Original Article

Prevalence of oral mucosal lesions among smokeless tobacco usage: A cross-sectional study

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Abstract

BACKGROUND: Tobacco use is one of the most prevalent forms of habit and associated with development of potential malignant disorders. The aim of the present study was to investigate the prevalence and distribution of oral mucosal lesions (OMLs) among smokeless tobacco users. **MATERIALS AND METHODS:** This is a hospital-based cross-sectional study. All the patients with the history of smokeless tobacco habit were included in the study. The patients were interviewed using the preformed questionnaire, including the patient's demographic details, the type of habit, duration, frequency, and the associated oral mucosal pathology. Further, patients were clinically examined and recorded on tobacco-related oral lesions. **RESULTS:** Prevalence of OML was 54.18%, and 91.50% being among male and with higher frequency at the age of second and fourth decade. The prevalence of oral submucous fibrosis, leukoplakia, carcinoma, lichen planus, and erythroplakia was 26.95, 10.35, 9.94, 5.5, and 0.66%, respectively. Smokeless tobacco habit was prevailing among males (98.79%) compared to females (9.37%). Frequency of habit-associated OML was statistically significant with odds ratio 0.24. **CONCLUSION:** The study proves a definite association between smokeless tobacco habit and OML. The data necessitate to correlate and follow up the individuals with smokeless form of tobacco habits to establish the definite correlation between the habit and oral mucosal lesions.

Key Words: Leukoplakia, mucosal lesion, oral submucous fibrosis, smokeless tobacco

Introduction

In India, tobacco consumption is responsible for half of all the cancers in men and one-fourth of cancers in women. The World Health Organization predicts that tobacco deaths in India may exceed 1.5 million annually by 2020.[1] Tobacco use in India differs from the globe. The documented form of tobacco used globally is the cigarette; however, in India, only 20% of tobacco is consumed as cigarette, 40% is consumed as bidi, and rest in the form of smokeless tobacco.[2] Tobacco usage is influenced by various factors such as individual attitude, stress, workload, availability, advertising campaigns, etc.

In India, the practice of tobacco consumption varies from one state to another state and within each state.Therefore, it is important to gather information about the prevalence of tobacco habit among the local population. This helps to assess the epidemiological and behavioral patterns among the habitual users. Also, this information would help to develop and implement relevant tobacco intervention strategies, as dentists often come across patients with tobacco habits, when compared to the medical practitioner. The incidence of potentially malignant diseases of the oral cavity is increasing and also showing predilection in younger age group due to increase in intake of smokeless form of tobacco.[3] Tobacco has been identified as initiation and progression of oral cancer. To reduce the mortality and morbidity of disease, it is important to screen all the patients with the history of tobacco habit, and early screening plays a vital role for early intervention and prevention of oral cancer. Tobacco cessation and education regarding the hazardous effects of tobacco is an essential component for reducing mortality and morbidity related to its use.[4] However, considerable research is required to comprehend the actual trends and reliable prevalence data on tobacco consumption are scarce. Cross-sectional studies are important in estimating the prevalence of a disease in the population and identifying high-risk populations. There is inadequate data regarding the smokeless tobacco use among the population in Dharwad of North Karnataka. The objectives of this study were to investigate the prevalence and distribution of oral mucosal lesions (OMLs) among smokeless tobacco users and to establish the clinical varieties of precancer and oral cancer associated with smokeless tobacco habits.

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Materials and Methods

Study population

A cross-sectional study was conducted at the SDM College of Dental Sciences, Dharwad to assess the relationship between tobacco-related habits and associated oral lesions. All patients reporting to the outpatient section of Department of Oral Medicine having history of chewing form of tobacco-related habit, areca nut, and/or betel quid for a minimum 5 years were included in the study. Patients who were unwilling to give complete habit details and smoking and mixed form of habits were excluded. Ethical clearance was obtained from the Institutional Review Board (IRB no. 2012/P/OP/15) and the study was carried out for 1-year duration.

Screening program

The predesigned questionnaire was used to record the data. The standardized questionnaire included patient's demographic details such as age, sex, educational status, occupation details of type of habit such as betel quid, pan masala with tobacco, gutkha, tobacco paste and combination, duration, and frequency of habit. Further habit-associated OMLs were recorded.

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Screening was done by two trained faculty. Before screening, all the patients were explained about the habits and its association with oral mucosal lesions and informed consent was obtained. Random sampling collection was done. This was followed by detailed recording of habits and examination was done by the same researchers for the presence of any oral lesions. Clinical examination was done using mouth mirrors under adequate illumination. If a lesion was clinically judged as suspicious for malignancy, punch biopsy was performed.

Statistical analysis

The data collected were tabulated in Microsoft Excel. Proportion analysis was done to know the percentage of distribution among the variables. Chi-square test was used to establish the statistical difference between the different variables, and significance was assessed at 5% level. Odds ratio at 95% confidence interval was used to evaluate the risk associated with tobacco habit.

Results

Of the 2455 study population, 2280 (92.87%) males and 175 (7.12%) females had smokeless tobacco habit. Tables 1a and 1b describe the detailed distribution of the subjects by basic characteristics and sociodemographic features. The findings show that the habitual users belonged to low or average socioeconomic status.

Table 1a depicts distribution of age group among habitual users. The habit was highly prevalent in the age group of 40–49 years and mean age was 45 years among males and in females the mean age was slightly older than the males, i.e., 53 years. The statistically significant difference was observed among the males and females and the age groups.

The educational status was higher among the males compared to females. Statistically significant difference was noted between education and gender [Table 1b]. Occupational relation with tobacco usage reveals that highest prevalence among drivers, tailors, army, tea sellers, cleaners, and maids, followed by laborers, landowners, shopkeeper/vendor, homemakers, students technical/professionals, teachers, and unemployed. The difference of rates of tobacco use with regard to the gender and occupation is statistically significant (P = 0.00001) [Table 1c].

Prevalence of the type of habit

Overall prevalence of smokeless form of tobacco in males was 90.37% and in females was 9.62%. The most common form of tobacco consumption in males was use of betel quid (58.06%). Following betel quid, gutkha is a commercially available processed areca nut product with tobacco that was practiced commonly in 31.95%; combination, i.e., more than one type of habit, which includes more commonly betel quid and gutaka was 4.86% and pan masala with tobacco was 2.92%. The least practiced habit was tobacco paste (1.88%), khaini (0.18%), and other forms (0.12%) such as tobacco in the form of powder.

Similar habit patterns was evident among females (n = 175). The various forms of smokeless tobacco used among both sexes showed statistically significant difference [Table 2].

Table 1a: Distribution of tobacco users according to age and sex

Age groups (in years)	Male *n* (%)	Female *n* (%)	Total *n* (%)
≤20	56 (2.45)	1 (0.57)	57 (2.32)
21-29	433 (18.99)	6 (3.42)	439 (17.88)
30-39	426 (12.57)	22 (12.57)	448 (18.25)
40-49	458 (20.08)	37 (21.14)	495 (20.16)
50-59	393 (17.23)	53 (30.28)	446 (18.17)
60-69	367 (16.09)	40 (22.85)	407 (16.58)
70+	147 (6.44)	16 (9.14)	163 (6.64)
Total	2280 (92.87)	175 (7.12)	2455 (100)
Mean age	44.94	52.32	45.47
SD age	15.69	12.89	15.62

χ^2=14.86, P=0.0213

Table 1b: Distribution of study subjects according to education status

Educational status	Male *n* (%)	Female *n* (%)	Total *n* (%)
Illiterates	431 (18.90)	68 (38.85)	499 (20.33)
Primary	164 (7.19)	37 (21.14)	201 (8.19)
Middle school	367 (16.09)	26 (14.85)	393 (16.01)
Secondary	669 (29.34)	29 (16.57)	698 (28.43)
College	594 (26.05)	15 (8.57)	609 (24.81)
Professional/PG	55 (2.41)	0	55 (2.24)
Total	2280 (92.87)	175 (7.12)	2455 (100)

χ^2=104.15; P=0.00001

Table 1c: Distribution of study subjects according to occupation and sex

Occupations	Male *n* (%)	Female *n* (%)	Total *n* (%)
Laborer	544 (23.85)	32 (18.28)	576 (23.46)
Vender/shopkeeper	138 (6.05)	2 (1.14)	140 (5.70)
Landowner	328 (14.38)	7 (4)	335 (13.65)
Teacher	51 (2.23)	2 (1.14)	53 (2.16)
Technical/professional	75 (3.28)	2 (1.14)	77 (3.14)
Homemakers	6 (0.26)	99 (56.57)	105 (4.28)
Unemployed	2 (0.08)	5 (2.85)	7 (0.29)
Students	98 (4.29)	5 (2.85)	103 (4.20)
Others	1038 (45.52)	21 (12)	1059 (43.14)
Total	2280 (92.87)	175 (7.12)	2455 (100)

χ^2=1316.85, P=0.00001

Table 2: Distribution of types of smokeless tobacco habits among the study subjects

Smokeless tobacco habit	Male *n* (%)	Female *n* (%)	Total *n* (%)
Pan masala with tobacco	48 (2.92)	4 (2.28)	52 (2.86)
Gutkha	525 (31.95)	10 (5.71)	535 (29.42)
Betel quid	954 (58.06)	159 (90.85)	1039 (57.15)
Khaini	3 (0.18)	0	3 (0.16)
Tobacco paste	31 (1.88)	2 (1.14)	43 (2.36)
Others	2 (0.12)	0	2 (0.11)
Combinations	80 (4.86)	0	0.00
Total	1643 (90.37)	175 (9.62)	1818 (100)

χ^2=74.542, P=0.00001

Prevalence of OMLs

The study revealed that 54.17% had developed the OMLs in tobacco habitual among both the sexes. Lesions were

highly prevalent among males (92.87%) as compared to females (7.12%); these findings well correlate with the habit practiced among them. The difference in the occurrence of OMLs among sex is statistically significant (χ^2 = 8.20, P = 0.0042) [Table 3].

In the different age groups, the OMLs were prevalent at the age of 40–49 years (19.85%) and least at the age of ≤20 years (2.93%). A difference in prevalence of OMLs in different age groups did not show statistical significance [Table 4].

Distribution of OMLs among males and females irrespective of the form of habit and prevalence noted in males was 91.50%, and females 8.49%. The highly prevalent lesion among males was oral submucous fibrosis (OSF) (26.95%), followed by leukoplakia (10.35%), carcinoma (9.94%), lichen planus (5.5%), and erythroplakia (0.66%). The other lesions noted were pan encrustations and hyperkeratosis. More than one lesion was observed only in 3.78% male subjects. Candidiasis was recorded only in 1.23% subjects. In females, the OMLs carcinoma was highly prevalent (28.31%) followed by lichen planus (12.38%), OSF (12.38%), leukoplakia and erythroplakia, pan encrustation, hyperkeratosis, candidiasis, and combination of lesions were 3.5%. A difference in prevalence of OMLs in male and female was found to be statistically significant [Table 5].

The occurrence of OMLs with frequency and duration of habit was assessed. The different frequency of smokeless tobacco and occurrence of OMLs were not statistically significant [Table 6]. But, duration of habit and the occurrence of OMLs revealed statistically significant correlation. Oral squamous cell carcinoma (OSCC) was seen associated with longer duration of habit, whereas the occurrence of potential malignant disorders (PMDs) such as OSF and lichen planus was seen at shorter duration [Table 7], while the other lesions such as erythroplakia, candidiasis, pan encrustation, and hyperkeratosis showed arbitrary distribution with the duration of smokeless form of tobacco habit.

Odds of occurrence of OMLs is 0.218 with frequency of more than 15 times use of smokeless tobacco as compared to reference category. It explains that the smokeless tobacco with the duration more than 15 times have 0.218 times more chances of OMLs as compared with other frequency. The findings were statistically significant [Table 8].

Less duration (1–5 years) of smokeless tobacco habit has got strong association with OMLs with odds ratio = 0.239 as compared to the other duration of smokeless habit [Table 9].

Table 3: Prevalence of oral mucosal lesions by sex

Gender	Without lesion *n* (%)	With lesion *n* (%)	Total *n* (%)
Male	1063 (94.49)	1217 (91.50)	2280 (92.87)
Female	62 (5.68)	113 (8.50)	175 (7.12)
Total	1125 (45.82)	1330 (54.17)	2455 (100)

χ^2=8.20, P=0.0042

Table 4: Prevalence of oral mucosal lesions by age groups

Age groups	Without lesion	%	With lesion	%
≤20	18	1.6	39	2.93
21-29	182	16.18	257	19.32
30-39	198	17.16	250	18.80
40-49	231	20.53	264	19.85
50-59	215	19.11	231	17.37
60-69	207	18.4	200	15.04
70+	74	6.58	89	6.69
Total	1125	100	1330	100

χ^2=13.85, P=0.0313

Table 5: Prevalence of types oral mucosal lesions in the study subjects by sex

Type of lesions	Male *n* (%)	Female *n* (%)	Total *n* (%)
Carcinoma	121 (9.94)	32 (28.31)	153 (10.99)
Leukoplakia	126 (10.35)	8 (7.07)	134 (9.62)
Erythroplakia	8 (0.66)	1 (0.88)	9 (0.64)
Lichen planus	67 (5.5)	14 (12.38)	81 (5.81)
Oral submucous fibrosis	328 (26.95)	14 (12.38)	342 (24.56)
Candidiasis	15 (1.23)	2 (1.70)	17 (1.22)
Pan encrustation	367 (30.16)	32 (28.31)	399 (28.66)
Hyperkeratosis	139 (11.42)	6 (5.30)	145 (10.41)
Combinations	46 (3.78)	4 (3.50)	50 (3.59)
Total	1217 (91.50)	113 (8.49)	1330 (100)

χ^2=48.66, P=0.00001

Discussion

Tobacco consumption in multiple forms is an emerging, significant, and growing threat to health. More than 7000 different chemicals have been found in tobacco and tobacco smoke. Among these more than 60 are considered as carcinogenic. Smokeless form of tobacco is practiced more commonly than smoking tobacco in India. Among the smokeless form, commercially available sachets are becoming common, especially among teenagers and young adults than in the older age group. A definite association has been recorded between tobacco habit and OMLs such as PMD and oral cancer.[5]

We studied parameters such as income, education, occupation, age, and gender of patients that give more meaningful information regarding the prevalence of this deleterious habit. The prevalence of adverse effect of oral habit was found to be much higher in males as compared to females. Illiterate or less education shows the lack of awareness of harmful effects of consumption of tobacco products.[3] As income was low, they tend to compromise on healthy and nutritious diet and these group of people will be more prone for developing mucosal lesions. As men with occupations such as laborer, daily wagers, tea seller, shopkeepers, etc., need substantial amount of energy to do work, they tend to chew tobacco, in addition to social and peer pressure among the youngsters being noted. This usage contributes to their work environment, to kill the hunger and to get instant soothing effect of tobacco which is common. Similar findings have been recorded by Choudary *et al.* and Keluskar and Kale.[6,7]

In addition, prevalence of oral habit was found to be much higher in males as compared to females in this study and

Table 6: Relationship between frequency of smokeless tobacco habit and oral mucosal lesions

Status of lesions	1-5 times	%	6-10 times	%	11-15 times	%	>15 times	%	Total
No. of lesions	347	49.71	257	36.81	63	9.02	31	4.44	698
Carcinoma	52	44.44	52	44.44	8	12.82	5	4.27	117
Leukoplakia	37	43.02	36	41.86	10	11.62	3	3.48	86
Erythroplakia	2	33.33	2	33.33	1	16.66	1	16.66	6
Lichen planus	30	55.55	17	31.48	5	9.25	2	4.55	54
Oral submucous fibrosis	147	43.49	121	35.79	45	13.31	25	7.39	338
Candidiasis	3	30	7	70	0	0.00	0	0.00	10
Pan encrustation	152	43.30	136	38.74	37	10.54	26	7.4	351
Hyperkeratosis	59	50.42	42	35.89	12	10.25	4	3.41	117
Combinations	18	43.90	15	36.58	4	9.75	4	9.75	41
Total	847	46.58	685	37.67	185	10.17	101	5.55	1818

χ^2=29.6333, *P*=0.3310

Table 7: Relationship between duration of smokeless tobacco habits and oral mucosal lesions

Type of lesions	1-5 years	%	6-10 years	%	11-15 years	%	16-20 years	%	21+ years	%	Total
None	160	22.92	200	28.65	77	11.03	110	15.75	151	26.63	698
Carcinoma	19	16.23	30	25.64	5	4.27	21	17.94	42	35.89	117
Leukoplakia	16	18.60	18	20.93	15	17.44	17	19.76	20	23.25	86
Erythroplakia	1	16.66	1	16.66	0	0.00	1	16.66	3	50	6
Lichen planus	21	38.88	12	22.22	6	11.11	8	14.81	7	12.96	54
OSMF	193	57.10	84	24.85	26	7.69	18	5.32	17	5.02	338
Candidiasis	1	10.00	3	30.00	1	10.00	2	20.00	3	30.00	10
Pan encrustation	48	13.67	83	23.64	51	14.52	52	14.81	117	33.33	351
Hyperkeratosis	26	22.22	31	26.49	13	11.11	19	16.23	28	23.93	117
Combinations	4	9.75	10	24.39	1	2.43	8	19.51	18	43.90	41
Total	489	26.89	472	25.96	195	10.72	256	14.08	406	22.33	1818

χ^2=293.7000, *P*=0.00001

Table 8: Association between frequency of smokeless tobacco habit and occurrence of mucosal lesions

Frequency of smokeless tobacco habit	Without lesions *n* (%)	With lesions *n* (%)	Total *n* (%)	Odds ratio
None	427 (67.03)	210 (32.96)	637 (25.94)	Reference category
1-5 times	347 (40.96)	500 (59.03)	847 (34.50)	0.341
6-10 times	257 (37.51)	428 (62.48)	685 (27.90)	0.295
11-15 times	63 (34.05)	122 (65.94)	185 (7.53)	0.254
>15 times	31 (30.69)	70 (69.30)	101 (4.11)	0.218
Total	1125 (45.82)	1330 (54.18)	2455 (100)	

χ^2=162.1360, *P*=0.00001

Table 9: Association between duration of smokeless tobacco habit and occurrence of mucosal lesions

Duration of smokeless tobacco habit	Without lesions *n* (%)	With lesions *n* (%)	Total *n* (%)	Odds ratio
None	427 (67.03)	210 (32.96)	637 (25.94)	Reference category
1-5 years	160 (32.71)	329 (67.28)	489 (19.91)	0.239
6-10 years	200 (42.37)	272 (57.63)	472 (19.22)	0.362
11-15 years	77 (39.48)	118 (60.51)	195 (7.94)	0.321
16-20 years	110 (42.96)	146 (57.03)	256 (10.42)	0.371
21 +years	151 (38.03)	255 (64.23)	397 (16.17)	0.291
Total	1125 (45.82)	1330 (54.18)	2455 (100)	

χ^2=167.6888, *P*=0.00001

similar findings are reported by other authors. Moreover, the habit was highly prevalent at the earlier age group among the males than females, probably due to practice of habit at an earlier age. These findings are similar to the earlier studies reported by Mehrotra *et al*., Shivakumar *et al*., Zain and Saraswathi *et al*., Jaber *et al*., Prashant *et al*.[8-13] Prevalence of oral habit in India reported by various authors in different geographical areas is as follows: at Chennai region 6.99%, Belgaum region 21.8%, Allahabad 21%, and Bangalore region 7.53%.[7-9,11]

Use of betel quid was prevalent among both males and females, followed by gutkha. Betel quid is composed of pan, tobacco, slaked lime, betel nut, and other additives, whereas gutkha comprises betel nut and tobacco. In addition to tobacco, betel nut is also been considered as carcinogen by IARC.[14]

Betel nut is mainly used in the form of gutkha and pan masala. Usage of these products is one of the major causes for the development of OMLs, particularly OSF. Habitual gutkha users have been found to be present with OSF at earlier ages compared with traditional betel quid users. A gutkha sachet weighs ~3.5 g and contains 7% moisture, whereas the net weight of a betel quid is nearly 4 g (with ~1.14 g of tobacco) and contains 70% moisture. Because gutkha users tend to consume more dry weight of tobacco, areca nut, and slaked lime, they may be exposed to OSF at earlier ages compared to other types of betel quid users.[14,15]

Among the alternative is tobacco users 54.17% had developed OMLs and lesions were highly prevalent among males than females. Similarly, higher prevalence was noted between 41.2 and 66.2% range. However, Shulman *et al.*, Shivakumar *et al.*, and Puneet *et al.* reported the frequency of OMLs at 10.26, 11.33, and 16.8%,[9,16,17] whereas Mobeeriek *et al.* noted the prevalence of OMLs higher in females than males and Corbert *et al.* did not find any difference between males and females.[18,19] This variation could be attributed to number of tobacco habituals recorded whether they are male or female individuals. Generally habit is common among males compared with females, and other reasons could be access to tobacco products, cultural constrains, etc.

Prevalence of OMLs between both sexes observed were PMDs such as OSF, leukoplakia, lichen planus, erythroplakia, and OSCC 26.9, 10.35, 5.5, 0.66, and 9.94%, respectively, in males. Other mucosal changes such as pan encrustation hyperkeratosis were also recorded. Bhatnagar *et al*. conducted a study in Modinagar, UP and recorded that OML includes leukoplakia (2.83%), lichen planus (0.8%), OSF (1.97%) and Sudhakar *et al.* in Eluru, AP, India, noted tobacco-induced lesions comprised smokers melanosis (3.49%), leukoplakia (2.04%), smokers palate (1.18%), OSF (0.7%), smokers keratosis (0.49%), tobacco pouch keratosis (0.16%), malignancy (0.16%), and chewers mucosa (0.13%).[17,20]

Roy and Varshney in Dehradun, North India reported that out of their 35 OPL patients, 4 (11.4%) had leukoplakia, 12 (34.2%) had oral lichen planus, 6 (17.1%) had OSMF, and 13 (37%) had discoid lupus erythematosus.[21] In another Indian study by Ranganathan *et al*., oral soft tissue lesions were found in 4.1% of the study subjects from Chennai, South India. The prevalence of leukoplakia, OSF, and oral lichen planus was 0.59, 0.55, and 0.15%, respectively.[22] Keluskar *et al*. recorded in Belgaum, Karnataka region the prevalence of lesion, highest being OSF 28.5%, leukoplakia 13.4%, and cancer 6.3%.[7] Sujatha *et al.* noted in Bangalore the prevalence of mucosal lesions as follows: leukoplakia 14%, OSF 8.2%, lichen planus 0.8%, and malignancy 0.8%.[23]

In a study by Holmstrup *et al*. (2006a), a total of 269 lesions in 236 patients were included; 39 lesions (41%) being homogenous and 46 (49%) nonhomogenous leukoplakia whereas nine (5%) were erythroplakia. 73% of the lesions were associated with tobacco habits. 71% of the lesions showed a degree of epithelial dysplasia. Nonhomogenous leukoplakia accounted for highest frequency of malignant development, i.e. 20%, whereas 3% of the homogenous leukoplakia developed carcinomas.[24] Prasad *et al.* noted the most prevalent lesions were lichen planus (2.02%), leukoplakia (1.73%), ulceration (0.73%), candidiasis (0.94%), and abscess (1.05%).[25]

We did not record the developmental anomalies as these are not associated with tobacco. Various authors have noted oral developmental lesions such as Fordyce's granules, fissured tongue, leukoedema, and hairy tongue.[18,23,26]

The relationship between the frequency and duration of the habit and OMLs was assessed. Frequency and duration of habit is known to influence the occurrence of OMLs, but in the present study frequency of habit with mucosal lesions did not show any statistical significant difference.

The premalignant and malignant lesions, i.e., leukoplakia and carcinoma had developed with the longer duration of habit, i.e., 21 years. OSF is a highly prevalent disease among premalignancy, associated with shorter duration of habit. In contrast, leukoplakia and carcinoma were seen in longer period of usage of smokeless tobacco and the habit of smoking tobacco. In addition, other mucosal changes such as pan encrustation and hyperkeratosis were seen more in number with increased duration habit. Sujatha *et al.* and Aruna *et al.* found a significant correlation between frequency and duration of habit on the development of OMLs. They also noted the patients with habit of 5–10 times/day had maximum number of lesions.[3,23] The changing patterns in the prevalence of habit and OMLs at the younger population are at risk of developing malignancy at the third and fourth decade of life. In the present study, OSF was the highly prevalent oral lesion. In a cohort study of 994 cases, 37 (3.72%) OSF transformed into malignancy with an average duration of 37.42 months.[26] Epidemiologic studies have shown that the rate of malignant transformation ranges from 3 to 19%.[27-29] Furthermore, more than 2400 new cases of OSCC arising from OSF have been diagnosed each year in Taiwan due to the prevalent use of betel quid.[30]

The National Cancer Control Programme[31] in India was formulated in 1984 with four major goals that include: (1) primary prevention of tobacco-related cancers, (2) early detection of cancers of easily accessible sites, (3) augmentation of treatment facilities, and (4) establishment of equitable, pain control, and palliative care network throughout the country.

Preventive measures should start at grass root levels aimed at individuals who are at high risk for tobacco usage along with intervention at a community level and policy interventions by the policymakers. Health professionals including dentists should also play an active role in prevention and control of tobacco-induced lesions by direct contact with patients who are at increased risk. In India, under the district cancer control program, the paramedical staffs of primary health center have been trained to conduct oral examination for early detection and for providing health education.[32]

Screening and early detection in populations at risk are mandatory to decrease morbidity and mortality of oral cancer. Visual oral examination is an effective screening method, with

varying sensitivity and specificity rates. Because the initial presentations of oral cancer and precancer are often subtle and rarely demonstrate the clinical characteristics compared to advanced cases,[33] additional screening aids are needed that can be employed along with oral visual examination to improve the sensitivity or specificity of oral screening beyond conventional oral examination alone.[34] These diagnostic tests include toluidine blue staining, brush cytology, tissue reflectance (Vizilite plus, Microlux DL), narrow emission tissue fluorescence which are light-based detection systems, and use of tumor markers for early diagnosis.

Conclusion

The study establishes the prevalence of OMLs in patients attending the institution. The study data can serve as a useful tool in educating the patients with deleterious habit of chewing form of tobacco. A regular and frequent examination of oral cavity is emphasized among the tobacco habituals. Further studies in the general population need to be performed, which would also help to prevent and plan the regional oral health programs, as the present data highlight the high usage of tobacco among community and its definite association with OMLs. OSF is an emerging disease among the youngsters, which needs immediate consideration.

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Conflicts of interest

There are no conflicts of interest.

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