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Toombak and Other Risk Factors Associated with Dental Caries Among Adult Males in Dawan Valley, Yemen

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ABSTRACT

Objective: This study aimed to determine the association between toombak use and other factors associated with the occurrence of coronal and root caries.

Materials and methods: This cross-sectional study included 346 adult males aged 18 years old to 68 years old. The toombak status, sociodemographic characteristics, oral hygiene practices, and habit of eating between meals were surveyed with a structured interview questionnaire. The occurrence of dental caries was recorded according to the criteria set by the World Health Organization. Logistic regression analysis was used to identify factors associated with coronal and root caries, respectively.

Results: The factors associated with coronal caries were low family income (adjusted odds ratio (AOR)=6.13; 95% confidence interval (CI)=3.72, 10.11; p=0.001) and eating between meals (AOR=4.59; 95% CI=2.45, 8.64; p=0.001). The factors associated with root caries were current toombak use (AOR=12.36; 95% CI=6.28, 24.33; p=0.001) and lower educational attainment (AOR=0.26, 95% CI=0.13, 0.55; p=0.001).

Conclusion: Results revealed the high association between root caries and toombak use. Therefore, the development of comprehensive prevention programs against toombak use is an urgent need in Yemen.

INTRODUCTION

Toombak is a traditional form of smokeless tobacco that is commonly used in Dawan Valley in Yemen. This commodity is made of sun-dried powdered tobacco leaves mixed with ash ^[1]. Toombak is inexpensive and typically sold in small bags. The Yemeni toombak differs in composition from the Sudanese toombak. The Sudanese toombak is made of fermented ground tobacco mixed with sodium carbonate ^[2]. Similar to other types of smokeless tobacco, toombak is usually placed in the buccal lower or labial vestibules of the oral cavity ^[3].

Smokeless tobacco use may be considered as predisposing risk factor for several oral diseases, such as oral leukoplakia-like lesions ^[4], periodontal disease ^[4], and dental caries ^[5].

Dental caries is one of the most common preventable diseases. This condition is reversible in its early stages and is recognized as the primary cause of oral pain and tooth loss ^[6]. Caries refers to the localized destruction of susceptible dental hard tissues by acidic by-products from the bacterial fermentation of dietary carbohydrates ^[6]. This chronic disease progresses slowly in most people and can be seen as smooth, pitted, and fissured surfaces of the crown and root of a tooth.

Dental caries affects the vast majority of adults and 60% to 90% of children^[7]. Most Yemeni studies have been conducted on school children, and only a few studies in adults have been published. Al-Haddad et al.^[8] reported that dental caries was observed in 198 (49.5%) of 400 school children in Yemen, including 51.5% males and 48.5% females.

Dental caries is a progressive infectious process with a multifactorial etiology^[9]. Certain factors, such as age, oral hygiene practices, eating habits, and smokeless tobacco habits, must coexist for dental caries to develop^[10-14].

The negative effects of different smokeless tobacco products on oral health have been previously reported^[15]. However, the number of published studies that reveal the association between toombak use and coronal and root caries is limited among adults in Yemen. The present study was undertaken to evaluate the association between toombak use and other risk factors associated with coronal and root caries among adult males in Dawan Valley, Yemen.

MATERIALS AND METHODS

Study design and area

A cross-sectional study was conducted from June to November in 2014 among adult males in Dawan Valley. Dawan Valley is a district of the Hadhramaut Province, which is located in the eastern part of the Republic of Yemen along the Arabian Sea coast.

Inclusion and exclusion criteria

Yemeni adult males aged 18 years old to 68 years old who lived in Dawan Valley were included in the study. Smokers and Khat leaf chewers were excluded.

Sampling method

A multistage random sampling technique was used to select the study location. According to the list of the people's committee in Dawan Valley, a simple random sampling approach was employed to select participants for this study.

Data collection

Prior to data collection, a calibration exercise was performed to diagnose the coronal and root caries of 20 toombak users. The kappa scores of the raters were 0.91 ($p < 0.001$; 95% CI=0.74, 1.08) and 0.82 ($p < 0.001$; 95% CI=0.60, 1.03) for coronal and root caries, respectively.

The interview questionnaire was structured to incorporate the sociodemographic characteristics (age, family income, and education level), oral hygiene practices (daily tooth brushing and dental visits), dietary habit (eating between meals), and toombak use status (nonuser and current toombak user). The status of toombak use was defined as follows: non users were the respondents who have never consumed toombak, whereas current toombak users have been consuming toombak on a daily or occasional basis within the past one year.

The diagnosis of dental caries was based on the World Health Organization criteria^[16]. Dental caries was defined as cavitated lesions detected up on visual observation. The prevalence of root and coronal caries was considered the percentage of participants presenting these lesions. Dental caries examination was performed on a dental chair with mouth mirrors and dental probes under an attached dental light. All the participants were examined by one dentist and an assistant entered the recordings into a form.

Data analysis

The Statistical Package for Social Sciences (SPSS, version 20.0; IBM, Chicago, IL, USA) was used for data entry and analysis. The descriptive analysis was presented as frequencies with percentage (%) for categorical variables. Simple and multiple logistic regression analyses were used to assess the dependent variable (dental caries: presence/absence) and the independent variables or covariates of the study.

Ethical approval

All of the participants provided written informed consent before they were enrolled in this study. This study was approved by the Dawan branch of the Ministry of Health and Population in Yemen.

RESULTS

Table 1 shows that, among all of the participants of this study, 278 (80.3%) have never used toombak and 68 (19.7%) are currently toombak users. Among the total number of participants, 135 males (39.0%) had coronal caries and 76 males (22.0%) had root caries. **Table 1** also shows the distribution of participants by age, family income, and education level. In particular, 226 participants (65.3%) were aged ≥ 30 years and 120 participants (34.7%) were aged 18 years to 29 years. Meanwhile, the family income distribution indicated that 55.8% of the participants received more than 20,000 Yemeni Rial (YER) per month, whereas 44.2% of the participants received 20,000 YER per month or less. Among the total number of participants, 24.0% had higher educational attainment, whereas 76.0% had lower educational attainment.

Table 1. Descriptive characteristics of all participants (n= 346).

Variable	Frequency (%)
Toombak status	
Current toombak user	68 (19.7)
Never toombak user	278 (80.3)
Dental caries	
Coronal caries	
Yes	135 (39.0)
No	211 (61.0)
Root caries	
Yes	76 (22.0)
No	270 (78.0)
Socio-demographic characteristics	
Age in years	
18-29	120 (34.7)
≥ 30	226 (65.3)
Family income (Monthly)	
YER More than 20,000	193 (55.8)
YER 20,000 or less	153 (44.2)
Educational level	
High	83 (24.0)
Low	263 (76.0)
Oral hygiene practice	
Tooth brushing/day	
Once or more	131 (37.9)
Never or when necessary	215 (62.1)
Dental attendance	
Regularly or occasionally	49 (14.2)
Never or when necessary	297 (85.8)
Dietary habit	
Between-meals eating habit	
Yes	243 (72.2)
No	103 (29.8)

In terms of the oral hygiene practices, **Table 1** shows the distribution of the participants by their daily tooth brushing and dental visits. In particular, the majority of the participants (62.1%) do not brush their teeth or only do so when necessary, whereas 37.9% brush their teeth once or more than once a day. Moreover, the majority of the participants (85.8%) have never visited the dentist or only do so when necessary, whereas only 14.2% regularly or occasionally go to their dentist. With regard to their dietary habit, the majority of the participants (72.2%) consume food between meals, whereas 29.8% do not.

Table 2 displays the significant factors associated with coronal and root caries according to the univariable analysis. The significant factors associated with coronal caries are current toombak users, lower family income, lower educational attainment, tooth brushing per day (never or when necessary), dental visits (never or when necessary), and eating between meals. The significant factors associated with root caries are current toombak users, age (≥ 30 years), lower educational attainment, and eating between meals.

Table 2. Factors associated with dental caries among adult males in Dawan valley from simple logistic regression (n=346).

Variable	Coronal caries	P- value ^a	Root caries	P- value ^a
	COR ^a (95% CI)		COR ^a (95% CI)	
Toombak status				
Never toombak user	1.00		1.00	
Current toombak user	1.99 (1.24, 3.21)	0.004*	7.54 (4.32, 13.18)	0.001*
Socio-demographic characteristics				
Age in years				
18-29	1.00		1.00	
≥ 30	0.84 (0.53, 1.32)	0.462	1.39 (0.80, 2.44)	0.236*
Family income (Monthly)				
YER More than 20,000	1.00		1.00	

YER 20,000 or less	0.15 (0.09,0.24)	0.001*	0.78 (0.46, 1.31)	0.346
Educational level				
High	1.00		1.00	
Low	1.79 (1.05, 3.06)	0.032*	0.72 (0.40, 1.27)	0.240*
Oral hygiene practice				
Tooth brushing/day				
Once or more	1.00		1.00	
Never	2.39 (1.49, 3.82)	0.001*	0.74 (0.44, 1.25)	0.259
Dental attendance				
Regularly or occasionally	1.00		1.00	
Never	1.93 (0.98, 3.79)	0.056*	0.97 (0.47, 1.99)	0.930
Dietary habit				
Between-meals eating habit				
No	1.00		1.00	
Yes	5.22 (2.89, 9.40)	0.001*	1.61 (0.86, 3.01)	0.136*
ªSimple logistic regression				
* Only independent variables with P-values of less than 0.25 were reported from the conducted simple logistic regression.				

Table 3 presents the results of multivariable logistic regression analysis for coronal and root caries versus the associated factors of these diseases. This table shows a significant association between coronal caries and lower family income. Participants with lower family income are 6.13 times more likely to develop coronal caries than participants with higher family income. Moreover, participants who consume food between meals are 4.59 times more likely to develop coronal caries than participants who do not. With regard to the factors associated with root caries in multivariable logistic regression analysis, **Table 3** shows that the participants who had higher educational attainment were 0.26 times more likely to develop root caries than the participants who had lower educational attainment. Meanwhile, the participants who currently use toombak were 12.36 times more likely to have root caries than those who have never used it.

Table 3. Factors associated with dental caries among adult males in Dawan valley from multiple logistic regression (n=346).

Variable	Coronal caries	P- value [†]	Root caries	P- value [†]
	AOR [†] (95% CI)		AOR [†] (95% CI)	
Socio-demographic characteristics				
Family income (Monthly)				
YER More than 20,000	1.00		1.00	
YER 20,000 or less	6.13 (3.72, 10.11)	0.001	–	–
Educational level				
High	1.00		1.00	
Low	–	–	0.26 (0.13, 0.55)	0.001
Dietary habit				
Between meals eating habit				
No	1.00		1.00	
Yes	4.59 (2.45, 8.64)	0.001	–	–
Toombak status				
Never toombak user	1.00		1.00	
Current toombak user	–	–	12.36 (6.28, 24.33)	0.001
ªMultiple logistic regression				
Backward step wise LR multiple logistic regression was applied				
Multicolinearity and interaction term were checked and did not found. For coronal caries: Hosmer-Lemeshow test, (P=0.073), classification table (overall correctly classified percentage (73.1%) and area under Receiver Operating Characteristics (ROC) curve (77.8%) were checked the fit of the model and reported to be fit.				
For root caries: Hosmer-Lemeshow test, (P=0.157), classification table (overall correctly classified percentage (77.2%) and area under Receiver Operating Characteristics (ROC) curve (78.9%) were checked the fit of the model and reported to be fit.				

DISCUSSION

Dental caries and periodontal diseases are the major oral health problems and indicators of oral health burden worldwide [17]. Generally, the prevalence of dental caries is decreasing in developed countries, whereas its prevalence is increasing in under-developed and developing countries [18]. These diseases are serious threats to the prevention of oral diseases in developed and developing countries, particularly Yemen. Data on the risk factors associated with dental caries, particularly toombak use, are highly limited in Yemen.

A higher prevalence of coronal caries (68.8%) was recorded by Sugihara et al. ^[19] as compared with our study (39.0%). Given the prevalence of root caries, their group indicated that the prevalence of root caries was 24.1% ^[19], which is compatible with our study results (22.0%). However, these values are higher than the levels (96.5%) reported by Islas-Granillo et al. ^[20]. This discrepancy may be explained by the differences between study age groups.

The results of multiple logistic regression analysis revealed that toombak use is a factor that influences the development of root caries, but not coronal caries, after adjusting the sociodemographic characteristics, oral hygiene practices, and dietary habit factors. Current toombak users are at greater risk of developing root caries than non-users. A possible contributing mechanism in the development of root caries among toombak user's results in loss of keratinized gingival and root surface will be exposed at the site where toombak held causing gingival recession and bone loss. The exposed root surface caused by the loss of cementum and some dentin are at increased risk to develop caries ^[21]. Our findings are similar to that of Bharateesh and Kokila ^[22], who reported a significant association between root caries and smokeless tobacco use.

Low family income was a significant predisposing factor for coronal dental caries after adjusting for other variables. This result is similar to that of Moimaz et al. ^[23], who documented a close link between coronal dental caries and low family income.

The present study considered the relationship between the habit of eating between meals and the occurrence of dental caries. The habit of eating between meals was present in a high percentage (72.2%) of adult males in this study. The results show that caries is more common in adult males who ate between meals than in adults who did not. This finding is consistent with that of Krzywiec et al. ^[24], who reported that eating between meals can be a significant caries coefficient. Moreover, Islas-Granillo et al. ^[20] supported the confounding effects of lower educational attainment on root caries development. Similarly, the current study highlights the association between lower educational attainment and the development of root caries.

CONCLUSION

Based on the study findings, coronal caries was significantly associated with low family income category and eating habit between meals; whereas root caries was significantly associated with toombak use and low level of education. Although we were not able to find statistical associations between coronal caries and toombak use, the high association between root caries and toombak is alarming. The findings of the current study highlighted the need to develop comprehensive toombak prevention programs and reduce root caries and other toombak-associated diseases.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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