International Journal of Dental Sciences
www.dentaljournal.in
E-ISSN: 2663-4708, P-ISSN: 2663-4694
Received: 08-05-2021, Accepted: 23-05-2021, Published: 07-06-2021
Volume 3, Issue 1, 2021, Page No. 96-100

Analysis of reasons for permanent teeth extraction in adult and children in Iraq, Mosul, retrospective study

Yusra Hameed Husain Taha AL Mukhtar
Master oral and maxillofacial surgery, Nineveh Health Directorate**,** College of Basic Dental Science, University of Mosul, Iraq

Abstract
Background: Tooth extraction is one of the dental treatments which should be considered the last option; extraction of tooth is the removal of teeth from the dental alveolus (socket) in the alveolar bone. Extraction of permanent teeth in adult and children should be performed for several reasons including dental caries, periodontal and gingivitis disease, crowded, perapical lesion, trauma, impacted wisdom teeth, failed root canal treatment, and orthodontic reasons. The oral health requires the permanent teeth retention as long as possible because the teeth are important not only for functional reasons but also esthetics.
Objectives: The aim of this survey was to investigate the primary reason for extraction of the permanent teeth and its correlations with age, gender, and education level, as well as, identify the important predictors for dental caries in general dental centers in Mosul, Iraq.
Subjects and Methods: The study was conducted over a period of 15 months; the sample consisted of (1254) patients, aged 9–70 years, who underwent tooth extraction. There were male and female patients. The frequency distribution was calculated using the 2 test, ANOVA and t test for differences in mean number of extracted teeth and the logistic regression model to evaluate the variables associated with reasons for tooth extraction.
Results: A total of teeth were extracted from the patients. The highest rate (23.4%) of extraction occurred for those 51–60 years old. Males comprised (41.1%) of patients and had more teeth (48.1%) extracted than females (41.9%). Significant differences are found between teeth extraction and the levels of education. Tooth loss due to caries is (35.4%); periodontal gingivitis (24.4%); peri-apical lesion (16.7%); crowded (6.8%); root canal failure (7.4%), wisdom (6.1%), and trauma (3.2%). Tooth loss is an easily identifiable outcome that summarizes a complex suite of factors in an individual's history of dental disease and its treatment by dental services over a lifetime.
Conclusion: The results of this survey indicated that dental caries and periodontal disease were the main reasons for tooth extraction in Mosul, Iraq. The majority of patients had incomplete secondary education or lower and had even more teeth extracted than patients having higher levels of education. The best predictors for tooth loss due to caries were age, gender, marital status, tooth type, and having had a previous extraction. However, the smoking status shows insignificant association with tooth loss.

Keywords: tooth extraction, dental caries, periodontal gingivitis, peri-apical lesion, crowded, root canal failure

Introduction

Tooth extraction is one of the dental treatments which should be considered the last option; extraction of tooth is the removal of teeth from the dental alveolus (socket) in the alveolar bone. Extraction of permanent teeth should be performed for several reasons including dental caries, periodontal and gingivitis disease, crowded, perapical lesion, trauma, impacted wisdom teeth, failed root canal treatment, and orthodontic reasons. The oral health requires the permanent teeth retention as long as possible because the teeth are important not only for functional reasons but also esthetics [1, 2]. In children, the first permanent molar, which is the first permanent tooth to erupt, is the keystone of the occlusion; it determines the shape of the lower part of the face and conditions the position and health of the other permanent teeth [3]. Additionally, the frequency of tooth brushing and dental visit, socio-demographic data such as age, gender, residence, place, education, and the income level were recorded for each participant. All permanent teeth extracted, during the period (January 2020 to May 2021) were recorded. The reasons for extraction were analyzed for each tooth type in the upper and lower arch. Data were not divided into right and left quadrants as the previous surveys have shown no differences in the rates of extraction for the right and the left sides of the oral cavity. The number of extracted teeth can serve as an indicator of socio-economic and oral hygiene level [4]. Caries and its squeal remain the most important cause of tooth loss throughout adult life in Mosul and, therefore, caries prevention and maintenance of restorations are of great importance at all ages [5]. It may be possible to limit future extractions and highlight the crucial role of prevention. Therefore, the purpose of this paper was to investigate the reasons for extraction of permanent teeth, its correlations to several aspects such as age, gender, smoking and educational level and the best predictors for dental caries in Mosul Iraq.

Materials and Methods

This cross-sectional, multicenter study of consecutive sampling was focused on general dental centers in a population of Iraq. In the Mosul health service system, patients seek dental care mostly

from public, but also from private practices. A representative sample of the health districts was randomly selected. Dentist who agreed to take part in the study were interviewed by the authors to explain the objects of the study. Moreover, a list of definitions for possible reasons for tooth extraction reasons has been reviewed. Written formal consents were obtained from the patients.

Statistical analysis

The data were entered and analyzed using the SPSS software (Version 20). The relationships of the categorical background variables, such as age groups, gender, education level, and smoking status with reasons for tooth extraction were analyzed Chi-square test, while differences in the mean number of extracted teeth per patient were analyzed with ANOVA and t test methods. A logistic regression model was used to evaluate the variables associated with reasons for tooth loss. p-value ≤ 0.05considered as significant.

Results

The sample of the study includes (1254) patients, 603 are males and (651) are females; their results analyzed as following:

Table (1) summarizes the mean number and standard deviation for tooth extraction in the current day of the study and that of the teeth extracted ever, and shows that the mean of the total tooth extraction in males is (7.0±0.7), which is significantly (p=0.001) differs from that of females (4.1±0.4). Furthermore, the average number of teeth extracted per patient on the day of study according to the age groups shows that in total, the extraction increasing with the age starting from (1.6±0.1) in younger than 14 years to (12.9±0.6) in patients between 61-70 years old with statistically difference (p=0.000), and by application of post hoc test to evaluate the real difference, only the age group≤14 shows insignificance (p=0.130). The patients with low educational level appear to have a highest mean of extraction (7.4±0.4), also the middle level (5.7±0.7), and the primary (3.7±0.2) comparing to high educational level (3.0±0.2), secondary (3.4±0.1); all appear to have significant difference among (p=0.000).

Table 1: Mean number and standard deviation of teeth extracted according to gender, age groups, and education levels.

Parameters		Previous extraction	Extraction on the day of study	Total	Results
Gender	Males (n=603)	4.9±0.1	2.1±0.7	7.0±0.7	*p= 0.001
	Females (n=651)	2.6±0.3	1.5±0.2	4.1±0.4	
Age groups in years	≤14 (n=132)	0.3±0.1	1.3±0.1	1.6±0.1	F= 37142.7
	15-20 (n=184)	0.4±0.1	1.1±0.2	1.5±0.2	
	21-40 (n=166)	2.9±0.3	1.2±0.1	4.1±0.3	1-2 ***
	41-50 (n=184)	6.1±0.3	2.0±0.02	8.1±0.3	p=0.130
	51-60 (n=229)	7.8±0.1	2.2±0.1	10±0.1	**p= 0.000
	61-70 (n=293)	10.4±0.5	2.5±0.1	12.9±0.6	
Education levels	Primary (n=311)	2.1±0.2	1.6±0.1	3.7±0.2	F= 6180.9
	Secondary (n=312)	2.3±0.1	1.1±0.1	3.4±0.1	
	Higher (n=163)	2. ±0.1	1.0±0.2	3.0±0.2	**p= 0.000
	Middle (n=219)	3.9±0.6	1.8±0.2	5.7±0.7	
	Low (n=249)	5.1±0.3	2.3±0.2	7.4±0.4	***p=0.000

*t-test of 2 means; ** one-way ANOVA; *** post hoc test

Table (2) displays the causes of tooth extraction in numbers and percentages regarding gender, age groups, levels of education, and smoking status, and depicts that the male constitutes (48.1%) of study sample. Extraction due to dental caries (35.4%) and, periodontal gingivitis (24.4%), and per-apical lesion (16.7%), crowded (6.8%), root canal failure (7.4%), wisdom (6.1%), and trauma (3.2%); (41.1%), (26.6%), (18.9%), (3.8%), (2.8), (5.0%), and (1.8%) of them in males respectively, but with insignificant difference with that of females (p=0.060).

The dental caries are higher in the age groups (≤14), (15-20), (21-30), and (51-60) than the other causes, while periodontal gingivitis becomes the main cause among the age groups (31-40), (41-50), and (61-70), and the differences are highly significant (p=0.000). Secondary educational level or lower appear to loss more teeth due to caries and periodontal disease compared with patients having higher education levels(p=0.002). About (59.6%) of smokers have tooth extractions due to dental caries and periodontal gingivitis in comparison to the other causes, but the difference is insignificant statistically (p=0.071).

Table 2: Reasons for tooth extraction.

Parameters		Dental cares	Periodontal gingivitis	Per-apical lesion	Crowded	Root canal failure	wisdom	Trauma	total
Gend	Male	248 (41.1%)	160 (26.6%)	114 (18.9%)	23 (3.8%)	17 (2.8%)	30 (5.0%)	11 (1.8%)	603 (100.0%)
	female	196 (30.1%)	146 (22.4%)	95 (14.6%)	62 (9.5%)	76 (11.7%)	47 (7.2%)	29 (4.5%)	651 (100.0%)
Age group in years	≤14	60 (45.5%)	36 (27.3%)	19 (14.4%)	14 (10.6%)	1 (0.8%)	0 (0.0%)	2 (1.5%)	132 (100.0%)
	15-20	81 (44.0%)	39 (21.2%)	31 (16.8%)	18 (9.8%)	13 (7.1%)	0 (0.0%)	2 (1.1%)	184 (100.0%)
	21-30	93 (56.0%)	21 (12.7%)	24 (14.5%)	4 (2.4%)	8 (4.8%)	11 (6.6%)	5 (3.0%)	166 (100.0%)
	31-40	39 (21.2%)	46 (25.0%)	28 (15.2%)	9 (4.9%)	14 (7.6%)	41 (22.3%)	7 (3.8%)	184 (100.0%)
	41-50	56 (24.5%)	64 (27.9%)	39 (17.0%)	17 (7.4%)	21 (9.2%)	19 (8.3%)	13 (5.7%)	229 (100.0%)
	51-60	107 (36.5%)	76 (25.9%)	48 (16.4%)	22 (7.5%)	29 (9.9%)	6 (2.0%)	5 (1.7%)	293 (100.0%)
	61-70	8 (12.1%)	24 (36.4%)	20 (30.3%)	1 (1.5%)	7 (10.6%)	0 (0.0%)	6 (9.1%)	66 (100.0%)

Education	Primary	109 (35.0%)	44 (14.1%)	56 (18.0%)	23 (7.4%)	44 (14.1%)	21 (6.8%)	14 (4.6%)	311 (100.0%)
	Secondary	106 (34.0%)	95 (30.4%)	41 (13.1%)	13 (4.2%)	21 (6.7%)	27 (8.7%)	9 (2.9%)	312 (100.0%)
	Higher	39 (23.9%)	45 (27.6%)	37 (22.7%)	20 (12.3%)	11 (6.7%)	9 (5.6%)	2 (1.2%)	163 (100.0%)
	Middle	61 (27.8%)	76 (34.7%)	38 (17.4%)	14 (6.4%)	11 (5.0%)	12 (5.5%)	7 (3.2%)	219 (100.0%)
	low	129 (51.8%)	46 (18.5%)	37 (14.9%)	15 (6.0%)	6 (2.4%)	8 (3.2%)	8 (3.2%)	249 (100.0%)
Smok	smoker	311 (35.5%)	189 (21.5%)	152 (17.3%)	45 (5.1%)	72 (8.2%)	72 (8.2%)	37 (4.2%)	878 (100.0%)
	Non smoker	133 (35.4%)	117 (31.1%)	57 (15.2%)	40 (10.6%)	21 (5.6%)	5 (1.3%)	3 (0.8%)	376 (100.0%)
Total		444 (35.4%)	306 (24.4%)	209 (16.7%)	85 (6.8%)	93 (7.4%)	77 (6.1%)	40 (3.2%)	1254(100.0%)

Table (3) shows the numbers and frequencies of the causes for teeth extraction according to the tooth type, and illustrates that, the molars represents (60.0%), of the extracted teeth, followed by premolars (18.7%), wisdom (11.5%), while incisors and canines are the least frequently extracted (8.9%).Dental caries, periodontal gingivitis, per-apical lesions, crowded, and root canal failure occur as causes for (69.6%), (54.6%), (68.9%), (38.8%), and (61.3%) of the molar extraction respectively. The premolars extraction occurs mostly due to periodontal gingivitis (29.4%).The trauma represents the most frequently cause for extraction of the incisors and canines(34.1%) with statistical significance of (p=0.000).

Table 3: Reasons for extraction by tooth type.

Tooth type	Dental cares	Periodontal gingivitis	Per-apical lesion	Crowden	Root canal failure	wisdom	Trauma
Molar	309 (69.6%)	167 (54.6%)	144 (68.9%)	33 (38.8%)	57 (61.3%)	40 (51.9%)	15 (37.5%)
Premolar	63 (14.2%)	90 (29.4%)	39 (18.7%)	13 (15.3%)	21 (22.6%)	1 (1.3%)	7 (17.5%)
Incisor and canine	31 (7.0%)	13 (4.2%)	19 (9.1%)	29 (34.1%)	3 (3.2%)	0 (0.0%)	16 (40.0%)
Wisdom	41 (9.2%)	36 (11.8%)	7 (3.3%)	10 (11.8%)	12 (12.9%)	36 (46.8%)	2 (5.0%)
Total	444 (100.0%)	306 (100.0%)	209 (100.0%)	85 (100.0%)	93 (100.0%)	77 (100.0%)	40 (100.0%)

Table (4) demonstrates the logistic regression model used to recognize the variables that associated with tooth loss due to caries and reveals that, the gender, marital status, age groups, educational levels (apart from the secondary level), tooth type, having had a previous extraction, and the smoking status were significantly associated with tooth extraction due to caries($p \leq 0.05$). However, the smoking status shows insignificant association with tooth loss ($p \geq 0.05$).

Table 4: Logistic regression analysis of selected variables for dental caries**.**

Variables selected	Beta value	SD	Odds ratio	(95% CI)	p-value
Gender (ref: male)					
Female	-0.3	0.2	0.7	0.5-1.0	0.000
Marital status (ref: single)					
Married	0.4	0.1	1.3	1.1-1.5	0.001
Age group (ref: ≤20)					
21-40	1.3	0.2	3.0	2.6-3.3	0.002
41-50	1.1	0.1	4.3	4.0-4.6	0.010
51-60	0.8	0.2	2.1	1.8-2.3	0.000
61-70	0.5	0.3	1.9	1.7-2.2	0.001
Education level (ref: high)					
Primary	-0.3	0.1	0.8	0.6-0.9	0.001
Secondary	1.0	0.3	1.1	0.9-1.3	0.28
Middle	-0.2	0.1	1.2	1.0-1.4	0.01
Low	-0.2	0.2	0.9	0.7-1.3	0.000
Tooth type (ref: incisors and canines)					
Molar	1.2	0.1	1.2	1.0-1.5	0.03
Premolar	1.1	0.2	2.6	2.3-2.8	0.000
Wisdom	0.6	0.2	1.4	1.1-1.6	0.000
Having a previous extraction (ref: no)					
Yes	0.5	0.1	1.7	1.4-2.0	0.000
Smoking (ref: no)					
Yes	0.3	0.1	1.3	1.1-1.5	0.23

Discussion

The sample of the study includes (1254) patients, (603) are males and (651) are females; dental caries and its complications were the leading reason for extraction. Periodontal disease was the next most common reason. The finding that caries was the most common reason is in agreement with the majority of similar studies [6] that searching for the reasons for extraction of permanent teeth in general dental practices in Tehran, Iran. A total of 2620 teeth were extracted from the 1382 patients. The highest rate (36.9%) of extraction occurred for those 41-60 years old. Males comprised 48.7% of patients but had more teeth (1470, 55.3%) extracted than females (1150, 43.9%). Nine hundred and

thirty-six (67.7%) patients had incomplete secondary education or less. Tooth loss due to caries was 51%; periodontal disease was 14.4%; supernumerary and tooth impaction 13.9%. There was a significant association between patient characteristics (age, gender and education level) and number of teeth extracted. But this study not agreement with Jordan study Reasons for extraction of permanent teeth [6] in this study extracted teeth during the study period. A total of 934 teeth were extracted from 582 patients, of these 33.4 per cent were extracted for periodontal disease, and 27.6 per cent because of caries and its squeal. Surveys, in Italy study [9] represented that 1056 teeth in 839 patients were extracted. More than two-thirds of the teeth were extracted for dental caries (34.4%) and periodontal disease (33.1%). The mean number of teeth extracted per patient showed a significant increasing trend with increasing age, the first and second molars and the premolars were extracted most often because of caries. Japan study [10] information on 9115 extracted teeth from 7499 patients was obtained. The results showed that dental caries and its sequel (totally 43.3%, 32.7% and 10.6%, respectively) and periodontal disease (41.8%) were the main reasons for teeth extraction. Extraction due to caries or fracture was commonly observed in all age groups while in Singapore study [11] data were collected from 1276 patients, from whom a total 272 teeth were extracted. In this population group, the results showed that the percentage of teeth extracted due to periodontal reasons and caries were about the same that is 35.8% and 35.4%, respectively. There was an increase in teeth extracted due to periodontal reasons with age and showed that both caries and periodontal disease were almost equally important reasons for tooth loss. But Matthews DC, Smith CG, Hanscom SL [12] results studies about 521 teeth were lost in 69 patients (20.6% of sample). Of teeth lost, 61.8% were due to periodontal disease; 24.8% to caries; 13.2% to other reasons. Most periodontal patients (79.4%) who received treatment at this dental school clinic did not lose any teeth due to periodontal disease over at least 10 years. Although patients who had surgical therapy lost more teeth than those who had nonsurgical therapy alone, this was not an important predictor of tooth loss., Canada study [13] information on 6143 patients they saw this study differs from finding that, overall, more permanent teeth were extracted because of periodontal disease than because of caries., like Jordan study [7], Taiwan [14] in this study, 857 teeth having undergone nonsurgical root canal treatment (NSRCT) in Taiwan in 2000 were evaluated during a 5-year follow-up period for first untoward events and reasons for tooth extraction was 7.5% of the NSRCT teeth were extracted by the end of the 5-year follow-up period, and only 10.7% of these teeth were extracted as a result of endodontically related diseases, but in Singapore study[11] had a lower percentage of dental caries compared to our study and many earlier studies in Japan [15] eight hundred forty-nine Japanese dentists were asked to record the reason for every tooth extraction of permanent teeth during 1 week in each of four seasons. Overall, caries was the most frequent reason for tooth extraction (55.4%), followed by periodontal disease (38.0%). In Germany study [16] was to collect information on the main causes of tooth loss in the western states, sixty-eight dentists, out of 80 that were selected with a systematic random method for an epidemiological study in the western states of Germany, recorded their reason for tooth extraction. Included in the study were only extractions of permanent teeth during a period of 2 weeks, the patients were asked for their main reason for tooth extraction. For the patients, pain was the major reason for extraction (47.2%). According to the participating dentists periodontal disease is the most frequent cause of tooth extraction for people over 40 year of age, while for those below 40 year of age, caries and third molar extractions are the most frequent reasons.

In my study (35.4%) of teeth extracted for dental caries and (24.4%) periodontal gingivitis, per-apical lesion (16.7%), crowded (6.8%), root canal failure (7.4%), wisdom (6.1%), and trauma (3.2%); (41.1%), main reason for extraction even in elderly patients, but to a less degree than in younger ones. This result was also reported by Hadeel M. Al Ameer Sally Awad [17]. This difference may be attributed to diet, socioeconomic factors, level of dental awareness as well as water fluoridation in these countries. The study was conducted over a period of 15 months; the sample consisted of (1254) patients, aged 9–70 years, who underwent tooth extraction. Regarding the gender of the patients, the mean of the total tooth extraction in males is (7.0±0.7) which is significantly (p=0.001) differs from that of females (4.1±0.4), the average number of teeth extracted per patient on the day of study according to the age groups shows that in total, the extraction increasing with the age starting from (1.6±0.1) in younger than 14 years to (12.9±0.6) in patients between 61-70 years old with statistically difference (p=0.000), and by application of post hoc test to evaluate the real difference, only the age group≤14 shows insignificance (p=0.130). The patients with low educational level appear to have a highest mean of extraction (7.4±0.4), also the middle level (5.7±0.7), and the primary (3.7±0.2) comparing to high educational level (3.0±0.2), secondary (3.4±0.1); all appear to have significant difference among (p=0.000)all that in table (1), while in table (2)in this study show the causes of tooth extraction in numbers and percentages regarding gender, age groups, levels of education, and smoking status, and depicts that the male constitutes (48.1%) of study sample. The dental caries are higher in the age groups (≤14), (15-20), (21-30), and (51-60) than the other causes, while periodontal gingivitis becomes the main cause among the age groups (31-40), (41-50), and (61-70), and the differences are highly significant (p=0.000). Extraction due to dental caries (35.4%) and, periodontal gingivitis (24.4%), and per-apical lesion (16.7%), crowded (6.8%), root canal failure (7.4%), wisdom (6.1%), and trauma (3.2%); (41.1%), (26.6%), (18.9%), (3.8%), (2.8%), (5.0%), and (1.8%) of them in males respectively, but with insignificant difference with that of females (p=0.060). Secondary educational level or lower appear to loss more teeth due to caries and periodontal disease compared with patients having higher education levels (p=0.002). About (59.6%) of smokers have tooth extractions due to dental caries and periodontal gingivitis in comparison to the other causes, but the difference is insignificant statistically (p=0.071).

Tooth extraction was assigned to seven groups; dental caries and periodontal disease, periapical lesion, crowded and orthodontic treatment, root canal failure, wisdom tooth, and trauma. Periodontal disease is an infection of the tissues and bones that surround and support the teeth have caused loosening of the teeth. Sometimes dentists pull teeth to prepare the mouth for orthodontia. The goal of orthodontia is to properly align the teeth, when the teeth are too big and need extraction in orthodontic

treatment, also periodentites, perapical lesions. If tooth decay or damage extends to the pulp-the center of the tooth containing nerves and blood vessels- bacteria in the mouth can enter the pulp, leading to infection. Often this can be corrected with root canal therapy (RCT), but if the infection is so severe that antibiotics or RCT do not cure it, extraction may be needed to prevent the spread of infection, also there are situations when wisdom teeth need to extracted surgically for aligning overcrowded denture, wisdom teeth removal and tooth extraction can be performed on impacted teeth to expand the jawbone to allow more space for the teeth to be aligned as needed, or to remove some of the teeth so that the remaining teeth can fit correctly, tooth extraction may be performed as part of a patient's orthodontic plan. If the patient's teeth are severely overcrowded, many situations, overcrowded denture becomes a problem where space provision for all teeth gets complicated and the orthodontist may recommend the removal of permanent teeth. In this situation, orthodontists plan for a systematic arrangement in denture so that all teeth can be properly placed and organized and surgical extraction of one or two teeth is prescribed. It is done mostly with children as well as with teenagers; this creates more space for the remaining teeth. Trauma was also other reasons for tooth extraction. Additionally, dental visit, socio-demographic data such as age, gender, residence, place, education, and income level were recorded for each participant. Obtained data were statistically analyzed by using descriptive statistic. However, the smoking status shows insignificant association with tooth loss ($p \geq 0.05$).

Conclusion

The results of this survey indicated that dental caries and periodontal disease were the main reasons for tooth extraction in Mosul, Iraq. The majority of patients had incomplete secondary education or lower and had even more teeth extracted than patients having higher levels of education. The best predictors for tooth loss due to caries were age, gender, marital status, tooth type, and having had a previous extraction. However, the smoking status shows insignificant association with tooth loss.

Acknowledgement

We extend our sincere thanks to all dentists and patients who kindly agreed to take part in this study. The author would like to thank in advance the ARC-statistical center for their statistical advice and assistance.

References

1. Da'ameh DDA. Reasons for permanent tooth extraction in the North of Afghanistan. *J Dent*. 2006:34:48-51.
2. Sahibzada HA, Munir A, Siddiqi KM, Baig MZ. Pattern and Causes of Tooth Extraction in Patients Reporting to a Teaching Dental Hospital. J Islamabad Med Dent Coll,2016:5:172-183.
3. Ndoye Soukeye, Diallo M Tidiane, Diouf Abdoulaye, Diouf N Guignane, Faye Malick, Tamba Aissatou. Department of Pediatric Dentistry, Cheikh Anta Diop University, Africa Received: September 10, 2018; Published: October 01, 2018.
4. Chrysanthakopoulos NA. Reasons for extraction of permanent teeth in Greece: a fiveyear follow-up study. Int Dent J,2011:61:19–24.
5. McCaul LK, Jenkins WMM, Kay EJ. The reasons for the extraction of various tooth types in Scotland: a 15-year follow up. J Dent,2001:29:401–407.
6. M Jafarian 1, A Etebarian: Reasons for extraction of permanent teeth in general dental practices in Tehran, Iran. Med Princ Pract, 2013;22(3):239-44. Doi: 10.1159/000345979. Epub 2012 Dec 29.
7. Haddad I, Haddad in K, Jebrin S, Ma'Ani M, Yassin O. Reasons for extraction of permanent teeth in Jordan. Int Dent J,1999:49:343–346.
8. Jovino-Silveira RC, Caldas AF Jr, de Souza EH, Gusmão ES. Primary reason for tooth extraction in a Brazilian adult population. Oral Health Prev Dent,2005:3:151–157.
9. Angelillo IF, Nobile CGA, Pavia M: Survey of reasons for extraction of permanent teeth in Italy. Community Dent Oral Epidemiol,1996:24:336–340.
10. Aida J, Ando Y, Akhter R, Aoyama H, Masui M, Morita M. Reasons for permanent tooth extractions in Japan. *J Epidemiol*,2006:16:214–219.
11. Ong G, Yeo JF, Bhole S. A survey of reasons for extraction of permanent teeth in Singapore. Community Dent Oral Epidemiol.1996:24:124–127.
12. Matthews DC, Smith CG, Hanscom SL. Tooth loss in periodontal patients. J Can Dent Assoc.2001:67:207–210.
13. Murray H, Locker D, Kay EJ: Patterns of and reasons for tooth extractions in general dental practice in Ontario, Canada. Community Dent Oral Epidemiol.1996:24:196–200.
14. Chen SC, Chueh LH, Hsiao CK, Wu HP, Chiang CP: First untoward events and reasons for tooth extraction after nonsurgical endodontic treatment in Taiwan. J Endod. 2008:34:671–674.
15. Morita M, Kimura T, Kanegae M, Ishikawa A, Watanabe T: Reasons for extraction of permanent teeth in Japan. Community Dent Oral Epidemiol,1994:22:303–306.
16. Reich E, Hiller KA: Reasons for tooth extraction in the western states of Germany. Community Dent Oral Epidemiol. 1993:21:379–383.
17. Hadeel M. Al Ameer, Sally Awad. Reasons for Permanent Teeth Extraction in Al-Madinah Al-Munawarah. JAMMR, 2017:24(7):1-6.