

Prevalence of tobacco and areca-nut use among patients attending dental teaching hospital in the central province of Sri Lanka and its association with oral mucosal lesions; a cross sectional study

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ABSTRACT

Introduction: Tobacco and areca-nut are risk factors for oral cancer and potentially malignant disorders. Oral cancer is ranked as the commonest among males in Sri Lanka (18.4 %). This research aims to determine the prevalence of tobacco and areca-nut use and its association with oral lesions.

Method: It is a cross-sectional study using 368 patients attending the Dental Diagnostic Clinic. Details of tobacco and areca-nut use were collected and participants were examined for mucosal lesions.

Results: It revealed that 23.9 % had tobacco use. Out of these, 41.1 %, 22.2 % and 36.7 % had smokeless-tobacco use, smoking and both, respectively. Similarly, 25.3 % had areca-nut/betel-quid use and majority (72.8 %) added tobacco to it. Tobacco (93.2 %) and areca-nut (79.6 %) use was higher among males ($p < 0.05$). Significant associations of areca-nut use with age ($p = 0.001$) and education level ($p = 0.025$) were noted. Oral lesions like de-pigmentation, white patches, ulcers, growths and oral sub-mucous fibrosis (OSF) had prevalences of 2.4 % each. Prevalence of pigmentation, lobulated tongue and erosive lesions was 10.6 %, 4.6 % and 1.4 %, respectively. 32.6 % had abnormalities like linea-alba, periodontal problems, pericoronitis and hairy tongue. The study revealed that >90 % of those who used tobacco and areca-nut had oral lesions ($p < 0.05$).

Conclusion: The prevalence of tobacco and areca-nut use is high among patients attending the Dental Teaching Hospital, and its association with mucosal lesions is significant. Hence regular awareness programs on the adverse effects of tobacco and areca-nut use should be carried out at the Diagnostic clinic as a preventive measure.

1. Introduction

Many different tobacco and areca-nut products are available in the market. The use of the traditional betel-quid is an ancient practice. A consensus workshop held in 1996¹ recommended that the term “quid” should be defined as, “a substance or mixture of substances, placed in the mouth, usually containing at least one of the two basic ingredients, smokeless-tobacco (SLT) or areca-nut (AN), in raw or any manufactured or processed form.” Hence many other various commercial products which include either tobacco and/or areca-nut can also be considered under this definition. A few such products include Gutka, Thul, Snuf, Snus, Pan-masala, Mawa, Red tooth powder, Khaini and Zarda.² In addition to the smokeless tobacco products listed above, the practice of

tobacco smoking is also highly prevalent. It includes the use of cigarettes, cigars, cigarillos, roll-your-own tobacco, pipe tobacco, bidis and kreteks.³ All these forms of tobacco are harmful and injurious. There is no safe level of exposure to tobacco. Over 80 % of the 1.3 billion tobacco users worldwide live in low and middle income countries.³ The use of smokeless tobacco and areca-nut, combined or individually, as betel quid chewing is commonly seen in many parts of Asia, the Western Pacific region⁴ and among migrant communities in South and East Africa, Australia, Europe and North America.⁵

The tobacco epidemic is one of the biggest public health crises the world has ever faced. Tobacco use is one of the greatest causes of preventable death. It kills more than 8 million people a year globally.³ Findings of the demographic and health surveys of six countries from the

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Southeast Asia region revealed that the highest prevalence of tobacco use among men was in Indonesia (76.4 %). The highest prevalence among women was in Nepal (15.7 %).⁶ According to the 2015 STEPS (WHO STEPwise approach for non-communicable disease risk factor surveillance) survey, more than one-fourth of the males (26.0 %) and nearly 5 % of the females are reported to be currently using smokeless tobacco in Sri Lanka. It is more prevalent among older age groups. Nearly 12 % of the current users are daily users.⁷ Non-communicable diseases have become the leading cause of morbidity and mortality. Cardiovascular and respiratory diseases due to tobacco smoking are abundant in the society.⁸ Smokeless tobacco use is highly addictive and impairs health and well-being. Smokeless tobacco contains many carcinogenic chemicals. Hence, it increases the risk of cancers of the head, neck, throat, oesophagus and oral cavity (including cancers of the mouth, tongue, lip and gingivae) as well as various other oral diseases.³ Patterns of mucosal lesions associated with tobacco smoking are different from smokeless tobacco. These vary according to the type; from traditional products to commercially prepared products. The risk of getting oral cancer due to tobacco among tobacco smokers was estimated as 34 % (45 % among males and 21 % among females) in Beijing.⁹ Tobacco smoking accounts for half of the periodontal diseases and three-fourths of oral cancers in the United States.¹⁰

Similarly, areca-nut for chewing is obtained exclusively from *Areca catechu*. It is believed to be native to Sri Lanka, West Malaysia and Melanesia.¹¹ It is chewed by approximately 600 million people globally, most of whom live in low to middle-income countries in the Asia-Pacific region.⁴ A recent nationally representative study from India revealed that about 23.9 % (95 % CI 23.1 to 24.8) of the adult population consumes areca-nut (approximately 223.79 million). The majority of the users (14.2%–95 % CI 13.5 to 14.9) consumed areca-nut with tobacco.¹² Another cross-sectional study in the United States among migrant communities revealed that 17 % of the participants had areca-nut use. A majority of them were associated with being of Indian origin.¹³ The concept about the role of areca-nut in the aetiology of oral cancer emerged from Taiwan, in which 10 % of the population is pure areca-nut chewers and 80 % of the preparations do not contain tobacco.⁴ In 2004, the International Agency for Research on Cancer confirmed areca-nut as a group I human carcinogen.¹⁴ A meta-analysis assessing the relationship between oral/oropharyngeal cancer, and betel quid chewing with areca-nut (without tobacco), revealed that the meta-relative risk for oral/oropharyngeal cancer was 2.56 (95%CI, 2.00–3.28) and 10.98 (95%CI, 4.86–24.84) in the Indian subcontinent and Taiwan, respectively.¹⁵ Another devastating oral health effect of areca-nut use is Oral Submucous Fibrosis (OSF), which is a debilitating and potentially malignant condition.^{16,17} Hence, the use of both tobacco (as smoking or chewing) and areca-nut (mainly as betel quid chewing) causes several oral mucosal lesions and conditions.

Oral mucosal diseases can be divided into malignant, non-malignant or potentially malignant lesions. The majority of malignant lesions due to tobacco or areca-nut use are oral squamous cell carcinomas. Most often these are preceded by Oral Potentially Malignant Disorders (OPMDs) like Oral Leukoplakia (OL), Erythroplakia and OSF. OL is defined as, “a white plaque of questionable risk, having excluded other known diseases or disorders that carry no increased risk for cancer¹⁸”. It is a clinical term with two main subtypes, namely homogenous and non-homogenous leukoplakia (erythroleukoplakia). Erythroplakia is a similar red patch with a histopathological diagnosis of dysplasia. OSF on the other hand is a chronic disease, characterized by generalized sub-mucosal fibrosis, which exclusively affects the oral, oro-pharyngeal and oeso-pharyngeal mucosa of individuals.¹⁹ Non-malignant lesions include physiological conditions or pathological lesions such as linea alba buccalis, erythema migrans, pericoronitis, hairy tongue, lobulated tongue and periodontal conditions. All these lesions may arise due to various aetiological factors out of which tobacco and areca-nut play a key role.

The current study aimed to determine the prevalence of tobacco and

areca-nut use among patients attending a specialized Dental Teaching Hospital in the Central Province. It is a tertiary center for dental and oral-maxillo-facial management. A fairly large number of patients from all over the country attend for dental treatment and management of oral mucosal lesions. Additionally, the study aimed to identify the association of oral mucosal lesions with these habits.

2. Materials and methods

The ethical clearance to conduct the study was obtained from the Faculty of Dental Sciences, University of Peradeniya (ERC no: ERC/FDS/UOP/I/2020/O3). The approval to carry out the study was obtained from the Dean, Faculty of Dental Sciences and Deputy Director of University Dental Hospital.

The primary objectives of the study were to evaluate the prevalence of tobacco and/or areca-nut use and to determine the association of the habit of tobacco and/or areca-nut use with the presence of oral mucosal lesions. Secondary objectives of this research included the determination of the prevalence and types of oral mucosal lesions present among the patients and the evaluation of the association of the habit of tobacco and/or areca-nut use with socio-demographic factors such as age, gender, ethnicity and education level.

An observational cross-sectional study was conducted among patients attending the Diagnostic Clinic of the Dental Teaching Hospital from January to September in the year 2020. The sample was selected from patients aged between 15 and 75 years, attending for routine treatment. Both male and female patients who were willing to participate were included in the study. However, patients with extreme trismus were excluded from the study, as it hindered a thorough oral examination of the patients. A sample size calculation was done²⁰ by considering the prevalence of smoking as 22 % and smokeless tobacco use as 28 % in the Sri Lankan population.²¹ Accordingly, a sample of 350 participants was calculated to be adequate. The patients were selected using systematic sampling. The 5th consecutive patient attending the diagnostic clinic was chosen using their registration numbers. Informed written consent was obtained from those selected.

An interviewer-administered questionnaire was provided to obtain details regarding socio-demographics such as age, gender, ethnicity, district of residence and education level. Relevant habit details on tobacco and areca-nut use were assessed using the format of the smokeless tobacco survey from the Global Tobacco Surveillance System.²² The type of product, ingredients, quantity, frequency, duration of use and whether the product was retained overnight in the oral cavity were assessed in patients who had the habit during the time of questioning or as a past habit. The questionnaire was pre-tested among 20 patients who attended the Oral Medicine Clinic with the habit of betel chewing or any other form of tobacco and/or areca nut product use, and necessary modifications were made before data collection. A thorough oral examination was carried out in each patient to check for any oral mucosal lesions and stains of tobacco and/or areca nut use. Strict infection control protocols were followed. Adequate lighting for visibility and suitable instruments for accessibility were provided for examination.

The presence of all types of mucosal lesions were recorded including anatomical variations (eg-lingual varicosities, fissuring, pigmentations), OPMDs and other types of mucosal conditions. The diagnostic criteria for oral mucosal lesions, such as leukoplakia, erythroplakia, lichen planus, OSF, smoker's palate, candidosis and oral cancer were in accordance with the WHO diagnostic criteria 2017 classification.²³ A modified WHO reference sheet was used for data recording. A concise description of the main clinical features of each condition was provided to the examiners based on the ICD-DA International Classification of Diseases to Dentistry and Stomatology. Standardized topography of the oral cavity with associated definitions of the boundaries and structures was used for examination and recording. Newly identified cases of any mucosal lesion were managed according to the standard treatment protocols²⁴ at the Oral Medicine Clinic. Whenever necessary, referrals

were made to nearby hospitals for follow-up.

Additionally, tobacco and areca-nut cessation advice was provided to each patient identified with these habits using the standard 5As (Ask, Advice, Assess, Assist, Arrange) and 5Rs (Relevance, Rewards, Risks, Roadblocks, Repeat) method.^{25,26}

The statistical analyses were carried out using the Statistical Package of Social Sciences (SPSS) version 21 software. The socio-demographics, habits of tobacco and areca-nut use and the presence of oral mucosal lesions were analyzed using descriptive statistics. The associations of socio-demographics and oral mucosal lesions with tobacco and areca-nut use were analyzed using the Pearson Chi-square analysis and Fisher’s Exact test. A p-value ≤0.05 was considered statistically significant. Additionally, the ODDS ratio of any significant association was also calculated to further highlight the findings.

3. Results

The sample consisted of a total of 368 patients. 44.3 % were males and 55.7 % were females. However, the majority of the participants (89.4 %) were Sinhalese with a few Tamils (3.8 %) and Muslims (6.8 %). The age-wise distribution of the participants was as follows; 15–30 years (30.7 %), 31–60 years (51.6 %) and 61–75 years (17.7 %). When considering the education level of the participants, 9.8 % had no education while another 41.6 % had not completed their secondary education. However, 33.2 % had completed secondary education and 15.5 % up to a tertiary degree/diploma.

The analyzed results revealed that 23.9 % of the sample had tobacco use. There were 37 with betel quid chewing (including tobacco), 20 tobacco smokers and another 33 with both smoking and smokeless tobacco use. Table 1 shows the details regarding their tobacco use. When age, gender, ethnicity and education levels were evaluated among tobacco users, a significant association was found between males and tobacco use (Table 2).

Areca-nut use was also analyzed and it revealed that 25.3 % of the participants had the habit mainly as betel quid chewing. Out of them, the majority (72 %) of the betel quid chewers added tobacco while 26.9 % chewed without tobacco. The patterns, frequency and duration of areca use are depicted in Table 1. Similar to tobacco use, there was a significant association between gender, age and education level for areca-nut users with a majority being males, between 31 and 60 years of

Table 1
Duration, frequency, time kept in mouth and the last use for various habits with tobacco and areca nut use.

		Tobacco smoking	Betel quid with areca and tobacco	Betel quid with Areca only
Total		53	67	25
Duration of use	Less than 1 yr	4	8	7
	1–5 years	15	20	7
	More than 5 yrs	34	39	11
Frequency	Occasional	7	11	13
	1-5 per quids week	9	9	4
	1 quid per day	4	6	6
	Upto 5 quids per day	25	25	2
	More than 5 per day	8	16	0
Time kept in mouth	30 min or less	NA	63	24
	more than 30 min	NA	4	1
Last use	Current user	31	43	13
	Within 3 months	8	9	6
	More than 3 months	14	15	6

Table 2
Association of Socio-demographics with tobacco and areca nut use.

Socio-demographics		Tobacco use (n = 88)	p value	Areca use (n = 93)	p value
Gender	Male	82	<0.005	74	<0.005
	Female	6		19	
Ethnicity	Sinhalese	79	0.45	86	0.066
	Tamil	4		5	
	Muslim	5		2	
Age	15–30 years	19	0.053	15	0.001
	31–60 years	48		54	
	61–75 years	21		24	
Education level	Uneducated	4	0.062	10	0.025
	Upto Ordinary level or below	46		50	
	Completed upto Advanced level	27		24	
	Tertiary education	11		9	

age and an education level up to Ordinary levels or below (Table 2).

Finally, the prevalence of oral mucosal lesions was analyzed and Fig. 1 shows the distribution of various types of lesions. It is found that 73.9 % of the sample had some form of mucosal lesions out of which a majority (32.6 %) of the lesions are non-malignant or physiological conditions such as linea alba buccalis, hairy tongue, periodontal problems or pericoronitis (represented by the yellow bar in Fig. 1). However, there were patients with white patches, red lesions, ulcers and other suspicious conditions as shown in Fig. 2. It requires further investigations to accurately diagnose those conditions as OPMDs or oral cancer.

Table 3 illustrates the prevalence of such conditions and the significant association of tobacco and areca-nut use with these various oral mucosal lesions as listed above.

4. Discussion

This study provides an overview of the prevalence of tobacco and areca-nut use and its association with oral mucosal lesions among a selected group in Sri Lanka; patients attending the Dental Hospital, in the Central Province of Sri Lanka. It is a tertiary center for management of oral mucosal lesions. Hence, this study is useful in determining the association of tobacco and areca-nut use with various mucosal lesions in the oral cavity. These include non-malignant, potentially malignant or malignant lesions and conditions.

The sample statistics with a male-to-female ratio of 4:5 and a majority of Sinhalese is more or less similar to the Sri Lankan population, according to the population statistics of the Registrar General’s Department, 2019.²⁷ When considering the age distribution, a majority were from the 31–60 year working age group and hence, the prevalence of tobacco and areca-nut habits are more weighted for this age group. However, the sample comprised patients from varying educational levels. A majority had at least completed primary or secondary education and only about 10 % were uneducated/illiterate. This finding is useful when planning and implementing various modes of awareness regarding the adverse effects of tobacco and areca-nut use, as well as when advising on cessation of such habits.

As the sample revealed that around 25 % of the patients had either tobacco, areca-nut or combined use of both substances, mainly due to the lack of awareness on the adverse effects of such substances, it is important to conduct awareness programs. This will minimize the incidence of OPMDs or oral cancer due to these habits. A study conducted in the same clinical setting reveals that less than 50 % of the participants were aware of oral cancer and OPMDs.²⁸ As deduced earlier, since a majority of the patients attending the diagnostic clinic are literate, the use of leaflets, booklets, posters and banners as well as

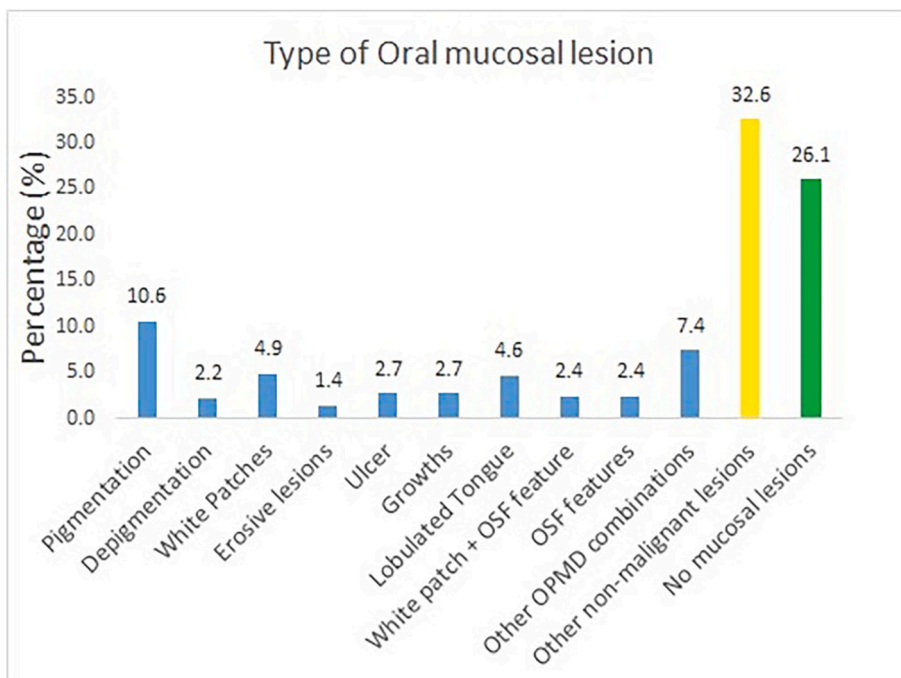


Fig. 1. Prevalence of oral mucosal lesions.

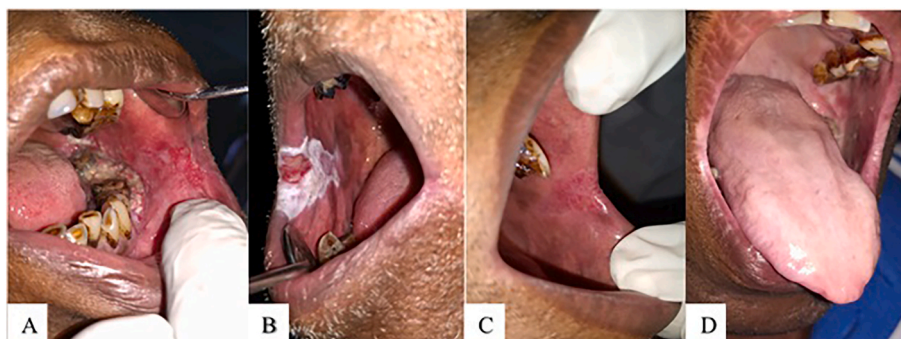


Fig. 2. Clinical images of a few oral mucosal lesions identified at the diagnostic clinic. (A- Exophytic growth on retromandibular region extending towards buccal sulcus and erosive red lesion on buccal mucosa, B- A distinct white patch with an erosive red lesion on commissure, C- Erosive red patch on commissure, D- Depigmentation of oral mucosa and depapillation of the tongue).

Table 3

Association of tobacco and areca nut use with the presence of oral mucosal lesions.

Mucosal lesions		Tobacco users (n = 88)		Areca users (n = 93)	
		n	%	n	%
Present	Suspect malignant or potentially malignant	61	65.2	58	66.4
	Other (nonmalignant)	21	28	26	23.9
	Total	82	93.2	84	90.3
Absent		6	6.8	9	9.7
p value		<0.005		<0.005	

audio and video presentations in the diagnostic clinic would be a useful measure.

As depicted in the current study, a majority of the betel quid (areca-nut) chewers added tobacco, which is similar to Ariyawardane et al.²⁹ in which 84.6 % of the estate workers added tobacco to their betel quid. However, in contrast to these findings, in the multi-nation study by Lee et al. in which Sri Lanka was also included, a majority of 71.5 % had

tobacco-free betel quid chewing. The betel quid chewers with added tobacco use was 72.9 % and 100 % in countries like Indonesia and Nepal, respectively, while 100 % of the betel quid chewers in Taiwan and Mainland China did not include tobacco.³⁰

Similar to earlier research by Lee et al. (2011), in which 18 % of males had the habit, both tobacco and areca-nut consumption were substantially associated with the male gender in this study. Comparatively, a lesser percentage of females were betel quid chewers. However, in countries such as Malaysia and Indonesia betel quid chewing is not only restricted or popular among males but also practiced among a higher percentage of females.³⁰ Ariyawardane et al.²⁹ also showed that the prevalence of these risk habits was strongly dependent on gender ($p < 0.001$) with significantly more men among chewers. Additionally, areca-nut use was also significantly associated with age and education level with a majority being in the working age group (31–60 years) and a satisfactory level of education (89.2 %). Age distribution was similar to a study conducted in urban Colombo and rural Polonnaruwa regions³¹ in which a mean age of 40.9 years and 40.3 years, respectively ($t = 1.03$, $p = 0.41$) was observed. In the study conducted among estate workers in Central Sri Lanka, a contrasting finding to the present study was observed. It revealed that the betel quid chewing habit is significantly

associated with a low socio-economic status.²⁹ This may be due to the difference in sample selection as patients attending the Dental hospital come from varying backgrounds while a majority of estate workers have a low socio-economic status.

Several studies have been conducted on the prevalence of OPMDs and oral cancer. The study by Lee et al. (2011) revealed that the prevalence of such lesions was higher among betel quid chewers than non-chewers in all the nations in which the study was conducted (Sri Lanka, Taiwan, China, Indonesia and Nepal).³² However, there were no lesions associated with betel quid chewing in the sample from Malaysia.³² According to Ariyawardane et al., 91.2 % of the estate workers who had OPMDs had betel quid chewing while 31 % were smokers. These studies further prove the findings of the current study regarding the significant association of tobacco and areca-nut use with oral mucosal lesions.²⁹

Even though, systematic sampling to obtain a representative group from the patients attending the Dental hospital was used to recruit participants, due to the restrictions of the pandemic the sample size was limited. Nevertheless, the sample had a higher number of participants than the calculated sample size. Further, studies with larger samples would be useful to confirm the findings of this research. Additionally, the study setting was limited to a single center in the Central province. However, a representative sample of the Sri Lankan population was obtained as the Dental Teaching Hospital is a tertiary health care center. This is one of the key strengths of the study. Furthermore, the diagnosis of oral mucosal lesions was done with the help of specialists in Oral Medicine and Oral and Maxillo-Facial Surgery, with their expertise in OPMDs and oral cancer. This increases the accuracy of research findings.

5. Conclusion

The prevalence of tobacco and areca-nut use among patients attending the Dental hospital, in Central Province is comparatively high. It is one of the key institutions available for the management of OPMDs and oral cancer in Sri Lanka. The research further established the significant association of tobacco and areca-nut use, with the development of oral mucosal lesions. These research findings revealed the importance of implementing awareness programs in the diagnostic clinic of the hospital, through the distribution of leaflets, booklets and audio/video presentations to reduce the prevalence of these adverse habits and the incidence of oral cancer.

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