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RESEARCH ARTICLE

PREVALENCE AND CAUSES OF TOOTH LOSS AMONG YEMENI PATIENTS VISITING THE DENTAL CLINIC AT AL-THAWRA HOSPITAL IN SANA'A CITY, YEMEN

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Abstract

Background and objectives: Tooth loss is still a major worldwide issue. In addition to examining potential correlations between tooth loss and various characteristics, including gender, age, educational attainment, and additional risk factors like diabetes, hypertension, khat chewing, and smoking behaviours, the current study sought to determine the causes of tooth extraction.
Subjects and Methods: The retrospective study reviewed 1,955 medical records of patients who had undergone at least one tooth extraction. Patient variables included sex, age, education level, hypertension, diabetes, khat use, and smoking
Results: Males constitute 55% and females 45% of the patient population. The predominant age groups are 18-22 years (30%). A significant majority (92%) have dental caries, primarily affecting 1-5 teeth (69%) and less frequently 6-10 teeth (27%). The decay rates are highest in upper molars (21%), lower molars (25%), and upper premolars (15%). About 13% of patients exhibit tooth mobility, mainly in lower central (26%) and lateral incisors (18%). Tooth loss is reported in 64% of patients, predominantly affecting 1-9 teeth (91%), with upper molars (26%) being the most lost, followed by lower molars (24%). The study identifies tooth decay as the primary cause of tooth loss (47%), followed by a combination of tooth decay and periodontal disease (38%) and periodontal disease alone (10%).
Conclusion: This study found that tooth loss was prevalent among participants, particularly involving upper molars. Key risk factors included advanced age (30+ years), male sex, and systemic diseases, with notably higher rates of tooth loss linked to dental caries and periodontal diseases.
Keywords: Causes of tooth loss, prevalence of tooth loss, Sana'a city, Yemen.

INTRODUCTION

The most prevalent dental issue in the world is still tooth loss[1]. Previous research on different locations have given the causes of tooth extraction and concluded that the primary causes of tooth loss are caries, periodontal disease, orthodontics, prosthodontic therapies, trauma, unstable teeth, endodontic problems, and root fractures[2-4]. Understanding the reasons behind tooth loss is essential for putting into practice reputable oral disease preventive strategies and oral health awareness campaigns.

Typically, dental caries is the primary cause of tooth loss in adults, according to the majority of research. Additionally, among patients in their late forties, periodontal disorders were the leading cause of tooth loss, and there was a strong correlation between periodontal disease and this age group[5].

On the other hand, it was observed that the most common reason for tooth extractions in patients aged 15 to 20 is endodontic and orthodontic treatment problems[2,6]. According to certain research, there is a correlation between gender and tooth loss, with men losing their teeth more frequently due to periodontal disorders and women losing more teeth due to dental caries[2,6]. Pre-prosthetic, root fracture, cosmetic, and poorly positioned reasons, for example, were found to have less of an effect on tooth loss than other causes[4,7].

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Promoting oral health outcomes requires an understanding of the reasons behind tooth extractions. Although there have been numerous studies in Yemen addressing various dental issues[8-11], there have been no prior studies in this area, with the exception of one study by Alhadi and others[3]. A significant number of cross-sectional studies have been carried out to examine tooth loss in various countries. Throughout the world, including Yemen, dental caries was the primary cause of tooth loss[12-16]. However, other research found that periodontal disease was responsible for a higher percentage of tooth extractions[17,18].

Yemen lacks sufficient data, and the necessary knowledge on this topic is desperately needed. It could be able to minimise future tooth extractions and highlight the need of prevention by identifying the primary causes and predictors of tooth loss. Thus, this study's goals were to look into the reasons behind tooth extractions and examine any connections that might exist between tooth loss and a number of characteristics, such as age, gender, and other risk factors including diabetes and hypertension.

MATERIALS AND METHODS

Study design: A cross-sectional study was used.

Study population: Adult patients aged (≥ 18 years) who attending outpatient dental clinics in Al-Thawra General public hospital, in Sana'a capital city.

Sample size: The Epi-info program was used to calculate the sample size with expected prevalence of 50% at 99% confidence interval. Sample size comes to be 1810. The sample was increased by 5% to 1900 to overcome for any refusal, so the sample comes to be 1900.

Inclusion criteria: All patients attending dental clinic in Al-Thawra General Public Hospital, aged 18 years and over.

Exclusion criteria:

Patients attending dental department in Al-Thawra General Public Hospital, aged <18 years.

Sampling methods:

All patients attending the dental clinic in Al-Thawra General Public Hospital who met the inclusion criteria.

Data collection technique:

By questionnaire and clinical examination. .

Ethical considerations:

Permission was obtained from the Faculty of Medicine at Sana'a University. Written consent was obtained from all participants who met the inclusion criteria. Patients were assured that their responses would be kept confidential and that the information would be used for research purposes only.

Statistical analysis

The Epi Info statistical tool version 6 (CDC, Atlanta, USA) was used to examine the data. Frequency and rates were used to express the quantitative data when it was regularly distributed (use percentages to describe the qualitative data).

RESULTS

In present study males make up 55%, while females make up 45%. Table 1 shows the age distribution of the study sample. Most patients were in the following age groups: 18-22 years (30%), 23-27 years (17%), and 28-32 years (22%), while older age groups were less common. The majority of patients (92%) suffered from dental caries.

Table 1: Distribution of the study population by age.

Age in years	N (%)
18-22	579 (30)
23-27	338 (17)
28-32	436 (22)
33-37	179 (9)
38-42	161 (8)
43-47	67 (4)
48 and more	195 (10)
Total	1955 (100)

Table 2: Distribution of the affected participants with dental caries by number of carious teeth.

No. of teeth	N (%)
1-5	1257 (69)
6-10	493 (27)
11-15	44 (2)
16-20	5 (1)
21-25	2 (1)
Total	1801 (100)

Table 2 shows the distribution of participants with dental caries according to the number of decayed teeth. Most patients had decay in 1-5 teeth (69%), followed by those with decay in 6-10 teeth (27%), while higher levels of decay were less common. Table 3 shows the distribution of decayed teeth by tooth type. The upper molars had the highest decay rate at 21%, followed by the upper premolars at 15%, then the lower molars at 25%, and finally the lower premolars at 17%. The lowest decay rate was in the lower central incisors at only 1%, and in the lower lateral incisors at 2%. Approximately 13% of patients have tooth mobility.

Table 3: Distribution of the carious teeth by the type.

Type of carious teeth	N (%)
Upper central incisors	283 (5)
Upper lateral incisors	215 (3)
Upper canines	359 (6)
Upper premolars	907 (15)
Upper molars	1335 (21)
Lower central incisors	76 (1)
Lower lateral Incisors	124 (2)
Lower canines	342 (5)
Lower premolars	1081 (17)
Lower molars	1556 (25)
Total	6277 (100)

Table 4: Distribution of the affected participants with tooth mobility by number of mobile teeth.

No. of mobile teeth	N (%)
1-2	152 (59)
3-4	101 (39)
5-6	6 (2)
Total	259 (100)

Table 4 shows the distribution of participants with tooth mobility according to the number of mobile teeth. 59% of patients with tooth mobility had one or two mobile teeth, followed by those with three to four teeth (39%), while 2% had five to six mobile teeth. Table 5 shows the distribution of mobile teeth by type. The lower central incisors were the most mobile at 26%, followed by the lower lateral incisors at 18% of the total mobile teeth. The percentage of tooth loss was 64%, while only 36% of patients had lost any teeth.

Table 5: Distribution of the mobile teeth by the type.

Type of mobile teeth	N (%)
Upper central incisors	30 (6)
Upper lateral incisors	25 (5)
Upper canines	43 (9)
Upper premolars	31 (6)
Upper molars	23 (5)
Lower central incisors	129 (26)
Lower lateral incisors	89 (18)
Lower canines	47 (9)
Lower premolars	56 (11)
Lower molars	25 (5)
Total	498 (100)

Table 6 shows the distribution of participants affected by tooth loss according to the number of teeth lost. 91% of patients suffered from the loss of 1 to 9 teeth, followed by those with 10 to 19 teeth (6%), while only 1% suffered from the loss of 20 to 29 teeth, and 2% suffered from the loss of 30 teeth. Table 7 shows the distribution of missing teeth by tooth type. Upper molars were the most commonly lost at 26%, followed by lower molars at 24%, then upper premolars at 16%, and lower premolars at 12%. The other tooth types were less commonly lost.

Table 6: Distribution of the affected participants with tooth loss by number of missing teeth.

No. of missing teeth	N (%)
1-9	1146 (91)
10-19	73 (6)
20-29	14 (1)
>30	23 (2)
Total	1256 (100)

Table 8 shows the distribution of participants affected by tooth loss according to the cause of loss. The most common cause was tooth decay (47%), followed by tooth decay and periodontal disease (38%), then periodontal disease (10%), while orthodontic cases and injuries each accounted for 2%.Table 9 shows the distribution of participants affected by tooth loss according to the age at which the tooth was lost.

Table 7: Distribution of the lost teeth by type of tooth.

Tooth type	N (%)
Upper central incisors	137 (4)
Upper lateral incisors	127 (4)
Upper canines	110 (3)
Upper premolars	511 (16)
Upper molars	858 (26)
Lower central incisors	113 (4)
Lower lateral incisors	109 (3)
Lower canines	116 (4)
Lower premolars	397 (12)
Lower molars	791 (24)
Total	3269 (100)

Table 8: Distribution of the affected participants with tooth loss by the cause of tooth loss.

Cause of tooth loss	N (%)
Dental caries	598 (47)
Dental caries and periodontal	476 (38)
Periodontal disease	122 (10)
Orthodontic purposes	22 (2)
Trauma	21 (2)
Others (e.g. arthritis and psychology)	17 (1)
Total	1256 (100)

The highest percentage of tooth loss was recorded among males (67%), followed by females (61%). Regarding age groups, the highest percentage was recorded in the 18-22 age group (74%), followed by the 23-27 age group (9%), and then the 28-32 age group (6%). The percentage was lower in the other age groups. Table 10 shows the distribution of the study sample according to the type of systemic disease. The prevalence of hypertension was 23%, followed by diabetes at 17%, liver disease at 13%, and gastrointestinal diseases at 10%, while other systemic diseases were less common.

Table 9: Distribution of the affected participants with tooth loss by the age in which teeth lost.

Sex	N (%)
Male	716 (67%)
Female	540 (61%)
Age group (years)	
18-22	926 (74)
23-27	109 (9)
28-32	74 (6)
33-37	42 (3)
38-42	38 (3)
43-47	27 (2)
≥ 48	40 (3)
Total	1256 (100)

Table 11 illustrates the relationship between tooth loss and tooth decay in the study sample. A correlation was found between tooth decay and tooth loss, with 65% of patients who lost teeth also having tooth decay, compared to only 35% of patients who did not have tooth decay. Table 12 illustrates the relationship between tooth loss and tooth mobility among the study participants.

A correlation was found between the presence and loss of mobile teeth; 95% of patients who lost teeth also had

mobile teeth, while only 5% of patients with mobile teeth did not have missing teeth.

Table 13 shows the relationship between tooth loss and education level, khat use, snuff use, and smoking habits among the study sample. A relationship was found between tooth loss and education level, khat use, snuff use, and smoking habits, with tooth loss rates reaching 85% (among the uneducated), 72%, 95%, and 79%, respectively.

DISCUSSION

This study provides a profile of tooth loss in Yemeni adult population attending dental clinics out patient at Althawra General Public Hospital. The present study showed that the prevalence of tooth loss was 64%. This prevalence is nearly similar to the study done in this study presents a profile of tooth loss among Yemeni adults who visit Al-Thawra General Public Hospital's dentistry clinics as outpatients. According to the current survey, 64% of people had tooth loss. This prevalence is almost same to the study conducted in Iran[20], which found that 68% of Iranian participants had partial edentulousness, and the study conducted in Palermo, Italy[19], which found that 60.6% of the population had this condition. The prevalence in Brazil was 91.4%[22], 90%[23], and 76.9%[24], while ours is lower than the 78% identified in the study conducted in Sudan by[21]. Furthermore, our prevalence is higher than was reported in Saudi Arabia: 40.9%[25]; in Turkish: 48%[26]; in India: 54.7%[27]; and 51.8% [28].

Table 10: Distribution of the study population by the type of systemic diseases.

Systemic disease type	N (%)
Hypertension	112 (23)
Diabetes mellitus	82 (17)
Liver disease	67 (13)
GIT Disease	51 (10)
Osteoporosis	30 (6)
Renal disease	29 (6)
Cardiovascular disease	21 (4)
Diabetes mellitus and hypertension	31 (6)
Fluorosis	15 (3)
Others	60 (12)
Total	498 (100)

Table 11: The association between tooth loss and dental caries among the study population.

Dental caries	Is there tooth loss		Total
	Yes	No	
Yes	1172 (65%)	629 (35%)	1801 (100%)
No	84 (54%)	70 (46%)	154 (100%)
Total	1256 (64%)	699 (36%)	1955(100%)

Table 12: The association between tooth loss and tooth mobility among the study population.

Mobile teeth	Is there tooth loss		Total
	Yes	No	
Yes	245 (95%)	14 (5%)	259 (100%)
No	1011 (60%)	685 (40%)	1696 (100%)
Total	1256 (64%)	699 (36%)	1955 (100%)

Table 13: The association between tooth loss and education level, qat, Shammah and using Smoking habits among the study population.

Characters	Tooth loss		Total
	Yes	No	
Illiterate	78 (85%)	14 (15%)	92 (100%)
Literate	1178 (63%)	685 (37%)	1863 (100%)
Khat Chewer	928 (72%)	355 (28%)	1283 (100%)
Non-Khat chewer	328 (49%)	344 (51%)	672 (100%)
Shammah User	83 (95%)	4 (5%)	87 (100%)
Non- Shammah user	1173 (63%)	695 (37%)	1868 (100%)
Smoker	427 (79%)	111 (21%)	538 (100%)
Non-smoker	829 (59%)	588 (41%)	1417 (100%)

It was observed that the mean number of missing teeth per patient is 4.3 (±5.3) compared to 3.6 (SD, 4.9) in Sudan[21], 5.47±6.81 in Brazil[24] and in India: 4.2±7.4[28]. In this study, we discovered a substantial correlation between dental caries and tooth loss. This result was consistent with prior research that found that greater dental caries was linked to the loss of one or more teeth[29-31]. Dental caries was identified by Khalifa *et al.*[21], as the primary cause of tooth loss in Sudan. In Brazil, Montandon *et al.*[32], showed that among children and people aged up to 44, dental caries was the leading cause of tooth death. Caries was also the most frequent reason for tooth extractions in the Saudi Arabian Jizan region[33], Kuwait[34], Riyadh[35], Al-Baha[36], and Jeddah[37].

It was observed that periodontal disease (including tooth mobility) was important leading cause of tooth loss. Similar results reported by Thorstensson & Johansson[41], Edman *et al.*[38], Muller *et al.*[39], Alhasani *et al.*[40], Guiguimde *et al.*[42], and Al-Kasem *et al.*[43].

We discovered that 38% of tooth loss in the study population was due to a combination of periodontal disease and dental caries. Similar findings were achieved by Al-Zahrani[44] and Alsufayyan and Khan[45], who claimed that prior research in private clinics in Riyadh had discovered coupled causes of periodontal

disease and caries. Age considerably increased the tooth loss rate in current study. Ribeiro *et al.*[29], have observed similar findings.

The current investigation verified that men were marginally more likely than women to have tooth loss. Our results are in line with those of Sabre Khazaei *et al.*[46]. It is different from other research, though, which indicated that women experienced more tooth loss than men[47]. We discovered that illiterates had the highest rate of tooth loss, which was similarly discovered by Buchwald *et al.*[48]. Additionally, people with higher levels of education had a much lower prevalence of tooth loss, according to Alsamhari *et al.*[49]. Also, we found that people with systemic disorders, particularly diabetes mellitus and hypertension, were more likely to have fewer teeth. According to Yongwen Jiang *et al.*[50], respondents with chronic diseases (such as diabetes and obesity) were more likely to have fewer teeth, which is consistent with our findings. According to Taylor *et al.*[51], the most dangerous causes of tooth loss are systemic conditions like diabetes mellitus. Sabre Khazaei *et al.*[46], showed that tooth loss was more common in people with chronic conditions such diabetes, hypertension, or hyperlipidaemia (p<0.0001). Diabetes mellitus has been identified as a risk factor for periodontitis, according to Kinane and Bouchard[52]. Pro-inflammatory cytokines are more prevalent in the gingival fluid and tissues of diabetic patients than in those without the disease, according to Iacopino and Cutler[53]. Periodontal infections in diabetes patients have been shown by Jimenez *et al.*[54], to start a cycle of tissue degradation and poor wound healing those results in tooth loss.

Total tooth loss has been linked to higher systolic blood pressure in Brazilian adults, according to Peres *et al.*[55], in South Africa, tooth loss has been identified as a risk factor for hypertension, according to Ayo-Yusuf *et al.*[56]. The most prevalent missing teeth, according to the current study, were upper and lower molars. These results aligned with a Brazilian study by Marília Jesus Batista and colleagues[57]. The permanent maxillary first molars were the most often extracted teeth in the study sample, which is consistent with the findings of Corraini *et al.*[23]. This is because these teeth are among the first permanent teeth to erupt and are therefore more vulnerable to the development of caries, which has been found to be the primary cause of tooth loss.

According to the current study, the most frequent effect of tooth loss was difficulty chewing meals. Our results concur with Felton's[58] findings.

CONCLUSION

This study concluded that tooth loss was common among participants, with upper molars being the most frequently lost teeth. Risk factors for tooth loss included advanced age (30 years and older), male sex, and systemic diseases. The rate of tooth loss was significantly higher among those with dental caries and periodontal diseases.

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AUTHOR'S CONTRIBUTIONS

Al-katta'a FAA: original draft writing, methodology, investigation. **Howilah AA:** study design, supervision. **Al-Serouri AW:** study design, supervision. **Al-Kholani AIM:** study design, supervision, formal analysis, data processing. Final manuscript was checked and approved by all authors.

DATA AVAILABILITY

The accompanying author can provide the empirical data that supported the study's findings upon request.

CONFLICT OF INTEREST

Regarding this project, there are no conflicts of interest.

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