

Tooth Mortality in Concurrent Cigarettes Smoking and Khat Chewing in Yemeni Population

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Abstract

This study aims to explore tooth mortality in Khat chewer smokers (KS) and Khat chewer non-smokers (KNS) in a selected population from Sana'a, Yemen.

A total of 1296 persons, 858 were male and 438 were female ranging in age from 15 to 64 years were examined. The samples of individuals were divided into two groups: KS and KNS. The number of tooth loss per person was calculated and data were analyzed with SPSS version 16.

There was a significant difference in the percentage of lost teeth between the KS and KNS groups ($p= 0.001$). The highest percentage of tooth loss was observed in the first and second molar teeth. Male KNS had significantly more teeth loss for second premolar, first and second molars compared to smoker khat chewers.

In this study sample, the first and second molars being the most commonly missing teeth among Khat chewing non-smokers. The central and lateral incisors were the most commonly missing teeth in Khat chewing smokers.

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Introduction

The khat plant is a tree of the family Celastraceae, cultivated in East Africa and the Arabian Peninsula. The leaves are chewed daily by population for the enjoyable and stimulant effect. Chewing khat in Yemen, is closely related to the social and cultural events. People thought it enhance their physical and mental functions. Research reported that khat excrete amphetamine-like properties, it contain many compounds like phenylalkylamine, norpseudoephedrine, alpha aminopropiophenone, tannins, vitamins, minerals and flavonoids¹⁻³.

Traditionally, during khat sessions one or two communal tobacco pipes or "hubble-bubbles" stand in the centre. Each consists of a tobacco

bowl, a 3- or 4-foot high metal pipe, a water filter, and a 20-foot long flexible tube. The tobacco is ignited with a layer of charcoal, and the flexible tube is passed from guest to guest. Each must limit himself to a few puffs because excess will cause dizziness, tremulousness, palpitations, and severe nausea. Smoking in Yemen is almost universal in the male population; it is the basis of a lifestyle and thus a regular habit. Al- Motarreb et al. reported that 80% of khat chewers were smokers. WHO estimated that 70-90% of men, 30-50% of women and 25% of children in Yemen chew khat daily⁴.

Study conducted by Hassan et al. in the colleges and secondary schools. A sample of 10,000 students aged between 15 and 25 years were studied. There were 3.8% female khat chewers and 37.70% male Khat chewers, the prevalence of Khat chewing seems to be high among male students and not remarkable among female students⁵.

There is wide spread belief that the periodontal disease is more severe in khat chewers than non-chewers, but the results of

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epidemiological investigations are inconsistent and even conflicting. In two separate studies, Ali A. estimated the prevalence of khat chewing habit in Yemen to be 60.5 % and 61.12 % respectively^{6, 7}. Khat chewing causes stomatitis that might be secondarily infected⁸⁻¹⁰. It also causes periodontitis, teeth discoloration and xerostomia^{8, 9}. There are wide differences in the published epidemiological studies about the effect of khat chewing on oral cavity. Besides its adverse dental effects, Hill and Gibson claimed there was reduced dental caries among khat chewers¹¹. However, others reported increased dental caries, especially the cervical ones, teeth staining, and attrition in addition to their mobility^{12, 13}. Regarding its effects on periodontium, it causes gingivitis, periodontitis, periodontal pocket formation, and gingival recession^{6, 13, 14}. On the contrary, other authors reported positive effects of khat chewing, namely less loss of clinical attachment and less pocket depth on the chewing side compared to non-chewing side^{11, 15} and less plaque and calculus indices among khat chewers compared to non-chewers¹⁶.

Al-Adimi selected 134 patients who were khat chewers and found that 51.8% of the subjects had Periodontitis and 9.7% of the patients had unilateral missing teeth which corresponded with the khat chewing side¹⁷. Al-Akhali studied 382 male patients. Among them, 310 were khat chewers and 72 non khat chewers. He reported a higher loss of attachment and gingival recession in chewers than non chewers and a higher percentage of teeth loss in chewers compared to non-chewers^{18, 19}.

Al-Akhali et al, conducted clinical study which showed the direct mechanical effect of khat chewing on teeth lost and prevalence of gingival recession on teeth which have been exposed to khat chewing for more than 15 years old among Yemeni people. The number of extracted tooth as a result of periodontal disease in this study was found to be higher in the chewing side than in non-chewing group. Where, chewing side demonstrated a higher percentage number of tooth lost (4%) than non-chewing side (1%), the difference was highly significant^{18, 19}.

Epidemiological and clinical studies concluded that periodontitis is world wide diseases and the bacterial infection is considered the main etiological factor^{21, 22}. Smoking is one of the risk factor contributing for periodontal diseases^{20, 21, 23}, recent findings showed that

tooth lost are more in smokers than nonsmokers^{24, 25, 26, 27}.

Chewing is practised in different ways: the main ingredients are usually areca nut (betel), betel leaf, lime, snuff and tobacco, their effect on periodontal health have been limited to attachment loss manifested as gingival recession and abrasion of the tooth surfaces and tooth loss at the usual site of placement^{3, 28}.

Tooth loss could be due to dental caries or periodontal disease, the number of tooth loss may reflect the level of oral health care and status in any community^{29, 30, 31}. In Yamen, there is a lack of research to find out the correlation between tooth loss, smoking and khat chewing. Therefore, the current research was carried out to explore the number of tooth loss in relation to khat chewing and smoking in a selected population in Sana'a.

Materials and methods

The investigation was carried out at the Department of Periodontology of the College of Dentistry in Sana'a University and University of Sciences & Technology over a period of 2 years (2004-2005). All individuals attending the dental clinics seeking for dental treatments and agree to participate in this study after reading and signing an informed consent form in Arabic were referred for the clinical examination. A total of 1296 individuals were examined, among them 858 were male and 438 were female ranging in age from 15 to 64 years. Two trained and calibrated examiners performed all the clinical examinations. A pilot study was carried out, in which 20 subjects were examined to carry out an inter-examiner and inter-examiner calibrations. The calibration period was terminated when a consistency of (level of confidences) 95% is reached.

A Questionnaire in Arabic language was used to collect data on demographic information smoking status and khat chewing status. The questionnaire was developed from those used by former researchers and applied in study carried out by Al-Akhali^{18, 19} amongst Yemenite khat chewer in Yemen Sanna. According to the US Centres for Disease Control and Prevention, Individuals who have smoked 100 cigarettes in their lifetime and currently smoke cigarettes every day (daily) or some days (non-daily) were considered as smokers. Patient take in account

as khat chewer how affirm chewing one or two times per a week for five years, while those with no history of khat chewing were considered as non-chewer. Patients who confirm that they chewed less than 5 times in their lifetimes or stopped chewing for one year earlier were excluded.

All the missing teeth were recorded. Tooth considered to be extracted either due to extensive dental caries, retained root and tooth with mobility grade 3 according to the Miller's Mobility Index. Third molars were excluded.

The sample size was based on the assumption of significance level of 0.05, a power of 90%, a difference in mean of 0.001 and within group standard deviation of 0.005. This gave a sample size of 526 in each group. As there are 2 groups male and female the total sample size required was calculated to be 1052. The sample size eventually reached 1296 as it was felt it was better to ensure that data was complete for as much data as possible. Both groups were subdivided into two groups; Khat chewing smokers (KS) and Khat chewing non smokers (KNS). Among the 858 Khat chewing males, there were 312 smokers, and there were 153 smoker females among the 438 Khat chewing females. The study stretched over 2 years to ensure that an adequate sample size was reached.

The number of tooth loss per person was calculated and data were entered and analyzed with SPSS version 16. Due to the categorical nature of the data, all variables were described with frequency and percentage. Chi square test was used to test the association between categorical variables. Significance level was set at 0.05.

Results

The study sample consisted of 1296 persons, 858 (66.4%) male and 438 (33.6%) female. Among the 858 KS males, there were 312 (36.4%) smokers and there were 153(35.5%) smoker females among the 438 KS females.

Gender	Khat chewer smoker	Khat chewer non-smoker	Total
Male	312 (36.4%)	546 (63.6%)	858 (100%)
Female	153(35.5%)	285(65.5%)	438(100%)
Total	465 (35.96%)	831 (64.24%)	1296

Table 1. Break down of the sample by gender and chewing status.

Table 1 displays the sample distribution according to gender, khat chewing and smoking habits.

Table 2 shows a comparison of tooth loss between KS and KNS. There was a significant difference in the percentage of lost teeth between smokers and non-smoker khat chewers ($p=0.001$). The highest percentage of tooth loss was observed in the first and second molars teeth. The KNS group had significantly higher tooth loss for second premolars, first molars and second molars than KS group. Tooth losses for central and lateral incisors were higher in KS group, with peak losses in both groups was in the first molars.

Status	Tooth						P	
	Central incisors	Lateral incisors	Canines	First premolars	Second premolars	First molars		Second molars
KNS	204 (10.7%)	153 (8%)	86 (4.5%)	174 (9.1%)	261 (13.7%)	600 (31.5%)	427 (22.4%)	0.001**
KS	262 (14.7%)	225 (12.7%)	78 (4.4%)	192 (10.8%)	242 (13.6%)	433 (24.4%)	345 (19.4%)	

Table 2. Tooth mortality of Khat chewers Smoker (KS) and non-smokers (KNS) for each tooth.

Table 3 displays the relationship between gender and smoking among khat chewers. There were minimal difference in the percentage of smoking between male and female. Males experienced more tooth loss compared to females. Females and males had higher tooth loss for KNS, than KS. Table 4 demonstrated the Individual tooth mortality relative to total tooth mortality, First molars shows the higher tooth loss followed by second molars and second premolars. Central incisors were the most affected anterior teeth in the total sample.

Gender	Status		P
	KNS	KS	
Male	1107 (50.5%)	1084 (49.5%)	0.074
Female	798 (53.5%)	693 (46.5%)	

Table 3. Total tooth mortality of Khat chewers Smoker (KS) and non- smokers (KNS) by gender.

Specific teeth loss in male and female groups is displayed in Table 5. Overall, a significant difference in tooth loss was found between smoking and KNS ($p=0.0001$). Both groups had significantly more tooth loss for the first and second molars. While KNS individuals

had significantly more teeth loss for second premolar, first and second molars compared to KS. The difference was reversed for the other teeth; KS had significantly more teeth loss than KNS for central incisors, lateral incisors, canines and first premolars. In the female group, overall, no significant differences were found in tooth loss between KS and KNS. First and second molars were the most teeth affected, represented by a high percentage of teeth loss in both groups; the picture was the same for central and lateral incisors. Generally, the pattern of tooth loss observed in both KS and KNS were that tooth loss decreased from the central incisors to canines, and thereafter increased again, and peak loss was of the first molars.

Tooth	n	%
Central incisors	466	12.6%
Lateral incisors	378	10.3%
Canines	164	4.5%
First premolars	366	9.8%
Second premolars	503	13.7%
First molars	1033	28.1%
Second molars	772	21.0%

Table 4. Individual tooth mortality relative to total tooth mortality.

		Tooth												p-value		
		Central incisors		Lateral incisors		Canines		First premolars		Second premolars		First molars			Second molars	
		N	%	N	%	N	%	N	%	N	%	N	%		N	%
Male	KNS	135	12.2%	105	9.5%	56	5.1%	93	8.4%	159	14.4%	333	30.1%	226	20.4%	0.001**
	KS	208	19.2%	168	15.5%	60	5.5%	120	11.1%	122	11.3%	217	20.0%	189	17.4%	
Female	KNS	69	8.6%	48	6.0%	30	3.8%	81	10.2%	102	12.8%	267	33.5%	201	25.2%	0.079
	KS	54	7.8%	57	8.2%	18	2.6%	72	10.4%	120	17.3%	216	31.2%	156	22.5%	

Table 5. tooth mortality of Khat chewers Smoker (KS) and non (KNS) for each tooth in male and female patients.

Discussion

There is wide spread belief that smoking was a predictor for tooth loss³². Higher loss of attachment and gingival recession in khat chewers than non khat chewers and a higher percentage of teeth loss in chewers compared to non-chewers reported by several researchers. WHO estimated that 70-90% of men, 30-50% of women and 25% of children in Yemen chew khat daily. However, no information is available on the tooth mortality in concurrent cigarettes smoking and khat chewing in Yemeni population over a wide age range 15 to 64 year³².

Generally, the pattern of lost posterior teeth differed from that of the anterior teeth. Comparisons between KNS and KS for the total sample, according to the tooth, revealed that KNS had significantly higher mean tooth loss for second premolar, first and second molars than KS, with the central and lateral incisors notably being the most commonly missing anterior teeth in KS, and the first molars representing the most commonly missing posterior teeth in both groups. These findings are in agreement with that reported by Al-Bayaty et al and Al-Akhali et al.^{18, 20, 33}. Our results have shown that male KNS and KS had higher teeth loss than their female counterparts. This result may confirm what is widely believed: that khat habit is deeply rooted in Yemen. A large proportion of the Yemeni population chew khat leaves daily²⁸, with khat being consumed by males and to a lesser extent by females. Khat chewing usually lasts from 4 to 6 hours and may result in a number of significant oral health and medical adverse effects³⁴. KNS of both genders presented with higher teeth loss than those in the smoking group. Statistical analysis revealed non-significant differences.

It was clearly demonstrated from the results of this study that mean tooth loss among males was higher in KNS for the posterior teeth than in KS. This difference was highly significant. However, the difference was reversed for the anterior teeth, whereby the KS appeared to have significantly higher mean tooth loss compared with KNS, a situation that may be ascribed to local direct effects of smoking. Many studies exist confirming the relationship between smoking and the deterioration of dental status^{35, 36}. Tobacco smoking can affect periodontal tissues directly, causing local irritation, and gingival pockets tend to be greater in the maxillary lingual sites^{36, 37}.

Overall, first and second molars represent the most effected teeth, and peak loss was of the first molars, these findings are in agreement with that reported by AL-Bayaty et al²⁷. However, researchers reported increased dental caries, especially the cervical ones, teeth staining, attrition, mobility, periodontal pocket formation and gingival recession^{6, 13, 14} in the chewing side which could be the reasons for tooth lost in chewers.

Results in this study have shown no significant differences between female KNS and KS. This may reflect the effect of chewing khat; the habit was limited to old and married women

as it was not socially accepted for young unmarried women to chew khat. Ali A et. al reported that the distribution of smoking among chewer subjects revealed that 51% and 10% were cigarettes smokers among males and females respectively³⁸.

In general, females have more posterior teeth loss than anterior teeth and the first molars representing the most commonly missing posterior teeth irrespective of whether they chew khat or smoke.

Certain limitations were challenged in the study, the first one that we couldn't evaluate the tooth loss according to the chewing side. Many patients declare that they change their chewing side from time to times. This could have justified why the side of chewing was not recorded. The second, the female's chewers were not keen to share their actual chewing and smoking behaviour due to social respect. These could reflect the underestimation of the association between khat chewing and number of tooth loss.

The mechanistic pathways to explains how khat constituents exerted their effect in tooth mortality is still unknown. we can speculate that khat exert its effect in two ways, first the mechanical or frictional effect due to the fibres in the lives which leads to gingival recession and periodontal problem and then lost of the teeth, the second pathway is the direct and indirect effect of the chemical constituents like tannins and phenolic compounds and chemical additives in pesticides.

Khat has been reported to result in xerostomia and many systemic diseases like diabetes mellitus, liver and kidney toxicity which may be considered as risk factors for tooth loss by their indirect effect on the periodontium³⁹.

Conclusions

In this study, the first and second molars being the most commonly missing teeth among Khat chewing non-smokers. The central and lateral incisors were the most commonly missing teeth in Khat chewing smokers. Nevertheless, further studies should be considered to clinically evaluate the relevance of our findings.

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Declaration of Interest

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