



## Reasons for dental extractions in children

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### Abstract

**Purpose:** The purpose of this study was to investigate the principal reason for primary tooth extraction and the tooth type most frequently extracted in children aged 3-13 years.

**Methods:** The patients selected for this retrospective study were identified by analyzing dental records of children receiving treatment at Franciscan Children's Hospital & Rehabilitation Center, Boston, MA (FCH & RC). In total, 2,000 records were reviewed, and 567 extracted primary teeth were analyzed from 277 patients who had at least one primary tooth extracted under local anesthesia. The criteria for inclusion in this study included children between the ages of 3 and 13 years.

**Results:** First primary molars were the most common tooth type extracted and comprised 30% of teeth removed. Central incisors were the next common tooth type extracted and accounted for 25% of the extractions. There was no difference, by gender, in the extraction of tooth type but there were striking differences according to age. Almost half of the primary teeth extracted in subjects 3 to 5 years were incisors, and in patients 6 to 9 years the first primary molar was the most common tooth type extracted. Molars were the tooth type most frequently extracted from those patients aged 10 to 13 years. There were significant differences in the reasons for extraction of various tooth types, and, while extractions due to caries predominated overall, this was not the case for all tooth types.

**Conclusions:** This study has concluded that despite the dramatic improvements in pediatric oral health over the last decades, caries and the resulting pulpal pathology remains the most common reason for extraction of primary teeth. (*Pediatr Dent* 23:109-112, 2001)

Tooth mortality in a population can provide information about the prevalence of dental care, the availability of dental care, and attitudes towards tooth extraction. Although the prevalence of dental caries in young children has decreased considerably in recent years, caries continues to affect many children in the general population, particularly in developing countries where the rate of the disease is increasing. Whittle et al reported dmfs data on 5-year old children (from 1989-1994) from an area of Manchester, UK, that showed an increase in the "m" component and a decrease in the "f."<sup>1</sup> Studies of the reasons for tooth extraction in general dental practice have been undertaken in many countries—all aimed at assessing the relative significance of caries and periodontal disease as causes of tooth loss in adults.

Of 12 studies published since 1984, 11 have suggested that caries had been the main cause of tooth loss and had accounted for a higher percentage of extractions in adults than periodontal disease.<sup>2-13</sup> A number of these studies have found that caries

is the principal cause of permanent tooth loss irrespective of age,<sup>4</sup> while others have reported that extractions for periodontal disease exceeded those for caries in older patients.<sup>9</sup> Stephens et al reported that, in patients under 20 years of age, extraction for orthodontic purposes accounted for 33% of extractions in a certain Canadian population.<sup>10</sup> Murray et al, in a survey of Ontario general dental practitioners, reported that orthodontic considerations were the main reasons for permanent tooth loss in childhood, caries continued to be an important cause of tooth loss at all ages, and periodontal disease accounted for more teeth lost after 40 years of age.<sup>14</sup> While only a few have looked at the reasons for the extraction of various tooth types, analysis by tooth type has shown that third molars were the most common tooth type extracted. However, there has been a difference, by age, in the type of the tooth extracted.

Ong et al, in a survey of reasons for extraction of permanent teeth in Singapore, showed that posterior teeth were more frequently extracted than anterior teeth with third molars accounting for 25% of all extractions.<sup>15</sup> Molars were often lost because of caries, and lower anterior teeth were most frequently lost for periodontal reasons. Vignarajah has proposed that the teeth most frequently extracted as a result of caries were the lower first permanent and upper molars, and the most commonly extracted periodontally-involved teeth were lower central incisors and upper third molars.<sup>16</sup> In Japan, Mortia et al reported that anterior teeth, especially in the mandible, represent the highest percentage of periodontal extractions.<sup>17</sup> In males, maxillary premolars and molars were extracted for periodontal disease as much as for caries, whereas caries was the predominant reason for loss of all maxillary teeth in females.

Despite the relative abundance of studies documenting reasons for extraction of permanent teeth, little information exists describing reasons for the extraction of primary teeth, and the tooth type extracted. In order to develop strategies for the future for the reduction in tooth loss, it is important to understand the factors which lead to such loss and the relative contributions of caries, periodontal disease, trauma, and orthodontic considerations.

The purpose of this study was to investigate the principal reasons for primary tooth extractions in children age 3-13 years, and the tooth type most frequently extracted.

### Methods

The patients selected for this study were identified by analyzing dental records of children receiving treatment at Franciscan Children's Hospital & Rehabilitation Center, MA (FCH&RC). The dental clinic provides primary dental care

to the local community as well as for special needs patients from the broader geographic area. As a retrospective study conducted in a teaching program, the children were examined and treated by a number of clinicians.

In total, 2,000 records were reviewed randomly; the criteria for inclusion in this study included children between age of 3-13 years, treated over a period of five years, who had a tooth or teeth extracted under local anesthesia. From each patient's record, where at least one tooth had been extracted, the following information was obtained: record number, date of birth, gender, any significant medical finding, dental diagnosis/investigation for the tooth/teeth extracted, tooth number, date of the extraction, and the reason for the extraction. Reasons for extraction were divided into the following categories based on those described by Kay and Blinkhorn.<sup>2</sup>

1. **Caries:** Primary and secondary caries plus all sequelae including periapical abscess and failed pulpotomy.
2. **Orthodontic:** Tooth removed to prevent or correct malocclusion.
3. **Trauma:** Tooth extracted as a direct result of acute trauma.
4. **Loss:** Tooth extracted because of its mobility; time for exfoliation.
5. **Periodontal disease:** Loss of function, periodontal abscess and pain.
6. **General medical reasons:** Prophylactic extraction.
7. **Economic reasons:** The tooth could have been saved but the patient found treatment too expensive.
8. **Over-retention:** Prolonged retention of primary teeth.
9. **Patient/parent request:** The tooth could have been repaired, but the patient/parent insisted on extraction.
10. **Other reasons:** Teeth extracted for reasons not encompassed by any of the above categories. The reason for the extraction was recorded, however.

### Statistical analysis

Descriptive statistics were calculated for the data from all groups and used to interpret the data. Chi-square tests were performed using a 0.05 significance level to determine if any significant difference existed among the age groups (Age 3-5, 6-9 and 10-13).

### Results

From the 2,000 charts reviewed, 277 (14%) patients had teeth extracted. A total of 567 primary teeth were extracted from these patients. The group consisted of 156 male and 121 female, and the subjects ranged in age from 3 to 13 years (mean age 6.5). Of the 2,000 charts reviewed, 657 were between ages 3-5, 707 were between age 6-9, and 636 were between age 10-13.

### Frequency of tooth extractions

Of these, 146 (53%) patients had more than one tooth extracted, and 131 (47%) had only one tooth extracted. The gender distribution of the patients with one or more primary teeth extracted was 57% male and 43% female, illustrating that there was no statistical difference in assessment by gender ( $\chi^2_6 = 6.821$ ;  $P=0.338$ ). The age distribution (%) was as follows: 3 to 5 years, 7%; 6 to 9 years, (56%); 10 to 13 years, (37%).

**Table 1. Reasons for Extraction of Primary Teeth\***

Reasons	Percent extracted (N= 567)
Caries	53
Orthodontic	13
Trauma	4
Mobility	10
Over-retention	10
Root resorption	3
Other reasons**	7
<b>Total</b>	<b>100</b>

\* 567 teeth extracted

\*\* Periodontal disease, general medical reasons, economic reasons, parent's request.

The total number of primary teeth extracted was 567, and the mean among those who had had extractions was 2.01 (SD=2.3) per patient. Just over half (53%) of these lost more than one tooth. More teeth were lost because of caries (53%) than for orthodontic reasons (13 %) (Table 1.)

### Extractions according to tooth type

First primary molars were the most common tooth type extracted and comprised 30% (14% upper; 16% lower) of teeth removed. Central incisors were the next common tooth type and accounted for 25% (19% upper;6% lower) of the teeth extracted. The extraction of lateral incisors and canines were relatively infrequent. They each made up a mere 12% of teeth lost (Table 2.).

There was no difference in the extraction of tooth types by gender but striking differences were apparent by age. Between ages 3 to 5 years, almost half of the primary teeth extracted were incisors and between ages of 6 to 9 years, first primary molars were the most common tooth type extracted. Relatively few anterior teeth were extracted, and molars remained the tooth type most frequently extracted from those aged 10 to 13 years (Table 3).

**Table 2. Distribution of Extraction of Primary Teeth by Tooth Type**

Tooth type	% of patients (N=277)*	% of teeth extracted (N=567)
Central incisors		
upper	37	19
lower	12	6
Lateral incisor		
upper	18	9
lower	6	4
Canine		
upper	12	6
lower	14	6
First molars		
upper	27	14
lower	32	16
Second molars		
upper	20	10
lower	19	10

\*Column total exceeds 100%, since patients may have lost more than one tooth type.

**Table 3. Distribution of Extraction of Primary Teeth (% of Teeth) by Tooth Type and Age**

Tooth type	Age groups (years)		
	3 - 5	6 - 9	10 - 13
Central incisors	%	%	%
Upper	46	22	8
Lower	4	8	4
Lateral incisors			
Upper	32	7	6
Lower	2	5	1
Canines			
Upper	5	4	10
Lower	0	6	10
First molars			
Upper	2	15	15
Lower	7	17	15
Second molars			
Upper	0	6	18
Lower	2	10	13
<b>Total</b>	100	100	100
<b>Number of teeth extracted</b>	41	317	209

All age difference in proportions statistically significant.  $\chi^2_{12}=91.074$ ;  $P<.001$

**Reasons for the extraction of different tooth types**

There were significant differences in the reasons for the extraction of different tooth types. Since very few extractions were attributed to periodontal disease, "patient requests," or "general medical reasons," these categories were subsumed in the "Other" category to reduce the size of the table.

While extractions due to caries predominated overall, this was not the case for all tooth types. Over-retention was the most common reason for loss of the lower central incisor. Upper and lower canines were equally likely to be lost for orthodontic reasons, whereas caries was the most common cause of the extraction of lower first molars.

Mobility and over-retention were almost equally likely to be the cause of the extraction of both incisors, although there were differences between upper and lower arches. While orthodontic reasons accounted for more than half of the extractions

of upper and lower canines, molars were more likely to be lost as a result of caries.

**Discussion**

Tooth mortality in a population can provide information regarding the availability of dental care, the prevalence of dental disease, and attitudes toward tooth loss. Despite the relative abundance of studies examining the nature of tooth loss and dental extractions in the permanent dentition, surprisingly little information exists regarding tooth loss in the primary dentition.

Extraction of primary teeth is a relatively common part of pediatric dental practice, often included as part of treatment predicated by caries, trauma, and orthodontic considerations. In the current study, dental charts of 2,000 dental patients were reviewed to examine the frequency of extraction, the tooth types extracted, and the reasons for the extractions. Extractions of primary teeth were a common procedure in the population under observation, with greater than 10% of the patients experiencing extractions during the study period.

Regarding extraction of primary teeth, several findings were evident from the data. In the first place caries and resulting pulpal pathology was the most common reason for extraction. Secondly, differences in the types of teeth extracted existed among the different age groups. These differences reflect the chronology of dental development and age differences in susceptibility to traumatic injury and dental caries. Thirdly, among the various tooth types, differences in the reasons for extraction were apparent. These differences reflect the chronology of dental development and patterns of dental disease.

Caries and pulpal disease often necessitate the extraction of primary teeth with 53% of the teeth being extracted as a result of pulpal and periapical disease, which is untreatable by pulp therapy. Despite the dramatic improvement in pediatric oral health over the last decades, recent evidence suggests that dental disease remains a continued source of tooth loss in a percentage of all pediatric populations. Studies within the last decade<sup>18</sup> have identified that the incidence of dental caries among U.S. children seems to be concentrated in about 20-25 percent of the U.S. child population. The data from the current study support these findings and add to the growing number of studies that suggest that investigations to identify

**Table 4. Distribution of the Reasons for the Extraction for Primary Teeth (%) by Tooth Type**

Reasons	Central incisors		Lateral incisors		Canines		First molars		Second molars	
	U	L	U	L	U	L	U	L	U	L
	%		%		%		%		%	
Caries	50	0	57	0	17	6	63	83	79	71
Orthodontic	1	0	10	26	66	67	4	4	4	4
Trauma	16	3	8	0	0	8	0	0	0	0
Mobility	20	12	8	26	3	6	12	2	9	9
Over-retained	9	74	10	26	11	8	6	0	0	4
Root resorption	3	6	2	0	0	0	5	4	5	2
Other	2	6	4	21	3	6	10	6	5	11
<b>Total</b>	100%		100%		100%		100%		100%	
<b>No. extracted</b>	105	34	49	19	19	35	36	90	57	55

U = Upper L = Lower

this subgroup of children at risk for caries, even in fluoridated communities, are urgently needed. The epidemiology of early childhood caries suggests that even in low-risk populations 4-5% of children will experience this type of aggressive decay and its sequelae. In our study, 53% of extractions were due to dental caries. Since this study did not include children treated under general anesthesia, it underestimates the effect of Early Childhood Caries (ECC) on the population. Regardless of the exact number of tooth extractions (in the study population) which were required as a result of caries, the data clearly demonstrate that dental caries remains a significant cause of tooth loss. Nevertheless, a significant percentage of tooth loss arose from causes related to dental development and orthodontic considerations. Likewise, trauma continues to be another significant reason for tooth loss in pediatric populations.

As one would expect, given the chronology of dental eruption, differences existed within different age groups with regard to the specific teeth extracted. Primary incisors were the most commonly extracted tooth in young children (ages 3 to 5), presumably due to the pattern of decay in ECC and as a consequence of dental trauma. In older children, posterior teeth were more frequently extracted due to the chronology of eruption and exfoliation, and the frequent involvement of these teeth in dental caries in school age children. In either case, extraction of primary teeth for reasons secondary to caries was common in all age groups. Primary second molars were rarely extracted in the youngest age group presumably due to their relatively late eruption. The reluctance of clinicians to extract these teeth in this age group, given their strategic importance during dental development and the eruption of the first permanent molar teeth, might also be an influential factor.

The reasons for extraction varied among different tooth types. Primary incisors are extracted as a result of dental caries and pulpal disease, as well as traumatic injury. This is in contrast to the permanent dentition where incisors are infrequently extracted because of caries and more frequently extracted due to traumatic injury and periodontal disease. Kuthy<sup>19</sup> reported that orthodontic considerations are more frequently the reason for the extraction of primary canines which are rarely extracted as a consequence of caries or trauma. Finally, the primary molars are frequently extracted with the majority extracted due to dental caries and pulpal involvement.

This study documents the rate of extraction of primary teeth in an urban outpatient setting. Although extraction is frequently the result of developmental issues such as over-retention of primary teeth or orthodontic guidance, the majority of extractions are still due to caries and its pulpal sequelae. Despite the tremendous advances made in prevention and management of dental caries in children, dental extraction, the *sine qua non* of failed preventive efforts, continues to be a common occurrence for many children.

Other studies analyzing other practice sites and populations may further document the continued prevalence of dental caries in the primary dentition. Prevention of caries in primary teeth must begin early in life to identify those at risk. Certainly this study and many others support the need for further studies defining these risk factors and exploring methods of intervention in those at risk.

## Conclusions

1. Caries and resulting pulpal pathology are the most common (53%) reasons for extraction of primary teeth.

2. First primary molars (30%) and central incisors (25%) were the types of teeth most frequently extracted.
3. Although no differences in types of teeth extracted were observed between genders, striking differences were noted in the different age groups.

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