TO STUDY THE CLINICAL ATTACHMENT LEVEL (CAL), RUSSEL PERIODONTAL INDEX (RPI) AND ORAL HYGIENC INDEX (OHI) IN PERIODONTAL DISEASE SUBJECTS AND SMOKELESS TOBACCO USERS

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ABSTRACT
Background - The use of smokeless tobacco (ST) is growing in popularity due to unsupported perception of safety, indoor smoking bans, ability to conceal use, increased social acceptance, and reported “positive” physiological effects, such as relaxation, increased concentration, heightened alertness, and diminished hunger. Use of smokeless tobacco, gutkha and mishri has been increased tremendously with increase risk of periodontal disease results in tooth loss (edentulousness). Objectives- The purpose of the present study was to evaluate and compare the tooth loss in periodontal disease subjects and in subjects using chewing smokeless tobacco in relation to periodontal diseases. And also to study and compare the Clinical Attachment Level (CAL), Russel Periodontal Index (RPI) and Oral Hygienic Index (OHI). Materials and Method- : In the present study, 50 periodontal disease subjects and total 50 subjects taking smokeless tobacco were included as tobacco chewers 25; gutkha users 10 and mishri users 15 were included. Average CAL (Clinical attachment level), OHI (Oral Hygenic Index) RPL (Russel Periodontal Index) In the periodontal disease subjects (non tobacco, Group I ) and subjects taking chewing tobacco, gutkha and mishri. We found highly significant values (p<0.0001) CAL, (p<0.002) OHI-S and (p<0.0001) RPL in
tobacco users (group II-1, II-2 and II-3). Conclusion- From the findings it clearly indicates that group II-1 patients i.e. gutkha users had less CAL, OHI-S and RPI. As well as Mishri users group II-2 patients had more OHI-S and RPI and medium CAL. Whereas Tobacco chewers group II-3 patients had medium level of OHI-S and RPI and shows more CAL.

**KEY WORDS**: Clinical Attachment Level (CAL), Russel Periodontal Index (RPI), Oral Hygenic Index (OHI), Mishri, Gutkha, Periodontal disease.

1. INTRODUCTION

Periodontal disease is gum disease. The word “periodontal” means “around the tooth.” Periodontal disease is a chronic inflammatory disease of the gum and tissues that surround and support the teeth. If left untreated, periodontal disease can lead to tooth loss.\[1\]

Periodontal Disease- Periodontal diseases are generally divided into two groups Gingivitis, which causes lesions (inflammatory abnormalities) that affect the gums, is a milder form of gum disease.

Periodontitis, which damages the bone and connective tissue that support the teeth, is a more serious form of gum disease.

Periodontal disease is caused by *plaque*, which is formed from harmful bacteria. The mouth is full of bacteria but they tend to be harmless varieties. Periodontal disease usually develops because of an increase in bacteria quantity in the oral cavity and a change in balance of bacterial types from harmless to disease-causing bacteria. These harmful bacteria increase in mass and thickness until they form a sticky film called plaque.

**Tobacco Use**

- Tobacco use is one of the most significant risk factors in the development and progression of gum disease.
- The chemicals in tobacco can slow down the healing process and make treatment of gum disease less successful.
- Tobacco users are more likely to have oral cancer, bad breath, stained teeth, tooth loss, bone loss, loss of taste, gum recession, mouth sores and wrinkles the gums may shrink away from the teeth making them look longer. Without treatment, the teeth may become loose, painful and even fall out. The teeth may eventually become loose and tissue that support the teeth are destroyed and have to be removed because of gum disease.\[2\]
Types of Chewing Tobacco

• There are two types of smokeless tobacco; chew and snuff.
• Health and social concerns with smokeless tobacco use include chronic bad breath, yellowing of the teeth, tooth abrasion, tooth decay, tooth loss, gum disease, gum recession and the loss of bone in the jaw.
• Smokeless tobacco is associated with leukoplakia, oral cancer, decay and gum disease

Our study concentrated on subjects taking smokeless tobacco in the form of
1-Chewing Tobacco
2-Gutaka and
3-Suff form i.e. Mishri

Tobacco has been used in India for centuries. Early forms of tobacco were limited to smoking tobacco or chewing tobacco leaves but many populations use smokeless tobacco, which comes in two main forms; snuff (finely ground or cut tobacco leaves that can be dry or moist, loose or portion packed in sachets) and chewing tobacco (loose leaf, in pouches of tobacco leaves, plug or twist form) and gutkha is a preparation of betel nuts and tobacco designed to be chewed.

More than 4,000 different chemicals have been found in tobacco and tobacco smoke. More than 60 of these chemicals are known to cause cancer (carcinogens). Nicotine is a drug found in tobacco. It is highly addictive – as heroin or cocaine. Over time, a person becomes physically and emotionally addicted to, or dependent on, nicotine. Almost 30 percent of the Indian population older than age 15 uses some form of tobacco. Men use more smoked tobacco than smokeless tobacco. Women are more likely to use smokeless (chewed) tobacco.[3]

Use of smokeless tobacco produces a specific change in the area of the mouth where it is held. The area appears more whitish and wrinkled than normal, healthy tissue (see Right). This degree of tissue change is directly dependent upon the type of smokeless tobacco (leaf versus finecut), the specific brand of tobacco, the size of the pinch of tobacco, and the length of time the pinch is in contact with the mouth tissues. Although the use of any tobacco product increases one’s risk of developing cancer, the oral cancer risk for smokeless tobacco use is largely unknown. However, use of leaf-type smokeless tobacco for greater than 50 years is associated with the development periodontal disease.
Changes Associated with Tobacco Use

The oral effects of smokeless tobacco are typically seen on the mucosal surfaces where the product is placed, as well as on the adjacent periodontium. Clinically, the lesion is usually clearly demarcated from the normal tissues. The affected site or lesion can be a white or yellow-brown colour and it may develop a thickened and wrinkled appearance with increased use of the tobacco product. The best clinical diagnosis that should be assigned to these white lesions is tobacco-associated leukoplakia. By definition, leukoplakia is a white patch or plaque that cannot be characterized clinically or pathologically as any other disease.[4]

Gutkha is a powdery, granular, light brownish to white substance. Within moments of chewing mixing with saliva, the gutkha begins to dissolve and turn deep red in color. It may impart upon its user a "buzz" somewhat more intense than that of tobacco chewing, snuffing and smoking.

In general, ST products contain, among other constituents, nicotine and known carcinogenic chemicals such as tobacco-specific N-nitrosamines (TSNA), benzo[a]pyrene, nitrate, cadmium, lead, arsenic, nickel, and chromium. A number of serious, adverse human health outcomes have been linked to ST use. These include: mainly periodontitis.[5]

Mishri is a form of smokeless tobacco which contains burnt tobacco. It is a black powder obtained by roasting and grinding tobacco on a hot metal plate until it is uniformly black & is most commonly used as a method of oral hygiene maintenance in rural Maharashtra especially by women. Women, who use it to clean their teeth initially, soon apply mishri several times a day. This is a mixture of dried tobacco powder and some scented chemicals. These preparations are popular because people believe – incorrectly – that tobacco in the product is a germicidal chemical that helps in cleaning teeth. Mishri is roasted tobacco powder that is applied as a toothpowder. Mishri users often become addicted and start applying it as pastime.

Our study suggests definite correlation between use of mishri and health of gingiva and periodontium. Gingival recession, loss of attachment, discoloration of teeth, halitosis, tooth abrasion and habituation are most commonly associated with long term use of mishri. However further research work is required in this field. Proper implementation of law and patient's education regarding ill effects of mishri and proper brushing technique are required.
Thus it was noticed that the effect of duration of using Mishri was directly proportional to clinical attachment loss of periodontium.\cite{17}

Our study is concentrate on subjects taking chewing tobacco, gutkha and tobacco used for cleaning teeth in the form of mishri and its effect on the the Clinical Attachment Level (CAL), Russel Periodontal Index (RPI) and Oral Hygenic Index (OHI).

2. AIMS AND OBJECTIVES

Aims- The aims of the present study were as follows

1- To assess the effects of smokeless tobacco on gingival health of adults.
2- To assess the effects of smokeless tobacco on periodontal status of adults.
3-To compare these two findings with those of nonusers with periodontal disease (Group I ).
4- To compare the effects of smokeless tobacco on periodontal status within tobacco chewers.

In view of the above concepts the present study was undertaken

Objectives- To study effects of tobacco use on oral health, with particular emphasis on the effects of periodontal diseases on tooth loss.

1. To study and compare the OHI –S (Oral Hygienic Index) in periodontal disease subjects non users (Group I ) and smokeless tobacco users (Group II-1,II-2,II-3 ).
2. To study possible alteration in average CAL (Clinical Attachment Level), periodontal disease subjects (Group I ) and smokeless tobacco users (Group II-1,II-2,II-3 ).
3.To study and compare R.P.I. ( Russel Periodontal Index) , periodontal disease subjects and smokeless tobacco users (Group II-1,II-2,II-3 ).
4.To study OHI-S, CAL, RPI in the group I, group II-1, group-II-2, group-II-3 patients.(i.e. within groups)
5.To correlate the prevalence of disease in group I and group II-1, II-2, II-3subgroups.

3. MATERIAL AND METHODS

The present study was carried out in the Department of Periodontitis, In Pravara Rural Dental College and Hospital Loni, at Pravara Nagar. The patients selected for the present study were attending indoor/outdoor patient department from the Hospital. The clinical checkup of the patient was done by periodontist on the basis of detailed clinical history and clinical examination .The ethical committee of the Hospital and Dental College approved the research project work and all the patients gave written informed consent.
In the present study total 100 subjects were included. The distribution of these subjects was as follows.

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Group</th>
<th>Types</th>
<th>No. of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Group I</td>
<td>Periodontal disease subjects without tobacco users</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Group II</td>
<td>Periodontal disease subjects with tobacco users</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1- Gutkha Users</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- Mishri Users</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- Tobacco Chewers</td>
<td>24</td>
</tr>
</tbody>
</table>

Factors identified for periodontitis are age, gender, socioeconomic status, genetic predisposition, bacterial colonisation, certain systemic conditions, illiteracy and Tobacco chewing. Tobacco chewing has been found to be a major environmental factor associated with generalized forms of severe periodontitis.

**Study Design**

In the present study, 50 periodontal disease subjects and total 50 subjects taking smokeless tobacco were included as tobacco chewers 25; gutkha users 10 and mishri users 15 both male or female patients between the age group of 15-60 years were included.

The periodontal disease subjects were selected who were non smokers, non tobacco chewers.

**Inclusion Criteria**

Study group (Group I): 50 subjects
1- Patients who did not use tobacco in smokeless or smoking form.
2- Patients with periodontal disease.

Study group (Group II): Total 50 subjects.
1- Patients using smokeless tobacco for more than 6 months
2- Patients with no history of any periodontal disease for the past 6 months.
3- Patients belonging to lower socioeconomic class.
4- Patients those who are not literate.

**Exclusion Criteria**

1- Patients with systemic diseases.
2- Pregnant or lactating females.
3- Patients taking Hormone therapy.
4- Tobacco users (e.g., Smokers)
Patients using any medication which affects the health of the periodontium.

**Data collection**

**Data were collected by two methods**

1. Using a questionnaire consisting of questions regarding daily oral hygiene and tobacco habits.
2. Clinical examinations were carried out under proper aseptic conditions using a mouth mirror, explorer, and William's Graduated Periodontal probe.

**The following clinical parameters were recorded**

1. Simplified Oral Hygiene Index (OHI)
2. CAL Clinical Attachment Level (CAL) - measured clinically from the base of the pocket to the cemento-enamel junction (in millimeters).
3. RPI (Russel Periodontal Index)
4. All the parameters were recorded by a single examiner to prevent intra-examiner differences.

**Study procedure**

After taking informed consents, all subjects were screened for inclusion and exclusion criteria. At base line all the clinical parameters were evaluated. The subjects were selected by the stratified random sampling method. The oral hygiene status of the subjects was evaluated using the simplified oral hygiene index.

Comparison for the clinical parameters among the four groups was carried out for the tooth loss in all groups. And the results were statistically compared. Clinical attachment levels were measured using Williams Graduated Probe.

**Statistical Analysis**

The CAL, OHI, RPI, was carried between the periodontal subjects (group-I) i.e. (non tobacco) and Tobacco users i.e. gutkha, mishri and tobacco chewers (group II-1, II-2, II-3) was determined by using Pearson's chi-square analysis. P value of Probability values < 0.001 was considered as significant.

**4. RESULTS**
Table 1: Average Cal (Clinical attachment level) in Periodontal Disease and Tobacco user subjects i.e., Gutkha, Mishri and Tobacco Chewers.

<table>
<thead>
<tr>
<th>Study Subjects</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Tobacco</td>
<td>3.17</td>
<td>1.29</td>
<td>6.416</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Tobacco</td>
<td>4.75</td>
<td>1.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.96</td>
<td>1.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Mean Average Cal in Tobacco users is significantly higher than that in non tobacco users.)

Table 2: Average OHI-S in Periodontal Disease and Tobacco user subjects i.e., Gutkha, Mishri and Tobacco Chewers.

<table>
<thead>
<tr>
<th>Study Subjects</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Tobacco</td>
<td>2.54</td>
<td>0.91</td>
<td>3.21</td>
<td>&lt; 0.002</td>
</tr>
<tr>
<td>Tobacco</td>
<td>3.05</td>
<td>0.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2.79</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Mean OHI-S in Tobacco users is significantly higher than that in non tobacco users.)

Table 3: Average RPI (Ressul Periodontal Index) in the study subjects

<table>
<thead>
<tr>
<th>Study Subjects</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Tobacco</td>
<td>3.05</td>
<td>1.40</td>
<td>7.63</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Tobacco</td>
<td>5.04</td>
<td>1.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.04</td>
<td>1.64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Mean RPI in Tobacco users is significantly higher than that in non tobacco users.)
Graph No.1 Depicts Average CAL (Clinical Attachment Level), OHI-S (Oral Hygienic Index) and RPI (Russel Periodontal Index) in Tobacco Users i.e. (Gutkha, Mishri and Tobacco Chewers) and non Tobacco users.

Graph No. 2 Depicts Average CAL (Clinical Attachment Level), OHI (Oral Hygienic Index) and RPI (Russel Periodontal Index) in Tobacco Users i.e. Gutkha, Mishri and Tobacco Chewers.

5. DISCUSSION
General health and oral health are inseparable, oral cavity is the mirror which reflects general health. In India the misconception is widespread that tobacco is good for teeth. Prevalence varies in different parts but minimum seems to be 15% and goes up to as high as 84% in rural areas. Prevalence is more in socially and economically disadvantaged group. In this study we have analyzed that the duration of mishri used directly correlates with clinical attachment loss.
seen in subjects using mishri as a dentifrice. Gingival recession and loss of attachment are the most common sequel of smokeless tobacco users. The risk is up to nine times higher in smokeless tobacco users than in non users. Recession occurs even with adequate plaque control and the gingiva may not regenerate even after cessation of habit. Pie Diagram No.1 exhibits distribution of subjects undertaken for study. Total 100 subjects were included in the present study. Of these 100, 50 subjects were grouped as Periodontal disease and 50 as Tobacco chewers, Gutkha and Mishri users.

Table No. 1. Exhibits Average CAL (Clinical attachment level),
Table No. 2. Indicates OHI (Oral Hygenic Index) and
Table No. 3. Shows RPL (Russel Periodontal Index) and

Graph No.1 Depicts Average CAL ( Clinical attachment level) , OHI (Oral Hygenic Index) RPL (Russel Periodontal Index) In the periodontal disease subjects ( non tobacco, Group I ) and subjects taking chewing tobacco, gutkha and mishri . We found highly significant values (p<0.0001) CAL, (p<0.002) OHI-S and (p<0.0001) RPL in tobacco users (group II) respectively.

Graph No.2 Indicates average CAL (Clinical attachment level), OHI (Oral Hygienic Index) RPL (Russel Periodontal Index) in the subjects using gutkha, mishri and chewing tobacco. It was observed that
1- Group II-1 patient had less clinical attachment loss in comparison to Group II-2 where as Group II-3 patients had more clinical attachment loss (CAL) than Group II-1 and Group II-2.
2- Group II-1 patients had less oral hygienic index in comparison to Group II-3 where as Group II-2 patients had more oral hygienic index (OHI-S) than Group II-1 and Group II-3.
3- Group II-2 patients had more Russel Periodontal Index (RPI) in comparison to Group II-3 and than in Group II-1 patients.

From the observation it clearly indicates that group II-1 patients i.e. gutkha users had less CAL, OHI-S and RPI. As well as Mishri users group II-2 patients had more OHI-S and RPI and medium CAL. Whereas Tobacco chewers group II-3 patients had medium level of OHI – S and RPI and shows more CAL.

So, use of mishri even as teeth cleaning seems to be proven very dangerous than chewing tobacco and using gutkha.
The rates of tooth loss among tobacco users were approximately twice those of never chewers. The oral diseases and other tobacco components can also induce tissue necrosis and ulceration seen in the disease. Smokeless tobacco users, furthermore oral leukocytes, especially neutrophils, may exhibit diminished ability to migrate and phagocytose, and they contribute to the inactivation of tissue proteinase inhibitors. Tobacco may exert a masking effect on gingival symptoms of inflammation, which might give patients a false sense of assurance of gingival health. Tobacco upregulates the expression of pro-inflammatory cytokines, such as interleukin-1, which contributes to increased tissue damage and alveolar bone resorption. Interleukin-1 genotypepositive tobacco users are more susceptible to severe adult periodontitis. This might be the reason for highly increased CAL, OHI and RPI in tobacco users.\cite{8,9}

**Mechanisms of tooth loss causation by Tobacco**

The periodontal tissues are continuously exposed to nicotine and its metabolites due to deposition of nicotine on the root surface and cotinine levels (a metabolite of nicotine) are elevated in saliva and gingival crevicular fluid. The current knowledge on periodontal disease causation by smoking has been summarised in excellent reviews in which several aetiological effects of tobacco smoke are discussed. However, tobacco related periodontal pathogenesis is not well understood. Some potential mechanisms are briefly presented here.\cite{10} The importance of oral micro-organisms for the development of periodontal inflammation was proven about 40 years ago. Tobacco chewing is likely to affect the composition of the oral microflora due to a decrease in oxygen tension in periodontal pockets and may lead to a selection of anaerobic bacteria.\cite{11} The oral bacteria are organised within biofilms. In addition, the oral microflora consists of more than 700 different types of bacteria and many of these are not classified and cannot be cultured.\cite{12} Periodontal diseases are likely to be associated with different microbial profiles, rather than to be associated with distinct pathogenic bacteria. The pathogenic subgingival biofilm has both direct and indirect effects on the periodontal tissues. In fact, damage to the periodontium results even without influence of bacterial invasion into the corresponding periodontal tissues because of the immune response of the host to bacterial stimulation.\cite{13} Tobacco smoking affects the humoral mediated and the cell mediated immunity of the host and this may increase susceptibility to periodontal disease. However, available data are conflicting and precise mechanisms have yet to be confirmed.\cite{14}
The periodontal tissues are very well vascularised. Typical signs of an inflammation, such as changes in gingival colour, swelling of the marginal as well as papillary gingiva, an increase of gingival crevicular fluid flow as well as bleeding on gentle periodontal probing (BOP) are caused by alterations of the vascular system. In smokeless tobacco users the clinical signs of inflammation and BOP are suppressed. There is evidence for an impact of tobacco chewing on bone metabolism such as an increased secretion of the bone resorbing factors PGE2 and IL-1β74 or a decreased intestinal uptake of calcium, and these factors may also increase susceptibility to periodontal disease in tobacco chewers. Periodontal disease is influenced by genetic factors. There is some evidence that chewing tobacco may affect the genetically determined susceptibility for periodontal diseases, though again, precise mechanisms remain to be elucidated. Tobacco-induced periodontal destruction results from a wide range of effects of tobacco on the different functions of cells, tissues and organs. Some of these effects are opposed to each other due to the effects of different tobacco constituents. However, when summarizing the characteristics of tobacco-induced alterations on periodontal tissues and humoral immunity, it is very likely that tobacco chewing disrupts the physiological turnover of tooth-supporting structures with the net effect being periodontal tissue breakdown.[15]

6-CONCLUSION
The severity of periodontal disease is enhanced in subjects chewing tobacco as compared with those subjects without chewing tobacco. The results show higher incidence of periodontal diseases in who use tobacco compared with non chewers who do not use tobacco. Based on the results, it was concluded that, although tobacco, gutkha and mishri has deleterious effects on the periodontium, the tobacco leads to a synergistic effect on the periodontal tissues.

REFERENCES
2. Dhirendra N Sinha¹, Krishna M Palipudi², Italia Rolle², Samira Asma², Sonam Rinchen Tobacco use among youth and adults in member countries of South-East Asia region: Review of findings from surveys under the global tobacco surveillance system. 2011; 55(3): 169-176.


11. Antonio Bascones-Martínez 1, Marta Muñoz-Corcuera 1, Susana Noronha 1, Paula Mota 2, Cristina Bascones- Ilundain 1, Julián Campo-Trapero 1Host defence mechanisms against bacterial aggression in periodontal disease:Basic mechanisms Periodontology : 2009 Dec 1; 14 (12): e680-5.


