



## EFFECT OF SMOKELESS TOBACCO ON GINGIVAL AND PERIODONTAL HEALTH AMONG THE RURAL POPULATION OF NUH, HARYANA, INDIA

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### ABSTRACT

**Introduction:** Smokeless tobacco (SLT) epidemiologically is the greatest threat to oral health among the human beings in the world and a vast majority of them reside in rural areas. Nuh district in Haryana state is a place attributed to low literacy along with low socio-economic status and rampant use of smokeless tobacco as an oral habit.

**Aim:** To determine the effect of smokeless tobacco on gingival and periodontal health among the rural population of Nuh, Haryana, India

**Material and Methods:** The oral hygiene status, gingival and periodontal status of 100 subjects (50 were SLT users and 50 were non-SLT users) was evaluated and compared using Simplified Oral Hygiene Index (OHI-S), gingival index (GI), Plaque Index (PI) and clinical parameters like clinical attachment loss (CAL), pocket probing depth (PPD) and gingival recession (GR).

**Results:** The mean OHI-S score of SLT users was 1.6458 which was approximately two fold greater than 0.6800 observed in non-users. The oral hygiene status was significantly higher among non-SLT users as compared with SLT users. The gingival inflammation was higher among SLT users as compared with non-SLT users. Loss of attachment was found to more in SLT users as compared to non-SLT users, similarly pocket probing depth was more in SLT users as compared to non-SLT users.

**Conclusions:** SLT has been found to have a role in deterioration of oral hygiene, gingival status and periodontal status and its severity increases with longer duration of its use.

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### INTRODUCTION

India is the second largest consumer of tobacco in the world. All sections of Indian population consume tobacco, though the prevalence of this habit and the types predominantly used vary across different geographical areas.<sup>1</sup> In India, tobacco consumption is mainly in the nonsmoking and application forms which is culturally accepted even among women. According to the Global Adult Tobacco Survey (GATS) survey conducted among population between 15 and 65 years of age, 35% of adults in India use tobacco. It was estimated that there are 274.9 million tobacco users in India with 163.7 million only smokeless tobacco (SLT) users, 68.9 million only smokers, and 42.3 million users of both smoking and smokeless forms of tobacco. Higher rates of tobacco consumption of 38.4% are seen in the rural areas as compared to 25.3% in the urban areas. The use of SLT is more common among both men (24% smokeless, 15% smoking and 9% both smoking and smokeless) and women (17% smokeless, 2% smoking, and 1% both smoking and smokeless) as compared to the smoking forms.<sup>2</sup> According to the National Family Health Survey-3 (NFHS-3), 57% of men in the age group 15-54 years and 11% of women in the age group 15-49 years, including 9% of pregnant women, use some form of tobacco.<sup>3</sup>

The relationship between smoking and oral health is known to all and its ill effect on periodontal tissues has also gained scientific evidence.<sup>4</sup> The habit of smokeless tobacco is widespread in south-east Asia, south America and among people of Indian origin migrated to rest of the world. Smokeless tobacco products are most commonly available in two major forms: snuff and chewing tobacco. Other forms like applying over the gums and teeth and sucking is also practiced in India. The most common methods of smokeless tobacco use in India are betel quid chewing and its variants such as chewing of Mawa, Khaini, Mainpuri tobacco and Pan Masala. Gutkha is a form of smokeless tobacco which has its origin in India and easily available in sachets and in various commercial forms. It is a mixture of areca nut (Areca catechu), catechu (Acacia catechu), lime, cardamom (Elettaria cardamomum), tobacco and unspecified flavoring agents. Gutkha chewers experience temporary euphoria, giddiness and sensation of heat in body. These pharmacological activities are usually interpreted as cholinergic effect of arecoline (an alkaloid obtained from the betel nut).<sup>5-7</sup> Smokeless tobacco use has been associated with several manifestations localized at the site of quid placement. These manifestations include: hyperplastic, dysplastic and malignant oral lesions, oral submucous fibrosis, dental hypersensitivity.<sup>8,9</sup> Previous studies on the effect of smokeless tobacco on periodontal health have been limited to attachment loss manifested as gingival recession at the usual site of tobacco placement.<sup>10,11</sup> Other effects of smokeless tobacco on periodontium like an increase in gingival inflammation,

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changes in gingival blood flow and interproximal periodontal attachment loss are documented.<sup>6</sup>

Nuh district in Haryana state, India is characterized as a rural region with a low level of education and socioeconomic status. In this region smokeless tobacco in the form of Gutkha is most popular which is widely sold and available at very low cost. This makes these products easily affordable for even the poor people and children. They come in small sized packets (Fig. 1) that cost between 2-10 rupees per packet which can be easily brought and carried/hidden.

Hence, the present cross sectional study was conducted to evaluate the effect of smokeless tobacco usage on oral hygiene, gingival and periodontal status in the rural population of Nuh dist. Haryana, India.



Fig 1 Most common smokeless tobacco form used in Nuh district in Haryana state

## MATERIALS AND METHODS

A total of 100 patients of both the genders (50 smokeless tobacco users and 50 non-smokeless tobacco users) aged between 20 and 35 years were selected from the outpatient department of Dentistry at our institute Shaheed Hasan Khan Mewati Govt. Medical College, Nalhar, Nuh based on the predetermined inclusion and exclusion criteria. Ethical clearance was obtained from the Institutional Ethical Committee and informed consent was taken from the subjects prior to the study.

### Inclusion Criteria

Subjects with at least 20 permanent teeth, including all the index teeth. In case of users, presence of using habit for a minimum of 3 months duration and consuming at least four times in a day. People in the age group 20 to 35 years were selected in this study.

### Exclusion Criteria

Patients who have undertaken periodontal therapy and those who had taken antibiotics in past 3 months. Patients with systemic illness, pregnant women, and those who used smoked tobacco in any form.

## METHODOLOGY

Subjects were examined under artificial light using mouth mirror, explorer, UNC- 15 periodontal probe, William's periodontal probe, and Community Periodontal Index (CPI) probe by a single examiner (Fig. 2). Intraoral examination was carried out to evaluate oral hygiene, gingival, and periodontal status using Oral Hygiene Index Score (OHI-S), Loe and Sillness gingival index (GI), and CPI respectively. The OHI-S by Greene and Vermillion determines the amount of debris and calculus on six preselected tooth surfaces. The GI estimates the severity of gingivitis by evaluating gum color, consistency, and bleeding during probing by the use of a periodontal probe on mesial, vestibular, distal, and lingual marginal gingiva of six index teeth. In order to assess CPI, oral cavity was divided into six sextants and the highest code for each sextant was recorded. Both CPI and loss of attachment (LOA) were assessed in each sextant. The highest code for CPI and LOA, among all sextants, was recorded as

the CPI and LOA score for the smoke less tobacco users and non users subject (Fig.3,4,5,6). The assessment was done using a CPI probe. In this study effect of smokeless tobacco on gingival biotype also recorded.



Fig 2 Armamentarium used



Fig 3 Non-Gutka chewer patient intraoral Photograph



Fig 4 Non- Gutka chewer patient intraoral photograph with UNC-15 probe assessment



Fig 5 Gutkha chewer patient intraoral photograph



Fig 6 Gutkha chewer patient intraoral photograph with UNC-15 probe assessment

### Clinical Parameters

- Full mouth Plaque index (PI) Silness & Loe 1964 and Gingival Bleeding Index (GBI) Ainamo & Bay 1975 were recorded.
- Probing depth (PD): calibrated manual periodontal probes (UNC-15) were used to measure to the nearest millimeter the distance from the gingival margin to the bottom of the periodontal sulcus or pocket, at four sites of a tooth (mesio-buccal, mid-buccal, disto-buccal, and mid-lingual).

- Recession depth (RD): the distance from the cemento-enamel junction to the gingival margin were measured to the nearest millimeter, at four sites per tooth, as for PD. When the gingival margin will be coronal to the cemento-enamel junction, the values were recorded as negative.
- Clinical attachment level: calculated from the RD and PD measurements.
- Gingival thickness (GTH) were evaluated at midfacial aspect of all maxillary and mandibular anterior teeth by atraumatically inserting the UNC-15 probe at the level of pocket probing depth.

## RESULTS

A total of 100 subjects participated in the study out of which 50 were enrolled as smokeless tobacco users and 50 were enrolled as non smokeless tobacco users. Mean age of subjects using non smokeless tobacco was 26.74 years, while it was 25.78 years among non - SLT user.

Stastical analysis depicts (Table 1) that the mean OHI-S in subjects using SLT was 1.64 which was approximately two fold greater observed in non-SLT users (mean value-0.68). The mean plaque index of 2.17 in SLT user was significantly greater than in non- SLT user (mean value-0.88). Higher prevalence of bleeding on probing (mean value-1.85) was seen in users compared with in non-users (mean value-0.58). Two fold more probing depth had been found in SLT pt. (mean value-2.96) than non- SLT pt. (mean value-0.96). Gingival recession was more seen in SLT pt. (mean value-0.58) than non SLT pt. (mean value-0.43). Attachment loss was observed more in SLT user (mean value-1.58) than non-SLT user (mean value - 0.48).

**Table 1** Group statistical analysis results

	Group	N	Mean	Std. Deviation	Std. Error Mean
Age (in years)	Tobacco non-user	50	26.74	4.641	0.656
	Tobacco user	50	25.78	5.797	0.820
Gingival bleeding index(GBI)	Tobacco non-user	50	0.5800	0.70247	0.09934
	Tobacco user	50	1.8550	0.29973	0.04239
Plaque index (PI)	Tobacco non-user	50	0.8860	0.19796	0.02800
	Tobacco user	50	2.1736	0.06898	0.00976
Debris index (DI)	Tobacco non-user	50	0.8200	0.38809	0.05488
	Tobacco user	50	2.0624	0.52029	0.07358
Calculus index (CI)	Tobacco non-user	50	0.5600	0.61146	0.08647
	Tobacco user	50	1.1452	0.44578	0.06304
Attachment loss (in mm) maxilla (CAL)	Tobacco non-user	50	0.580	0.7025	0.0993
	Tobacco user	50	0.435	1.0066	0.1438
Gingival recession (in mm) maxilla (GR)	Tobacco non-user	50	0.580	0.7025	0.0993
	Tobacco user	50	0.435	1.0066	0.1438
OHI-S	Tobacco non-user	50	0.6800	0.43753	0.06188
	Tobacco user	50	1.6458	0.49261	0.06967
Probing depth (in mm) maxilla (PPD)	Tobacco non-user	50	0.9600	0.53299	0.07538
	Tobacco user	50	2.6988	0.44381	0.06276
Attachment loss (in mm) mandible (CAL)	Tobacco non-user	50	0.580	0.7025	0.0993
	Tobacco user	50	0.426	0.9981	0.1412
Gingival recession (in mm) mandible (GR)	Tobacco non-user	50	0.320	0.4712	0.0666
	Tobacco user	50	0.426	0.9981	0.1412
Probing depth (in mm) mandible (PPD)	Tobacco non-user	50	0.820	0.6289	0.0889
	Tobacco user	50	1.878	0.7514	0.1063

## DISCUSSION

Smokeless tobacco is defined as tobacco that is chewed or snuffed rather than smoked by the user.<sup>12</sup> The present cross-sectional study was conducted to examine the effect of smokeless tobacco on periodontal health of its users as compared to its non users and to

investigate the relationship between the use of smokeless tobacco and the severity of periodontal destruction with gingival biotype. Claffey and Shanley<sup>13</sup> defined that the gingival biotype is thin if gingival thickness is <1.5 mm and thick if its thickness is ≥ 2 mm.

In the present study it was observed that the males (74.0%) have been associated with the habit of smokeless tobacco three times more as compared to females (26%). Similar observations were made by Bala *et al.*<sup>14</sup> who observed the use of Gutkha to be around four times higher in males as compared to females, whereas Sinha *et al.*<sup>15</sup> observed that the consumption of smokeless tobacco twice amongst males as compared to females. 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.

In the present study, among the different types of smokeless tobacco, Gutkha was the most commonly used smokeless tobacco form which contains betel nut/arecanut. Betel nut/arecanut use has been common in South East Asia. A recanut 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.<sup>16</sup> In an in vitro study by Chang *et al.*<sup>17</sup> they stated that Areca extracts containing arecoline inhibit the protein synthesis in human cultured periodontal fibroblasts. This indicated that Gutkha which essentially contains betel nut might be another risk factor in the pathogenesis of periodontal diseases.

In the present study results of PI, CI, GBI and CPITN index indicated that despite the daily oral cavity cleaning habits, either by tooth brushing, datoon or finger, the smokeless tobacco users had poor oral hygiene status and greater gingival inflammation than non users. In the present study gingival bleeding index score was more in SLT user as compared to non SLT users. Similar study was conducted by Robertson *et al.*<sup>18</sup> who observed that Gutkha chewers had significantly greater gingival bleeding than non-chewers. Johnson and his colleagues<sup>19</sup> 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.*<sup>20</sup> was neurogenic inflammation induced by activation of sensory nerves and the subsequent release of vasodilatory peptides from their peripheral endings known as “axon reflex”. Bleeding on probing has been shown to be an important risk predictor for increased attachment loss, if present at regular intervals,<sup>21</sup> or its absence is a good indicator of periodontal disease stability.<sup>22</sup> It is similar to the report by Chu *et al.*<sup>23</sup>

Present study concluded that PPD was significantly higher (2.69 mm) in SLT user as compared to non-SLT users (0.96) and LOA was also higher (0.58mm) in SLT user as compared to non-SLT users (0.42 mm). This was in confirmation with the study by Amarasena *et al.*<sup>24</sup> and Arun *et al.*<sup>25</sup> In another - study Fisher *et al* suggested that adults currently using smokeless tobacco are twice more likely to have severe active periodontal disease than adults who never used smokeless tobacco.<sup>26</sup> In favour of that Payne *et al.*<sup>27</sup> stated that smokeless tobacco is capable of stimulating monocyte secretion of PGE2 and IL-1 beta, which play a role in destruction of periodontium. Nicotine also has a deleterious effect on human periodontal ligament fibroblast growth, proliferation and protein synthesis, and thus may have a role in periodontal diseases.<sup>28</sup> 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.<sup>29</sup>

In this study the convenience of handling and consumption of Gutkha makes it a popular choice as compared to the other form of SLT. The impact of smokeless form of tobacco use was significantly higher on all the periodontal health indicators, viz. calculus, CAL, GR, PI, GI

and PPD. Similar study conducted by Batra *et al*<sup>30</sup>. which stated that occurrence of periodontal disease was higher in tobacco users than the tobacco non-users. The occurrence of periodontal pockets, gingival lesions and gum recession, were significantly higher in SLT users than non-users. Hence, as compared to smoke form, the smokeless tobacco form had a greater adverse effect on periodontal health.

The present study can act as a motivational tool to quit the habit of taking smokeless tobacco as well as various health agencies can be suggested to control and prohibit the use of different forms of smokeless tobacco, especially Gutkha, Khaini (tobacco and slaked lime), Paan (betel quid), Gul etc.

## CONCLUSION

In this study incidence and severity of calculus, clinical attachment loss, gingival recession and mobility as well as mean plaque index, gingival index and pocket probing depth were significantly higher amongst longer duration users as compared short duration users of smokeless tobacco followed by non smokeless tobacco users. It was also concluded that participants who had thin gingival biotype had more gingival recession and those who had thick gingival biotype had more pocket depth.

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