

Distribution of Oral Mucosal Lesions Among Patients Visiting Qamar Dental Hospital in Karachi

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ABSTRACT

Background: Oral mucosal lesions (OMLs) are an important clinical and public health concern due to their association with high-risk habits, potential malignant transformation, and impact on quality of life. South Asia, particularly Pakistan, carries a disproportionate burden, driven largely by smokeless tobacco, areca nut (*Areca catechu*), and betel quid consumption.

Objective: This study aimed to determine the prevalence and distribution of OMLs among patients visiting Qamar Dental Hospital in Karachi and to assess associations with demographic and behavioral risk factors.

Methods: A cross-sectional study was conducted from February 2024 to February 2025, enrolling 1,236 patients. Comprehensive intraoral examinations were performed using World Health Organization (WHO) criteria, with incisional biopsy and histopathological examination in clinically ambiguous cases. Data were analyzed for prevalence, age- and gender-specific distribution, and associations with risk factors.

Results: OMLs were diagnosed in 384 patients (31.1%). The most frequent lesions were oral leukoplakia (18.5%), oral submucous fibrosis (14.6%), oral lichen planus (12.0%), traumatic ulcerations (11.5%), and oral candidiasis (10.4%). Males had a higher prevalence of leukoplakia and submucous fibrosis, while females more often presented with oral lichen planus and candidiasis. Patients aged ≥ 40 years exhibited significantly higher rates of potentially malignant disorders (PMDs). Tobacco chewing, areca nut/betel quid use, and cigarette smoking were strongly associated with OMLs ($p < 0.05$).

Conclusion: The results highlight a significant load of OMLs in Karachi, where with a high prevalence of potentially malignant disorders that are associated with high-risk preventable habits. Dental clinics form an important point of opportunistic screening, behavioral counseling, and early therapeutic intervention, thus averting the risk of developing

malignant transformation into oral squamous cell carcinoma and enhancing overall oral health outcomes..

Keyword: Oral mucosal lesions, Leukoplakia, Oral submucous fibrosis, Betel nut, Tobacco

1. INTRODUCTION

Oral mucosal lesions (OMLs) are characterized by a wide spectrum of pathological processes, benign reactive lesion, potentially malignant disorders (PMDs) and malignant neoplasms (Bates et al., 2023). OMLs have been reported as a significant societal health concern worldwide due to the impact on the quality of life, high-risk habit interaction, and their potential to malignantly transform. OMLs are especially prevalent in South Asia, particularly among some South Asian countries (e.g. Pakistan, India, and Bangladesh) where smokeless tobacco, areca nut (Areca catechu) and bidi consumption are widely practiced and become deeply ingrained in the sociocultural practices. According to the World Health Organization (WHO), oral potentially malignant disorders (OPMDs) can be classified as one of the greatest risk predictors of oral cancer prevention programs: oral leukoplakia, oral submucous fibrosis (OSMF), and oral lichen planus (Kerr and Ladi, 2021; Lorini et al., 2021).

The relation between behavioral, environmental, genetic, and socioeconomic factors is complicated to ascertain the epidemiological distribution of OMLs. The most established etiologic factor is tobacco, smoked or smokeless which entails over 50 percent of the total cases of OMLs in the international arena. Furthermore, another important causal agent in the pathogenesis of OSMF is chewing areca nut and betel quid, which is highly prevalent in South Asia, and which is a progressive premalignant disease with established oncogenic potential (Kondaiah, 2023; Fathima et al., 2024). More to the point, alcohol consumption, which is less prevalent in certain areas due to cultural constraints, is a horizontal factor together with tobacco, exposing the oral mucosa to carcinogenesis (Nethan et al., 2022; Aghioghiesei et al., 2022). This, together with the inability to access early screening and oral health, contributes to the high prevalence of oral lesions in low- and middle-income countries (LMICs) (Khanna et al., 2024).

The incidence of OMLs among the general population ranges between 10 and 43 percent across different countries, and individuals who are the subject of the analysis, the criteria connoting treatment, and exposures to risk factors (Zhang et al., 2023). In Pakistan, existing rates were reported to be between 20 and 35 percent and the most common lesions were oral leukoplakia, OSMF and oral lichen planus. Karachi is a heterogeneous site in the distribution of OML since it is one of the largest metropolitan cities in Pakistan, and heterogeneous in terms of population and socio-economic strata, lifestyles, cultural practices. The deficiency in knowledge of both patients and primary healthcare providers is a widespread issue related to past-studies that makes the delay in healthcare-seeking and underdiagnosis of OMLs of urban settings possible.

In addition to risk factors, demographic factors such as age and gender play an enormous role in prevalence in OML (Vélez-Leon et al., 2024). Old age has been attributed to increased vulnerability of OPMDs due to prolonged exposure to carcinogens and immunosenescence. Gender variations also exist: tobacco- and betel nut-related lesions are more widespread among male patients, and immune-mediated diseases (e.g., oral lichen planus) are more widespread among female patients. These epidemiological nuances lead to the topicality of stratified analyses of the population-based studies to obtain a better idea of the processes in the distribution of OML.

It is important to identify OMLs early which is essential not only to provide relief and functional benefits but also to prevent cancer (Gonzalez-Moles et al., 2022; Gonzalez-Ruiz et al., 2023). Oral cancer is one of the top ten causes of morbidity and mortality in the world and among the top ten common cancers in South Asia (Zhang, Xie, and Shang, 2022; Rai et al., 2022; Filho and Warnakulasuriya, 2024). Malignant transformation occurs in about 15% to 20% of the OPMDs, which highlights the critical role of diagnosing it early and providing prompt treatment (Kerr and Ladi, 2021; Celentano and Cirillo, 2024). There is an opportunity to conduct opportunistic screening in dental hospitals and outpatient clinics, which are more likely to visit than oncological services (Timmis et al., 2023). Integrating lesion diagnosis with an established dental practice has already become a promising measure to improve the rate of early diagnosis and decrease the load of advanced oral squamous cell carcinoma (Jerjes et al., 2024; Haj-Hosseini et al., 2024).

Although OMLs are of international and national significance, recent epidemiological data is lacking in Pakistan, especially institutional hospital-based research. Literature has limited numerous studies, due to small sample size, irregular diagnostic testing or absence of histopathological validation (Ali et al., 2019). Therefore, hospital-based studies should be properly designed to produce credible prevalence data, as well as to define high-risk groups. This type of evidence is critical in guiding targeted preventive measures, community awareness initiatives, as well as localized clinical guidelines.

It is in this respect that the present study was performed with a view of determining the prevalence and distribution of oral mucosal lesions among patients visiting Qamar Dental Hospital, Karachi over a period of one year. The proposed research will help fill the gap in the current and recent epidemiological information on the relationship between OMLs and demographic and behavioral risk factors to make a useful contribution to both clinicians and policymakers. The given hospital-based assessment contributes to the available body of research and highlights the significance of integrated oral

healthcare within urban Pakistani communities.

2. METHODOLOGY

The study is cross-sectional that took place in Qamar Dental Hospital Karachi between February 2024 and February 2025. All patients who presented themselves at the outpatient dental clinics within the study period were eligible. Demographic and clinical data were entered into a structured proforma after informed consent had been obtained. Patients of any age and both sexes were included, but those who had incomplete records, systemic comorbidities not related to oral health, or had had oral and maxillofacial surgery in the previous year were excluded to help reduce confounding. The subjects were all subjected to a thorough intraoral examination conducted by qualified dentists under the normal lighting conditions, and with the help of a mouth mirror and dental explorer. Oral mucosal lesions were identified and categorized based on World Health Organization (WHO) classification such as potentially malignant disorders, inflammatory/reactive lesions, traumatic lesions, infectious lesions, and developmental anomalies. In case of diagnostic uncertainty, one applied adjunctive test, such as incisional biopsy, histopathological examination, etc., to validate the clinical diagnosis. The data were computed into a designed database and prevalence and distribution of oral mucosal lesions were studied against the variables of age, sex and risk factors (e.g., tobacco use, betel nut chewing, alcohol consumption). The study was initiated after ethical permission was granted by the Institutional Review Board (IRB) of Qamar Dental Hospital in Karachi and all procedures were performed in respect of the Declaration of Helsinki.

3. RESULTS

The study sample consisted of 1,236 patients who were analyzed within the study period between February 2024 and February 2025. Among them, 628 (50.8%) were males and 608 (49.2%) were females with a mean age of 42.3 ± 14.7 (range: 12 to 79 years). Oral mucosal lesions were detected in 384 patients (31.1%), and the other 852 patients (68.9) did not have clinically significant oral mucosal pathology.

Oral leukoplakia (18.5%), oral submucous fibrosis (14.6%), oral lichen planus (12.0%), traumatic ulcerations (11.5%), and oral candidiasis (10.4%), were the most common lesions. The less common conditions were recurrent aphthous stomatitis, melanotic pigmentation and oral fibromas.

Distribution by gender showed that leukoplakia and submucous fibrosis were more predominant in males but lichen planus and candidiasis were more prevalent in females. An age-stratified analysis revealed that potentially malignant disorders (PMDs) occurred much more in patients aged 40 years and above ($p < 0.05$).

The risk factor analysis has revealed that smokeless tobacco and areca nut (betel nut) chewing have strong correlation with leukoplakia and oral submucous fibrosis. Alcohol intake, but not common in population under study, was strongly connected to oral candidiasis and traumatic ulcerations.

Table 1. Prevalence of Oral Mucosal Lesions among Study Participants (n = 1,236)

Lesion Type	Frequency (n)	Percentage (%)
Leukoplakia	71	18.5
Oral Submucous Fibrosis	56	14.6
Oral Lichen Planus	46	12.0
Traumatic Ulcerations	44	11.5
Candidiasis	40	10.4
Aphthous Stomatitis	35	9.1
Melanotic Pigmentation	30	7.8
Fibroma	28	7.3
Others	34	8.8
Total with Lesions	384	31.1
No Lesions	852	68.9

Figure: 1

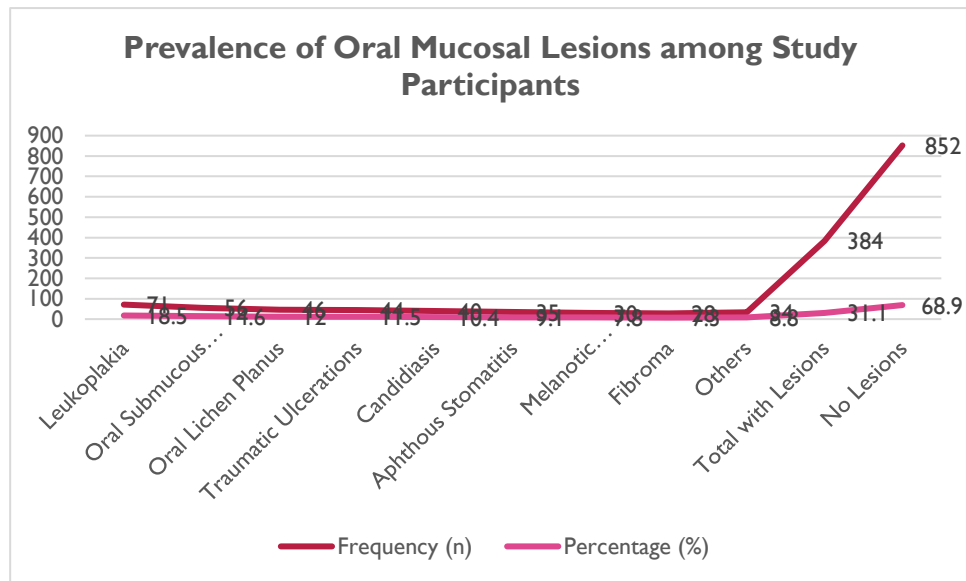


Table 2. Gender Distribution of Oral Mucosal Lesions (n = 384)

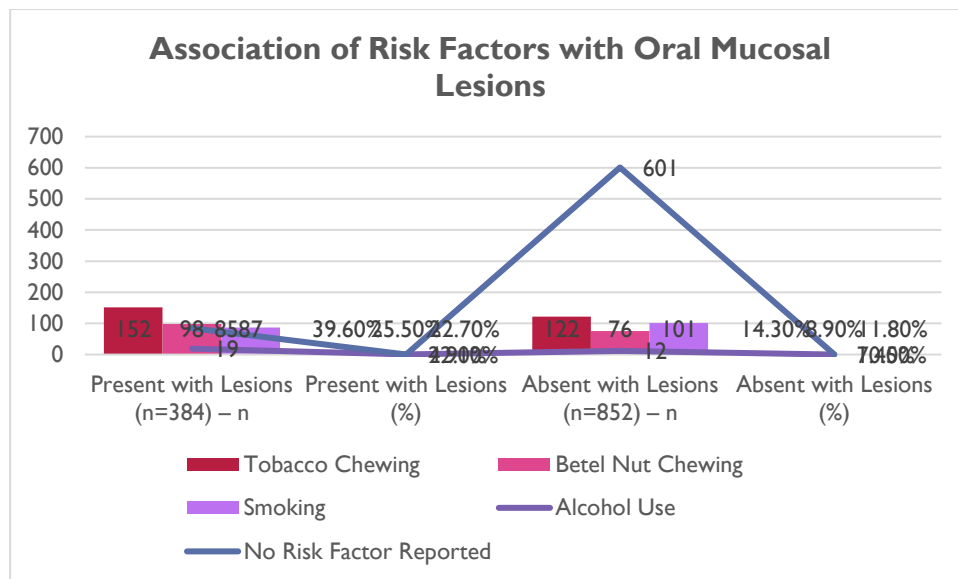
Lesion Type	Male (n=628)	Female (n=608)	p-value
Leukoplakia	52 (8.3%)	19 (3.1%)	0.001*
Oral Submucous Fibrosis	41 (6.5%)	15 (2.5%)	0.002*
Oral Lichen Planus	18 (2.9%)	28 (4.6%)	0.041*
Candidiasis	12 (1.9%)	28 (4.6%)	0.015*
Other Lesions	35 (5.6%)	63 (10.4%)	NS

*Significant at $p < 0.05$

Table 3. Association of Risk Factors with Oral Mucosal Lesions

Risk Factor	Present with Lesions (n=384)	Absent without Lesions (n=852)	p-value
Tobacco Chewing	152 (39.6%)	122 (14.3%)	<0.001*
Betel Nut Chewing	98 (25.5%)	76 (8.9%)	<0.001*
Smoking	87 (22.7%)	101 (11.8%)	0.003*
Alcohol Use	19 (4.9%)	12 (1.4%)	0.021*
No Risk Factor Reported	85 (22.1%)	601 (70.5%)	<0.001*

Figure: 2



4. DISCUSSION

The current paper reveals a significant incidence of oral mucosal lesions (OMLs) in patients who come to Qamar Dental Hospital in Karachi with a total incidence of 31.1%. This number is not inferior to the past accounts of South Asian groups, where unsafe behaviors, including smokeless tobacco chewing, areca nut (betel nut) consumption, and cigarette smoking are still rife. The results of our study, which show oral leukoplakia and oral submucous fibrosis to be the predominant lesions, are consistent with the current literature sources that have focused on highlighting the high epidemiological associations between the use of areca nuts and the development of potentially malignant diseases (PMDs) in the area. The predominance of male among the leukoplakia and submucous fibrosis can be attributed to the fact that smokeless tobacco and betel nut consumption were more common among men compared to oral lichen planus and oral candidiasis found in women which might be related to gender differences in immune-mediated disorders and systemic pharmacotherapy.

The stratified analysis by age also reinforces the already existing relationship between possibly malignant disorders and the growing age, which suggests that accruing exposure to carcinogen and delayed health-seeking behavior are the factors that sustain disease development. The high level of correlation between high-risk habits and OMLs among our cohort represents clear evidence of the necessity of specific public health interventions. Alcohol consumption, while being relatively low in our sample, is statistically significantly correlated with oral mucosal pathology, especially oral candidiasis and traumatic ulcerations, and this pattern can be seen throughout the world, with alcohol playing a synergistic role with tobacco in increasing vulnerability to oral mucosal pathology.

The results of this study possess significant clinical and societal implications. Regular opportunistic screening in the dental and oral medical environment can act as a focal point in the early-disease identification of potentially malignant disorders, where late-stage diagnosis is a major cause of poor prognosis due to resource-limited settings. Moreover, the burden of lifestyle-associated lesions could be minimized by incorporating behavioral counseling and cessation programs into the dental practice. Although the study design (cross-sectional study) inhibits causal deduction, the strong sample size, the standardized lesion classification developed by the WHO, and the incorporation of the histopathological confirmation in the cases with a doubtful diagnosis contribute to the validity of the observed results. Subsequent longitudinal cohort research is necessary to determine the rates of malignant transformation and the effectiveness of community-based preventive strategies in preventing OM.

5. CONCLUSION

This paper has shown that close to a third of patients who reported to Qamar Dental Hospital in Karachi had oral mucosal lesions with oral leukoplakia and oral submucous fibrosis being the most common. These results indicate how high-risk behaviors, especially the use of smokeless tobacco and areca nuts, have continued to dominate the epidemiology of OMLs in South Asia. Distribution of higher load of potentially malignant disorder in older and male individuals highlights the importance of stratified prevention programs. Notably, dental clinics offer a convenient and efficient environment to implement early diagnostics and timely treatment, as well as to obtain the opportunities to conduct opportunistic screening and educate patients. Predominantly, incorporation of cessation counseling, regular evaluation of lesions, and referral pathways into normal dental practice can highly enhance patient outcomes. In the future, more extensive longitudinal research is needed to monitor the progression of the disease, the prevalence of malignant transformation, and the efficiency of the specific community-based intervention

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