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Frequency of tobacco use and its relationship with oral soft tissue lesions

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ABSTRACT

Introduction: Tobacco use plays an important role in the development of oral lesions. The aim of this study was to evaluate the relationship between tobacco use and the incidence of these lesions.

Materials & Methods: This cross-sectional study was performed on 399 patients referred to Qom Dental School in four groups of non-tobacco users (n=146), cigarette smokers (n=98), water pipe smokers (hookah) (n=81), and cigarette and water pipe smokers (n=74) .Oral lesions, dental caries, halitosis and xerostomia were evaluated with the help of oral examination and the use of a questionnaire. Data were analyzed using the SPSS 24, ANOVA, Chi-square test (P<0.05).

Results: The highest prevalence of oral mucosal lesions (98.6%) was noted in group 4 (cigarette and water pipe smokers). Gingivitis, periodontitis, and coated tongue had the highest frequency among all oral mucosal lesions. Xerostomia, halitosis, impaired sense of taste, hairy tongue, coated tongue, nicotinic stomatitis, leukoedema, smoker's melanosis, and non-keratotic white plaques had significant correlations with tobacco use (P<0.05). Decayed, Missing and Filled Teeth (DMFT) also had a significant correlation with tobacco use (P<0.05).

Conclusion: **A** wide and varied range of oral mucosal lesions was observed in smokers. Due to its harmful influence on the oral mucosa and awareness of the prevalence of lesions and increase the risk of oral cancer, periodic examinations by specialists are emphasized.

Keywords: Tissues, Smokers, Dental Caries, Halitosis, Xerostomia

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Introduction

Tobacco use poses significant public health problems worldwide.[1] There are about one billion smokers worldwide, corresponding to approximately one-fifth of the world's population. This rate is estimated to reach 1.5 to 1.9 billion by 2025. [2] Cigarette smoking has a constant or descending trend in developing countries; however, its prevalence is on the rise in developing countries. [3] A study conducted on the adult population of Iran (15 to 64-year-olds) in 2007 reported that 14.8% of the population were tobacco users. Only 3.4% were ex-smokers while 12.5% were current smokers. Of all, 2.7% reported daily water pipe smoking.[4]

Tobacco use is the most important preventable cause of early morbidity and mortality.[5] Over two-thirds of such deaths occur in developing countries. All forms of tobacco can cause DNA damage and lead to oral and pharyngeal cancer. The risk of oral cancer in smokers is estimated to be 7 to 10 times that of non-smokers.[6] The risk of oral cancer increases with deeper puffs and a higher number of cigarettes smoked per day.[7] Recent basic scientific research has shown persistent oxidative, mutagenic, and inflammatory changes that can have potential health effects on precancerous oral lesions and chronic diseases such as chronic obstructive pulmonary disease and atherosclerosis.[8]

Tobacco use is among the most common risk factors for oral mucosal lesions such as lichen planus, leukoplakia, smoker's melanosis, leukoedema, hyperkeratosis, nicotinic stomatitis, median rhomboid glossitis, hairy tongue, squamous cell carcinoma, gingivitis, and periodontal disease.[9-12] A study conducted in Hamadan city reported the prevalence of hairy tongue, smoker's melanosis, friction keratosis, leukoplakia, nicotinic stomatitis, and squamous cell carcinoma in smokers to be 100%, 46.5%, 7.3%, 2.7%, 2.3%, and 1.1%, respectively.[6]

Smoker's melanosis is seen in 25% to 31% of tobacco users. It is characterized by distinct or multiple brown maculae that often involve the mandibular attached gingiva. Pigmentation of the palate and buccal mucosa is related to pipe smoking. [13] Tobacco use also plays a role in the development of periodontal disease. Smokers have a higher prevalence of periodontal disease, and the severity of the disease is also higher in them compared with non-smokers

Around 100 million people are water pipe smokers. [14] Water pipe users are exposed to toxins similar to those of cigarette smokers. [15, 16] it has been reported that the smoke released from each puff of water pipe smoke is 12 times that of cigarette smoke.[17] Because of the longer duration of water pipe smoke use, water pipe smokers may inhale smoke equal to the smoke of 100 cigarettes.[18] Evidence shows that water pipe use is as hazardous as cigarette smoking. [19] Contrary to the high consumption of cigarettes and water pipe in Iran, the prevalence of oral lesions between cigarette smokers and water pipe users has not been compared in any study in Iran. Thus, this study was designed to investigate the prevalence of oral mucosal lesions in cigarette and water pipe smokers.

Materials & Methods

This descriptive cross-sectional study evaluated 399 patients presenting to the dental clinic of Qom Dental School for a routine dental checkup. Sample size calculation was conducted based on α=0.05 and study power 80% as well as the prevalence of gingivitis was 57.3% and 32.2% in smokers and non-smokers, respectively. Based on these items and the sample size for comparing two proportions, the minimum sample size for each group was estimated as 61 people. Therefore, the subjects were placed in four groups including non-tobacco users (n=146), water pipe smokers (n=81), cigarette smokers (n=98), and both water pipe and cigarette smokers (n=74). The written informed consent was taken from all subjects and the study was approved by the Ethical Committee of Qom University of Medical Sciences by IR.MUQ.REC.1395.102 cod.

The inclusion criteria were inclination for participation in the study, absence of systemic diseases, no intake of medications, and no alcohol consumption. Smokers had to smoke at least 5 cigarettes or one water pipe smoking per day, and non-tobacco users had no history of cigarette or water pipe smoking. The exclusion criteria were alcohol consumption, substance abuse, presence of systemic diseases and medication intake.

After briefing the participants about the study and obtaining their written informed consent, they underwent clinical examination and oral interview by a dental student under the supervision of an oral and maxillofacial medicine specialist with a dental mirror and periodontal probe on a dental chair. Oral examinations were performed based on

visual diagnostic criteria for oral mucosal lesions and World Health Organization (WHO) criteria. Information regarding the presence of mucosal lesions (keratotic and non-keratotic white plaques, Erythematous plaque, Red and white plaques, Pigmentation…), dental caries, halitosis and xerostomia were recorded in a checklist.[5, 10, 20-22] Developmental lesions were not evaluated. The lesions were classified into white and red plaques, erythematous plaques and pigments based on the color atlas of the common oral disease. Non-keratotic white plaque is a white plaque that can be removed with gas and keratotic white plaque is a white plaque that cannot be removed with gas. Pigmentation lesion in this study includes single pigments (melanotic macules, moles, etc.) and diffuse pigments (physiological, etc.). Among the diffuse pigmentations, only the smokers' melanosis is listed in a separate category and as regards that systemic disease and medication intake were among the exclusion criteria in this study, other diffuse cases are referred to as diffuse pigmentations. [10, 21, 23] The diagnosis was initial. With respect to the high sample size and lack of patient cooperation, the biopsy was not possible for all patients .but in a few cases biopsy was performed, and because of the limited number, it was not mentioned in the study. Patients were asked to complete a standard fox dry mouth questionnaire. Halitosis, xerostomia and impaired sense of taste were also evaluated subjectively by interviewing the patients.[10, 20, 24] periodontal diseases (pocket depth more than 3 mm) were considered.[14] The DMFT index was calculated.[25]

SPSS version 24 (SPSS Inc., IL, and the USA) was used to analyze the data. In order to assess the normal distribution of data, the Kolmogorov-Smirnov test was used. ANOVA was used to analyze quantitative variables among all groups, and the Chi-square test was applied to analyze the nominal variables among four groups. Statistical significance was considered in P<0.05.

Results

There were 111 females and 35 males in group 1 (n=146, 36.6%, non-tobacco users), 50 males and 31 females in group 2 (n=81, 20.3%, water pipe smokers), 88 males and 10 females in group 3 (n=98, 24.6%, cigarette smokers), and 65 males and 9 females in group 4 (n=74, 18.5%, cigarette and water pipe smokers). The mean age of participants was 33.14±9.3 years (range 19 to 69 years). A total of 161 females (40.4%) and 238 males (59.6%) were evaluated the difference in frequency of males and females was significant in the control, cigarette smoker, and cigarette and water pipe smoker groups (P<0.001).

ANOVA showed in Table 1 Comparing the frequency and duration of tobacco smoking in the study population that the mean duration of water pipe smoking was 71.7 months (range 6 to 240 months) in group 2 and 7.03 months (range 1 to 30 months) in group 4 (p=0.001). The mean frequency of water pipe smoking per month was 2.72 in group 2 and 2.74 in group 4 (p>0.05). The mean number of cigarettes smoked per day was 11.27±12.39 cigarettes in group 3 and 9.19±6.86 cigarettes in group 4, but this difference was not significant (p>0.05). Overall, 71.8% and 78.1% of participants in groups 2 and 4, respectively reported water pipe smoking consumption a couple of times per month (P=0.076). Table 2 shows the frequency of detected oral mucosal lesions in the four groups. Gingivitis, periodontitis, and coated tongue were the most prevalent conditions in our study population. Xerostomia, halitosis, impaired sense of taste, hairy tongue, coated tongue, nicotinic stomatitis, leukoedema, smoker’s melanosis, and non-keratotic white plaques had significant correlations with tobacco use (P<0.05), such that the prevalence of these conditions was significantly higher in group 4 (cigarette and water pipe smokers). The Chi-square test did not show any significant correlation between other conditions and tobacco use (P>0.05).

The overall prevalence of oral mucosal lesions was statistically significant among the four groups (P<0.001). Group 4 had the highest prevalence of oral mucosal lesions (98.6%); while, this rate was minimum in group 1 (66.4%), while groups 2 and 3 had an overall prevalence of 81.5% and 98%, respectively. In group 4, periodontitis and in group 3, gingivitis had the highest prevalence. The four groups were significantly different in the prevalence of different conditions (P<0.001). Gingivitis, periodontitis and halitosis were the most common conditions in the study population. Chi-square test was showed that xerostomia (P<0.001), halitosis (P<0.001), impaired sense of taste (P<0.001), hairy tongue (P<0.001), coated tongue (P<0.001), nicotinic stomatitis (P<0.001), gingivitis (P=0.001), periodontitis

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(P<0.001), smoker's melanosis (P<0.001), and non-keratotic white plaques (detachable) (P=0.001) had a significant association with tobacco use (Table2).

Table 3 shows the DMFT score of the study groups. ANOVA revealed a significant difference among the four groups in the number of carious and missing teeth, such that the number of carious teeth was higher in water pipe smokers. This value was the same in cigarette smokers, and cigarette and water pipe smokers, and higher than that of non-tobacco users.

Table 1. Comparing the frequency and duration of tobacco smoking in the study population

Variables	Group1 (non-tobacco users)	Group2 (water pipe smokers)	Group3 (cigarette smokers)	Group4 (cigarette and water pipe smokers)	P-value *
mean duration of water pipe smoking (months)	-	71.7±56.87	-	7.03±5.2	<0.001
mean frequency of water pipe smoking	-	2.72±0.45	-	2.74±0.53	0.786
mean number of cigarettes	-	-	11.27±12.39	9.19±6.86	0.196

* Chi-square test (P<0.05)

Table 2. Frequency of detected oral mucosal lesions in the four groups

oral mucosal lesions	Group1 (non-tobacco users) 146 N (%)	Group2 (water pipe smokers) 81 N (%)	Group3 (cigarette smokers) 98 N (%)	Group4 (cigarette and water pipe smokers) 74 N (%)	P Value	Total prevalence 399 N (%)
Xerostomia	5(3.4)	11(13.6)	20(20.4)	17(23)	0.001<	53(13.3)
Halitosis	8(5.5)	19(23.5)	36(36.7)	28(37.8)	0.001<	91(22.8)
Impaired sense of taste	1(0.7)	7(8.6)	6(6.1)	11(14.9)	0.001<	25(6.3)
Hairy tongue	1(0.7)	9(11.1)	18(18.4)	22(29.7)	0.001<	50(12.5)
Coated tongue	17(11.6)	22(27.2)	39(39.8)	41(55.4)	0.001<	119(29.8)
Fissured tongue	11(7.5)	8(9.9)	8(8.2)	7(9.5)	0.925	34(8.5)
Median rhomboid glossitis	2(1.4)	6(7.4)	5(5.1)	4(5.4)	0.147	17(4.3)
Nicotinic stomatitis	0(0)	11(13.6)	7(7.1)	15(20.3)	0.001<	33(8.3)
Ulcers	5(3.4)	2(2.5)	3(3.1)	2(2.7)	0.979	12(3)
Leukoedema	5(3.4)	5(6.2)	12(12.2)	7(9.5)	0.058	29(7.3)
Gingivitis	36(24.7)	28(34.5)	46(46.9)	33(44.6)	0.001	143(35.8)
Periodontitis	24(16.4)	23(28.4)	43(43.9)	35(47.3)	0.001<	125(31.3)
Smoker's melanosis	0(0)	1(1.2)	16(16.3)	13(17.6)	0.001<	30(7.5)
Deep grooves of the tongue	1(0.7)	2(2.5)	5(5.1)	2(2.7)	0.195	10(2.5)
Petechia	3(2.1)	2(2.5)	4(4.1)	4(5.4)	0.547	13(3.3)
Keratotic white plaques	3(2.1)	3(3.7)	4(4.1)	6(8.1)	0.195	16(4)
Non keratotic white plaques	0(0)	1(1.2)	3(3.1)	8(10.8)	0.001<	1(0.3)
plaque Erythematous	0(0)	1(1.2)	2(2)	2(2.7)	0.308	5(1.3)

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Red and white plaques	1(0.7)	1(1.2)	4(4.1)	2(2.7)	0.275	8(2)
Exophytic lesions	2(1.4)	0(0)	3(3.1)	4(5.4)	0.110	9(2.3)
Geographic tongue	20(13.7)	12(14.8)	18(18.4)	13(17.6)	0.752	63(15.8)
Fordyce granules	5(3.4)	5(6.2)	4(4.1)	4(5.4)	0.803	17(4.3)
Pigmentation	9(6.2)	5(6.2)	6(6.1)	4(5.4)	0.996	24(6)
Abscess	4(2.7)	3(3.7)	5(5.1)	2(2.7)	0.767	14(3.5)

Table 3. DMFT score of the study groups

DMFT	Group 1 Mean± SD	Group 2 Mean± SD	Group 3 Mean± SD	Group 4 Mean± SD	P-value*
Caries	3.57 ±4.40	3.34 ±9.21	4.08 ±6.38	4.13 ±6.09	0.001<
Missing	3.11 ±2.94	3.32 ±3.57	5.15 ±5.77	3.57 ±4.32	0.001<
Filled	2.83 ±3.79	2.94 ±4.30	2.46 ±4.08	2.63 ±3.96	0.598
DMF	14.11± 7.5	07.12± 74.6	23.16± 26.6	38.14± 87.6	0.001<

SD: Standard deviation * Chi-square test (P<0.05)

Discussion

In this study, the highest prevalence of oral mucosal lesions (98.6%) was noted in group 4 (cigarette and water pipe smokers). Gingivitis, periodontitis, and coated tongue had the highest frequency among all oral soft tissue lesions. Ahmadi-Motamayel et al.[6] evaluated the prevalence of oral lesions in smokers and non-smokers and reported that coated tongue and gingival problems were the most common oral lesion in smokers. Al-Attas et al.[22] Reported the same results. The prevalence of periodontitis was 47.3% in cigarette and water pipe smokers and 43.9% in cigarette smokers in our study. Studies have shown that smokers have more severe periodontal disease compared to non-smokers and There is a dose-dependent relationship between the number of cigarettes smoked per day and the likelihood of periodontal disease.[26]

The prevalence of coated tongue was 55.4% in cigarette and water pipe smokers and 39.8% in cigarette smokers. The covered tongue was the most common lesion with a prevalence of 19.83% in Molania et al.'s [27] study and a prevalence of 40.8% in Delavarian and Zavar's study.[28] Our results regarding the correlation of coated tongue with cigarette and water pipe smokers were consistent with the findings of Babaee et al.[29] who reported a significantly higher prevalence of coated tongue in smokers compared with non-smokers. AL-Maweri et al[30] evaluated the correlation of oral lesions with tobacco use in Yemen and reported that hairy tongue had a 15.9% prevalence rate, which was different from our findings.

The high prevalence of hairy tongue in some studies may be due to the fact that many studies also considered coated tongue as hairy tongue. Our study also showed a significant correlation between tobacco use and DMFT, which was in line with the results of Akbari and Jiang.[31, 32] Also, xerostomia had a significant correlation with tobacco use in our study. The prevalence of xerostomia was the highest in cigarette and water pipe smokers (23%). This rate was 75% in a study by Prabhu et al.[33] The difference between their results and ours may be due to different sample sizes .Smoker's melanosis had a significant correlation with tobacco use in our study . Behura et al.[34] In India reported that smoker's melanosis was the most common lesion in smokers followed by submucosal fibrosis and leukoplakia. In the study by Ahmadi-Motamayel et al.[6] Melanosis was among the most common oral lesions in smokers. Gajdhar et al.[35] Also reported the most common oral mucosal lesions associated with smoking, white and pigmented lesions. Al-Maweri et al.[30]

Reported white lesions as the second most common tobacco-related lesions. Sujatha et al.[36] reported that leukoplakia was the most common oral lesion detected in tobacco users. Aishwarya et al.[37] Found that the frequency and duration of smoking were associated with an increased risk of oral lesions. In our study, keratotic and non-keratotic white plaques are more common in group 4 (cigarettes and water pipe smokers) than in other groups. Chemical components in tobacco and persistent friction factors and candidiasis lead to such lesions. [30, 31]

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One of the limitations of the study was the lack of cooperation of patients in performing a biopsy of suspected lesions and also the risk of bias in completing the questionnaire by the patient and the examiner bias due to being aware of smoking. One of the advantages of studying the sample size was high and examining oral lesions according to the type of smoking. Similar studies are required on a larger sample size in different parts of Iran.

Conclusion

A wide and varied range of soft tissue lesions of the oral mucosa was observed in smokers. Due to its harmful influence on the oral mucosa and awareness of the prevalence of lesions and increase the risk of oral cancer, periodic examinations by specialists are emphasized.

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Conflicts of Interest

There is no conflict of interest to declare.

Authors' Contribution

The study was designed by Yasamin Barakian. The study data were collected by Morteza Saeidi and Fateme Salehi. Analysis of data was performed Mohammad beige. Study supervision was conducted by Yasamin Barakian.

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