RESEARCH PAPER

Evaluating Betel Quid Dependence and the Prevalence of Oral Lesions Associated with Smokeless Tobacco Use - A Cross Sectional Study

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ABSTRACT

INTRODUCTION: Betel quid and smokeless tobacco use are deeply ingrained cultural practices in many parts of South and Southeast Asia, the Pacific Islands, and communities worldwide. While these substances are often consumed for their psychoactive effects, social significance, and perceived health benefits, their use poses significant health risks. Betel quid, a mixture typically consisting of areca nut, betel leaf, slaked lime, and sometimes tobacco, is known to have psychoactive properties, primarily due to the presence of arecoline and nicotine, which can lead to dependence.

AIM: The present study was undertaken to assess the tobacco dependence among individuals with the habit of tobacco chewing and evaluate the associated oral lesions.

MATERIALS AND METHOD:

STUDY DESIGN: A cross-sectional observational design

PARTICIPANTS: A total of 250 smokeless tobacco users aged above 18 years presenting to Saveetha Dental College were recruited for the present study.

INCLUSION CRITERIA: Subjects who had habit of consuming various forms of smokeless tobacco. Willingness to participate and provide informed consent.

EXCLUSION CRITERIA: Subjects with systematic illnesses, psychological illness and subjects who had adverse habits other than smokeless tobacco and those who had the habit of using more than one product of smokeless tobacco were excluded from the study. Presence of severe psychiatric disorders or cognitive impairments.

CONCLUSION: It is concluded that high tobacco dependence among smokeless tobacco users. Tobacco dependence is directly related with oral potentially malignant disorders. Leukoplakia is associated with high dependence, keratosis is associated with medium dependence, and OSMF was associated with very high dependence.

Keywords: Smokeless tobacco, hans chewers, panmasala, gutka, fagerstrom nicotine dependence.

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INTRODUCTION:

Betel quid, a culturally significant preparation in many parts of Asia and the Pacific, is a traditional substance that combines natural and chemical components to produce stimulating effects(1). The basic ingredients of betel quid include areca nut, betel leaf, and slaked lime (calcium hydroxide), However, the composition varies widely by region and personal preferences, with additions such as tobacco, spices, flavoring agents, and even sweeteners. This variability contributes to diverse health outcomes and patterns of use across populations(2). Betel quid has historical roots that date back thousands of years.(3) It is deeply intertwined with social customs, religious rituals, and traditional medicine. In many communities, chewing betel quid is

seen as a gesture of hospitality, a social activity, or a way to mark significant life events. Its perceived health benefits, such as aiding digestion and freshening breath, further reinforce its popularity(4). The primary psychoactive component of betel quid is arecoline, found in areca nut, which acts as a stimulant(5). When combined with tobacco, nicotine further enhances its addictive potential. Regular use leads to physical and psychological dependence, often comparable to nicotine addiction seen in cigarette smokers(6).

The use of betel quid is most prevalent in South and Southeast Asia, including countries like India, Bangladesh, Myanmar, and Sri Lanka. It is also commonly used in the Pacific Islands, parts of East Africa, and immigrant communities in Western countries. The World Health Organization (WHO) estimates that over 600 million people use betel quid globally, making it one of the most widely consumed psychoactive. While culturally embedded, betel quid use is associated with numerous health risks. Regular chewing can cause chronic irritation of the oral mucosa, leading to conditions like oral submucous fibrosis (OSMF)-a precancerous condition characterized by progressive stiffening of the oral tissues. Other conditions include leukoplakia, erythroplakia, and oral cancers. In regions where tobacco is included in the quid, the carcinogenic risks are even higher. Given its global prevalence and health implications, understanding the patterns of use, dependence, and associated oral lesions is crucial for public health initiatives aimed at reducing the burden of oral diseases(7).

The habitual use of betel quid and smokeless tobacco has been strongly associated with the development of oral lesions, including precancerous conditions such as oral submucous fibrosis (OSMF), leukoplakia, erythroplakia, and ultimately oral cancers. These lesions are often exacerbated by the chronic irritation and chemical effects of areca nut and tobacco(8). Despite the known risks, these practices remain widespread, particularly in low- and middle-income countries, where public health interventions and awareness campaigns are often limited(9). This study aims to evaluate the extent of betel quid dependence and assess the prevalence of oral lesions associated with smokeless tobacco use. Understanding these associations is critical for developing effective prevention, screening, and cessation programs to mitigate the health impacts of these practices.

MATERIALS AND METHOD:

STUDY DESIGN: A cross-sectional observational design

PARTICIPANTS: A total of 250 smokeless tobacco users aged above 18 years presenting to Saveetha Dental College were recruited for the present study.

INCLUSION CRITERIA:
Subjects who had habit of consuming various forms of smokeless tobacco
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DATA COLLECTION:
Fagerstrom dependence score test
Oral clinical findings: Various tobacco related oral lesions such as leukoplakia,Oral sub mucosa Fibrosis, Keratosis were clinically diagnosed.

STATISTICAL ANALYSIS:
Statistical analysis were performed using SPSS version 26.0

RESULTS:

From Table 1: The study population comprised 250 participants, with a male predominance (84.8%, N = 212), and females constituting only 15.2% (N= 38). This reflects the higher prevalence of smokeless tobacco use among males in the studied population.The overall mean age of participants was 42.47 ± 13.62 years. Males had a mean age of 41.06 ± 13.64 years,while females were older on average (50.37 ± 10.63 years). In age grop 18-30 years: Comprised 25.6% (N = 64) of the total participants, with males forming the majority (29.2%, N= 62) and only 5.3%females (N =2).In age group 31-45 years: Made up 27.6% (N =69), with males (28.8%, N= 61) again dominating, and femalesconstituting 21.1% (N = 8).In age group46-60 years: Represented the largest age group, 36.8% (N = 92), with males at 33.5% (N = 71) and a significant proportion of females at 55.3% (N = 21).In age group >60 years: Accounted for 10% (N= 25) of the total, with males at 3.5% (N =18) and females forming 18.4% (N=7). This suggests a higherprevalence of older femalesin the sample.Dependancy Scores were Categorized into

four levels: Very Low Dependence: Observed in 5.2% (N = 13), with equal representation from males (5.2%, N= 11) and females (5.3%, N = 2).Medium Dependence: Constituted 28.4% (N= 71), with a higher proportion of females (42.1%, N=16) compared to males (25.9%, N=55).High
Dependence: Represented 35.2% (N =88), predominantly males (37.7%, N= 80) compared to females (21.1%, N= 8).Very High Dependence: Comprised 31.2% (N = 78), with an almost equal distribution between males (31.1%, N= 66) and females(31.6%, N= 17).Clinical findings include The majority of participants (72.8%, N = 182) presented with no visible oral lesions, with similar proportions in males (71.2%, N = 151) and females (81.6%, N = 31).Keratosis: Was observed in 14% (N=35), with a higher prevalence among males (15.6%, N = 33) than females (5.3%, N= 2). Leukoplakia: Found in 9.2% (N = 23) of participants, with females (13.2%, N= 5) showing slightly higher prevalence than males (8.5%, N = 18).Oral Submucous Fibrosis (OSMF):Detected in 4% (N = 10) of the participants, exclusively among males (4.7%, N = 10), with no cases amongfemales.

From Table 2: Dependancy scores by sex Males (N = 212) had a meandependence score of 6.60 ± 2.35 while females (N = 38) had a slightly higher score of 6.66 ± 1.77.The difference in dependence scores between males and females was statistically significant (P = 0.039) using the independent T-test. This indicates that sex plays a role in the level of dependence on smokeless tobacco,The difference in dependence scores between males and females was statistically significant (P = 0.039) using the independent T-test. This indicates that sex plays a role in the level of dependence on smokelesstobacco.Participants were divided into four age groups, with the following mean dependence scores:18-30 years: 5.92 ± 2.55, 31-45 years: 6.84 ± 2.39, 46-60 years: 6.93 ± 2.02, >60 years: 5.56 ± 1.66.A statistically significant difference was observed among the age groups (P= 0.036) using one-way ANOV A. The 46-60 years group exhibited the highest dependence scores, followed closely by the 31-45 years group.The lowest dependence scores were seen in the 18-30 years group and participants aged >60 years.This trend suggests that dependence increases with age but may decline slightly in older individuals (>60 years), potentially due to health awareness or reduced tobacco consumption.Dependence scores varied among participants with different clinical oralconditions:Dependence scores varied among participants with different clinical oral conditions: No Lesion (N = 182): Mean score6.63 ±2.31 Keratosis (N= 35): Mean score 6.28 ± 2.28Leukoplakia (N = 23): Mean score 7.30 ±1.77OSMF (N = 10): Mean score 5.90 ±2.23 Although participants with leukoplakia had the highest mean dependence score (7.30 ± 1.77), followed by those with no lesions (6.63 ±2.31), the differences in dependence scores among clinical findings were not statistically significant (P = 0.277) based on one-way ANOV A.

From Table 3: The Pearson correlation test was employed to evaluate the relationships between sex, age group, dependence scores, and clinical findings among the participants with a significance threshold of P< 0.05.Sex vs. Age Group: A positive and statistically significant correlation was observed (r= 0.263, P ≤ 0.05).This indicates that sex has minimal influence on the presence of oral lesions.Age Group vs. Dependence Score: A weak positive and statistically significant correlation was found (r= 0.131, P ≤ 0.05). This suggests that dependence scores tend increase with age, particularly in the middle age groups.Age Group vs. Clinical Findings: A weak negative correlation (r= -0.073) was observed, which was not statistically significant.This implicates that older age does not strongly predict the likelihood of developing oral lesions. Sex vs. Dependence Score: A very weak and negative correlation was observed (r= -0.014), which was not statistically significant. This suggests that sex does not strongly influence dependence scores.Sex vs. Clinical Findings: A weak positive correlation (r= 0.085) was observed, but it was not statistically significant. This indicates that sex has minimal influence on the presence of oral lesions.The results highlight that while demographic factors like age and sex show some level of correlation with tobacco dependence, clinical findings (oral lesions) are not strongly influenced by these factors or dependence scores. This may suggest that the development of oral lesions is influenced by additional factors beyond dependence level, such as duration and type of smokeless tobacco use.

Category		Males N (%)	Females N (%)	Total
Sex		212 (84.8)	38 (15.2)	250 (100)
Mean Age		41.06 ± 13.64	50.37 ± 10.63	42.47 ± 13.62
Age Group	18-30 years	62 (29.2)	2 (5.3)	64 (25.6)
	31-45 years	61 (28.8)	8 (21.1)	69 (27.6)
	46-60 years	71 (33.5)	21 (55.3)	92 (36.8)
	>60 years	18 (3.5)	7 (18.4)	25 (10)
Dependence score Fagestrom)	Very low	11 (5.2)	2 (5.3)	13 (5.2)
	Medium	55 (25.9)	16 (42.1)	71 (28.4)
	High	80 (37.7)	8 (21.1)	88 (35.2)
	Very high	66 (31.1)	12 (31.6)	78 (31.2)
Clinical Finding	No Lesion	151 (71.2)	31 (81.6)	182 (72.8)
	Keratosis	33 (15.6)	2 (5.3)	35 (14)
	Leukoplakia	18 (8.5)	5 (13.2)	23 (9.2)
	OSMF	10 (4.7)	0 (0)	10 (4)

Table1: Frequency distribution of participants included in the study. N represents the number of participants and % in the parentheses represents the percentage. Values with ±are expressed as mean ±standard deviation.

Category		N	Dependence Score	P-Value
Sex	Male	212	6.60 ± 2.35	0.039*[a]
	Female	38	6.66 ± 1.77	
Age Group	18-30 years	64	5.92 ± 2.55	0.036*[b]
	31-45 years	69	6.84 ± 2.39	
	46-60 years	92	6.93 ± 2.02	
	>60 years	25	6.56 ± 1.66	
Clinical Finding	No Lesion	182	6.63 ± 2.31	0.277[b]
	Keratosis	35	6.28 ± 2.28	
	Leukoplakia	23	7.30 ± 1.77	
	OSMF	10	5.90 ± 2.23	

Table 2: Comparison of dependence score based on the Fagestrom scale according to the sex, age group, and clinical findings of the participants. N represents the number of individuals. Statistical tests applied a represents independent T test; b represents One-way ANOV A; * indicates statistical significance. P ≤ 0.05 is considered statistically significant.

	Sex	Age Group	Dependence score	Clinical Finding
Sex	-	.263*	-.014	.085
Age Group	.263*	-	.131*	-.073
Dependence score	-.014	.131*	-	.122
Clinical Finding	.085	-.073	.122	-

Table 3: Correlation between the sex, age group, dependence score, and clinical findings of the participants. Statistical test used: Pearson's Correlation test. * indicates statistical significance. P < 0.05 is considered statistically significant.

DISCUSSION:

Oral lesions are among the most severe health consequences of betel quid and smokeless tobacco use. Studies consistently demonstrate a strong dose-response relationship between betel quid consumption and the development of precancerous and cancerous oral conditions(10).In a study done by Maheshwari et al. (2018) report that OSMF affects 2-8% of habitual users, with higher rates observed in younger individuals starting betel quid use early. In rural India, OSMF,prevalencecan reach 13%, reflecting widespread use in economically disadvantaged areas(11).

Betel quid dependence stems primarily from arecoline, an alkaloid in areca nut, which stimulates the dopaminergic pathways in the brain, producing mild euphoria and increased alertness. This effect mirrors nicotine's addictive mechanism, as confirmed by studies like Chang et al. (2017).The addition of tobacco enhances this addictive potential, introducing nicotine, which synergistically increases dependence. Longitudinal studies, such as those by Zain et al. (2019),observed thatindividuals consuming tobacco-laced betel quid experience withdrawal symptoms, including irritability and cravings, similar to those seen in cigarette smokers(12). Social acceptance, peer

pressure, stress relief, and the perceived benefits of betel quid-such as improved digestion and fresh breath-often drive initiation, as detailed by Williams et al. (2021). Women in particular are more likely to use betel quid without tobacco, driven by cultural norms that discourage smoking but tolerate chewing. Leukoplakia and Erythroplakia are the most common precancerous lesions associated with betel
quid and smokeless tobacco. In a study done by Joshi et al. (2017) report a prevalence rate of 7-10% in chronic users, especially those using tobacco-containing quids. Leukoplakia appears as white patches in the oral mucosa, often at sites of quid retention. Erythroplakia is Less common but more concerning due to its higher malignant transformation potential (30-50%) according to Kumar et al. (2021)). This lesion appears as red patches and often coexists withleukoplakia(13).

This study faces limitations, including potential recall bias and underreporting of betel quid use, particularly among women and younger users, due to social stigma. The heterogeneity in betel quid composition across regions complicates standardized assessments, while the findings may lack generalizability due to the regional focus of many studies. Furthermore, the reliance on cross-sectional designs limits the ability to establish causal relationships between betel quid use, dependence, and the development of oral lesions or cancers. To address these gaps, future research should focus on longitudinal studies to explore causal links, global comparisons to enhance generalizability, and molecular investigations into genetic susceptibility. Additionally,
intervention trials and policy impact studies are needed to evaluate the effectiveness ofpublic health campaigns and regulations in reducing betel quid use and its associated health risks.

CONCLUSION:

It is concluded that high tobacco dependence among smokeless tobacco users.Tobacco
dependence is directly related with oral potentially malignant disorders. Leukoplakia is associated with high dependence, keratosis is associated with medium dependence, and OSMF was associated with very high dependence. Active Tobacco cessation and health education programmes targeting the high-risk population including both tobacco and areca nut chewers is recommended to assist the affected individuals in
quitting the habit to lead a healthy life.

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