

# Social Habits and Other Risk Factors that Cause Tooth Loss: An Associative Study Conducted in Taiz Governorate, Yemen

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## ABSTRACT

**Aims:** To investigate the relationship between tooth loss, age, gender, and its correlation with several local habits that affect oral health, especially the khat, and Shammah use.

**Materials and methods:** The current study included 580 participants. They were divided into five age groups 15–24, 25–34, 35–44, 45–54, and 55–64-years-old. Clinical and radiographic examinations were done for each subject. Reasons for teeth loss, age, gender, khat chewing, Shammah use, smoking, and use of oral hygiene aids were recorded. The data were statically analyzed using Chi-square tests of the statistical package for social sciences (SPSS) program. The  $p$  value  $< 0.05$  were considered statistically significant.

**Results:** Caries was the most cause of tooth loss in the young age groups 15–34 years-old and was significantly more common compared to the older groups ( $p < 0.001$ ). The periodontal diseases increased with age and progressively became the main cause of tooth loss of 100% in the 55–64 years-old group. Orthodontic reasons for the highest extracted teeth in the maxillary arch, followed by periodontal diseases, and caries. The lowest extracted teeth ranging from 9; 1.6% in maxillary arch, and 1.1% in mandibular arch. Anterior teeth were the lowest extracted teeth.

**Conclusion:** This study highlights the importance of oral hygiene and its relationship with social habits like Khat chewing and Shammah use. The results of this study will guide us to develop a preventive program with the aim of reducing the effects of these habits on oral health.

**Clinical significance:** Limited number of epidemiological studies in Yemen and its relationship with social habits like Khat chewing and Shammah use. The results of this study will guide us to develop a preventive program with the aim of reducing the effects of these habits on oral health.

**Keywords:** Dental caries, Khat, Meswake, Periodontal disease, Tooth loss  
*The Journal of Contemporary Dental Practice* (2019)



## INTRODUCTION

Loss of teeth is considered a major public health problem worldwide. Tooth extraction is the last resort treatment. A decrease in the number of teeth may be due to dietary habits and deterioration of the quality of life. The status of extracted teeth can serve as an indicator of oral health status, level of the oral hygiene and, treatment received from governmental services.<sup>2</sup> Extraction of permanent teeth is performed for several reasons, including dental caries, periodontal disease (PD), orthodontic treatments, periapical pathology (PA), failed root canal treatment (RCT), trauma, and iatrogenic causes.<sup>3-25</sup>

A large number of cross-sectional studies have investigated the reasons for tooth loss in various countries. Dental caries was the main cause of tooth loss among the young age groups.<sup>3-9</sup> while other researchers concluded that dental caries is the most common reason among elder age groups.<sup>4-10</sup> Many studies have indicated that both caries and periodontal diseases are the common causes of teeth loss,<sup>15-23</sup> but only a few studies have reported a greater proportion of teeth extractions due to periodontal disease.<sup>3,24-25</sup>

Even though, orthodontic reasons account for a small proportion, i.e.,  $< 10\%$  of tooth losses,<sup>5,7-9,12,18-20,22</sup> some studies have reported a higher percentage<sup>3,6,15,23</sup> and sometimes reached more than the periodontal disease percentage.<sup>4</sup> Few studies have registered parameters of teeth loss, such as trauma<sup>5,10,16,19-20,23,25</sup> and root canal failures,<sup>5,9,10,18</sup> while only one study has investigated the iatrogenic causes of tooth loss.<sup>7</sup>

in the young age group 15–24 years old. Third molars were the highest extracted teeth in the mandibular arch. Anterior teeth were the lowest extracted teeth. Shammah 8.1% besides smoking in tooth loss. Caries was the most common cause of tooth loss in the older age. Molars were frequently extracted teeth. The results of this study will guide us to develop a preventive program with the aim of reducing the effects of these habits on oral health.

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**How to cite this article:** Noman NA, Aladimi AA, Alkadasi BA, Alraawi MA, Al-Iryani GM, Shaabi FI, Khalid A, Al Moaleem MM. Social Habits and Other Risk Factors that Cause Tooth Loss: An Associative Study Conducted in Taiz Governorate, Yemen. *J Contemp Dent Pract* 2019;20(4):428-433.

**Source of support:** Nil

**Conflict of interest:** None

Khat and smokeless tobacco (Shammah) are prevalent habits in Yemen and neighboring areas. There are insufficient studies highlighting the potential association between these habits with teeth loss in Yemen, although it has been studied elsewhere.<sup>16,26-27</sup> The effect of Khat and Shammah,<sup>28-30</sup> smoking,<sup>7</sup> and some other risk factors, such as oral hygiene measurements (using Miswake and tooth brushing) have been investigated earlier.<sup>7,11,31-33</sup>

Therefore, due to the insufficient studies on this topic in Yemen and particularly in Taiz Governorate and the need for such studies

to minimize future extractions and for developing prevention plans. This study was conducted aiming to investigate the reasons of loss of permanent teeth and the correlation of tooth mortality with several factors that can affect oral health, as well as its association with age, gender, and location in the arch.

**MATERIALS AND METHODS**

The current retrospective cross-sectional study was conducted among subjects attending dental treatment in Taiz, Yemen. The data were collected at Al-Saeed University clinics, Al-Hikmah University clinics, Al-Thawrah Hospital, and at several other private clinics in war-free areas of Taiz, Yemen. This study was conducted in full accordance with the World Medical Association Declaration of Helsinki, and ethical approval was obtained from the Ethics Committee of the Director of the Health Affairs in Taiz region.

The data collection was carried out during the period from December 2017 to February 2018. A total of 580 participants (278; males and 302; females) were enrolled in this study. Patients of both genders, above the age of 15 years and without systemic diseases, were included in the study. The selected subjects were divided into five age groups, 15–24, 25–34, 35–44, 45–54, and 55–64-years-old. The participants were selected through non-probability convenience sampling. Data were collected by dentists who were provided a short period of training using a predesigned questionnaire. The clinical intraoral and radiographic examinations of subjects were performed using dental diagnostic kits. All files and patients records were evaluated after written consent had been obtained from each patient.

The questionnaire was a single page and designed to be as simple as possible. The examinations were done to register the causes of tooth loss in relation to gender, age, and area of missing teeth. Other variables recorded included khat chewing, Shammah use, smoking, the use of miswake and tooth brushing. The questions addressing the sites of khat chewing and shammah use were also recorded. Data concerning the missing teeth causes were classified and recorded using the criteria mentioned by Cahen et al.<sup>34</sup> and Ainamo et al.<sup>35</sup> with some slight modifications. The

criteria were caries (whenever the primary cause of extraction is associated with caries, root remnant, fracture of tooth weakened by caries or previous treatments); periodontal disease (when the reason for extraction is pronounced periodontal breakdown, a loose suppurating tooth); failures of root canal treatments (when symptoms resist healing); trauma (when a non-carious associated trauma to the tooth is the reason for its removal); orthodontic treatments (whenever a tooth is removed under the request from the orthodontist); iatrogenic (due to incorrect performance or treatments done in dental clinics). Periapical diseases or lesions (PA) and other reasons for extractions were also recorded.

Data were collected and summarized as frequencies and percentages, then analyzed descriptively using SPSS software (version 20.1 SPSS, Chicago, Illinois, USA). A comparison and association with different variables were done using the Chi-square test. *P* values < 0.05 were considered significant.

**RESULTS**

The current study included 580 subjects, 278; 47.9% males and 302;52.1% females. Most of the subjects 226; 40.5% were in the 15–24-age group, followed by 221; 38.1% subjects among the 25–34-age group. The age groups 35–44 and 45–54-years were 84; 14.5% and 39; 6.7%, while 10; 1.2% subjects were among the smallest 55–64-age group. The frequency and percentage of khat chewers among all participants were 307; 52.9% subjects, and 240; 41.4% subjects of which patients chewing khat daily. The Shammah users were 47; 8.1% of total number of subjects, while 367; 63.3% were smokers. The number of subjects using toothbrush and Meswake were 256; 44.1%, and 61, 10.5%, respectively. The use of the left side of the oral cavity in khat chewing and Shammah was higher than the right side 223; 38.4% and 32; 5.5%, respectively (Table 1).

Table 2 shows the association between age groups and the causes of tooth loss. Dental caries was the most common cause of tooth loss among the young age groups 25–34-years 121; 65.4%, and 15–24-years 105; 43.0%, and the difference had a significant value *p* < 0.05. In the current study, the rate of periodontal disease was low in the young age groups 15–24-years; 4.1% and 25–34-years;

**Table 1:** Descriptive of subjects in relation to gender, social habits, and risk factors of tooth loss

Parameter	Gender, social habit, and risk factors															
	Gender		Khat chewing		Khat site		Shammah		Shammah site		Toothbrush		Miswake		Smoking	
	Male	Female	Yes	No	Left	Right	Yes	No	Left	Right	Yes	No	Yes	No	Yes	No
Number	278	302	307	273	223	84	47	533	32	15	256	324	61	519	367	213
Percentage	47.9	52.1	52.9	47.1	38.4	14.5	8.1	91.9	5.5	2.6	44.1	55.9	10.5	89.5	63.3	36.7

**Table 2:** Association between different age groups and cause of tooth loss

Factor / age group	15–24	25–34	35–44	45–54	55–64	<i>p</i> value
Caries	105 (43.0%)	121 (65.4%)	22 (3.8%)	10 (21.3%)	0 (0.0%)	0.000*
PD	10 (4.1%)	55 (29.3%)	44 (7.6%)	29 (61.7%)	10 (100%)	0.000*
Orthodontic	65 (26.6%)	0 (0.0%)	9 (1.6%)	0 (0.0%)	0 (0.0%)	0.000*
Iatrogenic	10 (4.1%)	9 (4.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.100
Failure RCT	18 (7.4%)	9 (4.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.022
Trauma	9 (3.7%)	9 (4.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.135
PA lesion	9 (3.7%)	9 (4.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.135
I do not know	0 (0.0%)	9 (4.9%)	9 (1.6%)	0 (0.0%)	0 (0.0%)	0.000*
Total	226 (40.5%)	221 (38.1)	84 (14.5%)	39 (6.7)	10 (1.2%)	

\*Significant PD (periodontal diseases); Orth, Orthodontic; PA, Periapical; RCT, Root canal treatment

29.3%, increased in the middle age group's 35–44 years; 51.1% and 45–54 years; 61.7%, and reached 100% among 55–64-year-olds. Related to gender, the frequency and percentage of tooth loss in the female subjects were more due to dental caries and periodontal diseases 191; 63.2% and 57; 18.9%, while in males the periodontal disease was the main cause 95; 34.2%,  $p < 0.001$ . The other factors such as iatrogenic, failure RCT, trauma reasons, and unknown were non-significant among gender (Table 3).

The association between khat chewing and caries was not significant due to the equal percentage among subjects, but we did detect an association between Shammah use and caries  $p < 0.001$ . The rate of periodontal disease was 40.1% and 80.9% among khat chewers and Shammah users respectively  $p < 0.001$ . The other parameters of tooth extraction cause, such as iatrogenic cause and failure of RCT were significant among khat chewers  $p$  value 0.019 and 0.029, respectively. But the same causes were non-significant among subjects of Shammah user  $p$  value 0.088 and 0.097, respectively. Trauma and unknown causes were significant among Khat and Shammah user  $p < 0.001$ . The PA lesion cause was significant among khat chewers  $p < 0.001$ , but not significant among Shammah user with  $p$  value 0.213 (Table 4).

Regarding the association between dental caries and brushing of teeth and smoking, the frequency and percentages were not significant. However, we did detect an association between

Meswake use and dental caries  $p < 0.001$ . Among subjects with periodontal disease, it was significant among groups using toothbrushes  $p < 0.001$ , but not significant among Meswake or smoking subjects. The orthodontic reasons for teeth extractions were very significant among the risk factors parameters  $p < 0.001$  for khat chewing, Shammah user, brushing and Meswake user and smokers patients (Table 4).

Graphs 1 and 2 show that the maxillary third molar was the most frequently extracted tooth in maxillary arch right, 83; 14.3% and left, 72; 12.4%. The first molar was the highest in the

**Table 3:** Association between gender and cause of tooth loss

Factor/gender	Male	Female	<i>p</i> value
Caries	74 (26.6%)	191 (63.2%)	0.000*
PD	95 (34.2%)	57 (18.9%)	0.000*
Orthodontic	18 (6.5%)	47 (15.6%)	0.000*
Iatrogenic	18 (6.5%)	10 (3.3%)	0.057
Failure RCT	9 (3.2%)	18 (6.0%)	0.086
Trauma	9 (3.2%)	9 (3.0%)	0.532
PA lesion	0 (0.0%)	18 (6.0%)	0.000*
I do not know	0 (0.0%)	18 (6.0%)	0.135

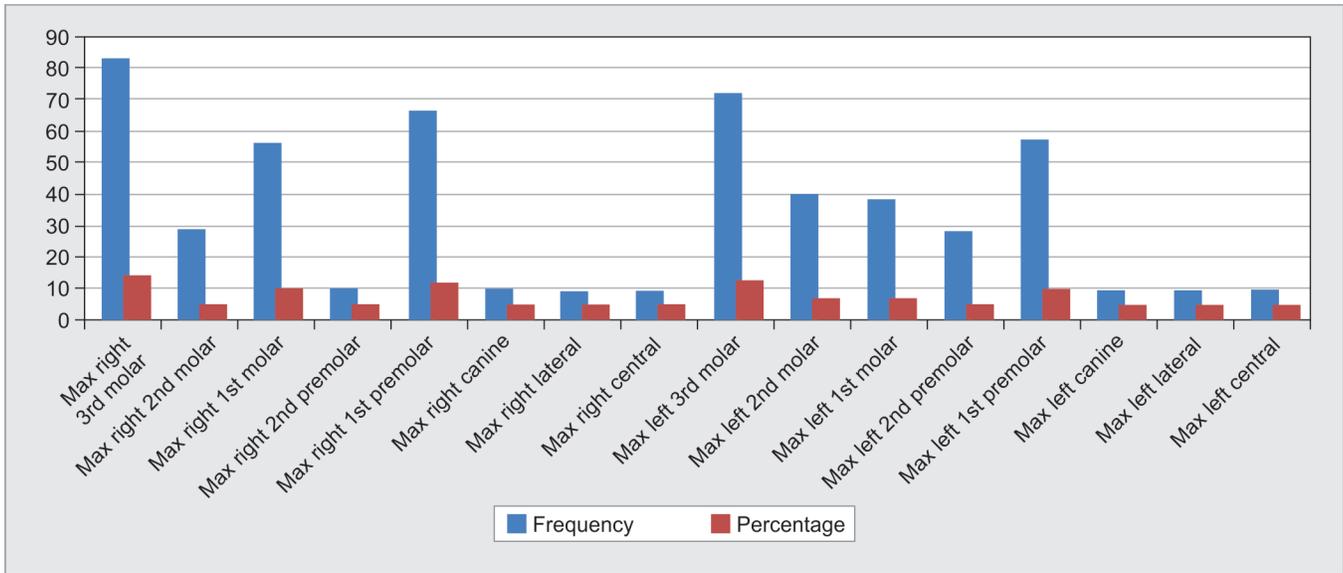
**Table 4:** Association between social habits, risk factors, and causes of tooth loss

Factor	Khat chewing		<i>p</i> value	Shammah using		<i>p</i> value	Brushing		<i>p</i> value	Meswake using		<i>p</i> value	Smoking habit		<i>p</i> value
	Yes	No		Yes	No		Yes	NO							
Caries yes	130 (42.3%)	135 (49.5%)	0.051	9 (19.1%)	256 (48.0%)	0.000*	101 (39.5%)	164 (50.6%)	0.005	9 (14.8%)	256 (49.3%)	0.000*	179 (48.8%)	86 (40.4%)	0.031
Caries no	177 (57.7%)	138 (50.5%)		38 (80.9%)	277 (53%)		155 (60.5%)	160 (49.4%)		52 (85.2%)	263 (50.7%)		188 (51.2%)	127 (59.6%)	
PD yes	123 (40.1%)	29 (10.6%)	0.000*	38 (80.9%)	114 (21.4%)	0.000*	19 (7.4%)	133 (41.0%)	0.000*	27 (44.3%)	129 (24.1%)	0.001	103 (28.1%)	49 (23.0%)	0.107
PD no	184 (59.9%)	244 (89.4%)		9 (19.1%)	419 (78.6%)		237 (92.6%)	141 (51%)		34 (55.7%)	394 (75.9%)		264 (71.9%)	184 (77%)	
Ortho yes	0 (0.0%)	65 (23.8%)	0.000*	0 (0.0%)	65 (12.2%)	0.003	56 (21.9%)	9 (2.8%)	0.000*	0 (0.0%)	65 (12.5%)	0.000*	24 (6.5%)	41 (19.2%)	0.000*
Ortho no	307 (100%)	308 (76.2)		47 (100%)	468 (87.8%)		200 (78.1%)	268 (97.2%)		61 (100%)	454 (87.5%)		343 (93.5%)	172 (80.8%)	
Iatrogenic yes	9 (2.9%)	19 (7.0%)	0.019*	0 (0.0%)	28 (5.4%)	0.088	18 (7.0%)	10 (3.1%)	0.023	9 (14.8%)	19 (3.7%)	0.001	26 (7.1%)	2 (0.9%)	0.000*
Iatrogenic no	298 (97.1%)	254 (93%)		47 (100%)	505 (94.7%)		238 (93%)	314 (96.9%)		52 (85.6%)	500 (96.3%)		341 (92.9%)	211 (99.1%)	
Failure RCT yes	9 (2.9%)	18 (6.6%)	0.029*	0 (0.0%)	27 (5.1%)	0.097	18 (7.0%)	9 (2.8%)	0.013	0 (0.0%)	27 (5.2%)	0.046	17 (4.6%)	10 (4.7%)	0.561
Failure RCT no	298 (97.1%)	255 (93.4%)		47 (100%)	506 (94.9%)		238 (93%)	315 (97.2%)		61 (100%)	492 (94.8%)		350 (95.4%)	203 (95.3%)	
Trauma yes	18 (5.9%)	0 (0.0%)	0.000*	9 (19.1%)	9 (1.7%)	0.000*	0 (0.0%)	18 (5.6%)	0.000*	9 (14.8%)	9 (1.7%)	0.000*	18 (4.9%)	0 (0.0%)	0.000*
Trauma no	289 (94.1%)	273 (100%)		38 (80.1%)	524 (98.3%)		256 (100)	306 (94.4%)		52 (85.2%)	510 (98.3%)		349 (95.1%)	213 (100%)	
P A lesion yes	0 (0.0%)	18 (6.6%)	0.000*	0 (0.0%)	18 (3.4%)	0.213	17 (6.6%)	1 (0.3%)	0.000*	0 (0.0%)	18 (3.5%)	0.131	3 (0.8%)	15 (7.0%)	0.000*
P A lesion no	307 (100%)	255 (93.4%)		47 (100%)	515 (96.6%)		239 (93.4%)	323 (99.7%)		61 (100%)	511 (96.5%)		364 (99.2%)	198 (93%)	
I do not know yes	18 (5.9%)	0 (0.0%)	.000*	9 (19.1%)	9 (1.7%)	0.000*	9 (3.5%)	9 (2.8%)	0.392	9 (14.8%)	9 (1.7%)	0.000*	18 (4.9%)	0 (0.0%)	0.000*
I do not know no	289 (94.1%)	273 (100%)		38 (80.1%)	524 (98.3%)		247 (96.5%)	315 (97.2%)		52 (85.2%)	510 (98.3%)		349 (95.1%)	213 (100%)	

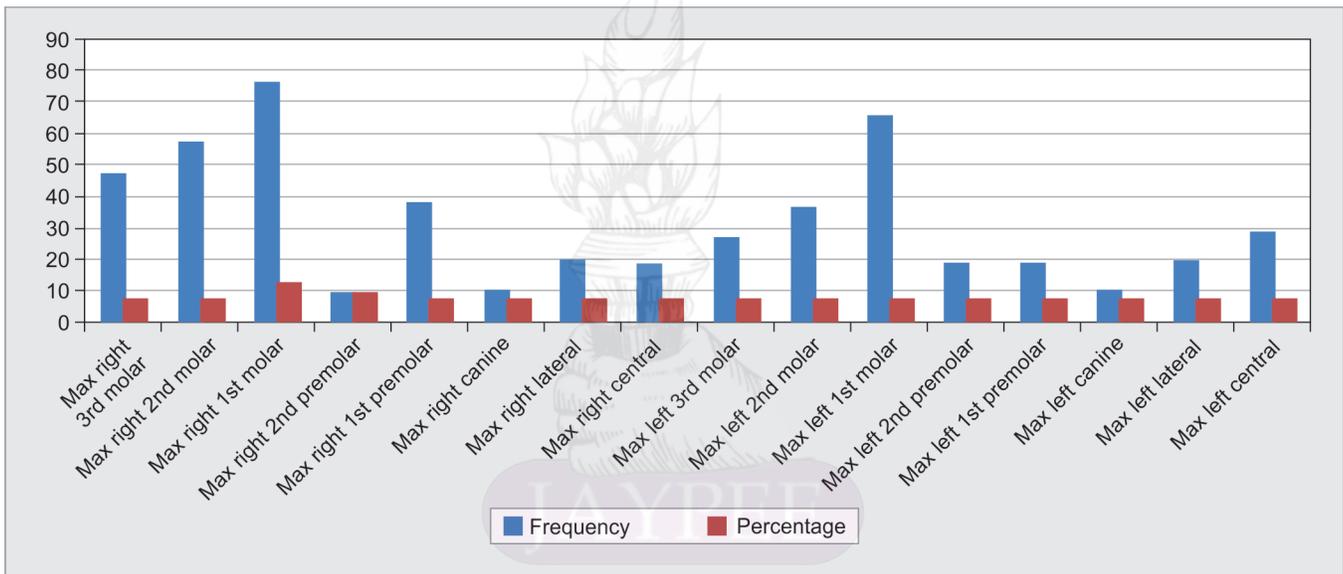
\*Significant differences  $p < 0.001$ .

Extractions for orthodontic reasons were mainly in the 15–24-year-old group. The other parameters of tooth extraction causes, such as iatrogenic, failure of RCT, trauma, and PA lesions, were recorded in the young age groups but their prevalence shows no significant difference.





Graph 1: Maxillary descriptive of the site of tooth loss



Graph 2: Mandibular descriptive of the site of tooth loss

mandibular arch right 77; 13.3% and left 66; 11.4%. On the left side of both arches (the usual site of khat chewing), the highest was the third molar (120; 20.7%, followed by the first molar 115; 19.9%. The maxillary first premolars, right 66; 11.4% and left 57; 9.8% were extracted more often than from the mandibular. Maxillary and mandibular anterior teeth and canines were the least extracted teeth and ranged from 9; 1.6% in maxillary teeth and 9–29; 1.6–5% in the mandibular teeth.

## DISCUSSION

Taiz city is the capital of Taiz Governorate, which is the most densely populated governorates of Yemen. It is inhabited by about 13% of the population of the country. It is located about 90 km from the port city of Mocha on the Red Sea and 256 km south of the capital of Yemen "Sana'a". Tooth extraction is a common daily surgical procedure. Here we investigated the reasons for teeth loss and its

relationships with age, gender, and location in the arch. Also, we aimed to recognize any associations between causes of tooth loss and several habits namely; khat chewing, Shammah using, smoking, teeth brushing and the use of Miswak.

A single study has investigated the prevalence of dental caries in Taiz and Yemen in general.<sup>36</sup> We found that caries was the main cause of teeth loss in 43% and 65.4% of 15–24 and 25–34-year-olds (Table 2). These findings are in line with previous studies conducted in neighboring Jazan of Saudi Arabia Al Moaleem et al.<sup>16</sup> 30.1% and other cities<sup>4,5</sup> in SA Riyadh and Al-Madinah Al-Munawarah 50.2%, and 63.4%, respectively. Other studies reported similar results, with caries being responsible for most of the extractions, with proportions ranging from 39.2% to 85.3%, Anand and Kuriakose, Nasreen and Haq, Jafarian and Etebarian, Anyanechi and Chukwunke, Kashif et al., Haseeb et al., Yousaf et al., Lee et al., Montandon et al., Al-Shammari et al., Sayegh et al., Baqain et al., Chrysanthakopoulos, Sahibzada et al., Kaira et al.<sup>6-14,18-23</sup>



while most of the extractions of maxillary first premolars were for orthodontic treatment.

There are strong associations between tooth loss and khat chewing and Shammah use. Risk factors (using toothbrushes, Meswake, and smoking) altered the incidence of tooth extraction but statistical significance was lacking for tooth brushing and smoking. Further clinical trials and longitudinal studies should be conducted to confirm the findings reported here.

## ACKNOWLEDGMENT

Authors want to thank Ms. Ahmed for her great support during collection of the questioner at Al Saeed University, Taiz, Yemen.

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