

# TOOTH LOSS AMONG ADULTS AT KING ABDULAZIZ UNIVERSITY DENTAL HOSPITAL “FACTORS, CAUSES, AND CLINICAL CHARACTERISTICS”

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## ABSTRACT

The study aims at evaluating the causes of tooth loss and correlates them to risk factors in adult patients, who are frequenting King Abdulaziz University Dental Hospital in Jeddah. A 153 patients were included, ages ranging from 14 to 85 years (mean 34.49±15.8). Clinical chart review was conducted, past medical history, potential risk factors such as poor oral hygiene and smoking, DMFS and bone loss level were recorded. A validated questionnaire was used to collect demographic data in addition to other variables including: smoking, oral hygiene practice, history of previous dental extraction and the reason of each extraction, and the number of extracted teeth in the current visit and the reason associated with it. statistical analysis done using Statistical Package for the Social Sciences (SPSS) version 26. A total of 249 teeth have been extracted from 153 patients; caries (82.4%) was the highest cause for extraction, followed by periodontal disease (12.4%). Males showed higher prevalence of extractions (51%). History of previous extractions was significantly associated with caries and periodontal disease as a cause of current extraction (p=0.043). Moreover, the frequency of upper posterior teeth extractions was the highest, followed by lower posterior teeth. In the current participant population, both caries and periodontal diseases were the most common causes of extraction. Further educational awareness strategies, are required for early prevention of caries and periodontal disease, to avoid teeth loss and the eventual associated complications.

**Key words:** Tooth loss, Early tooth loss, Extraction in adult, Tooth extraction, Extraction cause, Tooth loss cause.

## Introduction

Tooth loss is one of the most frequent conditions that have a high impact on oral health [1-3]. It constitutes an important challenge to both the patient and the healthcare provider. It affects the quality of life of the patients and their general health. The number of extracted teeth in a population can be used as a determinant of oral hygiene status, especially when a comparison reflects a correlation between the incidence of tooth loss and oral hygiene level.

The quality of life has been affected in many ways considering the attitudes and behaviors of people and the ability of the person to perform daily activities. In brief, losing teeth, either as a categorical variable or continuous factor, is the most impactful element with its confounding effect on oral health-related quality of life.

Moreover, the social presentation presents a remarkable communication limitation in personal and job interviews, speaking, smiling and confidence related to the esthetic factor. It is especially associated with anterior teeth loss and their impact on the person's appearance affecting his social life, clear speech with proper letter exits, and articulation. From the functional aspect, tooth loss has undoubtedly a

direct negative effect on nutrition. Mastication difficulties are encountered as well as new adaptive eating habits are especially linked to the loss of one or more posterior teeth, especially during chewing. The effect of the inability to chew properly does not cause digestion problems solely, but it will rather influence people's self-esteem during meal gatherings and social events [4]. It has been ironically reported that daily intake and vitamins are significantly lower in edentulous patients affecting their nutritional status [5]. The necessity of eating properly and having an appetite was regarded as essential in assessing the quality of life of elderly persons. In this sense, the use of dentures is still linked to the importance of dental health in forming connections [4].

Furthermore, one of the main important reported factors leading to teeth extractions, in the literature were teeth impaction and malocclusion especially in patients less than 20 years of age.

Researchers studied comprehensively, the relationship between malocclusion and the quality of life focusing on its influence on social, physical, and other psychological characteristics, exerting a major contributing role in social acceptance and interactions [4]. Regarding the oral hygiene

factor in causing tooth loss, a noticeable association has been established in a patient with orthodontic treatment and actual neglect of their oral hygiene with presenting potential variability of tooth loss [4].

The influential outcome of education revealed that people with limited or incomplete education levels depicted a higher number of lost teeth when compared with those with higher education levels persons [6].

The progression of dental problems such as caries and periodontal diseases is associated with poor oral health maintenance encountered in people with low economical income levels [7]. Moreover, a direct correlation exists between the pattern of tooth loss, the regular dental visit, and the self-conceptual understanding of the needed dental care and treatment [8].

A strong association exists between early tooth extraction and the presence of plaque biofilm, multiple dental caries and cavities, and periodontal disease. These findings had strong collaboration relative to the planning of health policies considering social equity as part of health strategies in primary health care [8].

The socioeconomic inequality displayed trends in tooth loss, peculiar to dentate adults and the entire population. Studies in the UK in the last two decades demonstrated that total tooth loss decreased by almost 80% among the high social class and only by 48% in the lower social class population [9]. Moreover, the social and economic status is deflectable and is attributable to neglect or inability to withstand the economic burden of the treatment costs.

Tooth loss is a reflection of an individual's dental disease history and their treatment through regular dental care throughout their lives, which results, in the capture of a lifetime's worth of experiences. The drivers of inequalities in tooth loss must be recognized and avoidable determinants addressed to minimize socioeconomic inequality's effect on tooth loss. Preventing dental and oral disorders and managing the reasons for any chronic illness, should receive more emphasis [9].

Regarding gender and tooth loss, a greater percentage of tooth loss was observed more frequently, in male patients. In the female population, the loss of teeth was mainly secondary to both caries management and/or orthodontic treatment. The males, on the other hand, revealed that periodontal disease was the main cause of extraction [10]. The variation in frequency and the etiological differences between both genders were related to the inherited belief that men are less motivated toward rehabilitation therapies. Furthermore, these discrepancies might be partly mediated by the morphological differences occurring during the adolescent period, when the sex hormones function actively, and by the associated proportionally increasing amount of functional masticatory force affecting the

temporomandibular joint [11]. In addition, unilateral mastication due to teeth loss might increase the masticatory load at the temporomandibular joint, the nonfunctional side. Accordingly, extraction of the posterior teeth unilaterally may lead to a compensative remodeling action of the articular eminence over a long time [11].

Furthermore, despite the fact, the degree of tooth loss could not be solely justified by physiological aging, its prevalence grows with time, peaking at 64 years of age [12]. Studies mentioned that a positive relationship exists between previous dental loss as a strong predictor of additional new dental losses, whether being patient preference related, or dentist preferable approach, especially in the patient presenting with severe associated pain.

As previously stated, it is obvious that the etiology of tooth loss is variable and even multifactorial. It can be associated with a personal habit such as smoking, concurrently with poor oral conditions including, high caries incidence and periodontal pathology. The general health and medical conditions with concurrently occurring systemic diseases such as diabetes jeopardize oral health and accelerate the potential tooth loss.

Lifestyle and behavioral factors such as smoking show significant predictors of tooth loss. It is related to the increase of the risk factor of the high incidence of tooth loss among the smokers' population. It was proven that people with cigarette smoking, have a remarkably low buffering capacity of saliva. The oral flora inhabitants in the smokers' saliva revealed that *Streptococcus mutans* and *Lactobacilli* show a prevailing number, significantly higher when compared to non-smokers. This complex effect of the increased level of cariogenic bacteria in combination with the decreasing buffering capacity of the saliva will undoubtedly produce high caries incidence, which will eventually lead to tooth extraction. Smoking and losing six or more teeth is a significant positive relationship [13]. On the other hand, periodontal disease-related factors in smokers are due to the chemicals in the cigarette and the eventual free radicals production by the host as an immune response to bacterial stimulation, resulting in damage of the periodontium, thus increasing the person's tendency to tooth loss [14]. Furthermore, scientists claim that nicotine reduces bone density and mineral content by increasing the secretion of bone-resorbing proteins or decreasing calcium uptake in the intestine. Interestingly, smoker females exhibited a low level of Estrone and Estradiol which affects postmenopausal and body health [14].

#### *Diabetes mellitus as a chronic systemic disease*

Is considered a high-risk factor associated with periodontal disease causing tooth mobility and extraction. Routine dental visits are recommended regularly since, treating periodontitis can improve outcomes (i.e. glycemic control) [15]. Diabetic patients show an increase in the inflammatory mediators, as the cytokines present in the gingival fluid lead

to normal periodontitis. Moreover, the periodontal pathogens present in diabetic patients, can initiate a devastating cycle of tissue destruction and delayed healing, which might eventually lead to the loss of teeth [13].

Although periodontal factors and a high incidence of caries are the most frequent reasons for tooth loss, research has shown that other factors such as orthodontics, prosthetics, impaction, trauma, and failure of earlier therapy can also influence tooth removals. Extraction for orthodontic treatment recorded the highest percentage between 11 and 20 years old, while the percentage of prosthetic extractions reached its highest level among the older age group 51-60 years. People over the age of 40 years had the highest percentage in the number of extractions due to periodontal disease for reasons of tooth loss exceeding those for various causes [16].

Dental caries is a condition that affects adults, with an incidence rate that is comparable to that of children and adolescents. Caries presents a chronic, progressive and cumulative illness that worsens with advancing age. Periodontal disease is distributed differently across the lifespan of an individual. Periodontitis, presenting as a periodontal pocket of 4-5 mm in depth, showed prevalence in 9.1% of adolescent patients, while only 27.7% was found in adults, and from the elderly population, 30.6 percent suffered from this condition. Severe periodontitis being progressive, worsens with age, peaking around 40 years of age, and then stabilizes in old age. In brief, it could be stated that, since among the most common reasons for tooth extractions are dental caries and periodontal disorders, it is a logical advocacy that this problem shows higher prevalence with age [17].

It has been hypothesized that the combined multifactorial outcome in a person with high caries incidence, advanced periodontal disease, bad oral hygiene, habits such as smoking, and systemic medical conditions with oral manifestations such as diabetes will eventually predispose this patient to earlier tooth loss in comparison to healthier patients with same age group.

#### *The aim of the study*

Our present study mainly aims at evaluating the causes of tooth loss and correlating them to related risk factors in adult patients, who are frequenting King Abdulaziz, University Dental Hospital in Jeddah. The evaluation criteria were based on the patient's demographic data including age, gender, and education. The social history included personal oral health, flossing frequency, and smoking habits. Medical history was concerned with systemic conditions with oral manifestations that could jeopardize the oral conditions. Past dental histories involved the number of previously extracted teeth and the associated reasons for their extractions. The number of these extracted teeth was recorded after thorough clinical and radiological examinations. All these variables were correlated to the

current clinical oral conditions and their association with the causes of tooth/or teeth loss.

The previewed conclusion will necessarily help in increasing the awareness and prevention of early tooth loss among adults. The main impact of the study is to help our patients understand the reasons and factors that cause early extraction. Educating the patients and developing ways to encourage and reinforce their self-motivation towards improving their oral and body health to preserve their dentition and prevent early tooth loss is another important task that should be adopted.

#### **Materials and Methods**

This is an observational, population-based study with adults participating in an epidemiological survey of oral health at King Abdulaziz University dental hospital. Ethical approval (no. 325-11-21) was obtained. A random sample was selected from patients visiting the surgery clinic at King Abdulaziz University Dental Hospital for four months (January-April 2022), the researchers collected the data from participating dentists weekly.

The survey was based on a validated questionnaire designed on different sections: demographic data, socioeconomic status, past medical, and dental histories, and clinical examinations.

There are two portions to the information in the record form. The first part included information on the patient's age, gender, medical status, educational level, income, and oral hygiene brushing and flossing frequency. The second part included the number of teeth to be extracted and the causes for dental extractions if the patient had previous extraction and for what reason, the number, and location of teeth to be extracted, DMFT score, and level of bone loss. The questionnaire carrying these questions was filled out by the participating intern dentists.

Data collected from this questionnaire included the patient's demographic data, gender, age, an education level (University, illiterate, primary, middle, and high school), medical condition, history of habit such as smoking, daily oral hygiene (brushing and flossing), previous dental extraction visit, mentioning the tooth type and the reason for each extraction. Several teeth were extracted in the current visit and the reason associated with it.

The medical record was checked for endorsement of the medical history. The decayed missing and filled tooth (DMFS) score was evaluated. A radiographic examination was also performed.

The inclusion criteria were any patient with permanent dentition, 14 years and above with one or more lost tooth/teeth. Exclusion criteria included any patient with syndromes affecting oral health.

Data such as tooth loss decayed missing and filled teeth (DMFS), bone loss, and oral hygiene were collected and statistically analyzed, using Statistical Package for the Social Sciences (SPSS) to verify the possible hypothesized outcome associated with early tooth loss causes to the following factors caries, periodontal disease, smoking history, orthodontic treatment, and trauma.

#### Statistical analysis

The data collected were analyzed statistically using the Statistical Package for the Social Sciences (SPSS) version 26. Quantitative and qualitative variables were represented by the chi-square test, descriptive mean  $\pm$  SD.

## Results and Discussion

#### Descriptive statistics

The participant patients' main age was  $34.49 \pm 15.8$ . I ranged from 14 to 85 years. Males showed higher preponderance (51%). The medical status revealed that 108

(70.6%) of the patients were healthy, while only 45 (29.4%) were diagnosed and controlled for diabetes and hypertension, asthma, and cancer. A total of 52 patients had variable smoking habits (34%) using different types of cigarettes and vaping. Most of the treated patients reported average income (77.8%) and low income (20.9%) which is understandable, since the governmental hospital charge no fees. People with limited education, that stopped at the high school level were the most common (44.4%), followed by only (34.6%) with a university level of education. The majority of patients reported brushing twice a day (45.1%). However, only (17%) reported using floss and water floss. The number of teeth extracted per session was requested by most of the patients to be one tooth only (56.2%). The most common cause of teeth extractions proved to be dental caries (82.4%) followed by periodontal disease (12.4%). The presented results depicted that upon clinical examination, (71.9%) of the patient had previous extraction performed. The most commonly extracted teeth were the maxillary posterior teeth (54.2%) followed by the mandibular posterior teeth (47.7%) (Table 1).

**Table 1.** Demographic information of collected data

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
Age	153	14	85	34.49	13.285
Gender	153	1	2	1.51	.502
Medical status *	153	1	2	1.29	.457
Do you smoke ?	153	0	1	.34	.475
Income ?	153	1	3	1.80	.430
Educational level?	153	1	5	3.93	1.159
How many times you brush your teeth?	153	0	2	1.27	.752
Do you use floss?	153	0	1	.17	.377
Number of teeth for extraction	153	1	3	1.63	.785
Cause of extraction	153	1	4	2.24	.705
Have you extract before ? and for what reason ? *	153	0	1	.72	.451
Upper posterior	153	0	1	.54	.500
lower posterior	153	0	1	.48	.501
Upper anterior	153	0	1	.08	.280
lower anterior	153	0	1	.04	.195
DMFS score for the tooth to be extracted	153	0	5	4.03	1.219
Site of extracted tooth (Radiograph)	153	1	4	2.05	.985
Valid N (listwise)	153				

#### Causes for tooth extraction

The results depict the correlations between tooth extraction reasons. Males had more teeth removed than females because of caries, followed by periodontal disease, residual roots, impacted teeth, and prosthodontics reasons, although the differences were yet statistically insignificant.

Two hundred and ninety-four (249) teeth have been extracted in the oral surgery clinic. The sequence of the extracted teeth was designing, the upper posterior as the

most frequently extracted teeth (54.2%), followed by the lower posterior (47.7%), upper anterior (8.5%), and lower anterior presented the least common extracted tooth (3.9%).

Dental caries and periodontal disease were the most common causes for extraction, with one hundred twenty-six 126 teeth (82.4%) lost due to dental caries and eighteen 19 teeth (12.4%) removed due to periodontal disease, only (2%) were extracted for orthodontic treatment, while (3.3%) were third molars with different problems such caries,

pericoronitis, or overeruption.

In the present population, tooth extraction for periodontal disease was significantly higher in unhealthy individuals

with chronic diseases (such as diabetes and hypertension) (p=0.038). Regarding smoking, the results showed that there was an insignificant statistical difference between smokers and non-smokers patient as a cause of tooth extraction (**Table 2**).

**Table 2.** Medical status and smoking behavior in participant as a cause of tooth extraction

		Medical status *		Total	
		Healthy	Un Healthy		
Cause of extraction	3rd molar	Count	5	0	5
		% within Medical status *	4.6%	0.0%	3.3%
	Caries	Count	91	35	126
		% within Medical status *	84.3%	77.8%	82.4%
	Orthodontic	Count	3	0	3
		% within Medical status *	2.8%	0.0%	2.0%
	Periodontal	Count	9	10	19
		% within Medical status *	8.3%	22.2%	12.4%
	Total	Count	108	45	153
		% within Medical status *	100.0%	100.0%	100.0%

**Chi-Square Tests**

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.430 <sup>a</sup>	3	.038
Likelihood Ratio	10.195	3	.017
Linear-by-Linear Association	5.612	1	.018
N of Valid Cases	153		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .88.

**Crosstab**

		Do you smoke ?		Total	
		No	Yes		
Cause of extraction	3rd molar	Count	5	0	5
		% within Do you smoke ?	5.0%	0.0%	3.3%
	Caries	Count	82	44	126
		% within Do you smoke ?	81.2%	84.6%	82.4%
	Orthodontic	Count	2	1	3
		% within Do you smoke ?	2.0%	1.9%	2.0%
	Periodontal	Count	12	7	19
		% within Do you smoke ?	11.9%	13.5%	12.4%
	Total	Count	101	52	153
		% within Do you smoke ?	100.0%	100.0%	100.0%

**Chi-Square Tests**

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.693 <sup>a</sup>	3	.441
Likelihood Ratio	4.271	3	.234
Linear-by-Linear Association	.448	1	.503
N of Valid Cases	153		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.02.

People with a history of previous teeth extractions showed a statistically significant difference in a patient with caries and periodontal disease (p=0.043). The patients with the previous extraction tend to extract repeatedly for the same

reason, while a patient who came to the clinic for third molar extraction or orthodontic reasons presented once for the procedure (Table 3).

**Table 3.** History of previous extraction and tendency to extract again

		Crosstab			
		Have you extract before ? and for what reason ? *			Total
		No	Yes		
Cause of extraction	3rd molar	Count	4	1	5
		% within Have you extract before ? and for what reason ? *	9.3%	0.9%	3.3%
	Caries	Count	35	91	126
		% within Have you extract before ? and for what reason ? *	81.4%	82.7%	82.4%
	Orthodontic	Count	1	2	3
		% within Have you extract before ? and for what reason ? *	2.3%	1.8%	2.0%
	Periodontal	Count	3	16	19
		% within Have you extract before ? and for what reason ? *	7.0%	14.5%	12.4%
	Total	Count	43	110	153
		% within Have you extract before ? and for what reason ? *	100.0%	100.0%	100.0%

  

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.138 <sup>a</sup>	3	.043
Likelihood Ratio	7.456	3	.059
Linear-by-Linear Association	3.298	1	.069
N of Valid Cases	153		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .84.

*DMFS and bone loss in the radiograph*

The patient who lost their teeth due to periodontal disease suffered from bone loss. The results showed that the highest percentage for severe bone loss (62.5%) and (23.3%) had moderate bone loss, while patients who had their teeth

extracted for caries scored 4 or remaining roots revealed moderate bone loss (76.7%), in addition, patients who came for teeth extraction for orthodontic reasons and third molar problems had intact bone (Table 4).

**Table 4.** Bone loss and DMFS for the extracted tooth

		Crosstab					
		Site of extracted tooth (Radiograph)				Total	
		Intact	Mild bone loss	Moderate bone loss	sever bone loss		
Cause of extraction	3rd molar	Count	5	0	0	0	5
		% within Site of extracted tooth (Radiograph)	9.3%	0.0%	0.0%	0.0%	3.3%
	Caries	Count	45	52	23	6	126
		% within Site of extracted tooth (Radiograph)	83.3%	98.1%	76.7%	37.5%	82.4%
	Orthodontic	Count	3	0	0	0	3
		% within Site of extracted tooth (Radiograph)	5.6%	0.0%	0.0%	0.0%	2.0%

Periodontal	Count	1	1	7	10	19
	% within Site of extracted tooth (Radiograph)	1.9%	1.9%	23.3%	62.5%	12.4%
Total	Count	54	53	30	16	153
	% within Site of extracted tooth (Radiograph)	100.0%	100.0%	100.0%	100.0%	100.0%

**Crosstab**

Cause of extraction		DMFS score for the tooth to be extracted						Total
		0	1	2	3	4	5	
		Count	3	2	0	0	0	
3rd molar	% within DMFS score for the tooth to be extracted	60.0%	28.6%	0.0%	0.0%	0.0%	0.0%	3.3%
	Count	1	0	0	10	59	56	126
Caries	% within DMFS score for the tooth to be extracted	20.0%	0.0%	0.0%	76.9%	92.2%	90.3%	82.4%
	Count	0	3	0	0	0	0	3
Orthodontic	% within DMFS score for the tooth to be extracted	0.0%	42.9%	0.0%	0.0%	0.0%	0.0%	2.0%
	Count	1	2	2	3	5	6	19
Periodontal	% within DMFS score for the tooth to be extracted	20.0%	28.6%	100.0%	23.1%	7.8%	9.7%	12.4%
	Count	5	7	2	13	64	62	153
Total	% within DMFS score for the tooth to be extracted	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Factor associated with oral hygiene and number of mobile teeth*

Oral care and brushing frequency revealed significant results at (P=0.049) as a cause of tooth extraction. People with orthodontic treatment, or referred for extraction of 3<sup>rd</sup> molars were brushing twice/day. On the other hand, patients

with multiple caries and periodontal problems were brushing mostly once a day. Most of the patients were not using floss regularly, which might explain the high incidence of caries and periodontal disease (P=0.05) (Table 5).

**Table 5.** Practice of participants toward brushing and floss using

Cause of extraction		How many times you brush your teeth?			Total
		None	Once/day	Twice/day	
		Count	0	0	
3rd molar	% within How many times you brush your teeth?	0.0%	0.0%	7.2%	3.3%
	Count	22	49	55	126
Caries	% within How many times you brush your teeth?	78.6%	87.5%	79.7%	82.4%
	Count	0	0	3	3
Orthodontic	% within How many times you brush your teeth?	0.0%	0.0%	4.3%	2.0%
	Count	6	7	6	19
Periodontal	% within How many times you brush your teeth?	21.4%	12.5%	8.7%	12.4%
	Count	28	56	69	153
Total	% within How many times you brush your teeth?	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.627 <sup>a</sup>	6	.049
Likelihood Ratio	15.389	6	.017
Linear-by-Linear Association	3.174	1	.075
N of Valid Cases	153		

a. 7 cells (58.3%) have expected count less than 5. The minimum expected count is .55.

Crosstab					
			Do you use floss?		Total
			No	Yes	
Cause of extraction	3rd molar	Count	2	3	5
		% within Do you use floss?	1.6%	11.5%	3.3%
	Caries	Count	106	20	126
		% within Do you use floss?	83.5%	76.9%	82.4%
	Orthodontic	Count	2	1	3
		% within Do you use floss?	1.6%	3.8%	2.0%
	Periodontal	Count	17	2	19
		% within Do you use floss?	13.4%	7.7%	12.4%
	Total	Count	127	26	153
		% within Do you use floss?	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.799 <sup>a</sup>	3	.050
Likelihood Ratio	5.869	3	.118
Linear-by-Linear Association	1.581	1	.209
N of Valid Cases	153		

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .51.

The current results correlated the patient's general health to the cause of tooth extraction. Tooth extraction due to caries showed higher frequency, in the healthy population with a mean age of  $34.49 \pm 15.8$ . On the other hand, periodontal involvement was more prominent in the unhealthy population. This is in accordance with previous results that linked the health condition of the patients to their periodontal diseases. Unhealthy patients with chronic disease lost their teeth frequently due to periodontal cause, tooth removal due to periodontal disease was more frequent in diabetic patients, rather than in healthy individuals ( $P = 0.04$ ) [18]. The prevalence of tooth loss among adults with chronic diseases is higher among poor oral health individuals when compared with the systemically healthy patient, the complexity of interactions between oral and systemic diseases might support this finding [8]. In addition, people with chronic illness exhibit mobility limitations, with difficulty in visiting the dentist regularly to maintain good home care.

The statistically insignificant difference in gender participants in this study proved that males were more prone to teeth loss (51%) than females (49%). This might be

explained based on lower health care in the male groups, especially in comparison with the females. Studies showed similar results, regarding the fact that the prevalence of tooth loss is higher in males [13, 18]. Many studies pointed out that women were losing their teeth mostly due to caries, while men were more accounted to caries and periodontal problems [6, 10].

Although smoking showed poor association with tooth loss, loss of teeth due to periodontal cause, depicted a proportional relationship since 13.5% were smoking and 11.9% were nonsmokers. This might be attributed to the poor hypoxic condition resulting from smoking, and directly affecting the periodontal tissues. However, there is no significant association between tooth extraction and education level [15]. Considering smoking as a risk factor, a study showed increased odds of tooth loss secondary to caries due to consuming the large number of packs smoked per day and duration of cigarette smoking; however, neither of these associations reached statistically significant levels [14]. Other studies showed that cigarette smokers are significant, and will cause a larger number of decayed and filled teeth compared to nonsmokers [13].



The frequency of upper posterior teeth extractions was the highest, followed by the lower posterior. The prevalence of tooth loss is highest in maxillary teeth [19]. The most frequently extracted teeth secondary to caries are the premolars, the molars of both jaws; first then second [6]. The patients' oral health was jeopardized due to the posterior teeth loss, which affected the patient quality of life causing occlusion and mastication problems. Some studies pointed to molars morphology, eruption time, and position in the oral cavity explain the reasons for the increased risk of extractions of molars in both dentitions. The presence of the normal anatomical fissures and pits presents a site of food and debris accumulation, which increases the tendency of plaque retention, and higher risk of caries [17]. The loss of the lower anterior teeth in elderly patients is associated with periodontal disease, rather than dental caries since they are less vulnerable to caries than other teeth. In mandibular and maxillary premolars, extractions for orthodontic reasons were more common, which is consistent with previous findings [10].

Fortunately, despite the different causes of teeth extraction, the patients visiting our clinic who were included in the study were using standard toothpaste. This can be attributed to the educational role of the dentists for these patients commonly frequenting our clinics for different dental treatments. Noticeably, people with multiple caries were mostly brushed once/day, while patients with periodontal disease practiced poorer oral care and nearly never brushed or brushed once/day. Brushing and oral care maintenance are the main factors causing caries in the population. Smoking will eventually cause multiple caries and increase the risk of tooth extraction [13, 14]. Furthermore, studies suggest that people with chronic diseases, especially diabetes and hypertension should attend regular visits to their dentist to control the factor of tooth loss [8].

The present results found that oral hygiene problems affected the populations with lower income, among those patients attending King Abdulaziz Dental Hospital, for dental care more than higher income patients. People with low income also have limited access due to limited dental care networks. According to a recent study in Saudi Arabia, patients frequenting public clinics had significantly more teeth extracted, rather than individuals treated in private practice ( $P=0.003$ ) [17]. Poor oral hygiene, increasing carbohydrate consumption, lack of periodic dental checkups, limited information about oral health care programs, as well smoking are serious factors that raise the risk of developing oral problems that can lead to tooth loss [17]. Awareness of regular check-ups needs to be improved in society. Regular check-up appointments will help detect incipient caries and prevent extraction. Cohort studies in industrialized nations, such as the United States [and Europe], have identified socioeconomic, and behavioral factors, and the individuals' lifestyles as important risk factors for teeth loss. Even in these industrialized countries, socioeconomic inequalities in relation to tooth loss appear

to reveal socioeconomic inequality [12].

The present findings reveal that the prevalence of dental caries and periodontal diseases are age-related, and hence this explains why the population experienced more tooth loss and extractions. Dental caries and periodontal disease are widely spread in diverse communities around the world, according to studies. According to the Global Burden of Disease Study (2017), oral problems and diseases affected around 3.47 billion individuals, with dental caries in permanent teeth being the most frequent health problem [17]. Tooth decay and periodontitis both can be avoidable. Primary tooth decay prevention includes treatment with fluoride added to drinking water, both professionally and at home. Periodontitis progression can be prevented by root planning and scaling in the dental clinic. On the other hand, the addition of fluoride, caries removal followed by tooth fillings, and proper restorations can combat further tooth decay. In 2009, an analysis of National Health and Nutrition Examination NHANES data collected between 1999 and 2004 revealed that, after accounting for several variants (for example income, ethnicity, and race), between people with chronic conditions had lower unmet needs for dental care compared to people without chronic conditions.

The prevalence of untreated decayed teeth due to neglected or delayed dental treatment imposes determined tooth loss. It should be noted that the risk variables identified in our study are changeable, indicating the need for improved oral disease prevention and health promotion in public health, particularly for preventable dental caries.

## Conclusion

The most common reason for tooth extractions, according to the study, was dental caries, followed by periodontal disease. The most often extracted teeth were the maxillary and mandibular posterior teeth. With increasing patient age, the frequency of extractions increased. To lessen the burden of tooth extractions and improve patient quality of life, oral healthcare systems' main target should be monitoring an effective prevention mechanism and strong treatment services for the most common oral diseases. Increasing the patients' awareness about the provided oral care should be more frequent to help the population understand the reasons and factors that cause early extraction and develop ways to improve their oral and body health, prevent tooth loss and provide a better quality of life.

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