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RESEARCH ARTICLE

Pattern and Reasons for Permanent Tooth Extractions at Dental Clinics of the University of Science and Technology of Fujairah, UAE

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Abstract:

Objectives:

To evaluate the pattern and reasons for permanent tooth extractions in an adult patient seeking free dental care at clinics of the University of Science and Technology of Fujairah, UAE.

Methods:

The current retrospective study involved patients who had a dental extraction in the student dental clinics of the University of Science and Technology of Fujairah. Data of 1000 randomly selected extractions were collected from the archive of the university dental clinics.

Results:

Males had more teeth extracted (88.3%) than females. The most frequent extraction (58.9%) was in individuals of 30-49 years old range. Dental caries was the major reason (44.6%) of extractions, followed by wisdom teeth related extraction (23.4%), periodontal disease (18.1), failure of endodontically treated teeth (8.7%), prosthetic reasons (2.6), orthodontic reasons (1.7%), and trauma (0.9%) respectively. The most extracted teeth were the maxillary posterior teeth (45.6%), followed by mandibular posterior teeth (38.2%); then, maxillary anterior teeth (8.8) and lastly, were the mandibular anterior teeth (7.4%). Caries was significantly more frequent in female gender ($\chi^2 = 250.126$; $p = .000$), while the periodontal disease was more common in male gender ($\chi^2 = 146.790$; $p = .000$).

Conclusion:

Caries is the principal reason for tooth extractions, followed by wisdom teeth related problems and periodontal disease. There is an increasing percentage of tooth extraction due to periodontal disease with both aging and male gender. Caries was the more frequent reason for extraction in all quadrants, except the lower anterior teeth in which periodontal disease was the more frequent reason. Lastly, anterior teeth were retained in the oral cavity more than posterior teeth.

Keywords: Reasons, Mortality, Teeth, Extraction, Caries, Periodontal disease.

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1. INTRODUCTION

Researches on reasons for tooth extraction in different samples and regions are essential to enhance oral health outcomes. Extraction and loss of teeth could lead to poor dietary habits and ultimately deteriorate the quality of life [1]. The consequence of tooth extraction is compromised esthetic and

function. Moreover, a significant financial burden arises in compensating the lost teeth by a dental implant, fixed, or removable dentures [2]. In dentistry, extraction of teeth is a dental treatment that should be considered as the last choice where other dental treatment procedures cannot be performed. A considerable number of tooth extractions in normal daily practice all over the dental centers in the world reflect several factors like persistent shortage of the provided dental treatment, patient's little awareness of after extraction problems, and economic and social conditions of the patients [3, 4]. Oral hygiene and socioeconomic level of life inversely affect the

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number of extracted teeth, while the figure of extracted teeth can be an indicator of the patient's background [5].

Dental reasons behind the extraction of permanent teeth were caries, periodontal disease, failure endodontic treatment, orthodontic treatment, trauma, prosthetic reasons and impacted tooth extraction [5]. However, less costly and time-consuming procedures, besides the lack of another treatment option, are the main reasons behind patients' decision to extract the tooth rather than keeping it [6].

For a successful strategical planning of dental health services, consideration should be given about the reasons for tooth loss. Indeed, determining the reason for dental extraction will provide information about the prevalence of dental diseases and dental care provided. Furthermore, the strategies of promotion and prevention of oral health must consider the target population when outlining the services of dental care [6].

Several studies that investigate the reasons for tooth extractions have been performed in various countries at different times and in different sample types [1 - 21]. There is little information regarding the trends in mortality of permanent teeth in the UAE. This study aimed to evaluate the pattern and reasons for permanent tooth extractions in adult patients seeking free dental care at clinics of the University of Science and Technology of Fujairah, previously named "Ajman University, Fujairah Campus". To the extent of our knowledge, this is the first study that deals with the reasons for tooth extractions in the UAE.

2. MATERIALS AND METHODS

The current retrospective study collected data of 1000 randomly selected patient records of different tooth extractions. Records were retrieved from the archive of the University of Science and Technology of Fujairah, previously named "Ajman University, Fujairah Campus" for the years 2015-2017. The data records include the patient's age, gender, tooth number, and the reason for extraction. The study sample mainly involved expatriates of different nationalities who sought free dental care, living in different UAE regions. The research has been conducted in full accordance with the World Medical Association Declaration of Helsinki of 1975, as revised in 2008 and was approved by the Research Ethics Committee of College of Dentistry at Ajman University (Ref. SSF-2016/17-05).

Inclusion criteria included all Ajman University, Fujairah Campus patients aged between 15 - 80 years old, both genders, both surgical and non-surgical extractions, and all permanent teeth. Meanwhile, the exclusion criteria involved primary teeth, supernumerary teeth, uncertain or unclear data. Reasons for

extraction were categorized as caries, periodontal disease, failure endodontic treatment, orthodontic reasons, trauma, prosthetic reasons and wisdom teeth related extraction. Wisdom teeth extraction, in this report, is a broad umbrella criterion that could involve and interlace with other reasons for tooth extractions, but these factors are exaggerated and strengthened due to association with the primary factors of malposition, malfunction, difficulty in saving and treating the tooth, besides the partially or totally impaction condition. The case sheet history, examination, radiograph, and definitive diagnosis were collectively assessed to determine the reason for the extraction.

The data were analyzed using Statistical Package for Social Sciences version 19 software (SPSS IBM, Chicago, IL, USA). Variables were calculated as frequency and percentage, while the comparison of different factors was done using the Chi-square test. A difference with a $p < 0.05$ was deemed statistically significant.

3. RESULTS

A total of 1000 patient records on different extracted teeth were included in this study. Table 1 showed the distribution of extracted teeth by age range and gender. Most of the extracted teeth (88.3%) were in males ($\chi^2 = 586.756$; $p = 0.000$). The differences among the numbers of teeth extracted by age groups were statistically significant ($\chi^2 = 393.440$; $P = 0.000$). Most extraction (29.7%) was done in age group (40-49), followed by (30 -39) age group, which constituted (29.2%) of total extractions (Table 1).

Caries was the most frequent reason for tooth extractions (44.6%), followed by wisdom teeth extraction (23.4%) and periodontal disease (18.1%). Other reasons included failed root canal treatment (8.7%), prosthetic reasons (2.6%), orthodontic reasons (1.7%), and trauma (0.9%). The reasons for caries and wisdom teeth related extraction were significantly more in females than in males. Meanwhile, periodontal disease, failure endodontic treatments, and prosthetic reasons were significantly more frequent in males than females. However, there was no significant difference in gender for orthodontic reasons and trauma (Tables 2 and 3).

In all age groups, dental caries was the main cause of tooth extraction. While, periodontal disease was the second most common cause of tooth extractions in age groups above 40 years old, problems related to wisdom teeth account for the second most common extractions for age groups (20-29; 30-39) (Fig. 1). However, there was no statistical difference between caries and periodontal disease as reasons for extraction in age groups (40-49) and above 60 ($\chi^2 = 254$, $p = 614$; and $\chi^2 = 862$, $p = 353$) respectively.

Table 1. Distribution of extracted teeth by age periods and gender.

Age group (years)	Numbers of extracted teeth in males	Numbers of extracted teeth in females	Total Numbers of extracted teeth in both males and females
<20	$n = 18$ (2%)	$n = 17$ (14.5%)	$n = 35$ (3.5%)
20-29	$n = 138$ (15.6%)	$n = 29$ (24.8%)	$n = 167$ (16.7%)

(Table 1) cont.....

Age group (years)	Numbers of extracted teeth in males	Numbers of extracted teeth in females	Total Numbers of extracted teeth in both males and females
30-39	n= 260 (29.4%)	n= 32 (27.4%)	n= 292 (29.2%)
40-49	n= 272 (30.8%)	n= 25 (21.4%)	n= 297 (29.7%)
50-59	n= 158 (17.9)	n= 9 (7.7%)	n= 167 (16.7%)
≥ 60	n= 37 (4.2%)	n= 5 (4.3%)	n= 42 (4.2%)
Total	n= 883 (100%)	n= 117 (100%)	n= 1000 (100%)

Table 2. The reasons for tooth extraction according to gender.

Reasons	Total	Male	Female	P. value
Dental caries	n= 446 (44.6%)	n= 390 (44.2%)	n= 56 (47.9%)	$\chi^2 = 250.126$ p= .000
Wisdom teeth related extraction	n= 234 (23.4%)	n= 201 (22.8%)	n= 33 (28.2%)	$\chi^2 = 120.615$ p=.000
Periodontal disease	n= 181 (18.1%)	n=172 (19.5%)	n= 9 (7.7%)	$\chi^2 = 146.790$ p= .000
Failed root canal treatment	n= 87 (8.7%)	n= 78 (8.8%)	n= 9 (7.7%)	$\chi^2 = 54.724$ p= .000
Prosthetic reasons	n= 26 (2.6%)	n= 25 (2.8%)	n= 1 (0.9%)	$\chi^2 = 22.154$ p=.000
Orthodontic reasons	n= 17 (1.7%)	n= 11 (1.2%)	n= 6 (5.1%)	$\chi^2 = 1.471$ p= .225
Trauma	n= 9 (0.9%)	n= 6 (0.7%)	n= 3 (2.6%)	$\chi^2 = 1.000$ p= .317

Table 3. Reason for extraction in different age groups.

Age periods (years)	Dental caries	Wisdom teeth related extraction	Periodontal disease	Failed root canal treatment	Prosthetic reasons	Orthodontic reasons	Trauma
<20	57.1%	0%	2.9%	5.7%	0%	28.6%	5.7%
20-29	55.1%	26.3%	3%	9.6%	0.6%	4.2%	1.2%
30-39	49.3%	33.9%	9.2%	6.8%	0%	0%	0.7%
40-49	33.7%	17.2%	31.1%	12.5%	4.4%	0%	1%
50-59	43.7%	22.8%	25.7%	4.2%	3.6%	0%	0%
≥60	40.5%	4.8%	28.6%	11.9%	14.3%	0%	0%
Total	44.6%	23.4%	18.1%	8.7%	2.6%	1.7%	0.9%

The current study showed that most of the extracted teeth were the maxillary posterior teeth (45.6%), followed by mandibular posterior teeth (38.2%); then maxillary anterior teeth (8.8%), and lastly, the mandibular anterior teeth (7.4%) (Fig. 2). In maxillary and mandibular posterior teeth and maxillary anterior teeth, caries was the predominant reason for extraction followed by periodontal disease. Nevertheless, in lower anterior teeth, periodontal disease was the most frequent reason followed by dental caries (Fig. 3).

4. DISCUSSION

The current retrospective study evaluated the reasons for permanent tooth extractions in a sample consisting mainly of foreigner expats who sought a free dental service in the UAE. Therefore, this sample is expected to involve patients with a

financial barrier to dental care. The indication of tooth extraction was assessed by the specialists, whereas other methods are not indicated to save the teeth. To the extent of our knowledge, this is the first study that deals with the reasons for tooth extractions in the UAE. Other studies, including more local UAE citizens that sought dental extraction in both university and private clinics, are recommended.

Edentulism in adults aged 65 years or above is high, and it varies between 7% and 78% of different countries all over the world [22]. Consideration should be given about the reasons for tooth loss in order to perform successful strategical planning of dental health services and will provide information about the prevalence of dental diseases and dental care provided. Silva-Junior *et al.* went a further step when suggested that strategies of promotion and prevention of oral

health must consider the target population when outlining the services of dental care [6]. Several previous reports have already been published in different countries using various sample types and at different times [1 - 21]. However, these previous studies used different criteria for assessing reasons for teeth mortality.

Dental caries affects nearly all the population in most countries worldwide. Interestingly, some countries of Latin America and most industrialized countries show higher DMFT values than the developing countries of Africa and Asia [22]. Dental caries was the principal reason for tooth extractions in the current report. This finding is comparable to most previous similar studies in different populations [3 - 5, 13 - 21]. The results propose maintaining adequate oral hygiene by the patient besides the regular dental visit in order to minimize the tooth extraction sequel of dental caries.

Periodontal disease was the second most frequent reason for tooth extractions in patients above 40 years old. However, different studies showed non-significant differences in the reasons for tooth extractions between dental caries and periodontal disease in Japan [1], Singapore [8], and Italy [9]. Furthermore, previous studies in Nigeria [7], Jordan [11], and Canada [12] revealed periodontal disease as the main cause of tooth extractions. This difference may be attributed to the diverse time of conducting the research, research sample heterogeneity, and the different research criteria used by investigators. Notably, the previous researches conducted on the reasons for tooth extraction have different criteria of methodology.

Worldwide, gingivitis is a sign occurred in most adolescents and children. Furthermore, different percentages of severe periodontitis are present in most adult populations globally [22]. Reflecting the high prevalence of periodontal

disease, a recent study conducted in Brazil showed that healthy periodontium was only found in 5% of the younger adults and 2.3% in older adults. Meanwhile, 43% of the studied population revealed the presence of gingival pockets [6].

The extraction of wisdom teeth and its complication was the second most common cause of tooth mortality below the age of 40 years old. In the criteria of the current study, wisdom teeth extraction is a broad umbrella term that could involve and interlace with other reasons for tooth extractions, but these factors are exaggerated and strengthened due to association with the malposition, malfunction, difficulty in saving and treating the tooth, in addition to the partially or totally impaction condition. A large percentage of extraction related to wisdom teeth was recorded in our report. This could be attributed to the criteria used that regarded the wisdom teeth related problems as a primary result that could predispose different other reasons for tooth mortality. On the other hand, the high frequency of wisdom teeth related extractions could reflect the figure of our sample, which included individuals seeking free dental treatment. Undeniably, removal of wisdom teeth is a relatively expensive procedure in dental centers. Basically, the more frequent the cause of wisdom teeth extraction in a sample, the better oral hygiene should be anticipated in that sample. This is because wisdom teeth associated problems are usually anatomical and represent the least avoidable reason for tooth extractions. Whether prophylactically remove or retain wisdom teeth as long as no symptoms are observed is a debated subject among oral surgeons [23]. The authors' point of view is to leave wisdom teeth *in situ* unless they are associated with a pathological condition or oral disease. This strategy is obvious in the results of this study, which showed no wisdom tooth extraction at the age of less than 20 years old.

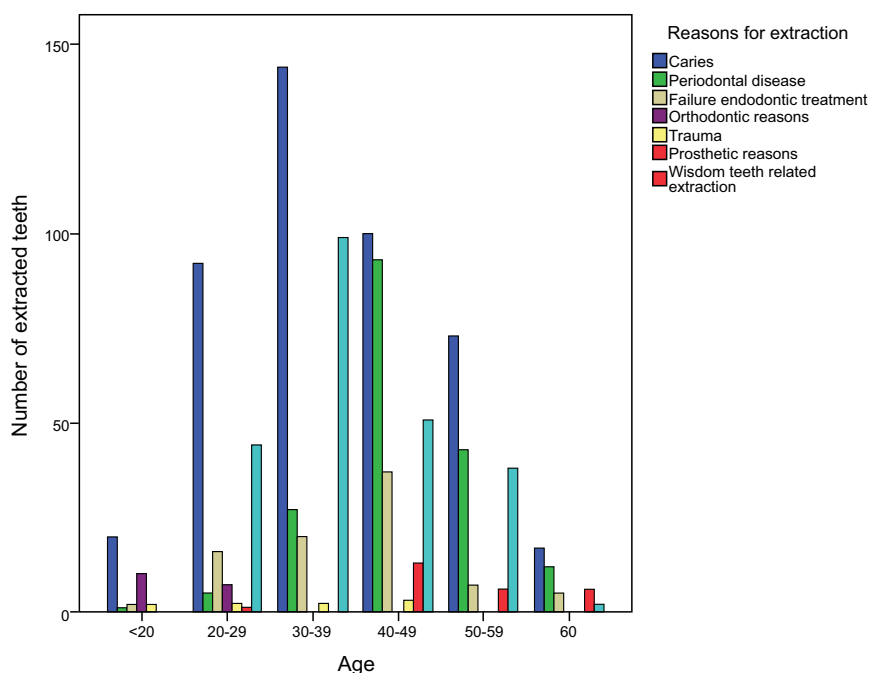


Fig. (1). Number and causes of extracted teeth in relation to age group.

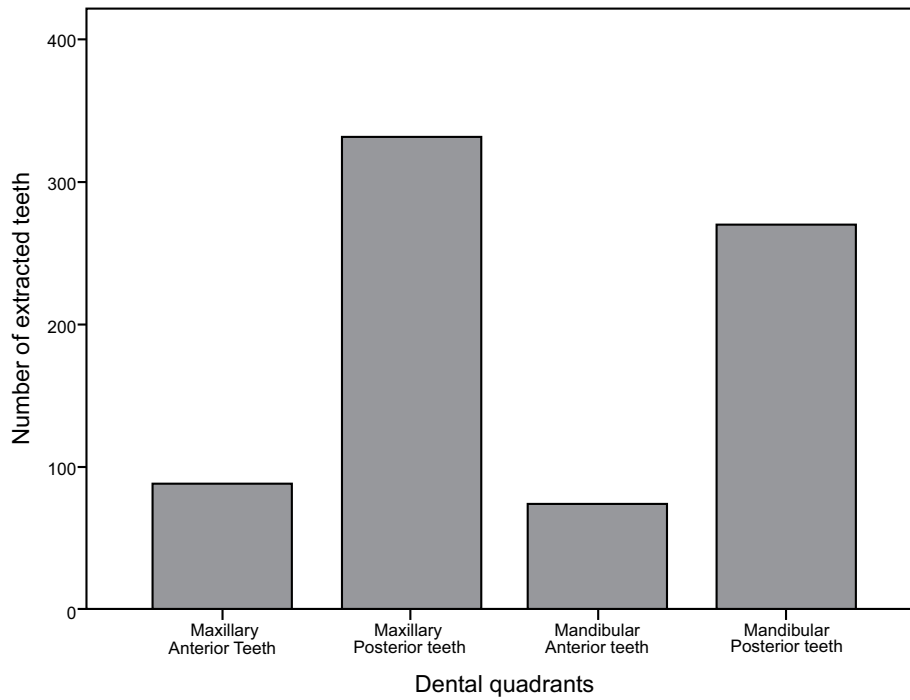


Fig. (2). Frequency of tooth extractions.

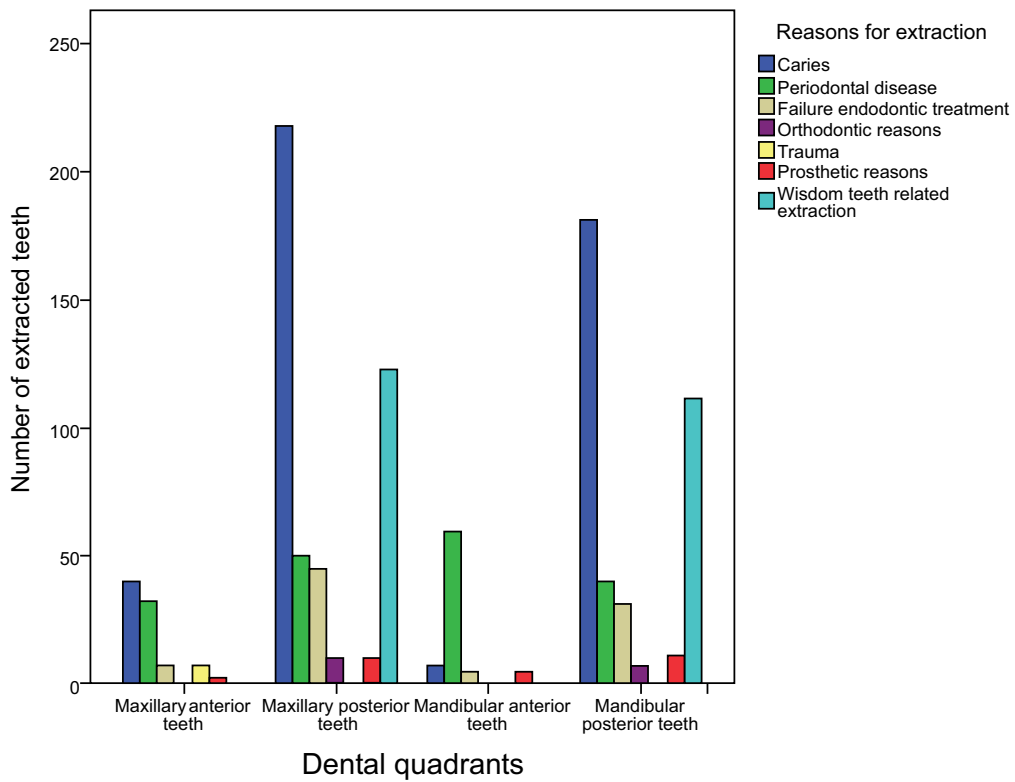


Fig. (3). Reasons for extraction by dental quadrants.

The percentage of teeth extracted due to failure after endodontic treatment is 8.7%, which is considered relatively higher than other studies [5, 14, 19]. This contrast may be due

to the unwillingness of the patient to receive endodontic retreatment due to the time factor in our sample. Extraction of endodontically treated teeth again is a broad category which

could interfere with other reasons like periodontal disease or caries, and even trauma that is provoked by endodontic treatment in addition to iatrogenic reason. This high percentage recommends performing another specific study aiming at the assessment of mortality of endodontically treated teeth only. Orthodontic reasons in the current study constitute 1.7% of the total extractions. This percentage is appropriate to previous studies performed in Japan [1] and Libya [15], which was 1.2% and 1.3, respectively. Nonetheless, other previous studies [13, 14, 17, 19] showed higher percentages. This controversy could be attributed to the heterogeneity of the sample type, mainly the age group and the economic factor. Worth noting, our study sample involved patients who sought free dental services. However, the orthodontic reason was the second most frequent cause of tooth mortality in patients less than twenty years.

In the current report, males are more frequent than females. This comes in agreement with other studies [1, 3, 13, 15 - 17]. Basically, females have the behavior of more health and dental seeking compared to the males, also they are more conscious regarding their facial esthetic [24]. These logics make females seeking earlier dental treatment, and therefore, less frequency of tooth extractions than her male counterpart.

In this study, extraction for dental caries and wisdom teeth related problems were more frequent in females, while extraction for periodontal disease, in addition to failed endodontic treatment, and for prosthetic reasons were more frequent in males. Several previous studies showed that caries was a predominant reason for extraction in females than in males [4, 5, 14], but other studies [13, 17, 19] are disagreed with that result. More pain perception associated with the problems of wisdom teeth, like pericoronitis, could be the factor behind the predominance of female gender for wisdom teeth related extraction. Male gender is a risk indicator for the severity of periodontal disease [25]. Several studies are in accordance with our results that showed significantly more male prevalence of periodontal disease as a reason for tooth extractions [1, 5, 14, 19, 20].

The more prevalence of total teeth extraction in male gender in the current study could rationalize the more frequency of males who intend extraction for prosthetic reasons. Therefore, males extract teeth more, thus they need to restore teeth more than females. The less awareness of males toward oral hygiene, together with the lack of their interest in spending more time on complicated restorative treatment [3, 17], could explain our results of more male gender predominance for the extraction of endodontically failed restorations.

In the current study, more significant extraction was done at the age between 30-49 years old, while less extraction occurs in both age extremities (<20 and ≥ 60 years old patients). This result could be attributed to the fact that most common dental diseases, which are dental caries and periodontal disease, are accumulative with aging. Therefore, less extraction was noticed in the younger age extremity. However, in the old age extremity, most of the diseased teeth would be already extracted. This finding is consistent with other studies [3, 5, 14]. Nevertheless, several previous studies showed the majority of tooth extractions were done in younger age groups [4, 18,

21] and older age groups [1, 20]. It is clear that the age of extraction in a sample is directly proportional to their better general oral and dental health.

The present study showed that, with aging, there was an increase in the percentage of the reason of periodontal disease as a cause of extraction. This is in agreement with most of the previous studies that showed the increase in the teeth mortality with aging as a result of periodontal disease [1, 3 - 5, 8, 13 - 16, 20]. Basically, periodontal disease has an increased frequency as a cause of dental extraction with the older age group. This is because many permanent teeth could be lost due to caries reason in younger age groups before they could be threatened by periodontal disease [13]. However, other studies showed younger ages as a predominant period of extraction [18].

The current study showed that the most extracted teeth were the maxillary posterior teeth, followed by mandibular posterior teeth; then maxillary anterior teeth, and lastly, the mandibular anterior teeth. These results are comparable to other available studies [4, 21]. Similarly, Da'ameh showed that posterior teeth were extracted more frequently than anterior teeth [3.] However, Alesia and Khalil [19] demonstrated that mandibular anterior teeth were found to be more frequently extracted than the maxillary anterior teeth.

In the present study, caries was the first reason for the extraction of teeth in all quadrants except in the lower anterior teeth, where it was replaced by periodontal disease. Similar data were found in other reports [1, 5, 15, 17]. It is clear that lower anterior teeth are more resistant to caries than other teeth in the mouth. Therefore, these teeth will remain more sound and then affected by the periodontal disease [10].

CONCLUSION

This study showed that caries was the principal reason for tooth extractions, followed by wisdom teeth related problems and periodontal disease. There is an increasing percentage of tooth extraction due to periodontal disease with both aging and male gender. In all dental quadrants, caries was the more frequent reason for extraction, except the lower anterior teeth, whereas periodontal disease is the more frequent reason. Posterior teeth were extracted more than anterior teeth. This recommends enhancing the instructions for oral hygiene and its rule in the prevention of caries to the patients seeking free dental care at dental school clinics.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the ethical approval committee of Ajman University, UAE (Ref. SSF-2016/17-05).

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. The research has been conducted in full accordance with the World Medical Association Declaration of Helsinki of 1975, as revised in 2008.

CONSENT FOR PUBLICATION

Informed written assent/consent was obtained from the participants and parents or guardians prior to participation.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of the article is available in the archive of the dental clinics at the College of Dentistry, University of Science and Technology of Fujairah at <http://www.ustf.ac.ae/en/dentistry.html>.

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CONFLICT OF INTEREST

The author declares no conflict of interest, financial or otherwise.

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