

Periodontal Status Among Gutka Chewers – A Prevalence Study

Dr. Singh Shrinkhala M.D.S

Senior Lecturer, Department of Periodontics,
Rama Dental College, Hospital & Research Centre

Dr. Roopa D.A. M.D.S

Professor & H.O.D, Department of Periodontics,
Rama Dental College, Hospital & Research Centre

Dr. Saumiya Gopal M.D.S

Reader, Department of Periodontics,
Rama Dental College, Hospital & Research Centre

Dr. Shikhar Johari

Dr. Yogendra Nath Pandey

Dr. Tanvi Gupta

Post Graduate Student, Department of Periodontics,
Rama Dental College, Hospital & Research Centre

Abstract:

Aim: The aim was to compare the periodontal status among habitual gutka chewers and non chewers residing in Kanpur city, Uttar Pradesh, India.

Material and Methods: A total of 1220 individuals were selected for the study, of whom there were 600 smokeless tobacco (gutka) users and 620 nonusers. Clinical data on periodontal parameters [oral hygiene status, gingival bleeding on probing (BOP), Clinical attachment loss (CAL), Gingival Recession, Mobility, Furcation) & gingival white lesion was recorded.

Results: Statistical significant results were found on all the periodontal parameters showing poor periodontal status & oral hygiene among gutka chewers.

Conclusion: The findings contribute to the evidence of smokeless tobacco (gutka) as a risk factor for periodontal disease.

Keywords: Arecoline, Gutka chewers, Gingival bleeding, Oral hygiene, Periodontal status.

I. INTRODUCTION

The term smokeless tobacco is used to describe tobacco that is consumed without burning or heating at the time of consumption. Gutka, a type of smokeless tobacco (ST) consists of tobacco, areca nut and catechu mixed together with several other ingredients believed to be highly addictive, flavored and sweetened, and has a high concentration of nicotine and other 'addictive' additives. This is why gutka chewers often become addicted to the product, and thus fall prey to the dual harmful effects of areca nut and tobacco. [1]

The use of smokeless tobacco has been increasing during the past decade particularly among young men. The use of tobacco was established in Mexico and Peru as early as 3500 B.C. People used to chew tobacco to alleviate hunger pains.[2] Chewing tobacco was introduced to the Indian people with the tradition of chewing betel leaf or *paan* as it is commonly known in Hindi. This chewing of *paan* and thereby consumption of chewing tobacco is age-old and deeply rooted in India.[3] Areca nut is commonly used in South-East Asian countries, including Pakistan, India, Bangladesh, Sri Lanka, Malaysia, and Thailand. Gutka is initially placed between the maxillary and mandibular teeth and lightly chewed. It is then held against the buccal mucosa over a long period of time and

continued to be gently chewed and sucked intermittently. The constituents may either be spat out or swallowed when desired. [4]

Anecdotal evidence suggests that the age of initiation of tobacco use is declining, with reports of children beginning to use tobacco as early as the age of 10. Tobacco use is more common among males when compared with females. However, in female's use of smokeless tobacco is more common than any other form of tobacco. Some advertising of smokeless tobacco products targets children. Tobacco manufacturers sell "starter" products that are milder or sweeter for initiating users. [5]

Periodontal disease is one of the leading causes of tooth loss, particularly among older individuals. Tobacco smoking is one of the most important environmental risk factors for periodontal diseases. Large numbers of studies have been conducted to understand the role of smoking in the etiology of periodontal diseases and the available data show that smoking is associated with increased prevalence and severity of periodontal disease, which may be due to the adverse effects of tobacco smoke on the physiology, immunology, and microbiology of the oral environment. Unlike smoking, the role of oral smokeless tobacco (SLT) in the etiology of periodontal disease has received considerably less attention. [6]

Hence the present study was conducted to evaluate the effect of smokeless tobacco on periodontal status among gutka chewers.

II. MATERIALS AND METHODS

A cross-sectional study was conducted in local populations attending the outpatient department of Rama Dental College & the camps organized for local community centers of Kanpur, Uttar Pradesh, India. The study was approved by the research ethical committee at the Dental department of the College. Participation of individuals was voluntary, and written informed consent was obtained from all individuals prior to their inclusion in this study.

The subjects were divided into two groups – Gutka chewers (n = 600) and non-chewers (n = 620) for comparison. Both genders were selected. Population in the age group of 15-60 years with at least 20 permanent teeth including all the index teeth, Patients using smokeless tobacco for more than 6 months & at least 2 packets a day, Patients with no history of any periodontal treatment for the past 6 months were included in the study. Exclusion criteria encompassed the following- Patients consuming tobacco in any form other than gutka chewing (smoking, snuff, chewing pan with tobacco & chewing tobacco leaf), alcohol consumption, systemic diseases, Pregnant or lactating females, Patients using any medication which affects the health of the periodontium.

Subjects were examined under artificial light using mouth mirror, explorer, calibrated UNC 15 & Naber's probe by a single examiner. Intraoral examination was carried out to evaluate oral hygiene, gingival bleeding, periodontal status (Probing depth, CAL, Recession, Furcation involvement) & gingival white lesion. A questionnaire was asked by all the participants, besides age and gender, the questionnaire also

gathered information concerning gutka usage (yes/no), , and duration of gutka habit.

The oral hygiene status of selected patients was determined by using Simplified Oral Hygiene Index (OHI-S), introduced by Greene & Vermilion in 1964, comprises the Simplified Debris Index (DI-S) & Simplified Calculus Index (CI-S). Each of these indices is based on numerical determinations representing the amount of debris or calculus on six pre-selected tooth surfaces.

Probing Pocket Depth (PPD) was measured by inserting calibrated UNC 15 probe parallel to the long axis of the tooth to measure the distance from the gingival margin to base of sulcus or pocket to the nearest millimeter, at four sites of a tooth, viz. mesio-buccal, buccal, disto-buccal, and mid-lingual, around all teeth. Deepest pocket in millimeter was considered amongst all PPD measurements. Gingival Recession was scored as "present" if gingival margin was located apical to cemento-enamel junction (CEJ) at the buccal aspect of all the teeth. Clinical Attachment Loss (CAL) was determined by calculating the distance from a fixed reference point, CEJ, to the base of pocket or sulcus.

Mobility was scored using the following criteria: no mobility (score 0), slight mobility to touch (score 1), mobility of 1-2 mm (score 2) and obvious looseness with mobility >2 mm (score 3). Furcation involvement was detected using Naber's probe and scored according to criteria modified from Loeche *et al.* as follows: no furcation involvement (score 0), slight indentation (score 1), pronounced indentation (score 2), through-and-through penetration but filled with soft tissue and might not be visible (score 3), through-and-through-penetration and furcation was clinically visible (score 4).

III. STATISTICAL ANALYSIS

Chi square test of total results was calculated & assessed. SPSS version was used for statistical analysis.

RESULTS

A total number of 600 gutka chewers & 620 non-chewers participated in the study. Mean age of 25.7 years for gutka chewers & 26.8 years among non-chewers (range 15-60 years) was seen as shown in table 1.

Oral Hygiene Index – Simplified (OHI-S) was assessed according to the overall scoring criteria i.e Good; Fair; Poor. Number of subjects with good oral hygiene (20.32%) was significantly higher among non-chewers when compared with gutka chewers where none of the subjects had good oral hygiene. Number of subjects showing poor oral hygiene among gutka chewers was (90.17%) as compared to non-chewers (32.42%), showing three fold greater poor oral hygiene among gutka chewers as shown in table 2.

The results concerning duration of gutka consumption was shown as 60.5% participants consuming between 1- 10 years, 20.8% between 11-20 years, 12.8% between 21-30 years, and 5.8% between 31-40 years as shown in table 3. Most of the patients were consuming 4-5 packets/day as shown in table 3.

Out of 600 patients observed 448 (74.7%) males were found to be associated with the habit of gutka consumption in comparison to females 152 (25.3%). Patients reported with gingivitis were 190 (31.7%) among gutka chewers while 224 (36.13%) among non chewers. Prevalence of periodontitis was higher among gutka chewers i.e 410 (68.3%) & 396 (63.87%) among non-chewers. The present study observed the percentage of white gingival lesion was higher among gutka chewers 83 (13.83%) & 15 (2.42%) among non- chewers as shown in table 4.

Periodontal status among gutka chewers as shown in table 5 showed the percentage of recession among gutka chewers 257 (62.68%) was higher as compared to non chewers 175 (44.19%). Clinical attachment loss was found with 1-2 mm attachment loss in 44 (17.1%) among gutka chewers & 83 (47.43%) in non-chewers, 3-4 mm attachment loss in 65 (25.3%) among gutka chewers & 41 (23.43%) in non-chewers, ≥ 5 mm attachment loss in 148 (57.6%) among gutka chewers & 51 (29.14%) in non- chewers as shown in table 5.

Mobility with score 1 was 68 (16.59%) among gutka chewers & 49 (12.37%) among non- chewers. Comparatively Mobility was found to be more in gutka chewers. Out of total periodontitis patients score 1 furcation involvement seen was 81 (19.76%) among gutka chewers & 58 (14.65%) was present among non chewers. Comparatively furcation involvement was found to be more in gutka chewers. Gingival bleeding was assessed as 281 (46.83%) as mild among gutka chewers & 322 (51.94%) in non chewers, 312 (52%) moderate gingival bleeding among gutka chewers & 243 (39.19%) in non chewers, & severe gingival bleeding 7 (1.17%) among gutka chewers & 55 (8.87%) in non chewers as shown in table 5.

IV. DISCUSSION

Epidemiological studies have demonstrated that tobacco use is a significant risk factor for the development of periodontal diseases. [7] The current cross-sectional, epidemiological survey was conducted with the aim assessing the association of tobacco chewing with periodontal status was evaluated in tobacco chewers as compared to non-chewers. Smokeless tobacco was strongly associated with severe active periodontal disease and inter-proximal attachment loss. The primary periodontal alteration in smokeless tobacco users is localized gingival recession.[8]

With the emergence of commercial pan masala and gutkha about three decades ago, not only did the Indian market witness massive growth in the sales of smokeless tobacco and areca nut products, but also a huge worldwide export market developed. The packaging revolution has made these products portable, cheap and convenient, with the added advantage of a long shelf-life. Tobacco products which were usually consumed by a small section of the population are today part of the modern urban and rural lifestyle. [9]

Betel nut/arecanut use has been common in South East Asia. Arecanut is the fourth most common psychoactive substance in the world. Areca nut, a main ingredient in gutkha, contains alkaloids such as arecoline, which might have a significant causative role in periodontal diseases along with other variable such as level of oral hygiene, dietary factors,

general health and dental status. [10] The effects of arecoline (the major alkaloid of areca nut) inhibit cell attachment, cell spreading and cell migration and decrease cell growth and collagen synthesis. [11,12] Areca nut extract induces the production of prostaglandin E2 (PGE2), the activation of the intracellular calcium concentrations, P-38 mitogen- activated protein kinase, and the extracellular signal-regulated protein kinase inhibitor. These findings suggest that areca nut chewing may induce an inflammatory response and affect the periodontal health of consumers. [13]

In present study mean age among gutka chewers was 25.6 years while among non-chewers 26.8 years. According to Kumar *et al.* [14] majority of smokeless tobacco users (60%) started consuming tobacco before 21 years of age and about 22% started before the age of 15 years.

The present study showed that the non-chewers have better oral hygiene compared to chewers. None of the gutka chewers showed good oral hygiene. Poor oral hygiene was found more (90.17%) in gutka chewers as compared to non-chewers. Similar results were seen in the study by Parmar *et al.* [15] which showed that oral hygiene status significantly deteriorated in persons having deleterious oral habits compared to controls. None of the patients with good oral hygiene among gutka chewers was also found by Arun MS (1) which is very similar to the present study.

The hardness of the areca nut and interactions among the various ingredients of chewing materials with periodontal tissues might be responsible for the poor periodontal status of chewers. Areca nut, which contains alkaloids such as arecoline, might have a significant causative role in periodontal diseases along with other variables such as the level of oral hygiene, dietary factors, general health and dental status, and tobacco smoking.[15]

The present study showed 31.7% with gingivitis & 68.3% individuals with periodontitis among gutka chewers, while 36.13% with gingivitis & 63.87% individuals with periodontitis among non-chewers. The most interesting part of the study was that Periodontitis was more prevalent among gutka chewers. Besides some case reports mentioning periodontal changes associated with oral smokeless tobacco (SLT) habits, initial studies conducted in the US have shown that oral SLT habits are associated with increased incidence of gingival recession. [6] Study done by Jawed [4] demonstrated that periodontal inflammatory parameters [PI, BOP, PD (4–6 and >6 mm), clinical AL and MBL] were significantly high in gutka and Betel quid chewers as compared to their respective controls. These results are in accordance with earlier studies (Jawed *et al.*, 2008). According to Brady, 73% of patients have periodontal disease.[16]

One explanation for this is that areca nut, slaked lime, and ST increase the production of ROS in the periodontal tissues, which enhance inflammation and alveolar bone loss by decreasing endothelial nitric oxide synthase expression and producing pro-inflammatory cytokines such as tumor necrosis factor-alpha and interleukin 1beta, as reported by Seyedroudbari and Khan, 1998; Haque *et al.*, 2000; Chang *et al.*, 2009. [4] Blood nicotine levels reached by using gutkha chewing are dramatically higher than that reached from cigarette smoking. Thus, the use of tobacco products may exacerbate periodontal disease. [17]

The present study showed 448 (74.7%) males & 152 (25.3%) females among gutka chewers. Gutka consumption by males was three times more than females. Similar observations were made by Bala *et al.* [18] who observed the use of *Paan masala* to be around four times higher in males as compared to females, whereas the consumption of tobacco was also observed to be more than twice amongst males as compared to females. In a study conducted on tobacco use in rural area of Bihar, India, by Sinha *et al.* [19] was found to be 78% in men and 52% among women. The gender wise differences in tobacco use are dependent on the regional or local issues. In the present study, higher prevalence of use of tobacco amongst males has been attributed to the fact that the concentration of economic power is in the hands of males and is also due to their proneness to stress situations and the assumption that tobacco use helps them to carry out their occupational tasks with more concentration. [20]

In this present study white gingival lesions were observed & was found that 13.83% among gutka chewers, where as 2.42% gingival lesions in non-chewers. According to study done by GP Singh [20] reported that among various smokeless tobacco uses, 35.4% oral lesions was observed among gutka chewers.

The present study revealed highly significant results showing 257 (62.68%) gutka chewers & 175 (44.19%) non chewers showed gingival recession. The association of Smokeless tobacco (ST) and gingival recession might be due to exacerbated inflammatory responses induced by ST, which contributes to accelerated periodontal breakdown and gingival recession at the site of placement. Mechanical trauma resulting from the abrasive nature of the ST being held in close proximity to thin gingival tissues could also be contributory to recession. [5] A study conducted by Robertson *et al.*, (21) showed that sites adjacent to mucosal lesions in smokeless tobacco users showed significantly greater recession and attachment loss than in the sites not adjacent to lesions in users or comparable sites in non-users.

Clinical attachment loss (CAL) was assessed as 1-2 mm in 44 (17.1%), 83 (47.43%), 3-4 mm in 65 (25.3%), 41 (23.43%) & ≥ 5 mm in 148 (57.6%), 51 (29.14%) among gutka chewers & non-chewers respectively. Proportion of moderate to severe form of attachment loss was observed to be significantly higher amongst most of smokeless tobacco users. Studies by Anerud [22], Amarasena [23] have shown more attachment loss in areca nut chewers. Study done by GP Singh [20] revealed CAL of ≥ 5 mm in majority of smokeless tobacco users. Chemical injury to thin areas of gingiva, chronically exposed to the smokeless tobacco, in addition to smokeless tobacco induced epithelial proliferation that bridges the narrow lamina propria of sites with an alveolar dehiscence might have resulted in loss of periodontal tissue. [21]

The present study showed score 1 mobility in 68 (16.59%) & 49 (12.37%) among gutka chewers & non-chewers respectively. Amongst the entire smokeless tobacco users group, no mobility was seen in majority. The present study showed score 1 furcation in 81 (19.76%) & 58 (14.65%) among gutka chewers & non-chewers respectively. Amongst the entire smokeless tobacco users group, no furcation involvement was shown by majority of the users, but, the incidence and severity were seen to be significantly higher

amongst smokeless tobacco users than non-users. Presence of furcation involvement may be due to increased loss of attachment & recession which is seen in gutka chewers.

The present study showed Gingival bleeding as mild in 281 (46.83%), 322 (51.94%); moderate in 312 (52%), 243 (39.19%) and Severe in 7 (1.17%), 55 (8.87%) patients among gutka chewers & non-chewers respectively. In Arun MS [1] study it was observed that gutka chewers had significantly greater gingival bleeding than non-chewers. Johnson and his colleagues [24] in their animal experiment disclosed that topical application of nicotine on gingiva, which was considered as a stimulation of smokeless tobacco use significantly enhanced gingival blood flow. The mechanism of action, as explained by Mavropoulos *et al.* [25] was neurogenic inflammation induced by activation of sensory nerves and the subsequent release of vasodilatory peptides from their peripheral endings, known as "axon reflex".

V. CONCLUSION

Nicotine is psychoactive and produces transient dose related euphoria. Since the exposure to nicotine from smokeless tobacco is similar to that of cigarette smoking. The betel nut or areca nut chewing habits adversely affect the periodontal health of the consumers. The direct damaging influence of arecoline on the periodontal tissues or the deposition of calculus due to hyper salivation and increased calcium salt level both finally lead to the destruction of periodontal tissues. [26]

Study Groups	Mean
Gutka Chewers	25.7
Non-chewers	26.8

Table 1: Mean value of age among groups

OHI-S	Gutka Chewers	Gutka non-chewers	Chi square-281.181
Good	0 (0%)	126 (20.32%)	p-value < 0.00001
Fair	219 (36.17%)	293 (47.26%)	
Poor	541 (90.17%)	201 (32.42%)	

Table 2: Oral hygiene status among Gutka chewers & non-chewers

Duration of habit (yrs)	Number of Patients	Percentage (%)
> 6 mths-10 yrs	363	60.5
11-20 yrs	125	20.8
21-30 yrs	77	12.8
31-40 yrs	35	5.8

Table 3: Showing the duration of gutka habit among gutka chewers

Parameters	Gutka Chewers	Gutka non-chewers
Gingivitis	190 (31.7%)	224 (36.13%)
Peridontitis	410 (68.3%)	396 (63.87%)
Genders		
Male	448 (74.7%)	346 (55.80%)
Female	152 (25.3%)	274 (44.19%)

White gingival lesion	83 (13.83%)	15 (2.42%)
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Table 4: Showing the percentage of gender, gingivitis & periodontitis

Parameters	Gutka Chewers	Gutka non-chewers	p-value
Recession			
Present	257(62.68%)	175 (44.19%)	Chi- square test – 27.694 p-value < 0.0001 Sig.
Absent	153 (37.32%)	221 (55.80%)	
CAL			
1-2 mm	44 (17.1%)	83 (47.43%)	Chi-square test – 50.963 p-value < 0.0001 Sig.
3-4 mm	65 (25.3%)	41 (23.43%)	
≥ 5 mm	148 (57.6%)	51 (29.14%)	
Mobility			
Score 0	295 (71.95%)	325 (82.07%)	Chi- square test – 13.986 p-value < 0.0029 Sig.
Score 1	68 (16.59%)	49 (12.37%)	
Score 2	34 (8.29%)	18 (4.54%)	
Score 3	13 (3.17%)	4 (1.01%)	
Furcation			
Score 0	266 (64.88%)	298 (75.25%)	Chi- square test – 10.695 p-value < 0.0302 Sig.
Score 1	81 (19.76%)	58 (14.65%)	
Score 2	36 (8.78%)	24 (6.06%)	
Score 3	19 (4.63%)	12 (3.03%)	
Score 4	8 (1.95%)	4 (1.01%)	
Gingival bleeding			
Mild	281 (46.83%)	322 (51.94%)	Chi- square test – 48.212 p-value < 0.0001 Sig.
Moderate	312 (52%)	243 (39.19%)	
Severe	7 (1.17%)	55 (8.87%)	

Table 5: Showing the percentage & p-value of gingival bleeding, gingival recession, CAL, mobility & furcation

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