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Prevalence of Oral Mucosal Lesions Among Smokeless Tobacco Users: A Cross-Sectional Study in Bikaner City

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ABSTRACT

Aim: To determine the frequency of oral mucosal lesions and to correlate the dose-response relationship among CT users of Bikaner province.

Materials and Methods: Nine hundred and one subjects, all CT users were surveyed in this cross-sectional study. A prestructured questionnaire which included information on type and amount of CT used, duration and frequency of use, and location of placement of tobacco in the oral cavity was used for assessment, which was followed by oral examination for the presence of lesions. Statistical Analysis Used: Chi-square and Fisher's exact tests were used to assess the statistical significance.

Results: Of the 901 subjects with CT habits, 55.8% revealed no clinically detectable oral mucosal changes and 44.1% showed mucosal changes of which 63.8% were males and 36.1% were females. The most common finding was chewers mucositis (59.5%) followed by submucous fibrosis (22.8%), leukoplakia (8%), lichenoid reaction (6.5%), oral cancer (2.7%), and lichen planus (0.5%).

Conclusion: This study provides information about different CT habits and associated mucosal lesions among this population.

Keywords: Oral mucosal lesions, smokeless tobacco, Prevalence.

INTRODUCTION

Chewing tobacco (CT) use is very common in India. Over 90% of the global smokeless tobacco use burden is in South-East Asia; [1] and about 100 million people in India and Pakistan use smokeless tobacco. [2] CT in traditional form is consumed as betel quid mixture of areca nut, slaked lime, and flavoring agent wrapped in betel leaf and tobacco commercial preparations (TCPs) such as gutka, zarda, khaini, mishri, etc., contain the pieces of areca nut coated with powdered tobacco, sweetening and flavoring ingredients in addition to other spices such as saffron, cardamom, etc. which are very popular and highly addictive. [3],[4],[5],[6] These TCP are very popular among adults and children as well. Though the government has taken a stand on banning this CT products sale, substitutes such as supari mix packets which contain a mixture of areca nut, lime, spices, and condiments are sold along with a free packet of CT, in the form of zarda or khaini. Since these products are not banned individually, the user mixes these two products and makes his own gutka. The CT (smokeless tobacco) used in India is mostly of the species Nicotiana rustica which contains higher concentrations of tobacco-specific nitrosamines and hence high carcinogenicity, while most smoking tobacco is Nicotiana tabacum. Sun/air-cured CT in unprocessed, processed, or manufactured form is

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Table 1: Gender based distribution based on type of tobacco used.

Gender	Betel quid (%)	Commercial tobacco product (%)
Males	103 (19.6)	451 (81.4)
Females	115 (33.1)	232 (66.8)

Table 2: Gender, type of tobacco and prevalence of oral mucosal Lesions.

Oral mucosal lesions	Total Number (%)	Males	Type of tobacco		Females (%)	Type of tobacco		*P* value
			BQ	CT		BQ	CT	
Chewers mucositis	237 (59.5)	133 (56.1)	36	97	104 (43.8)	59	45	<0.001**
Submucous fibrosis	91 (22.8)	70 (76.9)	23	47	21 (23)	2	19	<0.001**
Leukoplakia	32 (8)	22 (68.7)	18	4	10 (31.2)	6	4	<0.001**
Lichenoid reaction	25 (6.2)	22 (88)	15	7	3 (12)	2	1	0.036
Lichen planus	2 (0.5)	-	-	-	2 (100)	-	2	0.181
Oral cancer	11 (2.7)	7 (63.6)	2	5	4 (36.3)	2	2	≤0.05*

*Moderately significant (*P* value: ≤0.05) **Strongly significant (*P* value: *P*≤0.01). BQ=Betel Quid, CT=Chewing tobacco

Table 3: Dose response relationship between frequency of habit, type of tobacco and oral Lesions.

Oral mucosal lesions	1-4 times		5-10 times		11-15 times		>15 times	
	BQ	CT	BQ	CT	BQ	CT	BQ	CT
Chewers mucositis	14	18	36	55	40	55	5	14
Submucous fibrosis	5	10	14	41	4	9	1	6
Leukoplakia	1	1	4	5	4	1	13	1
Lichenoid reaction	10	3	4	5	3	-	-	-
Lichen planus	-	-	-	1	-	1	-	-
Oral cancer	-	-	1	1	1	3	2	3

BQ=Betel Quid, CT=Chewing tobacco

Table 4: Dose response relationship between duration of habit, type of tobacco and oral Lesions.

Oral mucosal lesions	6months-2years		2-5 years		5-10 years		10-15 years		>15 years	
	BQ	CT	BQ	CT	BQ	CT	BQ	CT	BQ	CT
Chewers mucositis	9	14	55	73	14	45	14	9	3	1
Submucous fibrosis	2	7	4	45	14	11	5	2	-	1
Leukoplakia	-	1	2	4	3	2	15	1	2	-
Lichenoid reaction	9	5	4	1	3	2	3	-	-	-
Lichen planus	-	-	-	1	-	1	-	-	-	-
Oral cancer	-	-	-	-	-	4	1	1	3	2

BQ=Betel Quid, CT=Chewing tobacco

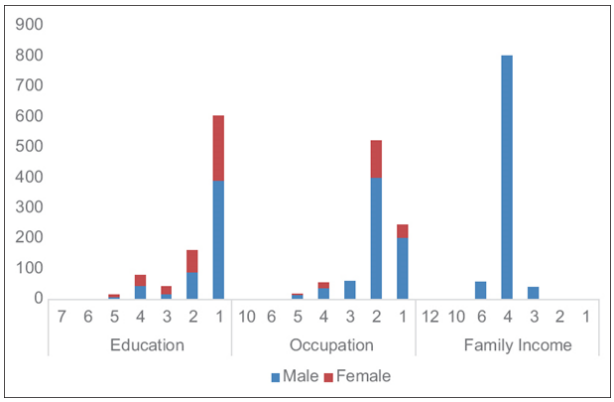

Fig 1: Distribution of study population based on education, occupation and family income (Socioeconomic Status).

the cheapest and is used in different parts of India. In Rajasthan, it is available as bundles of long strands of leaves (hogesoppu) or as powdered sticks (kaddipudi) which can be used with lime, areca nut, or in a betel quid (pan). [7] The preference of CT over smoking is related to the literacy and income of an individual and varying sociocultural norm. In India, where smoking by women is still considered a taboo, CT is the preferred choice.

Tobacco use causes an array of changes in the oral cavity, from mucosal pigmentation to thickening/ulceration of the epithelium. Oral cancer (OC) and other oral mucosal lesions such as chewers mucositis (CM), frictional keratosis, leukoplakia, and submucous fibrosis (SMF) are strongly associated with tobacco consumption. In comparison to Western populations, in which OC represents about 3% of malignancies, it accounts for over 30% of all cancers in India; this difference can be attributed to regional variation in the prevalence and pattern of tobacco habits, especially CT. [8],[9],[10],[11] The duration of tobacco exposure plays a vital role in mucosal irritation and possibility of malignant transformation in chronic users is increased by multiple folds. [12],[13] Though CT associated oral disorders are widespread in India, epidemiological data from various geographical areas is scarce. Hence the present study is undertaken to assess the prevalence of CT use, associated oral lesions and to correlate the dose-response relationship among this subset of the population.

MATERIALS AND METHODS

This population-based cross-sectional study was conducted among a randomized cluster sample of adults in low-income group (slums), [14] of Bikaner, Rajasthan state, India. Of the 3952 subjects examined, 2004 used tobacco in either smoking, chewing form, or both. Of them, 936 used smoking tobacco, 167 used both, and 901 CT. Subjects with the habit of betel quid with tobacco and/or TCP such as gutka, khaini, etc., formed the cohort of our study. Of 901 CT users, 554 were males and 347 females. An ethical clearance was obtained from the Institutional Review Board, and the study was carried out between January 2010 and January 2012. Inclusion criteria were individuals above 18 years using any type of CT for more than 6 months. Individuals using both concurrently smoking and CT were excluded from the study. All the subjects were informed regarding the nature of the study and informed consent was obtained. Following which they were interviewed for their CT habits and each subject (lesion) was examined by the two observers independently and diagnosis made. The patient's demographic details, information regarding the type of habit, duration, frequency, site of placement, period of contact with the mucosa, and history of discontinuation of habit were recorded using the standardized interviewer based questionnaire. All patients were then clinically examined using mouth mirrors and gauze under good illumination. The lesions location, color, size, and consistency were recorded. If a lesion was clinically suspicious for malignancy biopsy was performed. All the red and white lesions were referred for further definitive treatment at our hospital. All the lesions were diagnosed in accordance with international recommendations. Descriptive statistical analysis was carried out. Analysis of data was performed using IBM SPSS software version 20 (Armonk, NY: IBM Corp). Significance was assessed at 5% level of significance. Chi-square test was applied to find the significance of study parameters. $P \leq 0.05$ was considered significant.

RESULTS

Of the 901 subjects, 554 (61.4%) were males and 347 (38.5%) were females aged between 18 and 70 years. Of the 554 males using CT 29.6% (n = 103) used betal quid with tobacco, 81.4% (n = 451) used TCP, among females 33% (n = 115) used betal quid with tobacco, and 66.8% (n = 232) used

TCP [Table 1] and [Table 2]. Gutka was the most common commercially available CT product used by this population. Among the males 48.9% (n = 271) belonged to 21-30 years of age and among females 43.5% (n = 151) belonged to 41-50 years of age group. The mean age was 45.1 and 54.1 years for men and women, respectively.

Based on Kuppuswamy socioeconomic scale (URBAN) 2014, [15] based on the education, 603 subjects were illiterate (392 men and 211 females) and 162 were primary school certificate holder (90 men and 72 women), 42 were middle school certificate holders (19 men and 23 women), 80 were high school certificate holders (44 men and 36 women), and 14 were either graduates or diploma holders (9 men and 5 women). Based on occupation, 245 were unemployed (42 men, 203 women), 523 were unskilled worker (401 men and 122 women), 60 were semiskilled worker (all 60 men), 55 were skilled worker (37 men and 18 women), and 18 were either in clerical job or pity shop owners (14 men and 4 women). Based on the family income current price index, 41 subjects falls under price index range 5547-9248, 802 subjects falls under 9249-13,873, and 58 subjects fall under 13,874-18,497 [Figure 1].

The prevalence of Lesions: Each subject (lesion) was examined by the two observers independently and diagnosis made. There was an excellent inter-observer reliability 55.8% (503) revealed no clinically detectable oral changes and among 44.1% (398) mucosal changes were observed of which 63.8% (254) were males and 36.1% (144) were females. The difference was found to be statistically significant ($P < 0.001$). The odds of developing oral lesions in males with tobacco habits was nearly 1.19 times that of females, the most common was CM 59.5% (236) followed by SMF 22.8% (91), leukoplakia 8% (32), lichenoid reaction (LR) 6.5% (26), OC 2.7% (11), and lichen planus (LP) 0.5% (2) [Table 3]. A significantly high number of SMFs showed a trend of early occurrence and increased in number as the duration of habit increased [Table 3] and [Table 4].

DISCUSSION

One-third of women and two-third of men in India use tobacco in one form or another. [16] In prevalence studies of eight rural areas of India, CT use was found in 3-53% of men and 3-49% of women. [7] In a study from Mumbai, 69.3% of men used tobacco, 45.7% in smokeless form, similarly in Trivandrum, among the lower socioeconomic group, chewing betel quid with tobacco was practiced by 26.8% of men and 26.4% of women. [17] Betel quid or pan is a mixture of areca nut and slaked lime, to which tobacco can be added, all wrapped in a betel leaf. The specific components of this product vary between communities and individuals. [17] In our study, the prevalence of tobacco use was 50.7%, of which 55% and 44.9% used smoking and CT. It was found to be higher in males (61.4%) as compared to females (38.5%), $P < 0.05$ and it is in accordance with the other studies. [10],[18],[19],[20] In this study, we found that TCP was more popular among both genders which could be due to factors such as easy availability, easy to carry, low pricing, and colorful packaging. In India, chewing betel quid with tobacco is becoming less popular and is confined to the rural population and the elderly. [7] Among males 48.9% belonged to 21-30 years of age and among females 43.5% to 41-50 years of age. It was observed that females with tobacco habit increased in number as age progressed. The consumption of alcohol was 4.5% in our study which is slightly higher as compared to few studies [21],[22] and is in accordance with other studies. [23] Alcohol consumption in association with tobacco use is a significant risk factor for oral precancer and cancer. [24] In this study, population most of the subjects were laborers, daily wagers, maids, and drivers with more than 67% been illiterate. Of total subjects 89% belonged to lower class and upper-lower class. [15] Lack of awareness of the harmful effects of tobacco use and the substantial amount of physical energy with high level of concentration required for these unskilled occupations is reflected by the low level of education and initiation of deleterious oral habits at an early age. Apart from the regional preferences due to differing sociocultural norms, the preference for CT is inversely related to education and income. [7] In our study, oral mucosal changes were observed in 44.1%, much higher than most prevalence studies. Oral lesions were common among men 63.8% than women 36.1% ($P < 0.05$) similar to other studies. [22] Subjects with the habit frequency of 5-10 times/day for 2-5 years had maximum number of lesions due to prolonged exposure to carcinogens. The duration and frequency of habits have a significant effect on the

development of oral lesions, [10],[21] It was observed that the initiation and progression of oral lesions was dependent on the type of tobacco product, duration and frequency of tobacco use, which is in accordance with other studies. [10],[21] Other factors include pH of the product, surface area exposed, size of the tobacco cuttings, chemical coatings, contact time of tobacco kept, and handled in mouth establishing the dose-response relationship among CT users. Irritants, toxins, and carcinogens found naturally in CT causes intraoral pH changes, local alteration of membrane barriers and immune responses, altered resistance to fungal and viral infections making the oral mucosa vulnerable to changes. These changes could be categorized as tobacco-induced oral mucosal lesions which are less likely to develop cancer (CM and LR), lesions that are potentially malignant and tobacco-induced malignancies. Oral squamous cell carcinoma may occur either de novo or from the precursor lesions. In our study, the most common lesion was CM (59.5%) followed by SMF (22.8%), leukoplakia (8%), LR (6.5%), OC (2.7%), and LP (0.5%). CM was present at the site of quid placement with a prevalence of 59.5% in concordance with several studies. [25] SMF was observed as early as <2 years of duration with less frequent usage per day and was highly prevalent among TCP users ($P < 0.05$), which could be due the absence of betel leaf known for its anti-oxidant properties and proportionately higher dry weight of areca nut with concurrent tobacco use. Frequency of chewing rather than the total duration of the habit is directly related to OSF [26],[27] but in one study duration was significant. [28] The prevalence studies have shown SMF in 0.55% of study group, [9] 8% [29] 2.01%, [30] 0.7%, [31] and 9.7%. [32] LR and SMF showed a trend of early occurrence and were not associated with duration of habit. [22] Homogenous type leukoplakia was common in betal quid chewers, with a prevalence of 8% and the common site was buccal mucosa and lateral border of tongue. Both SMF and leukoplakia were observed in a subject using TCP. In India, leukoplakia prevalence varies from 0.2% to 5.2% and malignant transformation between 0.13% and 10%. [33]

Of the 11 cases of oral malignancy reported 63.6% were TCP users and 36.3% were betal quid chewers. Early occurrence of malignancy was reported among TCP as early as 5-10 years of duration. Maximum oral lesions were found among subjects with habit duration of 5-10 years and a frequency of 5-10 times. Statistically significant dose-response relationship was observed for duration and frequency of CT use in our study similar to other. [10],[21] In six Indian studies, the relative risks of OC in men among chewers of pan with tobacco as compared to nonchewers varied from 1.8 (95% confidence interval [95% CI]: 1.2-2.7) to 5.8 (95% CI: 3.6-9.5). Other studies reported 0.93%, [30]0.16%, [29] and 1.76% of OC in the study sample. [30] LR grossly resembles LP and generally occurs at the site of quid placement. In our study, 26 (6.5%) of the subjects had LR. Of the 26 subjects, five of them had amalgam restorations with respect to upper posterior teeth. There were no other restorations in the oral cavity, and there was no drug history. In a study on oral mucosal lesions, 89% of the LR occurred among betel quid chewers and 11% among those who chewed pan and smoked tobacco. [31] In our study, reticular type LP in buccal mucosa (bilateral) was found in 0.5% females. Several studies showed LP prevalence of 0.15%, [10] 1.20%, [30] 2.7%, [30] and 0.46%. [32]

Limitations of this study are information bias as self-reporting by the individual might have led to underreporting of tobacco use and detection bias as the researcher was aware of the habit history of the individual prior to the oral examination. To conclude, results of this study show CT to be a significant predictor of potentially malignant oral disorders in this population. The complex association of poverty, low education levels, low prioritization of the disease, and sociocultural practices are responsible for increased incidence of oral lesions among this population of tobacco chewers. Furthermore, the dose-response relationship with oral lesions was observed which can be a great tool in educating patients regarding the adverse effects of tobacco habits. Though the sale of commercial CT products is banned, people still continue to use them, hence creating awareness about its ill-effects is essential, to eliminate the use of these preparations.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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