



Patterns and Causes of Teeth Extraction among Children Attending Baghdad Dental Teaching Hospital: Original Article

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ABSTRACT

Aims: To determine patterns and causes of teeth extraction among children attending Baghdad Dental Teaching Hospital. **Materials and methods:** Total 1055 children participated in this study, ranging from 3 to 14 years old. Sociodemographic data was obtained along with dental information like the type of tooth/teeth extracted, and the reasons behind these extractions. All the data took nine months to be fully collected. **Results:** During the study period, 1709 teeth were extracted from 1055 children for various reasons. Majority of extractions i.e. 63.6% were done for decay reasons and its related complications. However, 6.61% of teeth were extracted for orthodontic reasons, and only 0.1% of them due to trauma. When comparing between primary and permanent teeth, a higher number of primary teeth 96.8% were extracted. Regarding the causes behind extraction, dental caries was the major cause. Additionally, the lower left first molar was the most frequent extracted tooth in both dentitions. **Conclusions:** Dental caries and its related pulpal pathologies remain the potential causes of teeth extraction. Lower left first molar was the most commonly extracted tooth in both primary and permanent teeth. These findings would call for extensive dental educational programs to overcome this problem.

Keywords: Dental caries, Premature teeth loss, Deciduous teeth, Permanent molars, Mandibular posterior teeth, Iraqi children

INTRODUCTION

The most important goal behind the treatment provided for a pediatric dental patient is directed towards preserving primary or permanent teeth from getting prematurely lost, as any teeth will participate in the stimulation and development of the dental arches, aid in normal occlusal relationship, maintain esthetics, help in speech development and effective mastication as well as enhance the improvement of life quality [1-3].

The primary teeth can act as a guide for their successors into occlusion and their premature loss may cause delay in the eruption of their permanent successors, tilting or drifting, and this will cause an adverse effect in the position of the adjacent and succedaneous teeth, which will eventually lead to malocclusion. However, teeth loss may also cause problems in mastication, esthetics and speech that may lead to psychological complications and social disturbances [1,3-5]. Whereas dental anxiety may also develop in some children after serial extractions [6]. Once these complications are established, it will be difficult and expensive to be corrected [2,5].

In different countries, many studies have been conducted to determine the reasons behind teeth extraction. However, their results were controversial, but most of them implicated dental caries and its sequelae to be the main cause for extraction [3,7-9]. Understanding the underlying causative reasons and their related factors (e.g. caries, periodontal disease, orthodontic management, trauma, and other reasons), it is important to develop future strategies in order to reduce teeth mortality [3,7].

In Baghdad, the last study concerning this subject was done immediately after the war in 2003 [9]. So, the present study was aimed to identify the pattern and evaluate the causes of teeth extraction and to see the changes if any that were developed during the last 11 years in comparison to the study done immediately after the war in 2003.

MATERIALS AND METHODS

Sample

The project was submitted to be reviewed by the Scientific and Ethical Committee of The Pedodontics and Preventive Dentistry Department in the College of Dentistry, University of Baghdad, Iraq, and the approval was obtained. The present study was conducted among a sample of children attending the pediatric dental clinic in the Department of Pedodontics and Preventive Dentistry at Dental Teaching Hospital of College of Dentistry, Baghdad University. The sample collection started from the September 2015 and continued until June 2016.

Methods

Prior to clinical examination, all the information concerning patient's name, age, gender, general health was listed. The information on dental diagnosis and treatment plan were also recorded. Oral examination was done for each patient on the dental chair, using the diagnostic instruments and under direct light illumination. When extraction was indicated, all the needed information was recorded in a different case sheet prepared especially for this purpose, which includes tooth type, number of teeth extracted, reason and date for extraction. Any child who was medically compromised, having neoplastic lesions, or came without their parents were excluded from the study.

Before including any child in the study sample, the study purpose was explained to the parents directly and consent was obtained from them by filling a consent form that contains all the needed information from them including the child's general health and their acceptance for participation.

Causes for extraction were recorded according to criteria gathered and modified by a group of researchers [10-12]:

- Periapical problems: Deep carious lesion, unrestorable tooth structure, periapical abscess and draining fistula (with the aid of X-ray), or pathological mobility.
- Retained root: Remnant root present of the untreated badly carious tooth.
- Orthodontic need: Teeth extraction to prevent or correct malalignment.
- Trauma: Extraction took place as a result of the traumatic cause.
- Retained primary tooth: No sign of primary tooth mobility, on X-ray there is no normal root resorption and the underlying permanent tooth reach 3/4 root formation.
- Shedding time: Keeping in mind the age of the child, if there is any mobility of the primary tooth associated with pain and/or discomfort during eating.
- Failure of pulp treatment: With the help of radiographical assessment, primary tooth with pulp treatment (pulpotomy or pulpectomy) and for the permanent tooth any root canal treatment associated with continuous pain fistula or periapical abscess.
- Supernumerary, impacted, natal and neonatal teeth.
- Other reasons: May include mobility due to periodontal disease, patient/parents' requests.

Statistical Analysis

The collected data was analyzed using SPSS package version 16 and the descriptive statistics were done, and the presentation of the results was performed by calculating frequencies and percentages. Chi-square test was used to interpret if there was any significant difference between the variables at a significance level of $p < 0.05$.

RESULTS

Over the nine months of the study period, 1709 teeth were extracted from 1055 children (mean extracted teeth per patient = 1.62 ± 1.02), 52% of them were males and 48% were females. Their age ranged from 3 to 14 years (mean age 8.65 ± 2.23 years). The highest number of patients and extracted teeth was found in the age group 9 to 11 years (433 and 728 respectively). However, the total number of patients and extracted teeth were found to be more in males than females. No statistical differences were recorded regarding gender among all of the age groups and for both number of patients and number of extracted teeth, as shown in Table 1.

Table 1 Distribution of the sample by age and gender according to the number of patients and number of extracted teeth

Age (Years)	No. of patients		No. of extracted teeth		Total	
	Males (N (%))	Females (N (%))	Males (N (%))	Females (N (%))	Patients (N (%))	Teeth (N (%))
3-5	40 (3.8)	40 (3.8)	76 (4.5)	75 (4.4)	80 (7.6)	151 (8.9)
6-8	232 (22)	194 (18.4)	362 (21.2)	294 (17.2)	426 (40.4)	656 (38.4)
9-11	221 (20.9)	212 (20.1)	386 (22.6)	342 (20)	433 (41)	728 (42.6)
12-14	56 (5.3)	60 (5.7)	86 (5)	88 (5.1)	116 (11)	174 (10.1)
Total	549 (52)	506 (48)	910 (53.3)	799 (46.7)	1055 (100)	1709 (100)

From all the 1055 children, 641 (60.8%) of them had extracted only one tooth (51% males, 49% females) and 414 (39.2%) had extracted more than one (54% males, 46% females). Concerning a number of teeth extracted per patient according to gender, no statistical differences was found. Meanwhile, analysis about the pattern of extracted primary and permanent teeth in both jaws and both sides of the dentition in various age groups was done, as shown in Table 2 and Table 3. They revealed that 1655 (98.2%) of the total extracted teeth were primary, and only 47 (2.8%) were permanent. For both dentitions, the number of extracted teeth were higher in the lower jaw compared to the upper jaw, and the difference was found to be significant for each tooth type by the type of jaw among different age groups (for primary teeth $X^2=157.2$, $df=4$, $p=0.00$ and for the permanent teeth $X^2=16.29$, $df=6$, $p=0.01$) (Table 2 and Table 3). However, no significant difference was found (for both dentitions) in extraction pattern of individual tooth type by the side of the jaw (right and left) across different age groups.

Table 2 Distribution of extracted primary teeth by tooth type and age group

Tooth Type	Right side (N=775) Upper right (385) Lower right (390)				Left side (N=880) Upper left (413) Lower left (467)				Total	
	Age group				Age group				N	%
	3-5	6-8	9-11	12-14	3-5	6-8	9-11	12-14		
Central incisor	32	79	6	3	34	78	9	3	244	14.74%
Upper	29	56	6	3	30	57	8	3	192	11.60%
Lower	3	23	0	0	4	21	1	0	52	3.14%
Lateral Incisor	13	37	19	2	16	52	19	2	160	9.67%
Upper	13	22	12	2	13	29	14	2	107	6.47%
Lower	0	15	7	0	3	23	5	0	53	3.20%
Canine	2	19	69	19	2	19	73	21	224	13.54%
Upper	1	5	37	13	1	7	33	13	110	6.65%
Lower	1	14	32	6	1	12	40	8	114	6.89%
First Molar	19	102	129	21	14	111	159	17	572	34.56%
Upper	6	42	53	10	7	27	60	9	214	12.93%
Lower	13	60	76	11	7	84	99	8	358	21.63%
Second Molar	12	60	102	30	7	85	127	32	455	27.49%
Upper	4	16	41	14	4	30	47	19	175	10.57%
Lower	8	44	61	16	3	55	80	13	280	16.92%
Total	78	297	325	75	73	345	387	75	1655	100.00%
Upper	53	141	149	42	55	150	162	46	798	48.22%
Lower	25	156	176	33	18	195	225	29	857	51.78%
p-value	p>0.05*								p<0.001**	

*No significant difference between tooth types between both sides in all age groups; ** Highly significant difference between upper and lower teeth.

Table 3 Distribution of extracted permanent teeth by tooth type and age group

Tooth Type	Right side (N=22)				Left side (N=25)				Total	
	Age group				Age group					
	3-5	6-8	9-11	12-14	3-5	6-8	9-11	12-14	N	%
Central Incisor	-	-	1	-	-	-	-	-	1	2.1%
Upper	-	-	1	-	-	-	-	-	1	100.0%
Lower	-	-	0	-	-	-	-	-	0	-
Lateral Incisor	-	-	1	1	-	-	1	-	3	6.4%
Upper	-	-	0	0	-	-	0	-	0	-
Lower	-	-	1	1	-	-	1	-	3	100.0%
Canine	-	-	-	-	-	-	-	-	-	-
Upper	-	-	-	-	-	-	-	-	-	-
Lower	-	-	-	-	-	-	-	-	-	-
First Premolar	-	-	-	2	-	1	-	2	5	10.6%
Upper	-	-	-	2	-	1	-	2	5	100.0%
Lower	-	-	-	0	-	0	-	0	0	-
Second Premolar	-	-	-	-	-	-	-	1	1	2.1%
Upper	-	-	-	-	-	-	-	0	0	-
Lower	-	-	-	-	-	-	-	1	1	100.0%
First Molar	-	4	5	8	-	6	7	5	35	74.5%
Upper	-	1	1	2	-	1	2	1	8	22.9%
Lower	-	3	4	6	-	5	5	4	27	77.1%
Second Molar	-	-	-	-	-	-	-	2	2	4.3%
Upper	-	-	-	-	-	-	-	1	1	50.0%
Lower	-	-	-	-	-	-	-	1	1	50.0%
Total	0	4	7	11	0	7	8	10	47	100.0%
Upper	0	1	2	4	0	2	2	4	15	31.9%
Lower	0	3	5	7	0	5	6	6	32	68.1%
p-value	p>0.05*								p<0.001**	

*No significant difference between tooth types between both sides in all age groups; **Highly significant difference between upper and lower teeth.

Concerning extracted primary teeth, striking significant difference was observed between extracted tooth type and children's age ($X^2=396.8$, $df=12$, $p<0.001$), in which the upper left incisor (both central and lateral) was the most extracted tooth among the age group of 3-5 years, while it was the lower left molar among children aged 6-8 years. For those children aged from 9-11 and 12-14 years, the extracted primary anterior teeth were relatively few compared to the primary molars that remained the most frequent type of extracted primary teeth. Overall analysis of the most extracted primary tooth type revealed that the first molar was the most common extracted tooth (572) which accounted 34.56% (12.93% upper, 21.63% lower) followed by the second molar (455) which accounted 27.49% (10.57% upper, 16.72% lower), as shown in Table 2.

On the other hand, no significant difference was found concerning type of permanent tooth extraction by age groups. Meanwhile, about 74.5% of the extracted permanent teeth were first molars (17.03% upper, 57.45% lower) followed by first premolar which comprised 10.6% and all of them were extracted from the upper jaw (Table 3).

However, a highly significant difference was recorded between the causes of teeth extraction and age groups as revealed in Table 4, where the retained root was the predominant cause of extraction among children aged from 3-5, 6-8 and 9-11 years, while extraction due to time of shedding was the most common cause among children aged 12-14 years.

Table 4 Distribution of extracted teeth by cause and age

Causes*	Age group				Total (%)
	3-5	6-8	9-11	12-14	
Periapical problems	28 (18.54)	103 (15.70)	111 (15.25)	23 (13.21)	265 (15.5)
Retained root	110 (72.85)	312 (47.56)	348 (47.80)	44 (25.29)	814 (47.6)
Failure of pulp treatment	2 (1.33)	4 (0.61)	3 (0.41)	-	9 (0.5)
Retained primary tooth	2 (1.33)	69 (10.52)	65 (8.93)	31 (17.82)	167 (9.8)
Shedding time	6 (3.97)	136 (20.73)	139 (19.09)	52 (29.89)	333 (19.5)
Orthodontic need	3 (1.98)	29 (4.42)	60 (8.24)	21 (12.07)	113 (6.6)
Trauma	-	-	1 (0.14)	-	1 (0.1)
Supernumerary	-	3 (0.46)	1 (0.14)	3 (1.72)	7 (0.4)
Total	151 (100)	656 (100)	728 (100)	174 (100)	1709 (100)

*Highly significant difference between causes and the age groups.

A total of 548 prematurely extractions were performed in the children of age <9 years due to dental caries and its associated complications. Premature primary teeth loss in relation to the totally extracted teeth among 3-5 aged group was higher than that found among 6-8 years age group (140 teeth (92.7%) and 408 teeth (63.6%) respectively). However, in 6-8 years aged groups, prematurely extracted primary molars were 87.7% higher than that found among 3-5 years age group 37.1%.

Statistical significant difference was found between cause of extraction of different tooth types and the age group for both primary ($X^2=910.215$, $df=18$, $p=0.00$) and permanent ($X^2=95.83$, $df=18$, $p=0$) teeth. Generally, extraction due to retained root was the predominant cause, but not the cause for all extractions. Shedding time was mostly the cause for upper incisors (central and lateral) extraction, whereas molars were more likely to be extracted as a result of retained root. Regarding permanent teeth, results proved that periapical problems were the main reasons for extraction (46.8%) followed by retained root (31.9%), whereas trauma was the infrequent cause for extraction (1.8%) as it seen in Table 5.

Table 5 Distribution of primary and permanent teeth by cause and tooth type

Causes*	Central Incisor		Lateral Incisor		Canine		First	Second	First Molar		Second Molar		Total (%)	
	Primary	Permanent	Primary	Permanent	Primary	Permanent	Premolar	Premolar	Primary	Permanent	Primary	Permanent	Primary	Permanent
Periapical problems	18	0	7	0	5	0	0	0	129	20	84	2	265 243 (14.7) 2 (46.8)	
Retained root	66	0	45	0	15	0	0	0	375	15	298	0	814 799 (48.3) 5 (31.9)	
Failure of pulp treatment	0	0	0	0	0	0	0	0	7	0	2	0	9 9 (0.5) 0	
Retained primary tooth	60	-	43	-	22	-	-	-	25	-	17	-	167 167 (10.1) -	
Shedding time	99	-	59	-	116	-	-	-	22	-	37	-	333 333 (20.1) -	
Orthodontic need	1	0	6	3	66	0	5	1	14	0	17	0	113 104 (6.3) 9 (19.1)	
Trauma	0	1	0	0	0	0	0	0	0	0	0	0	1 0 1 (1.8)	
Total	244	1	160	3	224	0	5	1	572	35	455	2	1702 1655 (97.2) 47 (2.8)	

* Highly significant difference between causes and nature of teeth (primary, permanent), $p<0.001$.

DISCUSSION

Increasing the knowledge about the pattern and reasons for teeth extractions are often beneficial to dental practitioner in order to provide better information about dental disease prevalence, dental care availability, and attitudes towards teeth mortality [13-15]. Till date, little is known about the pattern and reasons for teeth extraction among Iraqi children.

Inside pedodontic clinic, presentation of males who were seeking treatment by extraction was larger than females (for both number of patients and number of extracted teeth) as shown in Table 1, which may indicate carelessness and the

ignorance of boys to maintain good oral hygiene. However, no statistically significant difference among age groups between gender for both number of patients and number of extracted teeth was found. This came in agreement with a number of previous findings reported by Jabaur in 2004 and other researchers and in disagreement with the findings of Chukwumah, et al., and Anyanechi, et al., who reported more extractions in females [2,3,9,13,14,16,17].

In the present study, the highest percentage of patients were those who had one extracted tooth, and this may reflect the main goal in pediatric clinic, which tried to preserve the normal dentition throughout their life span either by prevention of dental disease or by providing treatment to it. This result is in line with previous Iraqi study in 2004. However, the results of Alsheneifi, et al., in America are contradictory with our results [9,13].

The highest percentages of extractions were performed for age groups of 6-8 and 9-11 years. This finding is in accordance with some previous reports and this may be due to higher children's' cooperation in these age groups [7,8,18,19]. Also, this may be because of the greater rate of attendance due to shedding time of primary teeth that occurs between 7-12 years.

The pattern of tooth extraction varies to a great extent between different countries. Primary teeth extractions were a common procedure in the sample under observation with the posterior teeth being the most frequent extracted type, specifically lower first molar; these findings were approximate to a previous report by Alsheneifi, et al., [13]. Meanwhile, the lower first molar was also the most extracted tooth in permanent dentition, and this was in agreement with some previous studies [3,7,20]. However, different results were reported by other studies conducted by Mosul, et al., who found that premolars were the most extracted teeth [8,21,22]. Concerning dental caries, the first permanent molar was the most affected tooth as being the earliest permanent tooth to erupt, in addition to its morphological features facilitate the accumulation of food and plaque, which will favor the bacterial invasion that ends to caries development.

In comparison with the previous study done in Baghdad by Jabaur in 2004 [9], lower first molar was the most extracted tooth in this study followed by upper first molar, whereas upper first premolar represented only a low percentage of the total extracted permanent teeth. However, the previous study showed that only two types of permanent teeth had been extracted (first premolar and first molar). The differences between the two studies may be attributed to many reasons namely variation in the security circumstances in Baghdad, which was more difficult during the present study than it was throughout the previous one, also the differences in the socioeconomic status of the people. Most of the parents seek treatment for their children only when they had pain or symptoms of acute inflammation, which is a tragic indicator for poor dental knowledge and attitude towards dental caries and its subsequent ramifications in children and their parents in our society, especially when it is related to a primary dentition as they are going to be replaced by another permanent one. A misconception was found among parents and caretakers whom assumed that the first permanent molar to be a primary tooth, and this may be added as another reason so that they do not seek treatment even if this tooth is severely decayed [15,16].

Untreated deep carious lesions may lead to either more destruction or tooth structure fracture and in both cases the result will be a retained root, or it could cause periapical diseases by reaching the periapical area through the pulp tissue [8,13]. Therefore, regarding this study, dental caries and its sequelae remain the main potential leading cause for teeth extractions in both dentitions and in all age groups. For the primary dentition, the result was near that found by other researchers [2,3,7-9,20,23-25]. Unfortunately, permanent teeth extraction was done mainly due to dental caries and its resulting pulpal pathologies, and this agreed with some studies [2,7] and disagreed with others [8,9] were the main cause for permanent teeth extraction was found to be due to orthodontic reasons.

CONCLUSION

Variations were noted regarding the principal reason behind permanent teeth extractions and the most frequently extracted tooth in children between a previous study in 2004 and the present one among a sample of Iraqi children. Dental caries with its pulpal pathologies were found to be the most common reasons for extraction, with the first lower left molar being the most commonly affected tooth. So, vigilance is required when dealing with molar teeth in children. Awareness programs on dental health education and promotion are needed in order to elevate the knowledge and awareness of the parents and their children. These programs should discuss the importance of both primary and

permanent teeth for the children. Furthermore, it should also give satisfactory information about the time of first permanent molar eruption, position in the dental arch as well as the best caries prevention methods in order to cease of its early loss.

The present study was more precise in determining the site of extracted teeth (side and type of jaw) than the previous one, in which highly significant differences in the type and position of the extracted teeth were noted. Also, striking differences between the causes and nature of the extracted teeth from both dentitions and different age groups were observed.

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