BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 8

DOI: 10.58240/1829006X-2025.21.8-21

ORIGINAL ARTICLE

PREVALENCE AND RISK FACTORS OF ORAL POTENTIALLY MALIGNANT DISORDERS IN TOBACCO USERS

Muneesh Joshi[1], Saloni Verma[2], Ashima B. Behl[3], Dhameliya Mansi Pravinbhai[4] , Astha Doshi[5], Gaurav Patri[6]

[1]Surgeon commander, Office incharge, Fleet Dental Centre, Mumbai, Maharashtra.

[2]**Dr.** MDS, Department of Oral Pathology and Microbiology, King George's Medical University, Lucknow, Uttar Pradesh.

[3]**Dr.** MDS, Prof. & Head, Department of Oral Medicine and Radiology, Baba Jaswant Singh Dental College and Research Institute, Ludhiana, Punjab.

[4]**Dr.**, BDS, College of Dental Sciences and Hospital, Amargadh, Gujarat.

[5]**Dr.** MDS, Associate Professor, Department of Public Health Dentistry, Kanti Devi Dental College and Hospital, Mathura, Uttar Pradesh.

[6]**Dr.** MDS, Prof. & Head, Department of Conservative Dentistry and Endodontics, Kalinga Institute of Dental Sciences, Bhubaneshwar, Odisha.

Corresponding author details: Dr. Muneesh Joshi, Surgeon commander, Office in charge, Fleet Dental Centre, Mumbai, Maharashtra Email: muneeshjoshi@gmail.com Phone: 8669779352

Received: *Jul 18. 2025;* ***Accepted:*** *Aug22, 2025;* ***Published:*** *Aug. 28, 2025*

ABSTRACT

Background: Tobacco use is a major public health concern and a leading cause of oral potentially malignant disorders (OPMDs). This study aims to assess the prevalence of OPMDs and associated risk factors among tobacco users.

Methods: A cross-sectional study was conducted among 2,800 tobacco users attending outpatient clinics across three tertiary care centers. Participants were evaluated for OPMDs through clinical examinations and a structured questionnaire capturing demographic data, tobacco use patterns, and associated risk factors. Logistic regression analysis was used to identify significant predictors of OPMDs.

.

Results: The prevalence of OPMDs was 23.6% (n = 661). Leukoplakia (12.4%) and oral submucous fibrosis (OSMF) (8.7%) were the most common OPMDs observed. Chewing tobacco was significantly associated with OSMF (OR = 3.42; 95% CI: 2.56–4.58; $p < 0.001$), while smoking tobacco was a major risk factor for leukoplakia (OR = 2.89; 95% CI: 2.11–3.97; $p < 0.001$). Other significant risk factors included duration of tobacco use >10 years (OR = 4.12; 95% CI: 3.01–5.65; $p < 0.001$) and concurrent alcohol consumption (OR = 2.53; 95% CI: 1.89–3.37; $p < 0.001$).

Conclusions: OPMDs are highly prevalent among tobacco users, with specific patterns of use posing distinct risks. Public health interventions focusing on cessation and early detection are essential to reduce the burden of OPMDs.

***Keywords*:** Oral potentially malignant disorders, tobacco use, leukoplakia, oral submucous fibrosis, prevalence, risk factors

INTRODUCTION

Oral potentially malignant disorders (OPMDs) were recognized as a spectrum of clinical conditions with varying risks of progression to oral cancer. Common examples included leukoplakia, erythroplakia, and oral submucous fibrosis (OSMF), each of which posed significant public health concerns due to their association with lifestyle risk factors, particularly tobacco use. Tobacco, in both smoked and smokeless forms, was identified as a predominant risk factor for OPMDs and oral cancer, contributing to a substantial global disease burden. It was estimated that nearly 90% of oral cancer cases could have been prevented by eliminating tobacco use. [1]

The prevalence of OPMDs varied across regions, reflecting differences in tobacco use patterns, cultural habits, and access to healthcare services. In India, the

burden of OPMDs was disproportionately high due to the widespread consumption of smokeless tobacco products, such as betel quid and khaini. [2,3] Studies conducted in various global populations reported the prevalence of oral mucosal lesions ranging from 0.1% to 10%, depending on geographic, demographic, and lifestyle factors. [4,5,6] For instance, a population-based study in Southern Kerala highlighted a high prevalence of OPMDs in a rural Indian setting, underscoring the need for targeted public health interventions. [7]

Early detection and intervention are crucial for reducing the risk of malignant transformation in individuals with OPMDs. However, data on the prevalence and risk factors associated with OPMDs, particularly among tobacco users, are limited in diverse populations. Hence this study was conducted with the aim to determine the prevalence of OPMDs and analyze their associated risk factors among tobacco users. The findings also aimed to provide valuable insights to inform public health strategies, enhance early detection efforts, and ultimately reduce the morbidity and mortality associated with these conditions.

MATERIALS AND METHODS

Study Design and Setting

The cross-sectional study was conducted over a one-year period from January to December 2024. The research was carried out in three tertiary care centers, strategically selected to represent urban and semi-urban populations in diverse geographic regions. The study aimed to assess the prevalence and associated risk factors for oral potentially malignant disorders (OPMDs) among regular tobacco users.

Study Population

A total of 2,800 participants aged 18 years and above were recruited for the study. Eligibility criteria included:

- Regular tobacco use in either smoked or smokeless forms for at least one year.
- No prior diagnosis of oral cancer.
- Willingness to provide informed consent.

Exclusion criteria included individuals with severe systemic illnesses that could interfere with the study or those who had undergone prior treatment for OPMDs.

Ethical Considerations

The study protocol was reviewed and approved by the institutional ethics committee. Written informed consent was obtained from all participants after explaining the study objectives, procedures, potential risks, and benefits in their native language. Confidentiality was maintained by anonymizing participant data.

Training and Calibration

To ensure reliability, all dental professionals underwent a one-day calibration session to standardize the diagnostic criteria. Random re-assessments of 10% of participants were conducted to evaluate inter-examiner consistency.

Data Collection

Data collection involved a structured approach, utilizing a combination of face-to-face interviews and clinical examinations:

1. **Structured Questionnaire**: A pre-validated questionnaire was used to collect detailed information on:

   - **Demographics:** Age, gender, socioeconomic status, and education level.
   - **Tobacco Use:** Type (smoking, smokeless, or both), frequency (daily consumption), and duration (years of use).
   - **Alcohol Consumption:** Frequency and quantity of alcohol intake.
   - **Lifestyle Factors:** Dietary habits, including fruit and vegetable intake, and oral hygiene practices, such as frequency of tooth-brushing and use of mouthwash.

2. **Clinical Examination**: Trained dental professionals conducted thorough oral examinations using artificial illumination and mouth mirrors. The examinations adhered to World Health Organization (WHO) guidelines for diagnosing oral lesions. Findings were documented systematically using standard recording forms.

Diagnostic Criteria for OPMDs

The diagnosis of OPMDs was made based on specific clinical features, as follows:

- **Leukoplakia**: White patches or plaques on the oral mucosa that could not be scraped off.
- **Oral Submucous Fibrosis (OSMF)**: Palpable fibrous bands in the oral mucosa, accompanied by reduced mouth opening (<35 mm in severe cases).
- **Erythroplakia**: Bright red patches with a velvety texture on the oral mucosa, without any apparent cause.

Statistical Analysis

Data were entered into a statistical software package (e.g., SPSS, version 25.0) for analysis. Descriptive statistics, including means, standard deviations, and frequencies, were used to summarize demographic and clinical characteristics. Prevalence rates of OPMDs

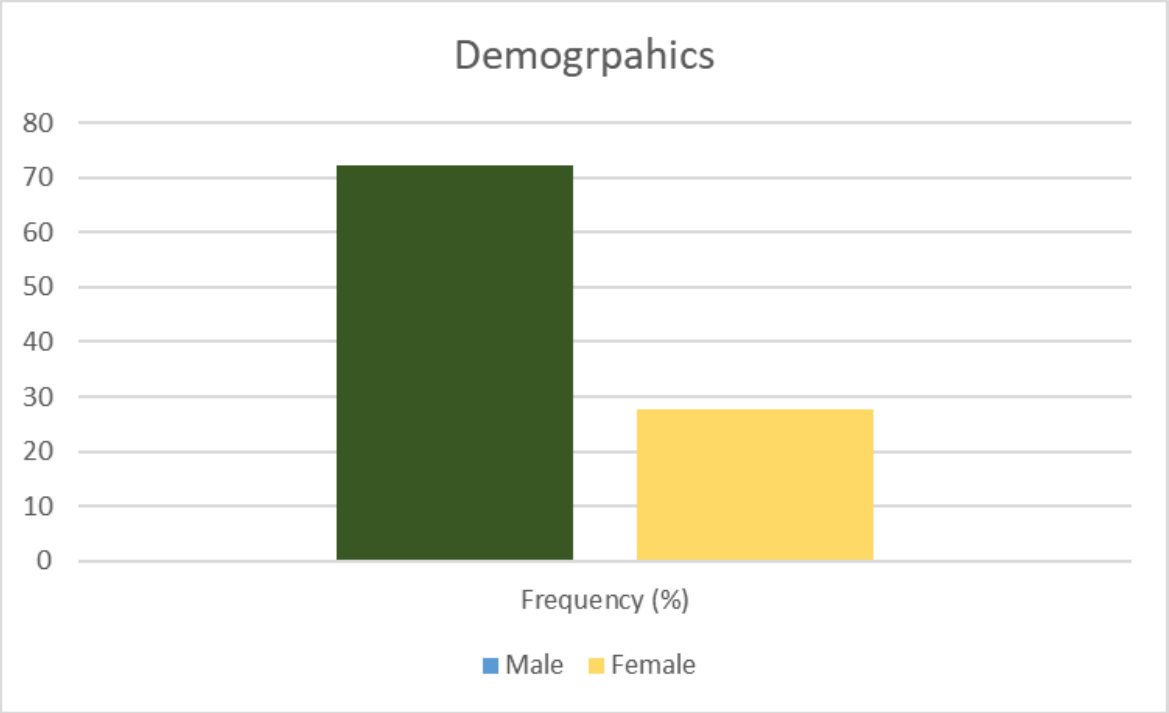
were calculated for the entire population and stratified by tobacco use patterns and other factors.

To identify independent risk factors for OPMDs, a multivariable logistic regression analysis was performed, adjusting for potential confounders such as age, gender, alcohol consumption, and oral hygiene practices. Results were expressed as odds ratios (ORs) with 95% confidence intervals (CIs). Statistical significance was set at a p-value of <0.05.

RESULTS Table 1 and Graph 1: **demonstrated the** detailed demographic distribution of the study participants. The study included 2,800 participants, with a male predominance (72.3%) and a mean age of 38.6 years (±12.4).

Table 1. Demographic Characteristics of Study Participants

Variables	Frequency (%)
Male	2024 (72.3)
Female	776 (27.7)
Mean age (years)	38.6 ± 12.4

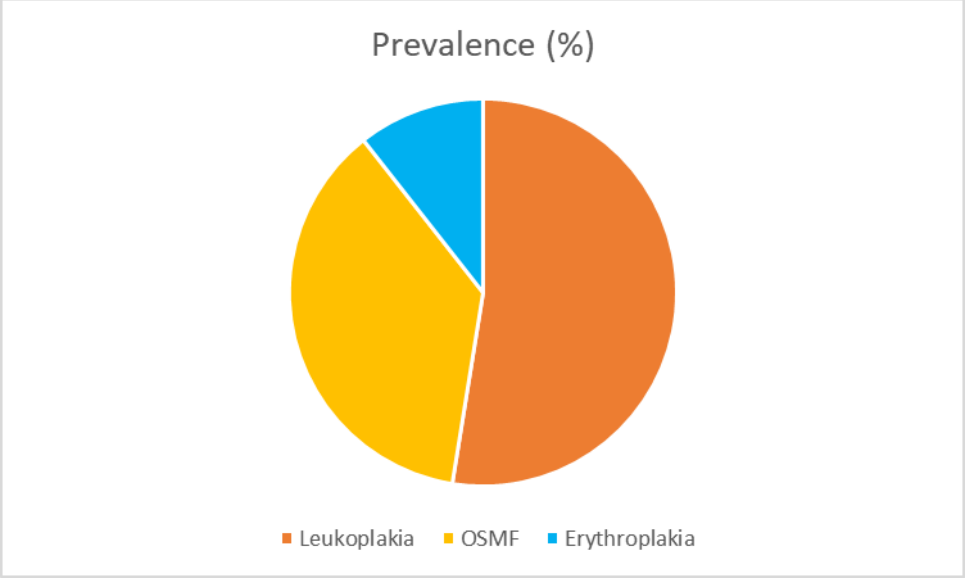


Graph 1. Showing Demographic Characteristics of Study Participants

The overall prevalence of **Oral Potentially Malignant Disorders (**OPMDs) among the participants was 23.6%. Leukoplakia was the most common OPMD (12.4%), followed by oral submucous fibrosis (OSMF) (8.7%) and erythroplakia (2.5%). The prevalence of different OPMDs is summarized inTable 2 and Graph 2**.**

Table 2. Prevalence of OPMDs among Participants

OPMDs	Prevalence (%)
Leukoplakia	12.4
OSMF	8.7
Erythroplakia	2.5
Total	**23.6**



Graph 2. Pie chart showing prevalence of OPMDs among Participants

Table 3. showed the Multivariable logistic regression analysis for several significant risk factors for OPMDs. Tobacco use patterns, including chewing and smoking, were strongly associated with an increased risk. Longer duration of tobacco use (>10 years), concurrent alcohol consumption, and poor oral hygiene practices also contributed significantly. Chewing tobacco significantly increased the risk of OSMF (OR = 3.42; 95% CI: 2.56–4.58; $p < 0.001$), while smoking tobacco was strongly associated with a higher risk of leukoplakia (OR = 2.89; 95% CI: 2.11–3.97; $p < 0.001$). Participants with a history of tobacco use exceeding 10 years had a markedly elevated risk of OPMDs (OR = 4.12; 95% CI: 3.01–5.65; $p < 0.001$). Additionally, alcohol consumption independently increased the risk of OPMDs by 2.53 times (OR = 2.53; 95% CI: 1.89–3.37; $p < 0.001$), and poor oral hygiene practices doubled this risk (OR = 2.18; 95% CI: 1.31–3.34; $p = 0.004$).

Table 3. Logistic Regression Analysis of Risk Factors for OPMDs

Variables	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Chewing tobacco	3.42	2.56–4.58	**<0.001**
Smoking tobacco	2.89	2.11–3.97	**<0.001**
Duration >10 years	4.12	3.01–5.65	**<0.001**
Concurrent alcohol use	2.53	1.89–3.37	**<0.001**
Poor oral hygiene	2.18	1.31–3.34	**0.004**

DISCUSSION

The findings of the current study provided valuable insights into the prevalence of oral potentially malignant disorders (OPMDs) and their associated risk factors among regular tobacco users. The overall prevalence of OPMDs was 23.6%, with leukoplakia being the most common subtype, followed by oral submucous fibrosis (OSMF) and erythroplakia. These results aligned with, but also diverged from, findings reported in previous studies, reflecting both shared patterns and regional variations.

The observed prevalence of 23.6% was consistent with studies conducted in India and other regions with high tobacco use. Saraswathi et al. (2006) [3] reported a similar prevalence of 21.6% among tobacco users in India, attributing it to the widespread use of smokeless tobacco products. Similarly, Patil et al. (2013) [2] found a prevalence of 24.8%, highlighting the combined effects of smoking and chewing tobacco on OPMD development. However, lower prevalence rates had been documented in studies from non-tobacco-endemic regions. For instance, Axéll (1987) [5] reported a prevalence of 3.6% for leukoplakia among a Swedish population, which was likely due to differences in tobacco consumption patterns, cultural practices, and public health interventions. Variations in diagnostic criteria and study methodologies might also have contributed to these discrepancies.

The high prevalence in this study could have been attributed to the widespread availability and cultural acceptance of tobacco products in the regions studied. Additionally, lower awareness of the harmful effects of

tobacco and limited access to early screening programs in semi-urban areas might have contributed to delayed detection of these disorders.

Chewing tobacco emerged as a significant risk factor for OSMF, with an odds ratio (OR) of 3.42. This finding was consistent with previous studies, such as Kumar et al. (2019) [8], which highlighted the strong association between smokeless tobacco use and OSMF. The fibrotic changes observed in OSMF were likely caused by areca nut alkaloids and tannins, which induced collagen cross-linking. Smoking tobacco was strongly associated with leukoplakia (OR = 2.89), a result that supported findings from Byakodi et al. (2011). [9] Smoking exposed the oral mucosa to carcinogens such as polycyclic aromatic hydrocarbons and nitrosamines, which explained the increased risk of leukoplakia. These findings highlighted the distinct pathophysiological mechanisms by which different forms of tobacco impacted the oral mucosa, emphasizing the need for targeted cessation strategies.

Participants with a history of tobacco use exceeding 10 years had a significantly higher risk of OPMDs (OR = 4.12), a finding that aligned with van der Waal (2009). [1] Prolonged exposure to carcinogens likely caused cumulative DNA damage, which over time progressed to precancerous lesions. This underscored the importance of early intervention and public education on the long-term risks of tobacco use.

Concurrent alcohol consumption was another significant risk factor (OR = 2.53), corroborating findings from Rooban et al. (2009). [10] Alcohol likely acted as a solvent, enhancing the penetration of tobacco carcinogens into oral tissues. The synergistic effect of combined tobacco and alcohol use could have explained the heightened risk observed in the study population. Poor oral hygiene practices doubled the risk of OPMDs (OR = 2.18), a result consistent with the findings of El Toum et al. (2018). [4] Poor oral hygiene created a pro-inflammatory environment conducive to lesion formation. Chronic irritation from plaque, calculus, and bacterial toxins likely exacerbated the effects of tobacco and other carcinogens, increasing susceptibility to OPMDs.

While the results of this study were largely consistent with previous findings, some studies reported contrasting patterns. For instance, Petti (2003) [11] documented a lower prevalence of OPMDs in populations with high fruit and vegetable intake, which was not specifically analyzed in this study. Antioxidants in fruits and vegetables may have mitigated oxidative stress caused by tobacco carcinogens, potentially explaining regional differences. Additionally, Kovac-Kavcic and Skaleric (2000) [12] found no significant association between alcohol consumption and OPMDs, differing from the results of this study. This discrepancy might have reflected differences in drinking patterns, genetic predispositions, or co-exposure to other risk factors.

The findings of this study were likely influenced by the widespread cultural acceptance of tobacco, particularly smokeless forms, in the study regions. Limited awareness of oral health risks and a lack of robust public health programs in semi-urban areas might have further exacerbated the problem. These factors underscored the need for community-based interventions aimed at reducing tobacco use, raising awareness of its health risks, and promoting regular oral health screenings to enable early detection and management of OPMDs.

Limitations

This study relied on self-reported data for tobacco and alcohol use, which may have introduced recall bias or underreporting due to social desirability. The cross-sectional design limited the ability to establish causal relationships between identified risk factors and the development of OPMDs. Additionally, the study did not assess the progression of OPMDs to malignancy, highlighting the need for future longitudinal studies to evaluate the natural history and transformation risk of these lesions.

CONCLUSIONS

Oral potentially malignant disorders (OPMDs) were found to be highly prevalent among tobacco users, with distinct risk factors associated with specific patterns of tobacco use and lifestyle behaviors. The findings underscore the importance of targeted interventions, including tobacco and alcohol cessation programs, routine screening, and early detection initiatives, to reduce the risk of malignant transformation and improve oral health outcomes in at-risk populations.

Public Health Implications

Targeted education campaigns, routine screening for high-risk individuals, and tobacco and alcohol cessation programs are critical to addressing the burden of OPMDs. Integrating dental professionals into primary care teams can enhance early detection and management. Policy interventions, such as tobacco control measures and improved access to dental care, are essential to reduce prevalence and progression to malignancy.

Clinical Relevance

Oral potentially malignant disorders (OPMDs) are a significant concern among tobacco users due to their risk of malignant transformation. This study highlights the strong association between tobacco use patterns and OPMD prevalence, emphasizing the need for early detection and cessation programs. Understanding these risk factors enables clinicians to implement targeted screening and preventive strategies. Routine oral examinations and patient education should be integrated into clinical practice to reduce the burden of OPMDs and prevent progression to oral cancer.

DECLARATIONS

Acknowledgments

None.

Competing of interest

The authors declare there is no conflict of interest

Ethical approval and consent to participate and publication

The present study was approved by the ethics committee of University

Funding

The author(s) declared that no funding was involved in supporting this work.

REFERENCES

1. van der Waal I. Potentially malignant disorders of the oral and oropharyngeal mucosa; terminology, classification and present concepts of management. *Oral Oncol*. 2009;45(4–5):317–23. doi:10.1016/j.oraloncology.2008.05.016
2. Patil PB, Bathi R, Chaudhari S. Prevalence of oral mucosal lesions in dental patients with tobacco smoking, chewing, and mixed habits: A cross-sectional study in South India. *J Fam Community Med*. 2013;20(2):130–5. doi:10.4103/2230-8229.114777
3. Saraswathi TR, Ranganathan K, Shanmugam S, Sowmya R, Narasimhan PD, Gunaseelan R. Prevalence of oral lesions in relation to habits: Cross-sectional study in South India. *Indian J Dent Res*. 2006;17(3):121–5. doi:10.4103/0970-9290.29877
4. El Toum S, Cassia A, Bouchi N, Kassab I. Prevalence and distribution of oral mucosal lesions by sex and age categories: A retrospective study of patients attending Lebanese School of Dentistry. *Int J Dent*. 2018;2018:4030134. doi:10.1155/2018/4030134
5. Axéll T. Occurrence of leukoplakia and some other oral white lesions among 20,333 adult Swedish people. *Community Dent Oral Epidemiol*. 1987;15(1):46–51. doi:10.1111/j.1600-0528.1987.tb00479.x
6. Petti S. Pooled estimate of world leukoplakia prevalence: A systematic review. *Oral Oncol*. 2003;39(8):770–80.doi:10.1016/s1368-8375(03)00102-7
7. Sivakumar TT, Sam N, Joseph AP. Prevalence of oral potentially malignant disorders and oral malignant lesions: A population-based study in a municipal town of Southern Kerala. *J Oral Maxillofac Pathol*. 2018;22(3):413–4. doi:10.4103/jomfp.JOMFP_202_17.
8. Kumar S, Narayanan VS, Ananda SR, Kavitha AP, Krupashankar R. Prevalence and risk indicators of oral mucosal lesions in adult population visiting primary health centers and community health centers in Kodagu district. J Family Med Prim Care. 2019;8(7):2337-42.doi: 10.4103/jfmpc.jfmpc_344_19.
9. Byakodi R, Shipurkar A, Byakodi S, Marathe K. Prevalence of oral soft tissue lesions in Sangli, India. J Community Health. 2011;36(5):756-9. doi: 10.1007/s10900-011-9370-x.
10. Rooban T, Rao A, Joshua E, Ranganathan K. The prevalence of oral mucosal lesions in alcohol misusers in Chennai, South India. Indian J Dent Res. 2009;20(1):41-6. doi: 10.4103/0970-9290.49064.
11. Petti S. Pooled estimate of world leukoplakia prevalence: A systematic review. Oral Oncol. 2003;39(8):770-80. doi: 10.1016/s1368-8375(03)00102-7.
12. Kovac-Kavcic M, Skaleric U. The prevalence of oral mucosal lesions in a population in Ljubljana, Slovenia. J Oral Pathol Med. 2000;29(7):331-5. doi: 10.1034/j.1600-0714.2000.290707.x.