

## PREVALENCE OF ORAL MUCOSAL LESIONS IN SMOKERS AND NON-SMOKERS: A CROSS-SECTIONAL STUDY IN A MALE EGYPTIAN POPULATION

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### **ABSTRACT**

**Introduction:** Smoking represents a chief health problem, and it is associated with high rates of fatal destructive events. Smoking is major risk factor for developing several oral mucosal lesions. Furthermore, it can result in epithelial dysplasia and subsequent increase in the risk for the development of oral potentially malignant disorders and oral cancer.

**Subjects and methods:** The present cross-sectional study included 1000 male participants and they were divided into 2 groups; smokers and non-smokers. All participants were clinically examined together with full-mouth intra-oral photographs were taken for all of them.

**Results:** The prevalence of oral mucosal lesions was higher in the smokers' group (82%), in which white and pigmented OMLs were found to be the most prevalent forms. Additionally, the prevalence of oral potentially malignant disorders (OPMDs) in smokers was higher than in non-smokers. However, it didn't show a significant difference, On the other hand, the prevalence of oral ulcers in non-smokers was higher than in smokers and this difference was found to be statistically significant ( $p < 0.05$ ).

**Conclusions:** White and pigmented OMLs were the most prevalent forms detected among smokers.

**KEYWORDS:** smoking, tobacco use, prevalence, oral mucosal lesions.

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## INTRODUCTION

Worldwide, tobacco smoking represents one of the major health problems and it is associated with high rates of fatal consequences <sup>(1)</sup>. Smoking is a major risk factor for developing several oral mucosal lesions (OMLs), for example; black hairy tongue, nicotine stomatitis, smoker's patch, smoker's melanosis and leukoplakia. In addition smoking represents an important systemic modifying factor for progression of periodontal diseases <sup>(2)</sup>. Moreover, tobacco smoking results in epithelial dysplasia and subsequent increase in the risk for development of oral potentially malignant disorders (OPMDs) and oral malignancies<sup>(3)</sup>. Cigarettes contain about 4,000 chemical ingredients and free radicals. Nicotine, carbon monoxide, acetaldehyde, nitric oxides and radium are considered the most important components. Polycyclic aromatic hydrocarbons and nitrosamines are the most significant chemical carcinogens in tobacco<sup>(2)</sup>. These chemicals may result in cellular damage and epithelial dysplasia <sup>(4)</sup>. In spite of the increased incidence of smoking habit in Egypt and the increased risk of developing OMLs and OPMDs, few studies assess the prevalence of OMLs that are associated with smoking in Egypt.

Males are more frequently affected by OPMDs mostly because of increased consumption of tobacco and/or alcohol compared to females. The malignant transformation rate of OPMDs is 7.9%, which represents a major oral health issue <sup>(5)</sup>.

The most common OPMDs with increased risk of malignant transformation encompass; leukoplakia, erythroplakia, oral lichen planus, actinic cheilitis, reverse cigar smoking habit lesions and discoid lupus erythematosus <sup>(6)</sup>.

Consequently, the aim of the current study was to assess the prevalence of OMLs among male smokers compared with non-smokers in an Egyptian population.

## MATERIAL AND METHODS

The current observational cross-sectional study was carried out in October 6 university and Cairo University including 1000 male participants who attended to Oral Diagnosis clinic for routine dental care. Participants who agreed to participate were divided into 2 groups; group-A: smokers who used to smoke at least 5 cigarettes a day for at least 5 years and group-B: non-smokers .

Exclusion criteria for both groups included any patients who are suffering from systemic disease e.g.; cardiac, respiratory, diabetic, hepatic, gastrointestinal, autoimmune and renal diseases. Also all patients who were under medical treatment were excluded from both groups. In addition alcohol and shisha consumers were also excluded.

All participants were subjected to full case history taking followed by careful clinical examination. Intra-oral photographs were taken for all participants. The Color Atlas of Common Oral Diseases was used as a guide for diagnosis and grouping OMLs, in which they were grouped as: pigmented, white, red and ulcerative lesions. Furthermore, another 3 groups were added and named as exophytic lesions, normal variants and OPMDs groups. Patients' data including age, gender, chief complaint, medical history, smoking habits, full history of the presented lesion and other oral parafunctional habits were recorded. Questionable lesions were investigated by toluidine blue test and biopsy. After detailed explanation regarding the scope of the research, individuals who agreed to participate in the research completed a written informed consent form. The study protocol was approved by the Research Ethics committee, Faculty of Dentistry, O6U (NO. RECO6U/4-2024).

### Statistical analysis

Categorical data were presented as frequency and percentage values and were analyzed using chi-square test. The significance level was set at

$p < 0.05$  within all tests. Statistical analysis was performed with R statistical analysis software version 4.3.3 for Windows (R Core Team (2024). URL <https://www.R-project.org/>.)

## RESULTS

The present study included 1000 individuals and they were selected to be males between (25-70y), the majority were 40 years old or younger. Individuals who were smokers were 615 (61.50%) while non-smokers were 385 (38.50%).

The prevalence of OMLs was elevated in smokers' group (group A) when compared to the non-smokers' group (Group B) and this difference was statistically significant (Table 2). The number of smokers who had OMLs were 509 (82% compared to 140 (39%) non-smokers ( $p < 0.05$ ). Smoking effects on oral mucosa was evaluated by using Odd Ratio (OR) estimates which was elevated in smokers (OR=0.059, 95% CI=0.106) as compared to non-smokers. Moreover, the higher prevalence of OMLs was noticed with the increasing duration and frequency of smoking.

The most prevalent lesions in the whole study sample were pigmented and white lesions. While normal mucosal variants, red lesions, ulcers, exophytic lesions and potentially malignant lesions were less common. Most of the diagnosed lesions were solitary, with multiple incidences occurring only in about 25% of the participated sample. A significant association was found between smoking and the incidence of mucosal variants; pigmented and white lesions, in which smokers having higher odds of incidence. In contrast, non-smokers had

significantly higher odds of having exophytic lesions and ulceration.

The prevalence of white lesions was considerably increased in group A when compared to group B and this difference was shown to be of statistical significance ( $p < 0.05$ ). The estimated OR for developing white OMLs was found to be elevated in smokers 5.96 (4.21:8.43) when compared to non-smokers (Table 2). Smoker's keratosis was the most prevalent white lesions reported in the study among individuals with smoking habits (Group A)

Moreover, there was increased prevalence of pigmented lesions in group A when compared to group B and the difference was found to be statistically significant ( $p < 0.05$ ). The estimated odds ratio for developing pigmented lesion was found to be higher in smokers (OR=13.31 (8.92:19.85)) (Table 2). Smokers' melanosis was the most common pigmented lesions reported in smokers' group.

Additionally, it has been shown that the prevalence of OPMDs in smokers was elevated than in non-smokers. However, it didn't show a statistically significant difference. The estimated odds ratio for developing OPMDs was found to be elevated in subjects with smoking habits (2.34 (0.94:5.83)) as compared to non-smokers (Table 2). OPMDs in smokers' group were represented in the form of leukoplakia (being the most commonly detected), candidal leukoplakia, OLP and erythroplakia. While non-smokers were presented with only OLP as a potentially malignant lesion.

Also, the prevalence of red OMLs in group A was slightly higher than in group B but this difference was found to be statistically insignificant ( $p = 0.345$ ).

TABLE (1) Descriptive data.

Parameter	Pigmented lesions	White lesions	Red lesions	Ulcer	Exophytic lesions	OPMD	Multiple lesions	Mucosal variants
No (%)	362 (36.20%)	321 (32.10%)	60 (6.00%)	52 (5.20%)	32 (3.20%)	28 (2.80%)	246 (24.60%)	80 (8.00%)

The estimated odds ratio for developing red OMLs was found to be elevated in smokers (OR=0.94 (0.55:1.59)) when compared to non-smokers (Table 2). Nicotinic stomatitis and atrophic candidiasis were the most prevalent lesions in smokers

On the other hand, the prevalence of oral ulcers in group B was higher than in group A and this difference was found to be statistically significant (p<0.05). The estimated odds ratio for developing ulcerative lesions was found to be elevated in non-smokers (OR=0.21 CI=(0.11:0.4) as compared to smokers. The most common ulcerative lesions reported in non-smokers was recurrent aphthous stomatitis (Table 2).

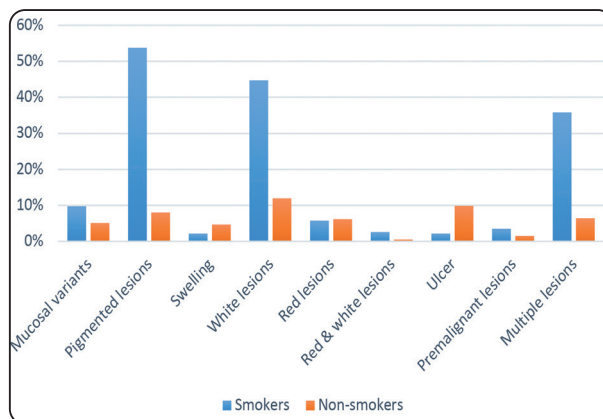


Fig. (2) Bar chart showing the association between the incidence of different lesions and smoking.

TABLE (2) Associations with smoking.

Lesion	n (%)		Test statistic	p-value	Odds ratio (95% CI)
	Smokers	Non-smokers			
<b>Pigmented lesions</b>	331 (53.82%)	31 (8.05%)	214.76	<0.001*	13.31 (8.92:19.85)
<b>White lesions</b>	275 (44.72%)	46 (11.95%)	116.64	<0.001*	5.96 (4.21:8.43)
<b>Red lesions</b>	36 (5.85%)	24 (6.23%)	0.06	0.805	0.94 (0.55:1.59)
<b>Ulcer</b>	14 (2.28%)	38 (9.87%)	27.70	<0.001*	0.21 (0.11:0.4)
<b>Exophytic lesions</b>	14 (2.28%)	18 (4.68%)	4.40	0.036*	0.47 (0.23:0.97)
<b>OPMD</b>	22 (3.58%)	6 (1.56%)	3.55	0.060	2.34 (0.94:5.83)
<b>Multiple lesions</b>	221 (35.93%)	25 (6.49%)	110.65	<0.001*	8.08 (5.21:12.51)
<b>Mucosal variants</b>	60 (9.76%)	20 (5.19%)	6.69	0.010*	1.97 (1.17:3.33)

CI Confidence interval, \* Significant (p<0.05).

## DISCUSSION

General dentists has an important role in detecting OMLs and educating patients about the importance of regular check-ups specially for those who have predisposing factors for the development of OPMDs <sup>(7)</sup>. Tobacco smoking is associated with many destructive events that may affect the systemic and oral health and is one of the main risk factors for OPMDs and OSCC development <sup>(8)</sup>. Regular screening and health education of smokers is very essential for early detection of OMLs that are associated with smoking <sup>(9)</sup>.

Due to the lack of evidence regarding the prevalence of OMLs among male smokers in Egypt, thus, the aim of the present study was to evaluate the OMLs most commonly detected among smokers and compare them to those detected in non-smokers in a sample of a male Egyptian population aiming at determination of the epidemiology and the severity of OMLs which will in turn help in identification as well as prevention of its possible risk factors.

In the current study, only male cigarette smokers were selected. Other habits such as alcohol consumption, shisha and tobacco chewing were excluded.

Results of the present study showed significant difference in the prevalence of white lesions and pigmented lesions in the smokers' group when compared to the non-smokers'. Furthermore, the prevalence of OPMDs was elevated among smokers when compared to the non-smokers' one but it didn't show a significant difference. This may be attributed to the presence of some OMLs in the non-smokers' group that are considered as OPMDs as OLP where its etiologic factor is not affected by smoking . However, Leukoplakia and Erythroplakia were 12 and 4 lesions respectively and they were exclusively detected in smokers. Conversely, the ulcerative lesions (mostly presented as aphthous ulcers) reported a significant increase in the non-smokers' group in comparison to the smokers' group.

Similarly, **Gajdhar et al.**<sup>(7)</sup> evaluated the incidence of OMLs among the Saudi-Arabia population (Both males and females were included) reported increased prevalence of OMLs in smokers when compared with non-smokers. In addition, they reported a significant increase in the pigmented lesions presented by (smoker's melanosis) and white lesions represented by (leukoplakia). Moreover, they supported the association between smoking and leukoplakia, in addition the prevalence of oral squamous cell carcinoma was 0.13% .

On the same line, **Fatemeh et al.** <sup>(8)</sup> performed a study in Iran studying the prevalence of OMLs in smokers and non-smokers and found a higher percentage of OMLs mostly represented in the form of coated tongue and gingival disorders in the smokers group <sup>(10)</sup>

Moreover, a previous study in India documented that the most prevalent normal oral mucosal variations and lesions were ; Fordyce granules, fissured tongue, frictional keratosis and smokers' palates <sup>(11)</sup>.

Additionally, **Abd el-Aziz et al.** <sup>(11)</sup> conducted a study to determine the prevalence of OPMDs and OSCC affecting smokers in Egypt, they reported that leukoplakia was the most commonly detected followed by oral lichen planus. The difference between their results and the current study can be attributed to the their larger sample size , in addition to the fact that they were focusing only on the detection of OPMDs and OSCC while the current study was generally investigating the prevalence of all OMLs that can be found in smokers and non-smokers.

After analyzing the data from the current study and most previous studies we concluded that higher incidence of OMLs in smokers and the difference was statistically significant. Due to the fact that tobacco smoking increases epithelial dysplasia in the oral epithelium which consequently increases the prevalence of oral potentially malignant and malignant lesions. Therefore, careful regular screening of

the oral mucosa for early detection of OMLs that may be associated with tobacco is mandatory and considered as an important step to convince the patient for smoking cessation in addition to early detection of any undetectable OPMDs.

## CONCLUSION

The results of the present study provide important information about the prevalence of OMLs among smokers in the Egyptian population. Pigmented and white OMLs were reported as the most prevalent detected types in smokers. Increasing patient's awareness regarding the complications of smoking is compulsory to recover the oral and general health. Results of the present study should serve as the basis for a larger survey of OMLs including the OPMDs and OSCC.

## DECLARATIONS

### Conflicts of Interest

The authors declared no potential conflicts of interest .

### Funding

None

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