International Journal of Research in Medical Sciences
Nahar K et al. Int J Res Med Sci. 2026 Apr;14(4):1318-1323
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20260935

Original Research Article

Prevalence and risk factors of oral potentially malignant disorders among tobacco users in Bangladesh

Kulsum Nahar[1]*, Dilruba Binte Mostafa[2], Isratul Jannat[3], M. Ummay Salma[4], Nipu Rani Chowdhury[5], Khandokar Emanuzzaman Emon[6], Shahela Sarmin[7]

[1]Department of Oral Medicine, Dhaka Dental College, Dhaka, Bangladesh
[2]Department of Science of Dental Materials, Rangpur Medical College, Rangpur, Bangladesh
[3]Department of Dentistry, Rangpur Medical College Dental Unit, Rangpur, Bangladesh
[4]Department of Science of Dental Materials, Dhaka Dental College, Dhaka, Bangladesh
[5]Department of Dentistry, Mugda Medical College Hospital, Dhaka, Bangladesh
[6]Department of Dentistry, OSD, Directorate General of Health Services (DGHS), Mohakhali, Dhaka, Bangladesh
[7]Department of Dentistry, Dhaka Dental College, Dhaka, Bangladesh

Received: 07 January 2026
Accepted: 13 March 2026

***Correspondence:**
Dr. Kulsum Nahar,
E-mail: naharkulsm918@gmail.com

ABSTRACT

Background: Oral potentially malignant disorders (OPMDs) are recognized precursors of oral cancer and are strongly linked to tobacco exposure. In Bangladesh, widespread use of smoked and smokeless tobacco, often combined with betel quid and areca nut, places a large population at increased risk of developing OPMDs. Objective was to determine the prevalence of OPMDs and identify associated risk factors among tobacco users in Bangladesh.
Methods: A cross-sectional study was conducted among 120 adult tobacco users. Data on socio-demographic characteristics, tobacco-use patterns, betel quid/areca nut consumption, and oral hygiene practices were collected using a structured questionnaire. Participants underwent clinical oral examinations for identification of OPMDs using standard diagnostic criteria. Data were analyzed using descriptive statistics, chi-square tests, and multivariable logistic regression.
Results: The prevalence of OPMDs was 35%. The most common lesions were leukoplakia (15%) and oral submucous fibrosis (11.7%), with the buccal mucosa being the most frequently affected site. OPMDs were significantly associated with smokeless and dual tobacco use, longer duration and higher frequency of use, betel quid/areca nut consumption, and poor oral hygiene. Multivariable analysis identified these factors as independent predictors of OPMDs.
Conclusions: OPMDs are highly prevalent among tobacco users in Bangladesh. Targeted screening and integrated tobacco and areca nut cessation strategies are essential to reduce progression to oral cancer.

Keywords: Bangladesh, Oral potentially malignant disorders, Tobacco use

INTRODUCTION

Oral potentially malignant disorders (OPMDs) are a group of oral mucosal lesions and conditions that carry an increased risk of malignant transformation to oral squamous cell carcinoma. The concept of OPMDs is clinically important because many oral cancers arise from identifiable, potentially preventable precancerous changes, and early detection can substantially improve outcomes. Common OPMDs include oral leukoplakia, erythroplakia, oral lichen planus/lichenoid lesions, oral epithelial dysplasia, and oral submucous fibrosis (OSF). Recent reviews emphasize that these entities represent a spectrum-from reversible mucosal changes to progressive fibrosis and dysplasia- where risk is influenced by lesion type, site, clinical appearance, histopathology, and ongoing exposure

to carcinogens.[1] Bangladesh is a high-priority setting for OPMD research because exposure to established oral carcinogens is widespread, particularly tobacco in both smoked and smokeless forms, and betel quid/areca nut chewing- often combined with tobacco. Nationally representative data from the Global Adult Tobacco Survey (GATS) Bangladesh 2017 reported substantial use of smokeless tobacco and betel quid with tobacco among adults, highlighting a large population at risk of developing OPMDs.[2] In south Asia, including Bangladesh, these habits are culturally embedded and frequently initiated early, continued for years, and practiced multiple times per day- creating prolonged mucosal exposure to nitrosamines, polycyclic aromatic hydrocarbons, and areca nut–related alkaloids that can trigger chronic inflammation, oxidative stress, epithelial dysplasia, and fibrotic remodeling.[3]

The public-health relevance is amplified by the burden of oral cancer in the region and the strong causal relationship between tobacco/areca exposures and oral malignant transformation. Contemporary global burden analyses show oral cavity cancer remains a major contributor to cancer incidence and mortality worldwide, with particularly heavy impact in Asian populations.[4] Bangladesh-focused literature continues to emphasize smokeless tobacco as a major modifiable driver of oral cancer risk, reinforcing the need to identify earlier stages of disease such as OPMDs among tobacco users.[5] Although OPMDs occur worldwide, prevalence varies markedly by geography and exposure patterns. A comprehensive review literature notes that pooled global prevalence estimates are in the range of a few percent, but rates are generally higher in Asian settings where tobacco chewing and areca nut use are common.[6] Within Bangladesh, a recent national-context review highlights that smokeless tobacco, smoking, and betel quid/areca nut chewing are repeatedly reported as dominant risk factors, and that early diagnosis is critical because progression risk increases when exposures persist and lesions advance to dysplasia.[7] However, robust community-based prevalence estimates specifically among "tobacco users" in Bangladesh remain limited and are often fragmented across settings, age groups, and habit types- making it difficult to compare regions, plan targeted screening, or evaluate prevention programs.

Studying prevalence and risk factors of OPMDs among tobacco users in Bangladesh is therefore justified for several reasons. First, tobacco users are a definable high-risk group suitable for efficient screening and risk stratification. Second, Bangladesh has substantial smokeless tobacco and dual-use patterns, and evidence suggests risk differs by product type, frequency, and duration of exposure, with potential variation by sex and socioeconomic status.[2] Third, the habit of betel quid chewing- often with tobacco- may shift the clinical profile toward lesions such as OSF and leukoplakia at placement sites (buccal mucosa, vestibules, floor of mouth), underscoring the need for lesion mapping and habit-specific risk modeling.[7] This study aimed to determine the prevalence of oral potentially malignant disorders (OPMDs) among tobacco users in Bangladesh and to identify key associated risk factors, including type and pattern of tobacco use, betel quid/areca nut co-use, and sociodemographic and oral hygiene factors. The findings are expected to inform targeted screening of high-risk groups, strengthen tobacco-cessation efforts in primary and dental care, and support policy initiatives to reduce smokeless tobacco and areca nut-related oral cancer risk.

Objectives

The main objective was to determine the prevalence of oral potentially malignant disorders (OPMDs) and identify associated risk factors among tobacco users in Bangladesh.

METHODS

This cross-sectional observational study was conducted in the department of oral and maxillofacial surgery, Dhaka Dental College and Hospital, Dhaka, from April 2024 to March 2025.

A total of 120 participants were selected through convenience sampling from outpatient departments and community settings. Individuals aged 18 years and above who reported current use of smoked tobacco, smokeless tobacco, or both were included. Participants with a history of oral cancer or who were unwilling to give consent were excluded.

Data were collected using a structured, interviewer-administered questionnaire to obtain information on socio-demographic characteristics, type and pattern of tobacco use, duration and frequency of use, betel quid/areca nut consumption, oral hygiene practices, and relevant clinical symptoms. All participants underwent a clinical oral examination performed by trained dental/medical professionals under adequate illumination, following WHO criteria for the diagnosis of oral potentially malignant disorders (OPMDs). Lesions such as leukoplakia, erythroplakia, oral submucous fibrosis, and oral lichen planus were identified based on standard clinical definitions. Written informed consent was obtained from all patients after proper explanation of the study. Ethical approval was obtained from the ethical review committee of SHNIBPS. Patient confidentiality was strictly maintained throughout the study.

Statistical analysis

All data were recorded systematically in preformed data collection form and quantitative data was expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. Statistical analysis was carried out by using Statistical analysis was done by using SPSS (Statistical Package for Social Science) version 23. Chi-square tests were applied to assess associations between OPMDs and potential risk

factors. Variables showing significant association in bivariate analysis were included in a multivariable logistic regression model to identify independent predictors of OPMDs. A p value <0.05 was considered statistically significant. Confidentially was strictly maintained.

RESULTS

Table 1 shows the socio-demographic profile of the 120 study participants. Most were aged 40-49 years (28.3%) and predominantly male (76.7%). A higher proportion lived in rural areas (61.7%). Nearly one-third had primary education, and over half were employed (56.7%).

Table 1: Socio-demographic characteristics of participants (n=120).

Variables	Category	Frequency	%
Age group (years)	18-29	18	15
	30-39	26	21.7
	40-49	34	28.3
	50-59	28	23.3
	≥60	14	11.7
Sex	Male	92	76.7
	Female	28	23.3
Residence	Urban	46	38.3
	Rural	74	61.7
Education	No formal	30	25
	Primary	38	31.7
	Secondary	34	28.3
	Higher	18	15
Occupation	Employed	68	56.7
	Unemployed/ Household	38	31.7
	Student	14	11.6

Table 2: Tobacco and related habit profile of participants (n=120).

Habit variables	Category	Frequency	%
Type of tobacco use	Smoked only	34	28.3
	Smokeless only	52	43.3
	Dual use	34	28.3
Smoking type	Cigarette	48	40
	Bidi	20	16.7
Smokeless type	Jarda	44	36.7
	Gul	28	23.3
	Sada pata/others	14	11.7
Duration of tobacco use (day)	<5 years	22	18.3
	5-10 years	40	33.3
	>10 years	58	48.4
	≤5 times	32	26.7
	6-10 times	46	38.3
	>10 times	42	35
Betel quid/ areca nut use	Yes	78	65
	No	42	35

Table 2 presents the tobacco-use patterns of the participants. Smokeless tobacco use (43.3%) was more common than smoking, while 28.3% were dual users. Cigarette smoking was more frequent than bidi smoking, and jarda was the most commonly used smokeless tobacco. Nearly half of the participants (48.4%) had been using tobacco for more than 10 years, and 35% reported use more than 10 times per day. Betel quid or areca nut use was reported by 65% of participants.

Table 3: Oral hygiene and clinical background (n=120).

Variables	Category	Frequency	%
Tooth brushing frequency	Once/day or less	74	61.7
	Twice/day	46	38.3
Oral hygiene status	Good	26	21.7
	Fair	48	40
	Poor	46	38.3
Dental visit (last 12 months)	Yes	32	26.7
	No	88	73.3
Mouth ulcer/burning sensation	Yes	54	45
	No	66	55

Table 3 shows the oral hygiene and clinical background of the participants. Most brushed their teeth once daily or less (61.7%). Oral hygiene status was mainly fair (40%) or poor (38.3%), with only 21.7% having good oral hygiene. A large majority (73.3%) had not visited a dentist in the past year, and 45% reported a history of mouth ulceration or burning sensation.

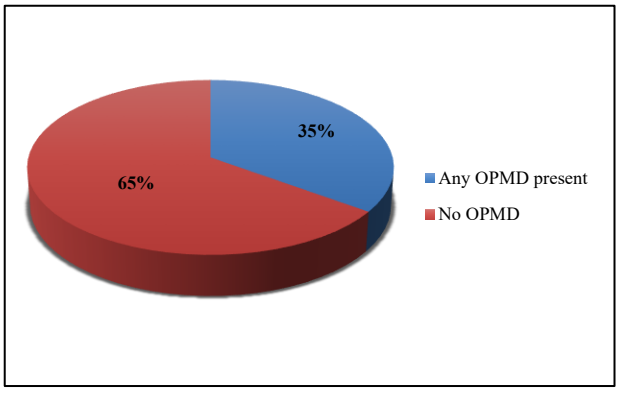

Figure 1: Prevalence of oral potentially malignant disorders (OPMDs) (n=120).

Figure 1 illustrates the prevalence of oral potentially malignant disorders among the participants. Overall, 35% (n=42) of the tobacco users had at least one OPMD, while 65% (n=78) showed no evidence of OPMDs at the time of examination.

Table 4 shows the distribution of different types of oral potentially malignant disorders. Leukoplakia (15%) was the most common lesion, followed by oral submucous

fibrosis (11.7%). Other OPMDs included oral lichen planus/lichenoid lesions (5%), erythroplakia (3.3%), and actinic cheilitis (1.7%); a small proportion (2.5%) had other lesions.

Table 4: Distribution of OPMD types (multiple responses possible).

OPMD type	Frequency	Percentage
Leukoplakia	18	15
Oral submucous fibrosis (OSF)	14	11.7
Erythroplakia	4	3.3
Oral lichen planus/ lichenoid lesion	6	5
Actinic cheilitis	2	1.7
Other	3	2.5

Table 5: Anatomical sites of OPMDs (among OPMD cases only, n=42).

Site	Frequency	Percentage
Buccal mucosa	22	52.4
Tongue	8	19
Floor of mouth	4	9.5
Gingiva/alveolar mucosa	3	7.1
Palate	2	4.8
Lip	1	2.4
Multiple sites	2	4.8

Table 5 describes the anatomical distribution of OPMDs among affected participants. The buccal mucosa was the most frequently involved site (52.4%), followed by the tongue (19%). Less commonly affected sites included the floor of the mouth (9.5%), gingiva/alveolar mucosa (7.1%), palate (4.8%), and lip (2.4%), while 4.8% of cases showed involvement of multiple sites.

Table 6: Association between key risk factors and OPMDs (n=120).

Variable	Category	OPMD present (%)	OPMD absent (%)	P value
Type of tobacco use	Smoked only	8 (23.5)	26 (76.5)	0.018
	Smokeless only	20 (38.5)	32 (61.5)	
	Dual use	14 (41.2)	20 (58.8)	
Duration	<5 years	4 (18.2)	18 (81.8)	0.006
	5-10 years	12 (30.0)	28 (70.0)	
	>10 years	26 (44.8)	32 (55.2)	
Frequency/day	≤5	6 (18.8)	26 (81.2)	0.004
	6-10	14 (30.4)	32 (69.6)	
	>10	22 (52.4)	20 (47.6)	
Betel quid/areca nut	Yes	32 (41.0)	46 (59.0)	0.011
	No	10 (23.8)	32 (76.2)	
Oral hygiene	Good/Fair	18 (24.3)	56 (75.7)	<0.001
	Poor	24 (52.2)	22 (47.8)	

Table 7: Multivariable logistic regression for predictors of OPMDs (n=120).

Predictor	Adjusted OR (AOR)	95% CI	P value
Dual tobacco use	2.48	1.12-5.51	0.024
Smokeless tobacco use	2.15	1.01-4.56	0.047
Duration >10 years	3.12	1.38-7.02	0.006
Frequency >10/day	3.64	1.59-8.35	0.002
Betel quid/areca nut use	2.31	1.08-4.92	0.031
Poor oral hygiene	3.89	1.72-8.80	<0.001
Age ≥40 years	1.94	0.88-4.26	0.098

Table 6 shows that OPMDs were significantly more common among dual and smokeless tobacco users, those with longer duration and higher frequency of tobacco use, betel quid/areca nut users, and participants with poor oral hygiene ($p<0.05$).

Table 7 indicates that dual tobacco use, smokeless tobacco use, long-term and high-frequency tobacco use, betel quid/areca nut use, and poor oral hygiene were independent predictors of OPMDs, while age ≥40 years was not statistical significance.

DISCUSSION

This study assessed the prevalence and risk factors of oral potentially malignant disorders (OPMDs) among tobacco users in Bangladesh and found a substantial burden of disease. The overall prevalence of OPMDs in the present study was 35%, indicating that more than one-third of tobacco users already exhibit precancerous oral changes (Figure 1). This finding highlights the urgent need for early detection strategies in high-risk groups, particularly in a country where both smoked and smokeless tobacco use are widespread. The case definition and terminology align with the WHO collaborating centre expert consensus on OPMDs, which emphasizes that these disorders carry an increased risk of oral cancer and require systematic detection and risk-factor control.[6]

Findings from another investigation showed that 23.6% of participants had OPMDs, among which leukoplakia was the most prevalent, followed by oral submucous fibrosis and erythroplakia.[8] The reported prevalence of 23.6% aligns with findings from studies in India and other regions where tobacco use is highly prevalent. Saraswathi et al observed a comparable prevalence of 21.6% among tobacco users in India, which was attributed to the extensive use of smokeless tobacco.[9] Likewise, Patil et al reported a prevalence of 24.8%, emphasizing the synergistic role of smoking and chewing tobacco in the development of OPMDs. In contrast, studies from regions with lower tobacco exposure have reported reduced prevalence rates.[10] The higher prevalence in the present study likely reflects differences in sampling and risk profile- your participants had a high proportion of smokeless tobacco use (43.3%), dual use (28.3%), long duration (>10 years, 48.4%), and betel quid/areca nut use (65%), which collectively increase OPMD risk (Table 2). In the current study, leukoplakia (15%) and oral submucous fibrosis (OSF) (11.7%) were the most common lesions (Table 4). This pattern is consistent with the Bangladesh-focused literature describing leukoplakia as a leading OPMD and strongly linked to smoking, smokeless tobacco, and areca nut/betel quid habits.[7] For instance, Axéll 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.[11]

The buccal mucosa was the most frequently affected site (52.4%), which is expected in smokeless tobacco and betel quid users because products are commonly kept in the buccal vestibule, causing prolonged local mucosal exposure. Similar site predominance has been reported in tobacco-associated lesion studies from the region.[12]

The elevated prevalence observed in this study may be explained by the widespread availability and cultural acceptance of tobacco products in the study regions. Furthermore, limited awareness regarding the adverse health effects of tobacco, along with restricted access to early screening services in semi-urban areas, may have resulted in delayed identification of these disorders. The analysis demonstrated significant associations between OPMDs and dual/smokeless tobacco use, longer duration, higher daily frequency, betel quid/areca nut use, and poor oral hygiene. These findings remained largely consistent in multivariable regression, where frequency >10/day, duration >10 years, dual use, smokeless tobacco, areca/betel use, and poor oral hygiene independently predicted OPMDs (Tables 6 and 7). This overall "dose-response" relationship (more exposure = higher risk) is widely supported in contemporary OPMD literature and reviews.[1] The strong role of areca nut/betel quid in your model is biologically plausible, especially for OSF. Recent mechanistic reviews explain that areca nut exposure promotes fibrosis through pathways involving chronic inflammation and myofibroblast activity and is linked with malignant transformation risk, supporting your observed association between betel/areca use and OPMDs.[13] Bangladesh has a large at-risk population due to high use of smokeless tobacco and betel quid with tobacco in adults, as documented in GATS Bangladesh 2017 reports.[2] Against this background, the high OPMD prevalence in your tobacco-user sample supports the need for targeted screening of tobacco users, integration of brief cessation counselling into primary/dental care, and addressing areca nut/betel quid alongside tobacco, rather than focusing on smoking alone.[7] In the present study, tobacco use showed a strong independent association with OPMDs, as dual tobacco users had 2.48 times higher odds and smokeless tobacco users had 2.15 times higher odds of developing OPMDs compared to single-form users, highlighting the particularly harmful impact of combined and smokeless tobacco exposure on oral health (Table 7).

This finding was consistent with previous studies, such as Kumar et al, which highlighted the strong association between smokeless tobacco use and OSMF.[14] The fibrotic changes observed in OSMF were likely caused by areca nut alkaloids and tannins, which induced collagen crosslinking. Smoking tobacco was strongly associated with leukoplakia (OR=2.89), a result that supported findings from Byakodi et al.[15] 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.

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design does not allow determination of a causal relationship between tobacco use and the development of oral potentially malignant disorders (OPMDs). Second, the sample size was relatively small and participants were selected using a non-random sampling method, which may limit the generalizability of the results to the wider

population of tobacco users in Bangladesh. Third, the diagnosis of OPMDs was based mainly on clinical examination without routine histopathological confirmation, which may have led to misclassification of some lesions. Fourth, information on tobacco use, betel quid consumption, and oral hygiene practices was self-reported, making the study susceptible to recall and reporting bias. Finally, potential confounding factors such as nutritional status, alcohol use, and socioeconomic conditions were not fully explored, which may also influence the risk of OPMDs. Future studies with larger, population-based samples, longitudinal follow-up, and histopathological confirmation are recommended to address these limitations.

CONCLUSION

This study demonstrates a high prevalence of oral potentially malignant disorders (35%) among tobacco users in Bangladesh, indicating a substantial burden of premalignant oral lesions in this high-risk population. The findings show that smokeless and dual tobacco use, long duration and high frequency of use, betel quid/areca nut consumption, and poor oral hygiene are major factors associated with OPMDs. These results highlight the urgent need for targeted oral screening programs, integration of routine oral examinations into primary healthcare, and strengthened tobacco and areca nut cessation initiatives. Early identification and prevention among tobacco users can play a crucial role in reducing the progression of OPMDs to oral cancer and improving long-term oral health outcomes in Bangladesh.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kumari P, Debta P, Dixit A. Oral potentially malignant disorders: etiology, pathogenesis, and transformation into oral cancer. Front Pharmacol. 2022;13:825266.
2. Bangladesh Bureau of Statistics (BBS). Preliminary Report on Global Adult Tobacco Survey (GATS) Bangladesh 2017. Available from: http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/57def76a_aa3c_46e3_9f80_53732eb94a83/Preliminary%20Report%20on%20GATS%20Bangladesh%202017.pdf. Accessed on 21 December 2025.
3. Khan Z, Khan S, Christianson L, Rehman S, Ekwunife O, Samkange-Zeeb F. Smokeless tobacco and oral potentially malignant disorders in South Asia: a protocol for a systematic review. Syst Rev. 2016;5(1):142.
4. Chen M, Li J, Su W, Huang J, Yang C, Li R, et al. Global burden of lip and oral cavity cancer from 1990 to 2021 and projection to 2040: findings from the 2021 global burden of disease study. Cancer Med. 2025;14(9):e70957.
5. Ullah MZ, Lim JN, Chrysanthou M, Rahman MM, Arefin MS, Dhar A, et al. Smokeless tobacco usage and oral cancer risk: a hospital-based case-control study from Bangladesh. Tobacco Use Insights. 2025;18:1179173X251383752.
6. Warnakulasuriya S. Oral potentially malignant disorders: A comprehensive review on clinical aspects and management. Oral Oncol. 2020;102:104550.
7. Shaikh MH, Iqbal MA, Sadat SA. Oral potentially malignant disorders: a review on Bangladesh perspective. J Bangladesh Coll Phys Surg. 2023;41(4):305-14.
8. Joshi M, Verma S, Behl AB, Pravinbhai DM, Doshi A, Patri G. Prevalence and risk factors of oral potentially malignant disorders in tobacco users. Bull Stomatol Maxillofac Surg. 2025;21(8):21-6.
9. Saraswathi TR, Ranganathan K, Shanmugam S, Sowmya R, Narasimhan PD, Gunaseelan R. Prevalence of oral lesions in relation to habits: crosssectional study in South India. Indian J Dent Res. 2006;17(3):121-5.
10. Patil PB, Bathi R, Chaudhari S. Prevalence of oral mucosal lesions in dental patients with tobacco smoking, chewing, and mixed habits: a crosssectional study in South India. J Fam Community Med. 2013;20(2):130-5.
11. 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.
12. Das A, Doraikanan SS, Doraiswamy JN, Chellappa LR. Prevalence and pattern of tobacco-associated oral lesion among migrant construction workers in Chennai: a cross-sectional study. J Pioneer Med Sci. 2024;13(7).
13. Kazemi K, Fadl A, Sperandio FF, Leask A. The areca nut and oral submucosal fibrosis: a narrative review. Dentist J. 2025;13(8):364.
14. 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 Fam Med Prim Care. 2019;8(7):2337-42.
15. 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.

Cite this article as: Nahar K, Mostafa DB, Jannat I, Salma MU, Chowdhury NR, Emon KE, et al. Prevalence and risk factors of oral potentially malignant disorders among tobacco users in Bangladesh. Int J Res Med Sci 2026;14:1318-23.