranging from about 70 to 100 per cent).

b) *Loss of attachment*

Loss of attachment was prevalent in subjects aged 35-44 (41.2 per cent) and 65-74 years (60.7 per cent). The least severe form of loss of attachment (4-5 mm depth) was the most prevalent in both age groups. In the states, in adults (35-44 years), only 6 out of 18 states surveyed had loss of attachment in more than 40 per cent of the subjects with a peak at 70 per cent in the state of Madhya Pradesh. In 65-74 years, this number increased to 15 out of 18 states with the peak at 80 per cent in Madhya Pradesh.

c) *National Oral Health Survey – 2002 – 2003 Karnataka Oral Hygiene Practices Across Age Groups*

The practice of cleaning teeth was universal across age groups. More than 60 per cent in all ages except in the age group 65-74 years, across both sexes and more in urban areas reported the use of toothbrush to clean their teeth. About 87-94 per cent, across both sexes and more in rural areas cleaned their teeth once a day. In urban areas, more people reported cleaning teeth twice a day. About 56-64 per cent across ages except 65-74 years old, across both sexes and more in urban areas reported the use of the toothpaste. The Hills & Coastal Region had a higher proportion using toothpaste. About 42-48 per cent across all age groups, sexes and area of residence had changed toothbrushes once in 3 months. About two-thirds of the respondents, across all age groups, sexes and area of residence had rinsed their mouth either always or sometimes.

d) *Dental Problems and Treatment Aspects Across Age Groups*

13-27% of 15 year olds and below respondents and 43-49% in the age groups 35-44 and 65-74 years reported some oral health problems in the last one year. It was more in females and in urban area. More than 50% were aware of Government and private dental facilities and over 68% of the respondents in urban area required less than half an hour time to reach the facility.

e) *Awareness of Dental Health Problems Across Age Groups*

About 36 % across age groups and both sexes, more in urban areas were aware of oral health problems. The problems most reported were tooth decay and gum disease. About 30-45 percent more females than males & more in rural were aware of preventive measures.

f) *Tobacco Smoking and Chewing Habits Across Age Groups*

About 30-39 % more males and more in rural, across ages had the habit of smoking tobacco. More than two thirds of them, more males and more in rural areas reported smoking Bidis. About 18-39 per cent, across age groups, both sexes and places of residence reported chewing pan or pan masala with tobacco. Around 43 per cent of them in 35-44 year age group said that they were chewing for less than 5 years, while 44 per cent of chewers in 65-74 years age group had this habit for more than 10 years.

III. PERIODONTAL STATUS

a) *Bleeding, calculus and pockets*

The prevalence of periodontal disease was highest in 35-44 years age group (about 94.3 per cent) and lowest in 5 years (about 46.5 per cent). Calculus was more than bleeding in subjects aged 15 years and above. The prevalence was more in males. The pattern of periodontal disease was similar in urban and rural

areas although more disease was recorded in rural than urban areas. The mean number of teeth with bleeding (2.4) was highest in 12 years, calculus in 15 years (2.9) and shallow pockets (1.6) in 35-44 years while deep pockets (1.1) and excluded sextants (1.3) were high in 65-74 years age group. Kodagu District had a higher mean number of sextants with periodontal disease (5.1-5.3) while Bangalore District had about 2.5-2.6 in 35-44 year age group.

b) Loss of attachment

The prevalence proportion of subjects with loss of attachment in one or more sextant was lowest in the 15 years age-group (4.8 per cent); it was much higher in 35-44 years (33 per cent); and highest in the 65-74 years age-group (47.9 per cent) in the state. It was higher in males than in females across age groups. The pattern of loss of attachment was similar in urban and rural and all the regions where in the prevalence of disease in urban was higher than rural. The prevalence of disease was highest in Bangalore region (75.2 per cent) and lowest in Mysore region. The mean number of sextants with loss of attachment was expectedly highest in 65-74 years age group (1.3) and lowest in 15 years (0.2).

IV. CONCLUSION

Health problems are linked with the social, economic and cultural environment of society. In India, chronic inflammatory diseases are endemic. The prevalence of periodontal disease is world-wide. It is present from first decade of life to old age. Many local factors as well as systemic factors play their role in the etiology of periodontal diseases. Oral hygiene has been proved as one of the most important etiologic factor. All adults will at some point during their lifetime experience some deterioration of their periodontal structures. As more people retain their teeth throughout their lifetime, and as the proportion of older people increases more teeth will be at risk for periodontal disease. Periodontal disease accounts for over 50% of missing teeth in adults and results in tremendous economic and social burdens both to the individual and society. Prevention aspect of periodontics requires the active involvement of both dentist and patient. Early diagnosis and treatment are essential. The disease should be intercepted in the earliest stage possible to prevent irreversible damage.

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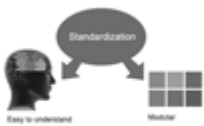
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Approach

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- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
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- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

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INDEX

C

Cementum · 4, 5

E

Erythematous · 22, 24
Estradiol · 31

F

Fusobacterium · 21

G

Glutaraldehyde · 1

H

Hypocalcemia · 15
Hypodense · 23

L

Lymphadenopathy · 14, 17

N

Nigrescens · 31

O

Odontogenic · 21, 23

R

Rhinoscropy · 22

S

Subgingival · 1, 5, 6

Z

Zygomatic · 24

T

Thyroidectomy · 14, 16, 17, 19



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