

Tooth Loss and Its Association With Frequency of Pregnancy: A Cross-Sectional Study Among Yemeni Women

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Abstract

Backgrounds: The present study sought to assess tooth loss and oral hygiene practices among a sample of Yemeni women in association with giving births (parity).

Subjects and Methods: This cross-sectional study included a sample of 644 Yemeni women. They were interviewed to gather socio-demographic (age, education, number of children) and behavioral data (oral hygiene practices, khat chewing and smoking). Additionally, they were examined clinically to assess number of tooth loss. Data were analyzed using SPSS with a P-value < 0.05 was considered statistically significant.

Results: The participating women aged between 16 and 51 years. Only one fifth of the sample reported brushing their teeth regularly (i.e, at least once a day), and around 36.8% reported using dental aids occasionally. Additionally, 52% and 21% of the sample reported they were khat chewers and smokers, respectively. The mean number of tooth loss was 4.7. The mean number of children was 4.15, with approximately 54% of the participating women had more than 3 children. The results of the logistic regression revealed a significant association between number of children and tooth loss.

Conclusion: Yemeni women had poor oral hygiene practices and high prevalence of tooth loss increased proportionally with the increased number of children. This emphasizes the importance of an effective oral hygiene motivation and health education among female patients during pregnancy periods.

Introduction

Dental diseases are amongst the most prevalent health issues worldwide (1). In particular, the tooth loss is a significant health burden that gravely impacts the patients' quality of life(2). Tooth loss is considered a marker of both periodontal disease and dental caries, though teeth can be lost due to other reasons such as trauma(3). The former, periodontal disease, is a very common chronic condition affecting a considerable proportion of the adult population worldwide(4). It is characterized by progressive inflammatory destruction of tooth-supporting structures in response to dental biofilm(5, 6). If untreated, periodontal disease may progress, destroying soft and hard tissues surrounding the tooth, causing attachment loss, tooth mobility and eventually tooth loss and edentulism (4, 7). The current evidence suggests that periodontal disease/tooth loss is a risk factor for several systemic diseases such as rheumatoid arthritis, atherosclerosis, respiratory diseases, and non-alcoholic fatty liver disease(8–12). it is recognized that dental plaque (biofilm) is the main causative agent for periodontal diseases(6). However, a plethora of factors including poor oral hygiene, tobacco use, alcohol consumption, advanced age, low socioeconomic status, stress, and systemic conditions such as diabetes mellitus, obesity, and osteoporosis, and pregnancy have been reported to increase the risk and severity of periodontitis(13–18).

Pregnancy, a physiological phenomenon, has been reported as a risk factor for oral diseases including periodontitis (19–22). It is associated with several hormonal changes that alter the gingival response to dental plaque, thus increasing its susceptibility to gingival inflammation and periodontal diseases (20, 22,

23). Several studies have reported greater gingival inflammation during pregnancy (19, 21, 22) and other studies reported a positive association between number of giving births and tooth loss (24–26).

In Yemen, the prevalence of dental diseases such as periodontitis, dental caries and tooth loss is amongst the highest in the world (16, 27, 28). This might be ascribed to the poor socioeconomic status, high prevalence of tobacco use and chewing habits, and limited human resources (16, 29–31). In fact, however, the studies on periodontal health status among Yemeni populations -especially among women- are very scarce, and mostly limited to the assessment of oral diseases among males in relation to local oral habits, namely smokeless tobacco and qat chewing (16, 27, 28, 31, 32). Although the fertility rate in Yemen is considered among the highest in the world, no any attempt has been made to assess the relationship between frequency of pregnancy and oral health status among Yemeni women. Availability of such information is very important for planning public health prevention and promotion programs. Hence, the present study sought to: 1) assess oral health status (using tooth loss as a proxy indicator) of Yemeni women, and 2) determine the relationship between tooth loss and frequency of pregnancy/giving birth among Yemeni women.

Subjects And Methods

This study was of an observational cross-sectional design. The study protocol was reviewed and approved by the research ethical committee at the University of Science and Technology (UST), Sanaa, Yemen (No: EAC/UST179). The target population was women who attended the dental clinics, College of Dentistry, UST, Sana'a, Yemen. The study was conducted during the 2018–2019 academic year: from November 2018 to April 2019. The sample size was calculated using version 3.01 of OpenEpi software for epidemiologic statistics (Bill and Melinda Gates Foundation, Emory University, Atlanta, Georgia, USA); the required sample size for 95% confidence level and power of 80%, was 424 subjects

Women were included if they aged above 16 years and had a previous history of pregnancy. Women who were medically compromised, had extraction because of previous orthodontic treatment or were out of the said age range were excluded.

The participants were informed about the study aims and procedures and asked to provide their consent-to-participate anonymously. The participant's sheet comprised questions related to age, education, qat chewing, smoking, oral hygiene practices, and oral hygiene aids. The sheet included also items about frequency of pregnancy along with the number of children as to take account for the chance of premature birth.

The number of missing teeth was evaluated by two well-trained dentists using a sterile dental examination kit under artificial light of the dental chair.

Intra- and inter-examiner agreements were conducted on fifty cases in two different occasions with a week interval. Kappa statistic revealed a perfect intra-examiner agreement (1) and a high level of inter-examiner reliability (0.9).

The analysis of the collected data was carried out using the SPSS statistical package (IBM SPSS Statistics for Windows, Version 20.0, Released 2011, IBM Corp, Armonk, New York, USA). The demographics and other characteristics of study population were presented as frequency with proportion and mean with standard deviation, as appropriate. The bivariate analyses were done using independent t-test or ANOVA to identify any potential differences in the mean number of missing teeth between two or more different subgroups, respectively. Spearman's correlation analysis was applied in order to identify any correlations between number of "missing teeth" and "number of children/frequency of pregnancy/interval of pregnancy." A logistic regression analysis was conducted to determine the independent determinants of tooth loss among study population while adjusting for the potential confounding factors. The outcome variable was "number of missing teeth", and level of education, oral health practices including frequency of tooth brushing and using interdental aids, gum bleeding, periodontal treatment, number of children, interval between pregnancy were considered as independent variables (determinants). Odd ratios (ORs) and their 95% confidence intervals (CIs) were calculated, and the significance level was set at $P < 0.05$.

Results

In total, 644 women (age range: 16–51 years) participated in the present study; most of the participants aged between 30–40 years (288, 44.7%), 28.9% were older than 40 years, and 26.4% were less than 30 years old. Around 46.2% were illiterate, 40.7% got high school education, and only 13.2% got University education. Only one fifth of the sample reported brushing their teeth regularly (i.e, at least once a day), and around 36.8% reported occasionally using one type of oral hygiene aids. Additionally, 52% and 21% of the sample were qat chewers and smokers, respectively. The mean number of children was 4.15, with 53.6% of the participating women having more than 3 children (Table 1).

Table 1
Demographics and general characteristics of the study sample

		N	%
Age	Less than 30 years	170	26.4%
	30–40 years	288	44.7%
	More than 40 years	186	28.9%
Level of education	Illiterate	297	46.2%
	High school	262	40.7%
	University	85	13.2%
Frequency of tooth brushing	Never	178	27.8%
	1 time per week	294	45.7%
	2 or 3 times per week	41	6.4%
	At least once daily	130	20.1%
Oral hygiene aids	None	407	63.2%
	Dental floss	49	7.6%
	Interdental brush	115	17.9%
	Mouthwash	73	11.3%
Gum bleeding when brushing	No	72	11.1%
	Yes	394	61.2%
Previous periodontal treatment	No	422	65.5%
	Yes	222	34.5%
Smoking	No	495	76.9%
	Yes	149	23.1%
Qat chewing	No	309	48.0%
	Yes	335	52.0%
Number of children	<= 3 children	299	46.4%
	> 3 children	345	53.6%
Interval of pregnancy	<= 4 years	556	86.3%
	> 4 years	88	13.7%

The mean number of missing teeth among the sample was 4.7. As presented in Table 2 and 3, the bivariate analysis results showed a statistically significant association between mean number of missing teeth and age, level of education, frequency of tooth brushing, oral hygiene aids type, bleeding on brushing, number of children and interval between pregnancy.

Table 2
Bivariate analysis of missing teeth (mean number of missed teeth) by independent factors

Variable		missing teeth	P- value
		Mean ± SD	
Age	Less than 30 years old	2.74 ± 1.2	0.000*
	30–40 years	3.68 ± 2.7	
	More than 40 years	7.80 ± 7.3	
Level of education	Illiterate	6.55 ± 6.6	0.000*
	High school	3.36 ± 2.1	
	University	2.89 ± 1.6	
Frequency of tooth brushing	Never	6.72 ± 7.4	0.000*
	1 time per week	4.15 ± 3.4	
	2 or 3 times per week	3.24 ± 1.9	
	At least once daily	3.04 ± 1.65	
Oral hygiene aids	None	4.86 ± 5.4	0.001*
	Dental floss	2.92 ± 1.4	
	Interdental brush	5.14 ± 4.4	
	Mouthwash	3.63 ± 2.9	
Gum bleeding when brushing	No	5.50 ± 6.2	0.000†
	Yes	4.06 ± 3.5	
Previous periodontal treatment	No	5.01 ± 5.4	0.074
	Yes	3.87 ± 3.5	
Smoking	No	4.82 ± 5.1	0.055
	Yes	3.95 ± 3.8	
Qat chewing	No	4.97 ± 5.3	0.132
	Yes	4.30 ± 4.2	
Number of children	<= 3 children	3.08 ± 2.7	0.000†

*Kruskal-Wallis test

†Mann Whitney test

	> 3 children	5.95 ± 5.8	
Interval between pregnancy	<= 4 years	4.88 ± 5.1	0.000†
	> 4 years	2.95 ± 1.5	
*Kruskal-Wallis test			
†Mann Whitney test			

Table 3
Bivariate analysis of the association between number of missing teeth and independent factors.

Variable	Missing teeth						<i>P-value</i>	
	<= or 5		6–10		> 10			
	F	%	F	%	F	%		
Age	Less than 30 years old	160	32.0%	10	10.4%	0	0.0%	0.000*
	30–40 years	243	48.6%	37	38.5%	8	16.7%	
	More than 40 years	97	19.4%	49	51.0%	40	83.3%	
Level of education	Illiterate	194	38.8%	59	61.4%	44	91.7%	0.000*
	High school	227	45.4%	31	32.3%	4	8.3%	
	University	79	15.8%	6	6.2%	0	0.0%	
Frequency of tooth brushing	Never	115	23.0%	33	34.4%	30	63.8%	0.000*
	1 time per week	231	46.2%	49	51.0%	14	29.8%	
	2 or 3 times per week	37	7.4%	2.1%	2	4.3%		
	At least once daily	117	23.4%	12	12.5%	2.1%		
Oral hygiene aids	None	313	62.6%	59	61.5%	35	72.9%	0.009*
	Dental floss	46	9.2%	3.1%	0	0.0%		
	Interdental brush	79	15.8%	26	27.1%	10	20.8%	
	Mouthwash	62	12.4%	8	8.3%	3	6.2%	
Gum bleeding when brushing	No	184	36.8%	37	38.5%	29	60.4%	0.006†
	Yes	316	63.2%	59	61.5%	19	39.6%	
Previous periodontal treatment	No	314	62.8%	70	72.9%	38	79.2%	0.019†
	Yes	186	37.2%	26	27.1%	10	20.8%	
Smoking	No	375	75.0%	79	82.3%	41	85.4%	0.103

*Kruskal-Wallis test

†Mann Whitney test

	Yes	125	25.0%	17	17.7%	7	14.6%	
Qat chewing	No	231	46.2%	52	54.2%	26	54.2%	0.241
	Yes	269	53.8%	44	45.8%	22	45.8%	
Number of children	<= 3 children	276	55.2%	19	19.8%	4	8.3%	0.000†
	> 3 children	224	44.8%	77	80.2%	44	91.7%	
Interval	<= 4 years	419	83.8%	89	92.7%	48	100.0%	0.001†
	> 4 years	81	16.2%	7	7.3%	0	0.0%	
*Kruskal-Wallis test								
†Mann Whitney test								

Table 4 illustrates the results of the logistic regression analysis which reveal the determinant factors for the number of missing teeth. The results showed that the number of children and age of participating women were the only independent determinants for number of missing teeth ($P < 0.01$).

Table 4
Logistic regression of the predictors factors of missing teeth.

	B	S.E.	P-value	Odds ratio	95% C.I.for OR	
					Lower	Upper
Education (ref: "Illiterate")						
High school	.926	.336	7.612	1	.006	2.525
University	.565	.331	2.914	1	.088	1.760
Interdental aids (ref: "None")						
Dental floss	.061	.302	.839	1.063	.589	1.920
Interdental brush	-.718-	.472	.128	.488	.194	1.229
Mouthwash	.352	.358	.326	1.422	.704	2.869
Gum bleeding (ref:"No")						
	-.254-	.193	.188	.776	.531	1.132
Periodontal treatment						
	-.012-	.198	.951	.988	.670	1.457
Medical history						
	.330	.299	.270	1.391	.774	2.500
Number of children						
	.769	.215	.000	2.157	1.416	3.286
Interval						
	-.309-	.304	.309	.734	.405	1.332
Age (ref: "Less than 30 years old")						
30–40 years	.563	.254	.027	1.756	1.067	2.889
More than 40 years	1.331	.293	.000	3.785	2.134	6.716
Frequency of tooth brushing (ref: "Never")						
1 time per week	.235	.229	.304	1.265	.808	1.981
2 or more times per week	.047	.269	.862	1.048	.618	1.777

Discussion

To the best of our knowledge, this is the first study that evaluated the oral health status and its relationship with frequency of pregnancy, giving birth and other independent variables among a sample of Yemeni women. We considered tooth loss as a proxy indicator of oral health (dependent variable). In fact, tooth loss is an ultimate marker of dental and periodontal diseases, though teeth can be lost due to other reasons such as trauma (3). Overall, the results showed a significant association between the number of children and number of tooth loss after controlling the other potential confounders. Additionally, the results revealed poor oral hygiene practices (only one fifth reported brushing their teeth regularly) as well as a high prevalence of oral habits namely qat chewing (52%) and smoking (23%), among Yemeni women.

The main result of the present study is a positive association between the number of children and tooth loss, a finding which is consistent with the results of many previous studies from other countries that reported a significant association between number of children and periodontal disease/tooth loss (20, 25, 26, 33–36). The positive association between these two phenomena could be explained by many biological mechanisms. The first plausible explanation is the increase of progesterone and estrogen hormones during pregnancy which lead to vascular permeability and minimal host modulation and thus increasing susceptibility to dental and periodontal infections (37). In addition, the limited access to dental health care owing to socioeconomic factors, especially in developing countries, could affect the oral health status; the effect of this factor magnifies with repeated pregnancy and giving births. Reports from the US indicate that more than 50% of pregnant women did not receive dental care during their recent pregnancy (37).

Another important finding of the present study is the lack of association between the number of missing teeth and both qat chewing and smoking habits. Qat chewing (also known as khat), a deeply rooted social habit in Yemen and some East African countries (38), has been reported to have several detrimental effects on oral and dental tissues including keratotic mucosal lesions, periodontitis, teeth attrition, and temporomandibular joint disorders (38–41). In contrast to our findings, most of the previous studies conducted on adult Yemeni males implicated qat chewing as a risk factor for periodontal signs/diseases including gingivitis, attachment loss, deep pockets and tooth loss (16, 29–31). With regard to smoking, the present study did not find a significant association with tooth loss, and this is consistent with a recent study conducted in Yemen (16), but contradicts other studies elsewhere that reported smoking as a significant risk factor for periodontal diseases and tooth loss (42). Such unexpected findings can be ascribed to the fact that the relationship between periodontal diseases and both qat chewing and smoking is dose-dependent response; that said, the relationship depends on many factors such as the duration of the habit practice (in years), duration per day (for qat chewing), and frequency of chewing/smoking (43).

Unfortunately, no detailed information was obtained about the intensity/duration of these habits although 53% and 23% reported qat chewing and smoking, respectively. Another possible explanation is the negative response given by Yemeni women regarding practicing these habits due to the delicacy of

this subject for cultural reasons. Thus, the real prevalence of these habits might have been underestimated.

Apart from the negative results of the present study, the deleterious effects of smoking and qat chewing on oral and systemic health have been well documented (38, 39). Hence, dental practitioners can play a pivotal role in reducing the deleterious effects of these habits. They have a commitment of educating their patients about the harmful consequences of such habits and providing them tobacco/qat cessation advice to help them quit the habits (44) .

The current study provides an insight on oral health status (using tooth loss as indicator) among a sample of Yemeni women and supports the association between the number of children and tooth loss. In line with the previous literature, the results of the present study found a significant positive association between tooth loss and advance age and low education level. However, the present study has several limitations that should be taken into consideration. These include the following: the nature of study design (being cross-sectional study), and hence the causality cannot be established; recall bias; and lack of reliable medical and dental records, or more accurate investigative tools to decrease the confounding factors such as systemic diseases.

In summary, the current study revealed poor oral hygiene practices and high prevalence of tooth loss among Yemeni women. Of utmost importance, the higher the number of children the Yemeni women have, the higher the number the tooth loss they have. This emphasizes the importance of an effective oral hygiene motivation and health education among Yemeni women at pregnancy periods. Further large-scale studies are also recommended.

Declarations

Consent to participate:

All participants anonymously accept in **informed consent** their participation age between 18-51 years, for those who their age 16-17 years or illiterate, their spouses or parents' gave their **informed consent** for acceptance and signature of confirmation to participate was taken after clarifying the aim of research and the main objectives

Guidelines and regulations :

All methods and research protocol carried out according to ethical and scientific guidelines and regulations.

Ethics approval :

The study protocol was reviewed and approved by the research ethical committee at the University of Science and Technology (UST), Sanaa, Yemen (No: EAC/UST179).

Availability of data and materials:

The materials and data supporting the results of the current study will be available upon request from the corresponding author "Anas Shamala" and in the supporting file immediately after obtaining acceptance for publication.

Consent for publication:

Not applicable

Author contribution:

Anas Shamala and Sadeq Ali Al-Maweri designed The present study and the main conceptual ideas, drafted the manuscript, provided critical feedback, helped shape the research, and supervising the diagnosis process. Ebtesam Al-Maimooni, Salsbeel Al-Matari, and Ryhana Hiyat carried out the investigation and diagnosis process and measurements that were under supervision, provided critical feedback and helped shape the research, and contributed to the final manuscript. Mohammed Al-wesabi and Esam Halboub carried out the program manipulation and measurements and discussed the results and contributed to the final manuscript. Mohammad Zakaria Nassani re-write the manuscript depending on the feedback and preparing it for publication and discussed the results and contributed to the final manuscript.

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Authors have no conflicts of interest to disclose.

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