RESEARCH ARTICLE

Prevalence of Potentially Malignant Oral Mucosal Lesions among Tobacco Users in Jeddah, Saudi Arabia

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Abstract

Smoking is recognized as a health problem worldwide and there is an established tobacco epidemic in Saudi Arabia as in many other countries, with tobacco users at increased risk of developing many diseases. This cross sectional study was conducted to assess the prevalence of oral mucosal, potentially malignant or malignant, lesions associated with tobacco use among a stratified cluster sample of adults in Jeddah, Saudi Arabia. A sample size of 599 was collected and each participant underwent clinical conventional oral examination and filled a questionnaire providing information on demographics, tobacco use and other relevant habits. The most common form of tobacco used was cigarette smoking (65.6 %) followed by Shisha or Moasel (38.1%), while chewing tobacco, betel nuts and gat accounted for 21-2%, 7.7%, and 5% respectively. A high prevalence (88.8%) of soft tissue lesions was found among the tobacco users examined, and a wide range of lesions were detected, about 50% having hairy tongue, 36% smoker's melanosis, 28.9% stomatitis nicotina, 27% frictional keratosis, 26.7% fissured tongue, 26% gingival or periodontal inflammation and finally 20% leukodema. Suspicious potentially malignant lesions affected 10.5% of the subjects, most prevalent being keratosis (6.3%), leukoplakia (2.3%), erythroplakia (0.7%), oral submucous fibrosis (0.5%) and lichenoid lesions (0.4%), these being associated with male gender, lower level of education, presence of diabetes and a chewing tobacco habit. It is concluded that smoking was associated with a wide range of oral mucosal lesions , those suspicious for malignancy being linked with chewable forms, indicating serious effects.

Keywords: Prevalence - mucosal soft tissue lesions - potentially malignant lesions - tobacco users

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Introduction

Tobacco use is a great health problem. It is associated with high levels of morbidity and mortality all over the world. Five million persons die from tobacco related diseases every year in the world, particularly in developing countries. While in the USA, the tobacco related health cost $167 billion per year. In the kingdom of Saudi Arabia, around $160 million is used for purchasing tobacco per year (Bassiony, 2009). In (1999), it was reported that the prevalence of smoking was (21.1%) for males and (0.09%) for females (Jarallah, et al., 1999), while recent Saudi research (2009) documented a prevalence of (11.6-52.3%) among adults from various studies all over the kingdom (Bassiony, 2009), and a prevalence of 11% among Jeddah Female University students (Merdad, et al., 2007), indicating an increasing trend, and was considered by Saudi researchers as a Public Health problem which needs intensive and comprehensive tobacco control efforts (Jarallah, et al., 1999).

Tobacco and alcohol use have been established as risk factors for the development of potentially malignant lesions of the oral mucosa (Blot, et al., 1988; Znaor, et al., 2003; Yen, et al., 2007). Researchers reported various lesions in association with tobacco use such as leukoplakia, smoker's melanosis, and oral sub mucous fibrosis (Saraswathi, et al., 2006; Sujatha, et al., 2012). In spite of the high level of tobacco use among Saudis and the reported risk of developing serious lesions associated with it, however it was found that there is scarcity of studies which assessed the prevalence of these lesions in Saudi Arabia.

Therefore this study aimed to assess the prevalence of oral mucosal, potentially malignant and/or malignant lesions among adult tobacco users in Jeddah, and to determine some risk indicators associated with higher prevalence of these lesions, such as socio-demographic and medical factors.

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Materials and Methods

Sample size calculation was done according to the prevalence of smoking among Jeddah adults (Bassiony, 2009), the prevalence of premalignant lesions among smokers (Talole, et al., 2006), and the estimated target population, with a 95% confidence level and 0.05 acceptable level of error, accordingly the sample size estimated was 388, which was rounded to 500-600 to decrease type I error and improve power of the study. The calculation was done using Statcalc Epi Info version 6. Various sections of Jeddah adult population were represented in the present sample, having been selected from population clusters such as companies, university students and employees, female training centers as well as productive groups of workers from different factories (WHO, 1997) and people from reception areas of major and private hospitals and during medical hospital events. All provided written informed consent prior to participation. Men and women who were ≥18 years old and tobacco users were eligible to participate in the study, which was voluntarily and done between 2011-2013. The study was approved by the local ethics committee at King Abdulaziz University Faculty of Dentistry (KAUFD).

All participants filled a questionnaire including demographic information, personal and medical history as well as tobacco use and other habits.

Clinical conventional oral examinations were standardized among the research team through training sessions on systematic oral mucosal examination (Kramer, et al., 1980), following the criteria for the Visual detection of oral mucosal lesions (Kerr, 2000) and the World Health Organization (WHO) criteria (WHO, 1999).

Training sessions and calibration of examiners were conducted by the two oral medicine consultants for the whole study team until an acceptable level of consistency in diagnosis was reached (95%). A portable dental chair and light were used to facilitate outreach examinations and field work.

Statistical analysis

Data were analyzed using SPSS, version 16.0 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics such as frequency and percentages were used. OR and its corresponding 95% confidence intervals (CI) were computed to estimate the risk of suspicious lesions in relation to the independent variables studied. Multiple stepwise logistic regression analysis was used to model the risk of suspicious lesions as a function of sociodemographic data, medical history, and habits. To control for confounders and to minimize the effect of multicollinearity, only significant variables in bivariate analysis were included in the stepwise model. If two variables were significantly highly related, only one of them was introduced into the model. All tests were two sided and $p<0.05$ indicates statistical significance (Streiner and Norman, 2008).

Results

The study included a total sample of 599 subjects with a mean age of 34.9 years. About 75% of the sample were males,. Those of Saudi origin were 42.9%, The majority of participants (71%) were of urban origin. Only 33.7% completed university education, and more than half of the samples (58%) were handy workers and nearly the same(85.9%) were of the lower income group (<3000 SR/ month).

Regarding the tobacco use habits (Figure 1), the highest frequency was related to cigarette smoking (65.6%) followed by Shisha or Moasel (38.1%), Chewing tobacco was practiced by 21.2% of the participants, while chewing betel nuts and gat accounted for 7.7% and 5% respectively .

Among the other habits tooth brushing was reported by the majority of participants (78%) as regular tooth brushing at least once a day.

Clinical findings and extra-oral-examination revealed

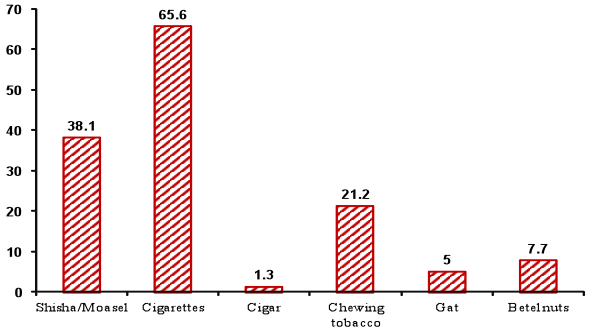

Figure 1. Tobacco Habits among the Study Participants

Table 1. Soft Tissue Lesions among the Study Sample

Lesion	No.	%
Acute necrotizing ulcerative gingivitis	1	0.2
Acute pseudomembranous candidosis	2	0.3
Angular cheilitis	2	0.3
Atrophy of tongue papillae	3	0.5
Denture-induced stomatitis	2	0.3
Desquamative gingivitis	1	0.2
Fissured tongue	160	26.7
Fistula and parulis	5	0.8
Frictional keratosis	162	27
Geographic tongue	18	3
Gingival or periodontal inflammation	154	25.7
Hairy tongue	299	49.9
Herpes labialis	6	1
Irritation fibroma	7	1.2
Leukodema	120	20
Median rhomboid glossitis	6	1
Melanotic macules	4	0.7
Morsicatio buccarum	47	7.8
Mucocele	1	0.2
Recurrent aphthous ulcerations	9	1.5
Smoker's melanosis	216	36.1
Stomatitis nicotina	173	28.9
Traumatic ulcer	17	2.8
Vascular proliferations/ haemangioma	4	0.7
Others:		
Early smokeless keratosis	50	8.3
Smoker's keratosis	49	8.2
Tie tongue	1	0.2
Foliate papillitis	1	0.2
None	67	11.2

No. with at least one STL=532 (88.8%)

Table 3. Stepwise Logistic Regression of Factors Afecting Prevalence of Suspicious Lesions

		B	S.E.	Wald	P	OR	95% CI	
							Lower	Upper
Model I	Age <30®							
	30-	-0.253	0.362	0.49	0.485	0.78	0.38	1.58
	40-	0.018	0.407	0.01	0.964	1.02	0.46	2.26
	50+	0.864	0.427	4.09	0.043*	2.37	1.03	5.48
	Female	-1.032	0.452	5.21	0.023*	0.36	0.15	0.87
	University®							
	Illiterate	0.174	0.495	0.12	0.725	1.19	0.45	3.14
	Primary/Intermediate	1.418	0.391	13.18	0.000*	4.13	1.92	8.88
	Secondary	0.585	0.409	2.05	0.153	1.80	0.81	4.00
	Constant	-1.595	0.666	5.74	0.017			
Model II	Diabetic	1.025	0.388	6.99	0.008*	2.79	1.3	5.96
	Constant	-2.248	0.144	242.33	0.000			
Model III	Chewing tobacco	2.628	0.304	74.91	0.000*	13.84	7.63	25.1
	Constant	-3.228	0.24	180.38	0.000			

®Reference group

Table 2. Prevalence of Suspicious(potentially malignant) Lesions by Conventional Examination

Suspicious lesions	No.	%
Negative	536	89.5
Positive	36	10.5
Smokeless keratosis	38	6.3
Leukoplakia	14	2.3
Erytrholeukoplakia	4	0.7
Erythroplakia	1	0.2
OSF	3	0.5
Lichenoid lesion	2	0.4
Proliferative leukoplakia	1	0.2

OSF =Oral sub mucous fibrosis

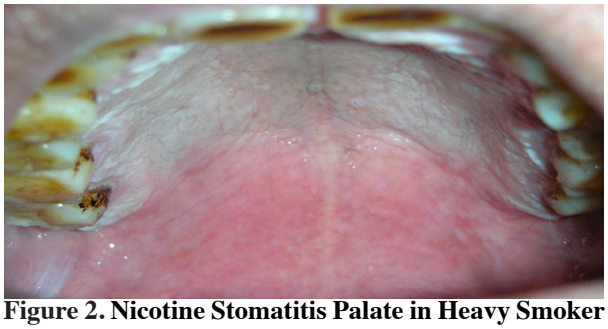

Figure 2. Nicotine Stomatitis Palate in Heavy Smoker

that palpable lymph nodes were encountered among 40.6% of the participants while TMJ clicking was found among 15.9%.

Intra-oral examination (Table 1), revealed that the majority of the examined population (88.8%) exhibited at least one soft tissue lesion. Nearly half of the subjects (49.9%) showed signs of hairy tongue, while smoker's melanosis was found among 36% of the examinees, followed by stomatitis nicotina (28.9%), then frictional keratosis found in 27%, fissured tongue accounted for about 26.7% while gingival or periodontal inflammation affected about 26% of the sample participants and finally leukodema among 20%.

The prevalence and characteristics of suspicious lesions are shown in Table 2. Only 10.5% of the studied patients had suspicious lesions diagnosed by clinical examination. The provisional diagnosis revealed the highest frequency for smokeless keratosis (6.3%),

Figure 3. Teeth Staining and Severe periodontitis

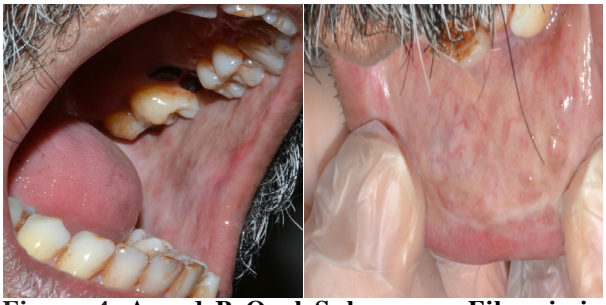

Figure 4. A and B Oral Submucous Fibrosis in Smokeless Tobacco and Betel Nuts Chewer

Figure 5. Smokeless Keratosis lesion

followed by leukoplakia (2.3%), erytheroplakia (0.7%), oral submucous fibrosis (0.5%), lichenoid lesions (0.4%), while both erytheroplakia and proliferative leukoplakia accounted for only 0.2% of the total lesions.

Table 3 shows the stepwise logistic regression of the factors affecting the prevalence of suspicious lesions.

Regarding the relation of suspicious lesions to socio-demographic characteristics of the study population,

they were found to be significantly related with a higher risk to the age group (50 years) (OR, p=2.69 (0.012), male gender (OR=3.46 (p=0.001), Asian nationality (OR=2.01, p=0.025), lower levels of education (primary and intermediate) (OR 4.64, p=0.000) and the lowest income category (OR=3.98, p=0.006). Relative to medical history, the only condition found positively associated with a higher risk of suspicious lesions was diabetes mellitus (OR=2.79, p=0.017). Considering the association of suspicious lesions with tobacco and other personal habits, higher risk and significant association was found among tobacco chewers (OR=13.84, p=0.000), and betel nut chewers (OR=5.74, p=0.000). Table 3 shows the adjusted odds ratios of the factors affecting the prevalence of suspicious lesions, and it confirmed the results of bivariate analysis.

Discussion

According to the WHO, the global smoking epidemic is expected to remain as one of the major factors of premature death, illness and sufferings for several decades (WHO, 1999).

The present study is an original research conducted in Jeddah, Saudi Arabia, and is a leading investigation for assessing oral mucosal lesions, potentially malignant or malignant lesions associated with tobacco use among an adult sample selected from population clusters in Jeddah.

Results of the current survey showed gender distribution with a higher percentage of males (75%) and a mean age of around 35 years, similar to other studies conducted in India (Chandra and Govindraju, 2012; Sujatha, et al., 2012) and pointing at the spread of tobacco habits among these groups, and the lower rate of reporting of smoking among females, especially in such a conservative community.

The most common form of tobacco used was cigarette smoking (65.6) almost similar to results of many other surveys in different countries (Lin, et al., 2001; Scott and Palmer, 2002; Chandra and Govindraju, 2012; Sujatha, et al., 2012), followed by Shisha or Moasel (38.1).

By clinical conventional examination a high prevalence (88.8%) of soft tissue lesions was found among the tobacco users examined, and a wide range of lesions present in table (4) about 50% had hairy tongue, (36%) smoker's melanosis, (28.9%) stomatitis nicotina, (27%) frictional keratosis, fissured tongue (26.7%), gingival or periodontal inflammation (26%) and finally leukodema (20%),

Suspicious (premalignant) lesions affected only 10.5% of the subjects (Table 5), most prevalent was smokeless keratosis (6.3%), leukoplakia (2.3%), erytheroplakia (0.7%), oral submucous fibrosis (0.5%), lichenoid lesions (0.4%).

The high level of oral mucosal soft tissue lesions (88.8%) may be attributed to the irritational effect of tobacco on oral structures, including genetic and host modification factors. These include adhesion molecule dysregulation, reduced response of T cells to antigens, altered neutrophil activity and platelet aggregation influencing the immune system (Pitzer, et al., 1996; Scott and Palmer, 2002).

This high level of soft tissue lesions is similar to Indian studies conducted on dental hospital patients (Chandra and Govindraju, 2012; Sujatha, et al., 2012), detected a level of (74% 62%) among the population studied. However the type of lesions differed in prevalence from the present investigation with leukodema highest in the first study (7%) among smokers and oral submucous fibrosis OSF (2.4%) among chewers, while in the second study smoker's melanosis (23%) was highest among smokers, and OSF (9.4%) among chewers, while in the current study a higher level of benign lesion such as leukodema (20%) and a lower level of OSF (0.5%) was found, the difference of results may be attributed to the different sampling methods, a stratified random sample selected from population clusters in the current study, versus a dental hospital sample in the Indian studies with the expected higher level of more serious lesions.

The types of oral mucosal lesions (OMLs) detected in the present study are so similar to those reported in a study conducted among adult Chinese in (2001) (Lin et al., 2001) where the most prevalent lesions among the 35-44 years old was smoker's palate, followed by hairy tongue, while fissured tongue was the most common among the elderly.

Further support is also gained from a survey conducted in Slovenia (2002), and reported a prevalence of 61.6% among a population aged 25-75 visiting the oral medicine department in Ljubljana, Slovenia (Kovac-Kovacic and Skaleric, 2000) and an approaching level of fissured tongue (21.1%), in the present survey (27.2%) was found, while frictional keratosis was much higher in the latter (22.6%) than in Slovenia study, being related to the smokers population studied.

The current results are also in accordance with the results of a Swedish study conducted on a random sample of Swedish adult population (2006) (Shankar, et al., 2010), it revealed the presence of oral mucosal lesions among 95% of them, a positive correlation was found between tobacco use and frictional white lesions, coated tongue, hairy tongue and excessive melanin pigmentation, which were typically the lesions detected with a high frequency in the present investigation.

Suspicious lesions (potentially malignant) were diagnosed by clinical examination among 10.5%, which although was considered a small percentage, but it was in accordance with an Indian research reporting 14.4% of oral dysplasia among smokeless tobacco (Scott and Palmer, 2002) users. And a previous research (Pitzer et al., 1996), conducted in Virginia where oral lesions were found among 13% of smokeless tobacco users. In the present investigation, this low level of suspicious lesions may be because about(65-6%) of the population surveyed smoked cigarettes and (38.1%) used Shisha, which were not significantly associated with suspicious lesions, while chewing tobacco and betel nuts was practiced by only (21.2%) and (7.7%) successively which were positively associated with these lesions.

Regarding the relation of suspicious lesions detected to socio-demographic factors; In the present study, they were related to older groups (50 years and over), male gender and these were supported by the results of the adult

Chinese study (Lin et al., 2001). Furthermore suspicious lesions were positively related to lower levels of education (primary and intermediate) and the lowest income category (< 3000 SR/month) indicating that socio-economic factors may contribute to unhealthy lifestyles, using tobacco, and poor hygienic habits, which promote the occurrence of such lesions, and these factors were also reported in other studies (Shankar et al., 2010; Sujatha et al., 2012). This was further documented by the association of suspicious lesion with participants who reported to rarely brush their teeth Suspicious lesions were also positively related to Asian nationality and this may be explained by the high prevalence of tobacco chewing habits among Indians in the various ethnic groups as well as urban and rural inhabitants (Reddy and Shaik, 2008;Halawany, et al., 2013). Other studies also reported the prevalence of leukoplakia and other white lesions among elderly Chinese (22), and among selected Cambodian and Vietnamese populations (Ikeda, et al., 1995; Nair, et al., 1996).

It was also found that the first group of examiners (Oral Medicine consultants, examiner I) reported the presence of 12% suspicious lesions among the study participants while the second group (general dentists, examiner II) diagnosed only 9.1% of the cases This indicated that clinical diagnosis was affected by the experience of the first group and their sensitivity in detecting those lesions.

Among the medical factors of the study population, only diabetes was significantly and positively related to the occurrence of suspicious lesions (Table 3). This may be explained by the higher susceptibility of diabetic patients to white and red changes in the mucosa, and the bacterial infections (Sandberg, et al., 2000), specifically those with poor glycemic control, who are more liable to fungal opportunistic infections caused by Candida Albicans (Al-Maskari, et al., 2011).

Among the tobacco use habits, chewing tobacco, and betel nuts were positively and significantly associated to the occurance of suspicious lesions. These results are supported by an Indian research (Sujatha et al., 2012), which reported that oral submucous fibrosis (19.4%, leukoplakia (13.1%) and tobacco induced keratosis (9.7%) affected smokeless tobacco users with the preceding percentages. Another Indian study documented the association of higher level of OSF, chewers mucosa and tobacco pouch keratosis among the tobacco chewers group (Chandra and Govindraju, 2012). A third study documented the prevalence of OSF among areca nut and Guthka chewers, and leukoplakia among mixed (smoking and chewing) habit participants (Patil, et al., 2013). All these study results are in accordance with the present study. Data from Malmo University, oral health database in 1997 declared that among adolescents in USA, leukoplakia was the most frequent lesion among smokeless tobacco users and affected around 2.9% of both males and females (Tomar, et al., 1997). This association was explained by the stronger effects of smokeless tobacco than the smoked types because of the direct contact of carcinogenic substances present with the oral mucosa in the former (Madani, et al., 2010).

In conclusion, smoked tobacco was associated with a wide range of benign oral mucosal lesions while smokeless (chewable) tobacco was associated with a higher level of suspicious (potentially malignant) lesions. Suspicious lesions were associated with male gender ,higher age ,Asian nationality and lower socio-economic levels. Tobacco cessation programs should be directed to industrial workers and low socio-economic groups to increase their awareness to its hazards especially the chewable types.

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