

# Prevalence and risk indicators of oral mucosal lesions in adult population visiting primary health centers and community health centers in Kodagu district

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## ABSTRACT

**Background and Objective:** Utilization of primary health center (PHC) and community health center (CHC) could be one of the few practical approaches in early detection of oral cancers and potentially malignant disorder (PMD). This study was designed to estimate the prevalence and distribution of oral mucosal lesion (OML) and its associated risk factors among the adult population of Kodagu district. **Methodology:** 1048 patients, 18 years of age and above, attending the outpatient department of PHC and CHC in Kodagu district comprised the study population. The World Health Organization Oral Health Assessment Form, clinical examination, and demographic factors were recorded using a proforma. Chi-square test and contingency coefficient and logistic regression were applied to check statistical differences. **Results:** The overall prevalence of OML was found to be 18.89%. Prevalence of PMD was 5.63%. Prevalence of PMD was highest among the elementary occupation (15.63%). Two cases of oral cancer were identified. There was a significant association of PMD with the age group of 41–60 years. Leukoplakia was strongly associated with male gender [odds ratio (OR) 2.83,  $P < 0.001$ ]. Smoking and chewing were significant risk factors associated with leukoplakia (OR 11.05,  $P < 0.001$ ) and oral submucous fibrosis (OR 4.63,  $P < 0.001$ ), respectively. **Conclusion:** The overall prevalence of OML in the study population was 18.89%. A high prevalence of PMD in the population could be attributed to the associated risk factors such as smoking, chewing habits, and alcohol use. Utilization of PHC and CHC could be a useful strategy to detect previously undiagnosed OML including PMD and cancerous lesions among the population.

**Keywords:** Chewing, Kodagu, oral lesions, oral mucosa, potentially malignant disorders, smoking

## Introduction

Oral mucosal lesions (OMLs) are common in many populations around the world. In literature, epidemiological studies of OMLs are still few when compared with reports regarding dental caries or periodontal diseases.<sup>[1]</sup> Accurate estimates of the epidemiology of oral lesions and a better understanding of

the factors associated with their occurrence are essential for the establishment of adequate preventive and health promotion measures.

Primary health center (PHC) is established in a plain area with a population of 30,000 people and in hilly/difficult to reach/tribal areas with a population of 20,000 and is the first contact point between the village community and the medical officer.<sup>[2]</sup> PHC is established and maintained by the state governments under the Minimum Needs Programme/Basic Minimum

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Services Programme. Each PHC is aimed at providing curative, preventive, primitive, and family welfare services. Community health center (CHC) is a 30-bedded hospital/referral unit for four PHCs with specialized services.

Implementing screening of oral diseases in PHC and CHC could be a cost-effective means of identifying potentially malignant disorders (PMD) and oral cancers in developing countries.<sup>[3]</sup> Smoking and drinking are positively associated with oral lesions such as oral submucous fibrosis (OSMF), leukoplakia, and oral lichen planus, which have the potential for malignant transformation.<sup>[4-6]</sup>

As of 2011 census, the population of the Kodagu district was 5.55 lakhs, 14.61% of which resided in the district's urban centers, making it the least populous of the 30 districts in Karnataka.<sup>[7]</sup>

Kodagu district literacy percentage is around 78%. Illiteracy was primarily among plantation workers, agricultural labourers, tribals, and schedule caste.

There are a total of 30 PHCs and 7 CHCs combining the three taluks in Kodagu district. There are very little data regarding the prevalence of OML and their risk indicators among the adult population in this region.

## Aims and Objectives

The aim of this study was to assess the prevalence and risk factors of OML among subjects 18 years of age and above, visiting PHC and CHC in Kodagu district, and to associate risk factors with PMD of patients with OML.

## Methodology

### Study design and population

A cross-sectional study was designed to estimate the prevalence and distribution of OML and its risk factors. The study was carried out between July 2017 and June 2018. The study population comprised patients attending the outpatient department of PHC and CHC who are 18 years of age or older and willing to consent for the study.

Kodagu was divided into north and south. The PHC and CHC were considered by dividing Kodagu into four zones (northeast, northwest, southeast, and southwest). Five centers (four PHCs and one CHC) was considered from each zone. Finally, a total of 20 centers were considered. Study subjects were selected by systematic sampling method. Every subject who was 18 years of age and above was selected till required sample size was met.

### Ethical considerations

Permission was obtained from the District Health Officer, Madikeri, to conduct a study in PHC and CHC. Ethical clearance was obtained from the Institutional Review Board. Informed consent was obtained from the participating patients in the study.

## Clinical oral examination

The World Health Organization (WHO) Oral Health Assessment Form was used, and clinical assessment and the details were entered in the proforma.<sup>[8]</sup> All participants underwent a comprehensive type III clinical examination of the oral mucosa performed by a single trained examiner. Information regarding age, gender, cigarette smoking, alcohol intake, chewing habit, and lesion type at the time of examination was documented in detail.

The diagnosis of OML was performed in accordance with WHO criteria.<sup>[8]</sup> For lesions such as median rhomboid glossitis and other mucosal variants, criteria described by Axéll *et al.*<sup>[9]</sup> and for mucosal lesions in betel chewers, the work by Reichart *et al.*<sup>[10]</sup> were referred.

## Statistical analysis

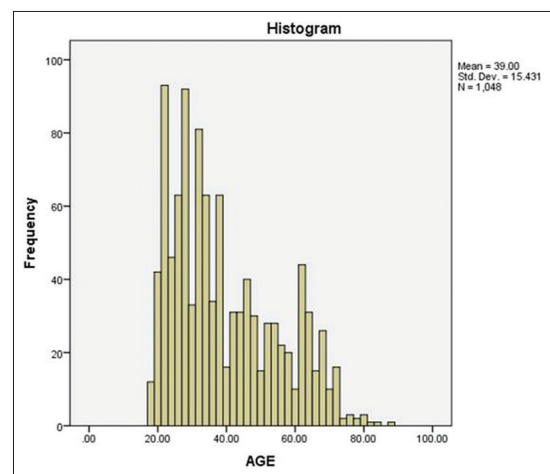
Statistical analysis was done using SPSS ver. 23. Chi-square test and contingency coefficient analysis to assess the differences among qualitative variables and categorical variables and logistic regression were applied to evaluate risk ratios and the association among variables, and odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated. All the tests were two-sided, and *P* values <0.001 were considered statistically significant.

## Results

A total of 198 participants (18.89%) presented with different types of OML at the time of examination.

The age of the participants ranged from 18 to 87 years (39.99 years) and was divided into three categories: 18–40, 41–60, and >60 years. Figure 1 shows histogram representing frequency distribution of age of all participants.

Occupation category was adapted from the National Classification of Occupation 2004.<sup>[11]</sup> The occupation distribution of all the participants is presented in Figure 2.



**Figure 1:** Histogram representing frequency distribution of age of all participants

The overall prevalence of smoking, drinking alcohol, and chewing was 18.98%, 12.02%, and 16.50%, respectively. The distribution of habits among all the participants is presented in Figure 3.

### Prevalence and association of risk factors with OMLs

A total of 198 OMLs were recorded among 1048 patients in this study. The most prevalent lesion found was leukoplakia [33 (3.1%)], followed by chewers mucosa [29 (2.8%)], and least irritational fibroma [1 (0.1%)]. Prevalence and distribution of OML among all the participants is presented in Table 1.

Table 2 shows the association of age and gender as risk factors of OSMF, leukoplakia, and lichen lesions. The OR shows significant association of leukoplakia in the male population. Statistical significance was noted in the second age group (41–60 years) for leukoplakia and OSMF.

Occupation as risk factors of OSMF, leukoplakia, and lichen lesions is presented in Table 3. The OR for leukoplakia and smoking is significant in categories 5, 6, 8, and 9, respectively. For lichen lesions, OR was significant in category 10 and for OSMF OR was significant in occupation category 9.

Habits as risk factors of OSMF, leukoplakia, and lichen lesions are presented in Table 4. The results show that the risk of leukoplakia is 11.03 times more in smokers, while it is 2.75 and 3.19 times in chewers and alcoholics. Chewers were 4.63 times more likely to have OSMF when compared with 1.73 and 2.19 times in smokers and alcoholics, respectively. Statistical significance in lichen lesion was observed in the chewing population who had 1.16 times more risk than the nonchewing population.

Table 5 shows the analysis of habits as risk factors of PMDs and other lesions.

### Discussion

The total prevalence of OML among subjects was 18.89% which is similar to a study by Bhatnagar *et al.* (16.8%).<sup>[12]</sup> And in contrast to studies by Sandeepa *et al.* (42.4%),<sup>[6]</sup> Shulman *et al.* (28.24%),<sup>[13]</sup> Mathew *et al.* (41.2%),<sup>[14]</sup> Rooban *et al.* (25%),<sup>[15]</sup> Kovač-Kavčić and Skalerič (61.6%),<sup>[16]</sup> and Patil *et al.* (26.88%).<sup>[17]</sup> These variations in prevalence could be due to the differences in sample size and demographic factors.



Figure 2: Occupation distribution of the participants

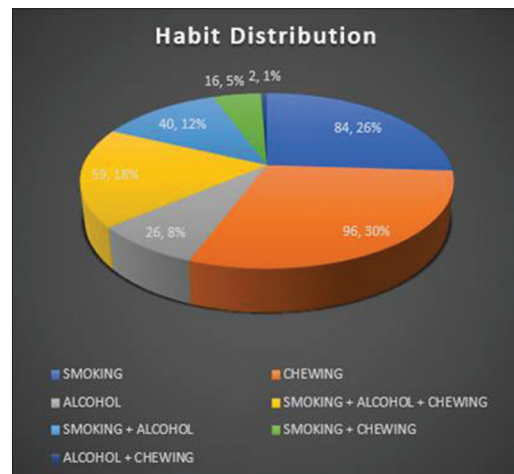


Figure 3: Distribution of habits among the participants

Table 1: Prevalence and distribution of OML among the participants

Lesion type	Total, n=198	Population prevalence (%)	Lesion frequency (%)	Mean age (years)	Male (%)	Female (%)
Pouch keratosis	22	2.1	11.11	43.1	11 (2.2)	11 (2.0)
Leukoplakia	33	3.1	16.66	44.9	29 (5.7)	4 (0.7)
Chewers mucosa	29	2.8	14.64	44.4	4 (0.8)	25 (4.6)
Oral submucous fibrosis	26	2.5	13.13	45.1	10 (2.0)	16 (3.0)
Apthous ulcerations	21	2.0	10.60	41.2	13 (2.6)	8 (1.5)
Coated tongue	16	1.5	8.08	37.3	7 (1.4)	9 (1.7)
Herpes lesions	4	0.4	2.02	44	1 (0.2)	3 (0.6)
Geographic/fissured tongue	2	0.2	1.01	26.5	1 (0.2)	1 (0.2)
Nicotina stomatitis	11	1.0	5.55	54.6	11 (2.2)	0.0
Radiation mucositis	1	0.1	0.50	62	1 (0.2)	0.0
Candidal lesions	16	1.5	8.08	50.7	8 (1.6)	8 (1.5)
Lichen lesions	14	1.3	7.07	44.7	6 (1.2)	8 (1.5)
Irritational fibroma	1	0.1	0.50	68	1 (0.2)	0.0
Malignancy	2	0.2	1.01	53	1 (0.2)	1 (0.2)

OML: oral mucosal lesion

**Table 2: Association of age and gender as risk factors of OSMF, leukoplakia, and lichen lesions**

Variable	Leukoplakia (n=33)		Lichen lesions (n=14)		OSMF (n=26)	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Gender						
Female	1 (ref)	<0.001	1 (ref)	0.523	1 (ref)	0.370
Male	2.83 (1.67-4.80)		0.97 (0.89-1.05)		0.91 (0.74-1.11)	
Age group						
18-40	1 (ref)	<0.001	1 (ref)	0.689	1 (ref)	<0.001
41-60	1.82 (1.23-2.68)	0.112	1.02 (0.92-1.12)	0.298	1.45 (1.17-1.80)	0.211
>60	1.49 (0.91-2.44)		1.05 (0.95-1.16)		1.21 (0.89-1.63)	

OSMF: oral submucous fibrosis; OR: odds ratio; CI: confidence interval

**Table 3: Occupation as risk factors of leukoplakia, lichen lesions, and OSMF**

Occupation	Leukoplakia (n=33)		Lichen lesions (n=14)		OSMF (n=26)	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Category 0	1 (ref)		1 (ref)		1 (ref)	
Category 5	3.12 (1.32-7.35)	<0.001	0.957	0.565	0.91 (0.54-1.54)	0.738
Category 6	3.62 (1.53-8.54)	<0.001			0.98 (0.58-1.66)	0.952
Category 8	4.85 (2.15-10.92)	<0.001			1.02 (0.60-1.74)	0.915
Category 9	5.92 (2.82-12.41)	<0.001	1.02 (0.93-1.12)	0.636	1.75 (1.39-2.20)	<0.001
Category 10			1.32 (1.08-1.62)	<0.001		

OSMF: oral submucous fibrosis; OR: odds ratio; CI: confidence interval

**Table 4: Habits as risk factors of OSMF, leukoplakia, and lichen lesions**

Variable	Leukoplakia (n=33)		Lichen lesions (n=14)		OSMF (n=26)	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Smoking						
Absent	1 (ref)	<0.001	1 (ref)	0.727	1 (ref)	<0.001
Present	11.03 (5.35-22.73)		1.01 (0.91-1.13)		1.73 (1.40-2.14)	
Chewing						
Absent	1 (ref)	<0.001	1 (ref)	<0.001	1 (ref)	<0.001
Present	2.75 (1.90-3.99)		1.16 (1.08-1.26)		4.63 (2.61-8.22)	
Alcohol						
Absent	1 (ref)	<0.001	1 (ref)	0.069	1 (ref)	<0.001
Present	3.19 (2.22-4.61)		1.09 (0.99-1.19)		2.19 (1.77-2.71)	

OSMF: oral submucous fibrosis; OR: odds ratio; CI: confidence interval

**Table 5: Analysis of habits as risk factors of PMD and other lesions**

Variable	Potentially malignant disorders (n=59)		Other lesions (n=137)	
	OR (95% CI)	P	OR (95% CI)	P
Smoking				
Absent	1 (ref)	<0.001	1 (ref)	<0.001
Present	3.11 (2.39-4.05)		1.14 (1.09-1.19)	
Chewing				
Absent	1 (ref)	<0.001	1 (ref)	<0.001
Present	3.53 (2.69-4.62)		1.13 (1.07-1.19)	
Alcohol				
Absent	1 (ref)	<0.001	1 (ref)	0.217
Present	2.39 (1.97-2.93)		1.06 (0.99-1.13)	

PMD: potentially malignant disorder; OR: odds ratio; CI: confidence interval

The prevalence of leukoplakia in this study is similar to Al-Attas *et al.* (2.3%).<sup>[18]</sup> Higher prevalence of 7.4% and 8.2% was seen in studies by Rooban *et al.*<sup>[15]</sup> and Patil PB *et al.*,<sup>[17]</sup> respectively. In India, the prevalence of leukoplakia varies from 0.2% to 5.2% and the majority occurs in the age range of 35–45 years.<sup>[19]</sup> It

has been reported that reverse smoking in Srikakulam district was strongly associated with palatal lesions and showed a varied clinical picture and specific histological changes associated with a high percentage of epithelial dysplasia.<sup>[20]</sup>

In a study conducted by Ortiz *et al.*, 89.4% of palatal changes associated with reverse smoking included various combinations of leukoplakia and were exclusively noted in females.<sup>[21]</sup> Leukoplakia was more prevalent in men than in women (5.7% and 0.7%, respectively). This is in agreement with the results of Axéll *et al.* who found significantly more tobacco-associated leukoplakias in men.<sup>[22]</sup> The highest prevalence of leukoplakia was seen in the second age group (41–60 years).

In a Sri Lankan study where PHC workers were used for detection of oral cancer and premalignancy, a prevalence of 4.2% was observed. This is comparable to the prevalence of PMD in this study (5.6%). In this study, prevalence of chewer's mucosa was 2.8% which is similar to Patil *et al.* (2.16%).<sup>[17]</sup> Chewer's mucosa was more prevalent in women (4.6%). This is in agreement with



Reichart *et al.* in Thai women.<sup>[10]</sup> Highest prevalence was seen in the second age group (41–60 years).

About 2.1% of subjects had tobacco pouch keratosis among 41–60 years. Both men (2.2%) and women (2.0%) are equally affected. Only by histopathology we can distinguish between leukoplakia and pouch keratosis which is reversible.<sup>[23]</sup>

The prevalence of OSMF in study was 2.5%. In India, it ranges from 0.03% to 6.42%.<sup>[24]</sup> Similar prevalence was reported by Mathew *et al.* (2.01%)<sup>[14]</sup> and Bhatnagar *et al.* (1.97%).<sup>[12]</sup> The prevalence of oral was more in the second age group and among females (6.20%–10.78%).

The prevalence of lichen lesions in our study was 1.3% which was comparable to studies by Mathew *et al.* (1.2%)<sup>[14]</sup> and Ikeda *et al.*<sup>[25]</sup> (1.8%). While a higher prevalence of 2.3% in the population of Ljubljana, Slovenia, was observed in a study conducted by Kovač-Kavčič and Skalerič.<sup>[16]</sup> Betel quid chewing is so strongly associated with this lesion that it almost exclusively occurs at the site of the placement of betel quid.<sup>[25]</sup>

The prevalence of aphthous ulceration in our study was 2.0% which was comparable to studies by Bhatnagar *et al.* (1.53%)<sup>[12]</sup> and Feng *et al.*<sup>[26]</sup> (1.48%).

The prevalence of herpes lesions in our study was 0.4% which is comparable to a study by Feng *et al.*<sup>[26]</sup> (0.44%). The prevalence of *Candida* lesions in our study was 1.5%. This is similar to the prevalence in studies conducted by Ikeda *et al.*<sup>[25]</sup> (1.41%) and Ghanaei *et al.*<sup>[27]</sup> (1.8%).

The prevalence of nicotina stomatitis in our study was 1.0%, which was comparable to studies by Ghanaei *et al.*<sup>[27]</sup> (1.65) and Kovač-Kavčič and Skalerič<sup>[16]</sup> (0.5%).

Two patients were identified with oral malignancy and were referred to cancer centers.

The prevalence of smoking was higher among males (14.57%) when compared with females (4.1%). Alcohol consumption was again higher in males (7.91%) when compared with females (4.1%). Chewing habit was higher in females (10.3%) when compared with males (6.2%).

PMLs were significantly higher among smokers (3.11 times), chewers (3.53 times), and alcohol users (2.39 times),  $P < 0.001$ .

In the multivariable analysis for lesions other than PMD, ORs were 1.208 (95% CI,  $P < 0.001$ ) and 1.12 (95% CI,  $P < 0.001$ ) for smokers and chewers. Lesions such as pouch keratosis, chewer's mucosa, and nicotina stomatitis were significantly associated with smoking and chewing habits.

Leukoplakia was significantly associated with men (OR 2.83, 95% CI,  $P < 0.001$ ) compared with women. The second

age group (41–60 years) was significantly associated with leukoplakia (OR 1.82, 95% CI,  $P < 0.001$ ). In the multivariable analysis, OR for smokers was 11.03 (95% CI,  $P < 0.001$ ) when compared with chewers (2.75; 95% CI,  $P < 0.001$ ) and alcohol users (3.19; 95% CI,  $P < 0.001$ ) which indicates a highly significant association of smoking with leukoplakia.

OSMF did not have any significant association with gender. The second age group (41–60 years) was significantly associated with OSMF (OR 1.45, 95% CI,  $P < 0.001$ ). Statistical significance was seen in occupation category 9 with OR of 1.75 (95% CI,  $P < 0.001$ ). In the multivariable analysis, OR for chewers was 4.63 (95% CI,  $P < 0.001$ ), smokers 1.73 (95% CI,  $P < 0.001$ ), and alcohol users 2.19 (95% CI,  $P < 0.001$ ) which indicates a highly significant association of chewing with OSMF.

## Conclusion

The results of the study indicate that screening of patients in PHC and CHC could be a useful strategy to detect previously undiagnosed OML, PMD, and cancerous lesions among the population. Implementation of a feasible screening and examination program at these centers could be valuable in targeted prevention and treatment of OML.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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