



## Oral and Periodontal Manifestation of Smokeless Tobacco (SLT) Users in Khartoum Locality 2022-2023

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### ABSTRACT

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**Back ground:** Smokeless Tobacco (SLT) can cause oral mucosal lesions such as keratosis, gingival inflammation, periodontal inflammation, alveolar bone damage, dental caries, tooth abrasion, staining of tooth structure, dysplasia, and oral cancer. Tobacco has been linked to severe consequences for overall health.

**Objective:** To identify the oral and periodontal manifestation of smokeless tobacco (SLT) users in Khartoum locality.

**Methodology:** A descriptive cross-sectional hospital based study was done among 80 current smokeless tobacco patients attending the outpatients and periodontology clinic in ACTH (Academy Charity Teaching Hospital), KDTH (Khartoum Dental Teaching Hospital), and alhekmah health center from January to March 2023, patients undergo oral examination after obtaining an informed consent, data collected using online Google form, pretested questionnaire and interviews. Data collected using Microsoft Excel spreadsheets and analyzed by SPSS version 23.

**Results:** The study included mostly male participants (97.5%), aged 18-29 years old (31.3%). With lower education levels (31.3%). and working as unskilled workers (47.5%). Most participants put the snuff at buccal mucosa (42.5%), used for less than 10 years (41.3%), for 1-5 minutes (52.5%), and 1 pack per day (56.3%). The majority had dental caries (66.3%) with class I predominance (53.8%), inflammation (97.5%), recession (67.5%), staining (78.8%), and halitosis (73.8%). Mucosal hypertrophy was the most common mucosal change (71.3%). There was a statistical association between start time and plaque index (P value = 0.008), and quantity in packs and pocket depth (P value = 0.013).

**Conclusions:** The study revealed that SLT has severe and considerable adverse effects on oral health and periodontal tissues.

**KEYWORDS:** Smokeless tobacco, snuff, periodontitis, periodontal disease, mucosal changes, inflammation.

### INTRODUCTION

Nicotiana tabacum and Nicotiana rustica are the two main species from which tobacco is derived. Nicotine, a volatile alkaloid, is the key component in the leaves of these plants. Nicotine is one of the most stimulating and addictive

medications. Although nicotine has an impact on every organ, it is primarily an addictive substance because it binds to a central nervous system receptor and raises brain dopamine levels. Although nicotine is addictive, other compounds in smokeless tobacco use are mostly responsible for the harmful health effect (1).

Additionally, tobacco leaves are matured, processed, and cured in a variety of methods after harvest. The end results can be applied to the gums as dipping and chewing tobacco, smoked (in cigarettes, cigars, and pipes), or breathed (as snuff). Tobacco use and exposure to second-hand smoke have

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been strongly associated with many types of cancer and other diseases. Cure tobacco leaves and the products made from them contain many chemicals known to cause cancer (2). In addition, snuff and chewing tobacco are the two main types of smokeless tobacco (2). Furthermore, snuff can be dry or moist. Typically, moist snuff is consumed orally. This product is available in small, spherical cans with loosely packed snuff inside or in tiny, teabag-like sachets. Less popular dry snuff is typically inhaled through the nose (3). Moreover, snuff dipping is a practice that is causally linked to pharyngeal and oral cancer in North America and Western Europe. Natives in the Sudan make their own snuff, known as toombak, using the local tobacco species *Nicotiana rustica*, which has high quantities of nicotine and nornicotine. To make a paste, sodium bicarbonate and water are combined with the finely powdered tobacco leaves. The final "saffa" is put in the oral vestibule, where it can stay for a while. A saffa is often changed 10 to 30 times each day (4).

Analogously smokeless tobacco is one of the true risk factors among the environmental factors and is known to be causally associated to periodontal disease (5).

Smokeless tobacco users have been shown to have blood nicotine levels that are comparable to or even higher than those seen in tobacco smokers, according to a 1987 WHO study group report (6).

Moreover, the harmful effects of nicotine and other tobacco compounds on vascular, inflammatory, immune, and healing cells can have an impact on the vasculature, revascularization, inflammatory response, and fibroblast function. The main alkaloid in tobacco, nicotine, may be crucial in the deterioration of periodontal tissue. It has been established that nicotine exposure causes vasoconstriction and poor angiogenesis. It has been shown that exposure to nicotine results in vasoconstriction and inadequate angiogenesis (7). Equally important, gum disease, also known as periodontitis, is a dangerous gingival infection that harms soft tissue and, if left untreated, can damage the bone that supports your teeth. Periodontitis can result in tooth loss or tooth loosening (8).

What is more periodontitis is a disease characterized by inflammation that influences the tissues that support teeth and is mostly brought on by particular pathogens or collections of certain microorganisms that exist in dental plaque. Although dental plaque is the primary cause of periodontal illnesses, other risk factors, among them diabetes, smoking, pathogenic bacteria, and microbial tooth deposits, might alter how the host respond to microbial aggressiveness (9).

In addition, at the site of periodontal inflammation, cytokines like interleukin 1 operate as chemo attractants, encouraging the recruitment of leukocytes and macrophages, and they trigger a local immunological response. Any type of tobacco use modifies neutrophil chemo taxis and the differential leukocyte count, which reduces the ability of the body to remove periodontal infections and exacerbates the consequences of periodontitis (6).

Additionally about 20–50% of the world's population suffers from periodontal diseases, which are common in both industrialized and developing nations (10).

The prevalence of periodontal disorders varies around the world depending on the definition of periodontitis and the research population, and it has been noted that they may be more prevalent in underdeveloped nations than in industrialized ones.

(10).

In addition, use of smokeless tobacco (SLT) can cause a variety of oral health issues, such as oral cancer, leukoplakia and erythroplakia, oral submucous fibrosis (if combined with areca nut), recession of the periodontal ligament, and staining of composite fillings and teeth (1).

Coupled with, oral squamous cell carcinoma (SCC) and verrucous carcinoma, oral potentially malignant disorders (OPMDs) (leukoplakia, erythroplakia, and erythroleukoplakia), and tobacco pouch lesion (tobacco and lime users' lesion, oral submucous fibrosis (OSF) when mixed with areca nut) are the most common types of smokeless or chewing tobacco-induced oral mucosal lesions (1).

As well as oral mucosal lesions (MLs), which are typically defined as 1) SLT-induced keratoses (STKs), (2) gingival inflammation, periodontal inflammation, and alveolar bone damage, (3) dental caries, tooth abrasion, and staining of tooth structure, and (4) dysplasia and oral cancer, are the main changes seen in the oral cavity related to SLT use (11).

Likewise, users of smokeless tobacco experience increased gingival recession, periodontal pocket formation, plaque and calculus accumulation, and periodontitis, which are all symptoms of periodontitis. The area surrounding the anterior teeth has more obvious gingival recession (1).

Lastly, numerous lesions in the oral cavity have been connected to extensive tobacco smoking. Smoker's melanosis, acute necrotizing ulcerative gingivitis, other periodontal diseases, burns, keratotic patches, black hairy tongue, nicotinic stomatitis, palatal erosions, leukoplakia, epithelial dysplasia, and squamous-cell carcinoma are just a few of the tobacco-related lesions. A dental health expert at an early stage can discover the majority of these lesions during a routine intraoral examination, and early treatments may prevent catastrophic sequelae. As a result, dental practitioners' diagnosis of lesions related to tobacco use in addition to counseling patients about their tobacco use has become the norm (12).

Smokeless tobacco use increases in young age group in Sudan, yet it is sever side effects that occur in all body systems including respiratory system, cardiovascular system and oral cavity.

There is no enough studies done in Sudan with regard to search about the manifestations along with increasing the awareness of the users. This study had determined the effects

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of smokeless tobacco in oral cavity and periodontium along with oral hygiene levels of the users.

### METHODS

This descriptive Cross sectional study hospital base was done by simple non-probability convenience sampling technique among 80 current smokeless tobacco users above 18 years old age who were willing to participate in the study, excluded any patient with existence uncontrolled systemic diseases and any dental implications that is not caused due to snuffing during the study period from January to March 2023 at the ACTH (Academy Charity Teaching Hospita), KDTH(Khartoum Dental Teaching Hospital), and alhekmah health center in Sudan. Data was collected by a Pretested structured organized questionnaire will be used for interviews.

The questionnaire were structured into four sections, section A describe the demographic background of the participants, which divided into four questions, age, gender, occupation and educational level. The second section, section B concerning about snuff history which collected from another four questions site of placement, year of starting, time of contact with mucosa and quantity in packs. Section C measures the oral hygiene level by three questions about brushing habit. The last section, section D is the examination part, it is divided into two parts the mouth examination part which searches the periodontal parameter(plaque index PI ,Gingival Index GI, Pocket depthPD and Clinical Attachment Level CAL. And the second part is site examination which looks for inflammatory signs, recession, staining, mucosal changes, halitosis and caries.

A written informed consent was obtained from all the participants after explaining the details of the study.

Data collected using Microsoft Excel spreadsheets and analyzed by SPSS version 23.

Frequency tests were use to describe the distribution of the contributors, and chi square test was used to detect the correlation and association between various variables.

### RESULTS

The majority of the participants were males (97.5%) of the age between 18 – 29 years old (31.3%). The education level

of the participants was below university and they were found to be unskilled workers (47.5%).

Most of the population put the snuff at buccal mucosa (42.5%), and they started to use the snuff for less than 10 years (41.3%). The time of contact if the snuff with mucosa was mostly found to be 1 – 5 minutes (52.5%). In addition, most of them were found to use one pack per day (56.3%).

Regarding the oral hygiene habits, the greater part of the population brush their teeth once a day (61.3%). For 2 – 4 minutes (45%) and in horizontal brushing technique (51.3%). When a periodontal examination done, the generality of the contributors were found to have score, two and three equally in plaque index (40%), and score two in gingival index (72.5%). Half of the population scored 4 – 5mm pocket depth among the examination (50%), while the clinical attachment loss was found to be moderate (46.3%).

On the site examination, the inflammation was found in 78 of the population (97.5%), and the most common inflammatory sign was Gingival enlargement (81.3%). Larger part of the population was found to have recession (67.5%), staining (78.8%), and halitosis (73.8%).

When periodontal parameters are compared to snuff history, we figured out a statistical relationship between start time in years and PI (P value = 0.008) and quantity in packs and PD (P value = 0.013). However, no relationship was found between any other periodontal parameter and any aspect of snuff history as seen in table 7.

Majority of the contributors had dental caries (66.3%) with class I predominance (53.8%).

The mucosal change was present in 57 participant (71.3%) and white patches (mucosal hypertrophy) been the most common mucosal change.

In Picture 1 (A) we found remnant of snuff (black arrow), staining, recession and mucosal darkening and hypertrophy associated with upper labial vestibule as placement site. While picture 1 (B) show recession, root caries, erosion, and gingival inflammation of the lower anterior teeth associated with placement site

Picture 2 demonstrate the calculus, staining, sever gingival enlargement, and mucosal alteration (mucosal hypertrophy) at placement site in upper right buccal mucosa 21, 22, 23.

### Results:

#### Section A: Demographic Background

Table (1): Population demographics:

		Frequency	Percent
Gender	Male	78	97.5%
	Female	2	2.5%
Age	18 - 29 years	25	31.3%
	30 -39 years	20	25%
	40 - 49 Years	10	12.5%

50 - 59 Years	13	16.3%
60 years and above	12	15%
Total	80	100

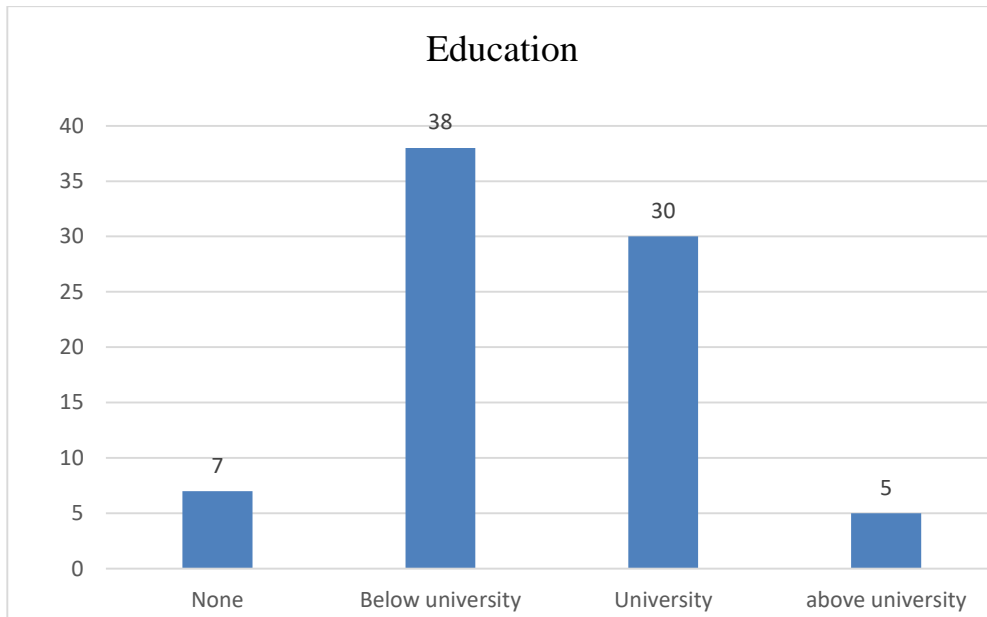


Figure (1): Education level of the patients

Table (2): The distribution of occupations among study population:

Occupations	Frequency	Percent%
Professional career	12	15%
Skilled worker	24	30%
unskilled worker	28	35%
Unemployed	16	20%
Total	80	100

**Section B: Smokeless tobacco use history:**

Table (3): Site of placement:

Site of placement	Frequency	Percent
Buccal mucosa	34	42.5%
Labial vestibules	32	40%
Buccal mucosa and Labial vestibules	14	17.5%
Total	80	100%

Table (4): History of starting and contact time:

		Frequency	Percent%
Time of starting	Less than 10 years	33	41.3%
	10 -20 years	20	25%
	20 years and more	27	33.8%
Contact time	1 - 5 minutes	42	52.5%
	6 - 15 Minutes	18	22.5%
	15 minutes and more	20	25%
Total		80	100%

Table (5): Quantity in packs:

Quantity in packs	Frequency	Percent%
Less than one pack	30	37.5%
One pack	45	56.3%
Two packs	5	6.3%
Total	80	100%

Section C: Oral hygiene habits:

Table (6): Oral hygiene habits

		Frequency	Percent%
Frequency of brushing	Once a day	49	61.3 %
	Twice a day	27	33.8 %
	More than twice a day	4	5 %
Brushing time	1-2 minutes	26	32.5 %
	2-4 minutes	36	45 %
	5minutes and more	18	2.5 %
Technique of brushing	Vertical	17	21.3 %
	Horizontal	41	51.3%
	Circular	8	10 %
	Vertical and Horizontal	14	17.5 %
Total		80	100 %

Section D: Examination

D1: Mouth examination

Table (7): Periodontal parameters:

		Frequency	Percent%
Plaque index	Score 0	2	2.5%
	Score 1	14	17.5%
	Score 2	32	40%
	Score 3 (calculus)	32	40%
Total		80	100%
		Frequency	Percent%
Gingival index	Score 1	16	20%
	Score 2	58	72.5%
	Score 3	6	7.5%
	Total	80	100%
		Frequency	Percent
Pocket depth	0 - 3 mm	11	13.8%
	4 - 5 mm	40	50%
	6 mm and more	29	36.3%
	Total	80	100%
		Frequency	Percent%
Clinical attachment loss	No CAL	2	2.5
	Mild	10	12.5%

Moderate	37	46.3%
Sever	31	38.8%
Total	80	100%

Table 8: The correlation between periodontal parameters and smokeless tobacco history:

	Site of placement	Start time	Quantity in packs	Contact time
PI	0.539	0.008	0.548	0.894
GI	0.160	0.567	0.212	0.253
PD	0.165	0.137	0.013	0.174
CAL	0.406	0.256	0.142	0.135

D2: Site examination

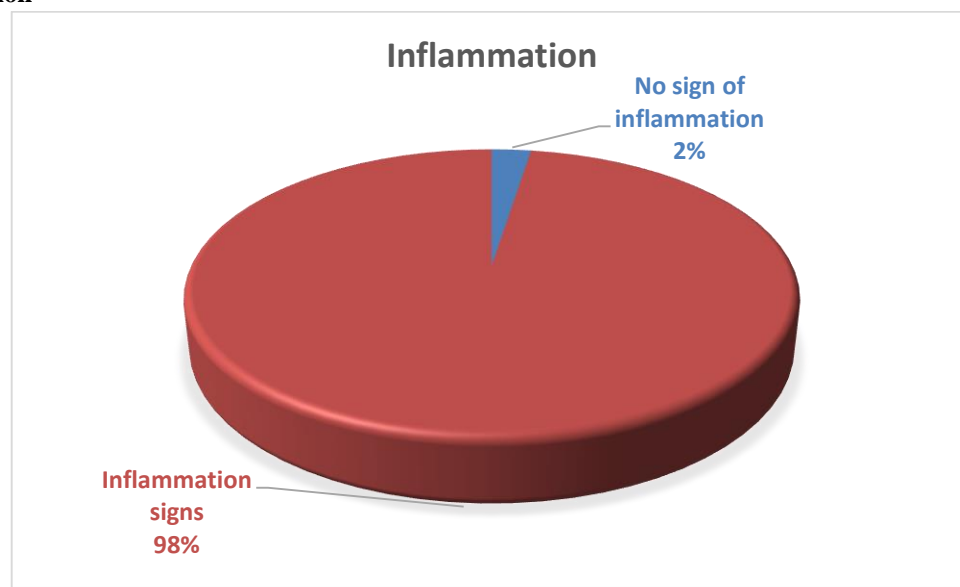


Figure (2): Presence of the inflammation

Table (9): Inflammation signs detected:

	Frequency	Percent
Redness	44	55%
Gingival Enlargement	65	81.3%
loss of stippling	62	77.5%
loss of contour	30	37.5%
Paleness	17	21.3%
papules	1	1.3%

Table (10): Recession, staining and halitosis:

		Frequency	Percent %
Recession	Present	54	67.5%
	Not Present	26	32.5%
	Total	80	100%
Staining	Present	63	78.8%
	Not Present	17	21.3%
	Total	80	100%
Halitosis	Present	59	73.8%
	Not Present	21	26.3%
	Total	80	100%

Table (11): Caries examination:

	Frequency	Percent%
Caries detected	53	66.3%
No caries detected	27	33.8%
Total	80	100%

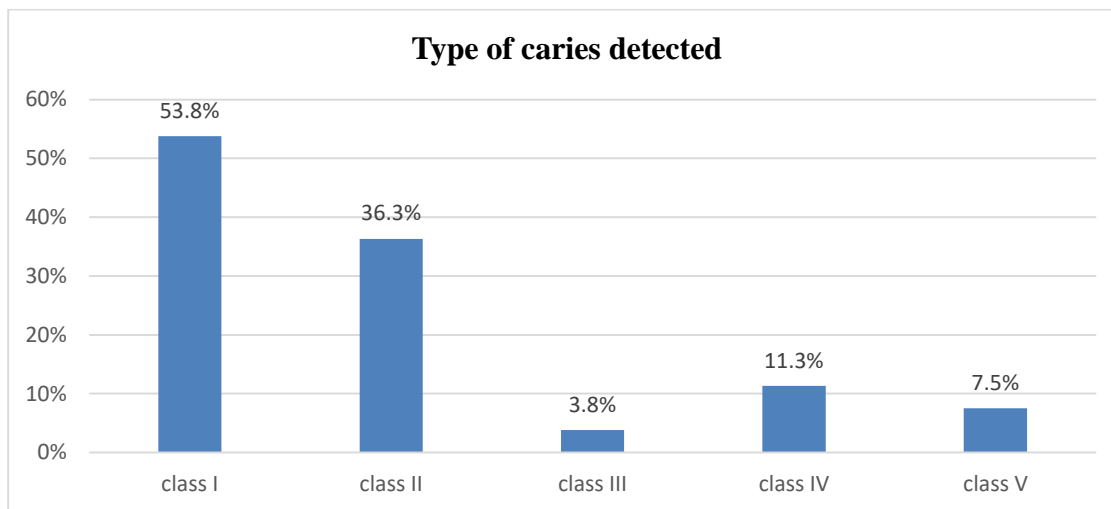


Figure (3) : Type of caries detected:

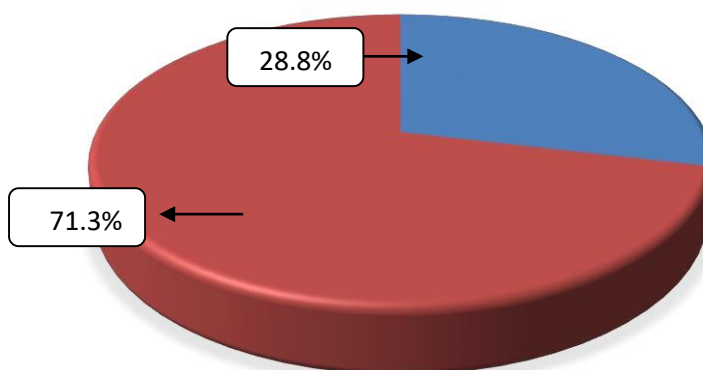


Figure 4: Presence of mucosal changes:

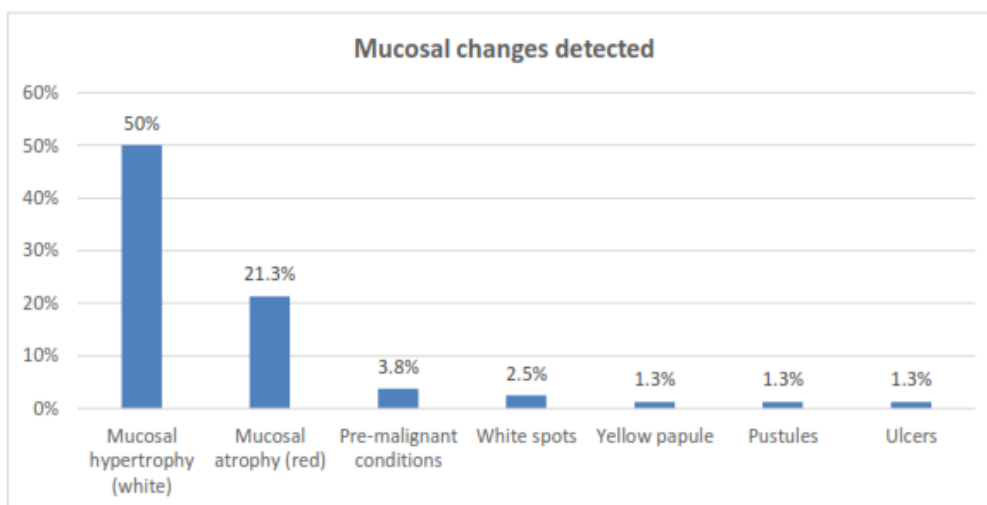


Figure (5): Type of mucosal changes detected



Picture (1): (A): remnant of snuff (black arrow), staining, recession and mucosal darkening and hypertrophy associated with upper labial vestibule as placement site. (B): recession, root caries, erosion, and gingival inflammation of the lower anterior teeth associated with placement site



Picture (2): calculus, staining, sever gingival enlargement, and mucosal alteration (mucosal hypertrophy) at placement site in upper right buccal mucosa 21, 22, 23.

## DISCUSSION

This study was conducted in Sudan, Khartoum in academy charity dental hospital, Khartoum teaching dental hospital and al-Hekmah health center from January – March 2023 among 80 snuff dippers attending the outpatient and periodontics clinic of the mentioned hospitals. The study aimed to investigate the oral and periodontal changes that occur in the oral cavity of the participant from using snuff, and to measure the periodontal parameter of smokeless tobacco users to determine oral hygiene levels and its relation to underlying changes.

Among the 80 participants, Males made up most of the population (97.5%), and those between the ages of 18 and 29 made up 31.3%. Participants had less than a bachelor's degree in education (35%) and were mostly unskilled laborers (47.5%). This shows similarity with studies done by Moomal Memon et.al who stated that the majority of the patients were males (84.5% with mean age of 34.9 and SD  $\pm$  11.7. and they were illiterate (24.9%) or only primary education (32%) and around 36.5% were unskilled or unemployed (35.1%) (10).

Also with Neha Agrawal, et.al, who found among 542 that most of participants were male (63.83%), with mean age was 36.23 years, reporting an average of 11.26 years of SLT use, their education level was Middle School Certificate 183 (33.76%) (13).

Regarding the smokeless tobacco duration, the study revealed that majority of the participants started for less than 10 years (41.3%). This similar to study done by Kishore Kumar Katuri, et.al, who revealed that most of the participants (27.5%) started the habit 6-10 years (9). This result was dissimilar to study done by Simoona Athar, et.al, which stated that majority of the population, started the habit for more than 10 year (46.5%) (14). The quantity of packs consumed by the most of snuffers was found to be one pack (56.3%). This agree with study done by Kishore Kumar Katuri, et.al. Which stated that the majority of smokeless tobacco users consume 1-2 packs per day (57.5%) (9).

In the present study, the site of placement and time of contact with mucosa has found to be mostly in the buccal mucosa (42.5%) for 1 – 5 minutes (52.5%) respectively. Which go similar with study done by Maher Alshayeb et.al who found



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that the most common site of placement is the buccal mucosa (40.5%) (15). This also disagree with study done by Nada Binmadi, et.sl, that found that the most preferred placement site by SLT users was the mandibular posterior vestibule (27.1%), followed by the maxillary anterior vestibule (23.7%), and the frequency of use was found to be 4–6 times a day (16).

For oral hygiene habits, the literatures had no much concern about the duration and method of brushing, which has found to be 2 – 4 minutes (45%) in a horizontal brushing technique (51.3%).

In contrast, frequency of brushing have been studied in different literature, K.Goel et.al, 47 which revealed that most of participants brush their teeth for one or less time per a day(70.9%), and Neha Agrawal, et.al, which stated that majority brushed their teeth daily(84.13%). Which found to be similar to the present study that showed that majority brush their teeth once a day (61.3%) (5, 13).

On mouth examination, the results revealed that the majority of the contributors had scores of two and three in equal measure for the plaque index (40%), and a score of two for the gingival index (72.5%). In the evaluation, 50% of the population had a pocket depth of 4 to 5 mm, and the clinical attachment loss was determined to be moderate (46.3%). This quit similar to study done by GP. Singh et.al who showed that PI mean is 1.43, GI mean is 1.51, PD mean is 4.94 and CAL is found mostly equal or more than 5mm (17). When site examination is done, white patches (mucosal hypertrophy) were the most prevalent mucosal alteration, found in 57 participants (71.3%). This agree with study doneby Nada Binmadi et.al, which stated that majority of participants (76.3%) had focal mucosal lesion (16).

Recession which found to be (67.5%) of the present study showed similarity with studies done by PS. et.al, who found that recession is higher in area of smokeless tobacco placement compared to non-placement sites (18).

The majority of contributions (66.3%) had dental caries, with class I caries predominating (53.8%). This resembling a study done by Nagarajappa et.al, who revealed prevalence of caries was substantially lower among chewers (26 of 42), or those participants who were impacted by caries, at 61.9% (mean DMFS = 3.5), compared to non-chewers (38 of 42, 90.5%) (Mean DMFS = 5.5) (P 0.05) (19).

When a periodontal parameters are compared to snuff history, we found that there is statically association between start time in years and PI (P value= 0.008) and quantity in packs and PD (P value= 0.013). While there were no association found between any other periodontal parameter and any factor of snuff history which disagree with study done by Neha Agrawal et.al, who revealed that at the placement site, the gingival index was significantly higher (p=0.01). Plaque accumulated more frequently where smokeless tobacco was stored, but the difference was not statistically significant (p=0.51). Greater pocket probing

depth at nonplacement sites, which was statistically significant (p=0.001) in the pocket probing depth difference at placement (13).

This also disagree with study done by PS. et.al, who revealed that Mean PD was significantly higher (p=0.002 and p=0.014, respectively) among those who had the habit for less than five years (n=44) compared to those who had it for five to ten years (n=26). However, mean CAL (p=0.017) showed statistically significant changes among people who had the SLT habit for more than 10 years (n=20). More severe periodontal damage was seen in those who had the habit for more than 10 years (higher mean PD, mean REC, and mean CAL) (18).

### CONCLUSION

In a completion, the study conclude that SLT is a major risk factor for aggregating the periodontal and oral health as the study revealed that the majority had a mucosal changes and recession and other risk factors that may initiate the malignant transformation. In addition the low awareness, primary education level, and bad oral hygiene habits, may contribute to worsen the conditions of the patients.

### RECOMMENDATIONS

- 1- Increase awareness level of the users about the risks of prolonged use.
- 2- Facilitate the cessation therapy for those who intended to stop the habit.
- 3- Increase the cessation centers and specialist to guide the patients
- 4- Legal prohibit for the places that sell the snuff.
- 5- Financial penalty must be applied for those who disobey the rules.

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