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RESEARCH ARTICLE

ASSESSMENT OF TOOTH WEAR AMONG TOBACCO CHEWERS IN THE RURAL POPULATION
OF KARAD, MAHARASHTRA, INDIA: A CROSS SECTIONAL STUDY

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ABSTRACT

Context: The nature of chewable areca nut and tobacco consumption in India has undergone rapid transformation with introduction of pan masala and gutkha. The negative health effects of tobacco on oral soft tissue including premalignancy and malignancy are well documented, however research on its effect on oral hard tissues especially on tooth wear is lacking.

Aims: To assess and compare tooth wear among tobacco chewers and non chewers in the rural population of Karad, Maharashtra, India.

Settings and Design: Methods and Material: A cross sectional study was conducted on 200 subjects selected randomly from those visiting the Krishna Charitable Hospital, Karad. Tooth wear was assessed for both tobacco chewers and non chewers. The chi square test was used for statistical analysis.

Statistical analysis used: SPSS version 15 (SPSS, Chicago, IL, USA)

Results: The subjects chewing tobacco had significantly greater tooth wear as compared to the controls. The wear was especially significant in mishri chewers compared to the other tobacco combinations. It was also observed that the frequency and duration of chewing tobacco was directly proportional to the number of pathologically worn sights.

Conclusions: Tobacco products containing abrasives contribute to tooth wear and this factor must be taken into account for treatment planning for these patients.

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INTRODUCTION

In India, tobacco chewing is very popular especially in rural areas and this habit has increased in recent times according to World Health Organization (WHO). According to WHO estimates, about 194 million men and 45 million women use tobacco in smoked or smokeless form in India (World Health Organization, 1997). The nature of chewable areca nut and tobacco consumption in India has undergone rapid transformation with introduction of pan masala and gutkha (Caudhry *et al.*, 2001). The powdered form of tobacco called as mishri is used by most of females in south India. Although smoking by women is not well accepted in Indian society, consumption of smokeless tobacco is well accepted, and use of Mishri (tobacco containing teeth cleaning powder) is very common (Ganganahalli *et al.*, 2011). Tobacco use usually begins in adolescents; the time of their observation, understanding, struggling, facing challenges and psychological development (Kishore *et al.*, 2007). Many of the risks to health and life caused by tobacco consumption develop over a long

period, and take decades to become fully evident. But tobacco use also inflict immediate harm on users and their families, damage is wreaked little by little each day (World Health Organization, 2004). The negative health effects of tobacco on oral soft tissue including premalignancy and malignancy are well documented, however research on its effect on oral hard tissues especially on tooth wear is lacking. Tooth wear may be defined as the gradual loss of tooth substance due to repetitive physical contacts or chemical dissolution (Smith and Knight, 1984). Studies have shown that the effect of chewing tobacco on occurrence of tooth wear is high, with users having many times the risk of nonusers (Bowles *et al.*, 1995).

Thus, tooth wear is a composite term and includes non carious tooth surface loss by attrition, abrasion and erosion (Addy and Bristol, 2005). This tobacco related tooth wear can have effect on the tooth reparative mechanisms as well as on restorations in extreme cases. Hence, the current study was undertaken to assess and compare tooth wear among chewers of various forms of tobacco in rural population of Karad, Maharashtra, India.

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MATERIALS AND METHODS

The present study was undertaken at the Department Of Oral Pathology, Microbiology And Forensic Odontology, School Of Dental Sciences; KIMSUDU, Karad, after due approval of the ethical committee. Around 200 patients were selected randomly from those visiting the hospital. Out of these 100 were chewers of various forms and combinations of tobacco products while 100 were non chewers of the same. A survey proforma was prepared to acquire personal details such as age, sex, oral hygiene practices and patterns of smokeless tobacco use, specifying the frequency, duration, type (plain tobacco, mishri, tobacco with paan, tobacco with pan masala) and approximate quantity in which they consumed. Following criteria was followed for inclusion of patient in the present study as chewers.

Inclusive criteria

- Minimum 12 teeth are present in oral cavity
- The person should have habit of chewing tobacco, applying the mishri or in combination.
- Should not have any other habits like bruxism, alcoholism.
- Should not have eating disorders like anorexia or bulimia nervosa.
- Did not work in factories or have occupations that may promote tooth wear.

Oral examination was carried out for each subject and their tooth wear analyzed by using tooth wearing index (Smith and Knight, 1984). The Tooth Wear Index (Smith and Knight, 1984) was used to assess the tooth wear.

Cervical (C), Buccal (B), Lingual (L) and occlusal/incisal (O/I) surfaces were recorded separately for all erupted permanent teeth; thus, a maximum of 128 surfaces was examined per subjects. The scores of the tooth wear index used in the study were as follows:

- Score 0- no loss of enamel surface characteristics on B/L/O/I and no change in contour on C.
- Score 1- loss of enamel characteristic on B/L/O/I and minimal loss of contour on C.
- Score 2- loss of enamel exposing dentine for less than 1/3 of the surface on B/L/O/I and defect less than 1 mm deep on C.
- Score 3- loss of enamel exposing dentine for more than 1/3 of surface on B/L/O/I and defect 1 to 2 mm deep on C.
- Score 4 – complete loss of enamel or pulp exposure on B/L/O/I and defect more than 2 mm deep on C.

The data was analysed using SPSS version 15 (SPSS; Chicago, IL, USA). The chi-square test was used to test whether there were significant differences in outcome measures. $P \leq 0.05$ was considered statistically significant.

RESULTS

A total of 200 subjects, 132(66%) males and 68(44%) females, aged above 18-56 years constituted the study population. They were divided into five groups: tobacco with pan (87.5% and 12.5% males and females respectively), plain tobacco (97.3% and 2.7%), tobacco with pan masala (100% and 0%), Mishri (9.09 % and 9.91%) and controls (48.5% and 51.5%).

Table 1. Distribution of study population according to sex and individual pathologically worn surfaces

Groups N=200	Sex	Study subjects n (%)	Total surfaces scored	Cervical n (%)	Buccal n(%)	Occlusal n(%)	Lingual n(%)	Total n(%)
Tobacco with pan N=16	M	14(87.5)	1452	307(21.63)	282(19.87)	689(48.55)	141(9.95)	1419(97.72)
	F	2(12.5)	240	79(22)	77(21.44)	164(45.68)	39(10.88)	359(1.49)
Plain tobacco N=38	M	37(97.3)	4184	37(97.3)	585(17.63)	1835(55.30)	351(10.59)	33189(79.38)
	F	1(2.7)	128	0(0)	12(26.55)	28(59.58)	7(14.87)	47(36.71)
Pan masala with tobacco N=1	M	1(100)	128	18(21.95)	6(7.31)	35(42.68)	23(28.06)	82(64.06)
	F	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
Mishri N=44	M	4(9.09)	480	28 (7.65)	75(20.49)	237(64.75)	26(7.11)	366(76.25)
	F	40 (90.91)	4604	579 (12.63)	1069(23.33)	2222(48.50)	711(15.54)	4581(99.55)
Control group N=100	M	49(48.5)	5880	42(5.54)	175(23.12)	439(58.00)	101(13.34)	757(12.87)
	F	51(51.5)	6324	22(3.40)	174(26.85)	341(52.62)	111(17.13)	648(10.04)

Significant set at $P \leq 0.05$. Tobacco chewers VS controls: $P < 0.001$ [the two tailed P value is 0.001, considered very significant.]

Table 2. Distribution of pathologically worn surfaces according to sex and frequency of tobacco chewing

Groups and frequency	No. of subjects		Total surfaces scored		Pathologically worn surfaces n (%)		
	Male (1)	Female (2)	male	female	Male	Female	
1. Tobacco with pan	4	40	480	4604	366(100)	4581(100)	
	Less than 5/day (a)	3	32	368	4381	240(65.57)	3481(75.99)
	More than 5/day (b)	1	8	112	223	126(34.43)	1100(24.01)
2. Plain tobacco	37	1	4184	128	3318(100)	47(100)	
	Less than 5/day	24	1	2704	128	2297(69.23)	47(100)
	More than 5/day	13	0	1480	00	1021(30.77)	00(00)
3. Pan masala with tobacco	142	2	1452	240	1419(100)	359(100)	
	Less than 5/day	12	1	1380	120	1217(85.76)	169(47.07)
	More than 5/day	2	1	14	120	202(14.24)	190(52.93)
4. Mishri	4	40	480	4604	366(100)	4581(100)	
	Less than 5/day	3	32	368	4318	240(65.57)	3481(75.99)
	More than 5/day	1	8	112	223	126(34.43)	1100(24.01)
5. Controls	49	51	6324	5880	648(10.04)	757(12.82)	

Significance set at $P \leq 0.05$. I) a vs b: not significant. II) a vs b, 1 vs 2: $P < 0.001$, III) a vs b, 1 VS 2: $P < 0.001$, IV) a vs b, 1 vs 2: $P < 0.001$, tobacco chewers vs non chewers $P \leq 0.0038$ [the two tailed P value is 0.0038, considered very significant]

Table 3. Distribution of pathologically worn surfaces according to sex and duration of tobacco chewing

Groups and frequency	No. of subjects		Total surfaces scored		Pathologically worn surfaces n (%)	
	Male (1)	Female (2)	Male	Female	Male	Female
1. Tobacco with paan	14	2	1452	240	1419(100)	359(100)
Less than 5 years (a)	04	0	118	00	278	0(0)
More than 5 years (b)	10	2	1334	240	1141(80)	359(100)
2. Plain tobacco	37	1	4184	128	3318 (100)	47(100)
Less than 5 years (a)	10	1	1216	128	847(25.53)	47(100)
More than 5 years (b)	27	0	2968	128	2471(74.47)	00(0)
3. Pan masala with tobacco	1	0	128	00	82(100)	00(100)
Less than 5 years (a)	1	0	128	00	82(100)	00(100)
More than 5 years (b)	0	0	0	00	0(0)	00(100)
4. Mishri	4	40	480	4604	366(100)	4581(100)
Less than 5 years (a)	0	8	00	231	00(0)	594(12.97)
More than 5 years (b)	4	32	480	4373	366(100)	3987(87.03)
5. Controls	49	51	6324	5880	648(10.04)	757(12.87)

Significance set at $P \leq 0.05$. a VS b, 1 VS 2 $P \leq 0.001$. tobacco chewers was controls $P \leq 0.001$ [the two tailed P value is 0.008, considered very significant]

Pathologically worn surfaces among the study subjects in the various groups were as follows: tobacco with pan (97.72% and 1.49% males and females respectively), plain tobacco (79.38% and 36.71%), tobacco with pan masala (82% and 0%), Mishri (76.25 % and 99.5%) and controls (12.87% and 10.04). It was observed that males had higher scores of pathologically worn sites than did their female counterpart except mishri users group where females had higher scores of pathologically worn sites than did their male counterpart. We also observe that a statistically significant ($P < 0.001$) difference between tobacco chewers and control group in relation to pathologically worn sites. In particular, mishri users showed the most tooth wear. The distribution by surface of pathologically worn sites showed the occlusal tooth wear was higher in tobacco chewers than in control group. (Table no 1). A higher risk of tooth wear was associated with a greater frequency of tobacco chewing. In all the subgroups it was observed that as the frequency of chewing tobacco increased, the pathological worn sights also increased. This relationship was statistically significant (Table 2). The pathologically worn surfaces in both sexes chewing any form of tobacco for more than 5 years, was significantly higher than in subjects who chewed less than 5 years. Similarly, regardless of duration, the tobacco chewers and non chewers also differed statistically significantly ($P < 0.001$) (Table 3)

DISCUSSION

Tobacco is the biggest enemy of the public health today and the distributors are one of the richest business groups. Prevalence of tobacco use in India is continuously increasing but there are considerable changes in the methods of its use (Bhonsle *et al.*, 1992). Tobacco is the second major cause of death in the world. WHO sources emphasizes the rate of tobacco consumption especially in developing countries as an epidemic. Tobacco death toll is expected to double by 2025 from the present 5 million deaths (approx). At every 6.5 seconds, one dies because of tobacco related disease globally. This is occurring mostly in developing countries, adding significantly to their burden of disease, poverty and economy (Abdullah and Husten, 2004; Kishore *et al.*, 2007). In India almost everywhere, male smoking has become a social norm and smoking by girl is socially unacceptable but in recent times use of Gutkha by the adolescent boys is found to be significant and use of Nas / Mishri by girls are very high. This is a very important finding of the present study as Gutkha has much

more deleterious effect on health than plain tobacco and is one of the most highly advertised tobacco products in all the media (Kishore *et al.*, 2007). Prevalence figures suggest that tooth wear must be the fourth dimension risk factor for the aesthetics, function and longevity of the human dentition behind acute trauma, caries and periodontal disease (Nunn, 1996). The term 'tooth wear' (TW) is a general term that can be used to describe the surface loss of dental hard tissues from causes other than dental caries, trauma or as a result of developmental disorders. It is a normal physiological process that is macroscopically irreversible and is cumulative with age (Hattab and Yassin, 2000). Smokeless tobacco is a blanket term that refers to a number of tobacco products that are used by means other than smoking. These uses include chewing, sniffing, placing the product between the teeth and gum, and application to the skin. According to American Cancer Society (ACS) a common misconception is that many people think using smokeless tobacco is safer than smoking. A person who uses eight to 10 dips or chews a day receives the same amount of nicotine as a heavy smoker who smokes 30 to 40 cigarettes a day and just because there's no smoke, doesn't mean it's safe. Smokeless tobacco, like cigarettes and other forms of tobacco, is addictive. The nicotine in smokeless tobacco is absorbed more slowly than in smoking, but it remains in the body longer. Much concern has been expressed over the effects of smokeless tobacco on the mucous membranes of the oral cavity, particularly the increased risk of oral cancer. This is indeed a major problem. However, the possibility of direct damage to the dentition by materials found in smokeless tobacco and cigars also should be a concern.³ Several authors have reported excessive dental attrition in users of oral forms of tobacco (Greer and Poulson, 1983; Christen, 1970). When teeth are gradually worn away by abrasion, the tooth normally forms secondary dentin. However, when teeth are exposed to increased amounts of abrasives, the secondary dentin is also worn down. In extreme cases, the entire clinical crown may be worn away (Ganganahalli *et al.*, 2011). Since long-time users of oral tobacco products can experience severe dental attrition, it has suspected that tobacco might contain abrasive materials capable of wearing away dentin (Baker *et al.*, 1959; Barnicoat *et al.*, 1960). Tobacco contains tiny silica particles which can abrade the dentition of chronic users. These deposits of silica have been found in stems, roots and leaves of more than 400 varieties of plants (Sangster and Parry, 1980). Some silica particles found in tobacco products may be the result of fallout

from airborne dust. A significant portion of the particles are part of the leaf structure as the result of metabolic processes of the plant itself. Tobacco leaves are not subjected to any specific cleaning process before being incorporated into various smoking and smokeless products. Thus any abrasive particles clinging to the surface are included in the prepared product. Since most of the abrasive particles are present within the plant structure, washing would have little effect on reducing the abrasive content. When tobacco products containing abrasive silica are mixed with saliva and chewed, an abrasive paste is formed that over time can wear down teeth very efficiently. The minute size of most particles prevents the chewer from perceiving the product as objectionably "gritty," but the particles are abrasive in spite of their small size (Ganganahalli et al., 2011).

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