Patterns and Reasons for Extracted Primary Teeth in Children Attending a Pediatric Dental Teaching Clinic

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Abstract

Introduction: Understanding the patterns and reasons why children's primary teeth are extracted is crucial to improving oral health outcomes among children. Objective: This retrospective study aimed to determine the patterns and reasons for primary teeth extraction in children attending a dental teaching clinic in Malaysia. Materials and methods: Between 2009 and 2019, dental records were screened by undergraduate students for patients aged under 16 years who had undergone primary tooth extraction. Data were collected on age, gender, indications, and year of tooth extraction, as well as the type of tooth extracted. Descriptive statistics and bivariate association analysis were performed. A p-value ≤ 0.05 was considered statistically significant. Results: 1,785 teeth were extracted. Females had more tooth extractions than males. Tooth extraction was common among the 7–9 years old group (47.2%). The most frequently extracted primary tooth was the first molar (29.1%), whereas the lateral incisor was the least (11.7%). Extraction due to dental caries was the main reason among all age groups (57.5%), followed by shedding time (38.1%). Statistical differences were found between patterns and reasons for tooth extraction and age groups (p < 0.05). However, no significant differences were observed in terms of age and year of extraction (p > 0.05). Conclusions: First molars were the most frequently extracted teeth. Dental caries and its sequelae remain the foremost cause of dental extraction among this sample of Malaysian children. The development of appropriate oral health education programs on the importance of primary teeth, alongside early dental examination, is recommended to prevent tooth extraction.

Keywords: Children, extraction, patterns, primary teeth, reasons

(J Med J 2023; Vol. 57 (3): 221-228)

Received Accepted

April 8, 2021 February 3, 2022

INTRODUCTION

Primary teeth, also known as deciduous or milk teeth, are very important for children, just as permanent teeth [1]. Tooth extraction in children is one of the last dental treatment options to consider to avoid future malocclusion [2]. Children's dental treatment is aimed at preserving deciduous dentition since it is essential for speech development, mastication, dental arch development, the guidance of the eruption of permanent teeth, maintenance of normal occlusion, and esthetics and self-esteem [3, 4].

Early loss of primary teeth in children may lead to detrimental effects such as a delay in the eruption of the permanent tooth, tilting, drifting, or malposition of succedaneous teeth,

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potentially creating functional problems [5]. Furthermore, it can affect the esthetic, and the child's speech and social interactions, which causes psychological and self-esteem issues [5]. Hence, the treatment required may burden the child and parents financially and psychologically.

Tooth extraction reflects the pattern of oral diseases and oral health status in any community [5, 6]. Several studies have been carried out in different countries to identify the reasons behind primary teeth extraction and most reported dental caries and its sequelae as the main cause for extraction [4, 5, 7–11]. Traumatic dental injuries often happen in young children shortly after tooth eruption. Therefore, dental trauma is considered another reason for premature loss of teeth in children [6, 7, 12]. Tooth extraction for orthodontic considerations is another common reason [11, 13, 14]. Moreover, there are other reasons such as supernumerary teeth, periodontal disease, and natal and neonatal teeth [4, 5].

In order to prevent oral diseases in children and develop strategies for minimizing untimely extraction of the primary tooth, it is important to understand the causes that lead to such early extraction and the relative contributions, including caries. trauma. orthodontic considerations, and other reasons [15]. To date, such a study has not been conducted in Malaysia, and data on this topic are greatly warranted. Therefore, the aims of this study were to identify the pattern of the primary teeth extracted and its causes in healthy children attending a pediatric dentistry teaching clinic at the Faculty of Dentistry of Universiti Teknologi MARA, as well as to assess the correlation with the child's age, type of tooth extracted, and its location.

METHODS

This was a retrospective study of pediatric patients who had tooth extraction at the pediatric dental teaching clinic between 2009 and 2019. Patient records were retrieved from pediatric documents (students' logbooks) held at the Department of Pediatric Dentistry and Orthodontics. This study was approved by the

Human Ethics Committee of the university.

The minimum sample size was calculated using Epi software. Assuming the prevalence of tooth loss was 58.8% [5], a confidence interval of 1.96 and a 5% degree of accuracy was supposed; the minimum sample size required for the present study was 372. However, the total sample of this study was 1,785 which is higher than the minimum.

Modified criteria of the reasons for tooth extraction in children were used [15]. Dental caries and its sequelae: deep carious lesion, unrestorable tooth structure, periapical abscess, presence of draining fistula, or failure of pulp treatment in primary teeth. Retained root: remnant root present of the untreated badly carious tooth. Orthodontic treatment needs: teeth extraction to prevent or correct malalignment. Dental trauma: Extraction took place as a result of dental traumatic injuries. Retained primary tooth: no sign of mobility, no root resorption in the radiograph, and the underlying permanent tooth reached threequarters root formation. Shedding time: keeping in mind the age of the child, we considered whether there was any mobility in the primary tooth associated with discomfort and/or pain during eating. Supernumerary: the erupted supernumerary, tooth impacted, natal and neonatal teeth. Other reasons included mobility due to periodontal disease. patient/parents' requests, or severe attrition.

The dental records of healthy patients aged under 16 years who had received primary tooth extractions under local anesthesia undergraduate students between 2009 and 2019 were included in the study. The child's age, gender, type of tooth extracted, reason for the extraction and the year of extraction were collected over a period of six months. The patients' ages were categorized into four groups: below 6, 7-9, 10-12 and 13-16 years. Some 359 out of 1,785 cases were excluded due to incomplete records, such as tooth type and reason for extraction. Moreover, extraction cases due to supernumerary teeth (n=8) were excluded from the analysis in order to evaluate the association between tooth type and reason for extraction among different age groups.

Hence, the total number of cases included in the final analysis was 1,418.

Data were coded and entered into the computer using Statistical Package for Social Science software, version 23.0, (SPSS Inc., IBM, Armonk, NY, USA). Descriptive and analytical statistics were performed. Descriptive was presented as analysis frequencies and percentages of the type of extracted tooth, its location and the reason for extraction. Chi-square test was used to assess the association of extracted tooth with age, type of tooth and the cause of the extraction. The level of statistical significance was set at $p \le$ 0.05.

RESULTS

A total of 1,426 primary teeth were extracted from 676 children who attended the

undergraduate dental clinic. They consisted of 52.7% (356/676) females. The age range of children was from 1 to 16 years with a mean age of 9.03 ± 2.38 years. Most of the children had had one tooth extracted (41.0%, 277/676), whereas (59.0%, 399/676) had had more than one tooth extracted (2-9 teeth). The mean number of extracted teeth per child was 2.10 ± 1.31 (Table 1).

The frequency of extracted primary teeth was high in females (56.4%, 780/1384) as compared to males (43.6%, 604/1384), with no statistical differences (χ^2 =3.192, p>0.05). Considering the distribution of extracted teeth according to the age groups, extraction was most common in the early mixed dentition (7 to 9 years old group) while it was least common in the 13 to 16 years group (47.2% and 7.0%, respectively) (Table 1).

Table 1: Distribution of the children and their extracted primary teeth by age and gender

| Age (year) | Number of extracted teeth | | | Number of patients | | | |
|---------------|---------------------------|------------|------------|--------------------|------------|------------|--|
| | Male | Female | Total | Male | Female | Total | |
| | N (%) | N (%) | N (%) | N (%) | N (%) | N (%) | |
| 1–6 | 87 (14.4) | 88 (11.3) | 175 (12.6) | 51 (17.2) | 41 (11.5) | 92 (14.1) | |
| 7–9 | 276 (45.7) | 377 (48.3) | 653 (47.2) | 132 (44.6) | 178 (50.0) | 310 (47.5) | |
| 10–12 | 198 (32.8) | 261 (33.5) | 459 (33.2) | 91 (30.7) | 105 (29.5) | 196 (30.1) | |
| 13–16 | 43 (7.1) | 54 (6.9) | 97 (7.0) | 22 (7.4) | 32 (9.0) | 54 (8.3) | |
| Total | 604 (43.6) | 780 (56.4) | 1384 (100) | 296 (45.6) | 356 (56.4) | 652 (100) | |
| p value | | p = 0.363 | | | p = 0.152 | | |

The most frequently extracted tooth was the primary first molar (29.1%, 402/1375) followed by the primary second molar (28.2%, 384/1375). The lateral incisor was the least frequently extracted (11.7%, 161/1375). Furthermore, there were variations in the patterns of extraction between the type of tooth extracted and different age categories. In children aged under six years, the central incisor was the most extracted tooth (50.6%, 88/174). In contrast to early mixed dentition (7–9 years old group), the most common tooth extracted was the primary first molar (31.3%, 203/649). Highly significant differences were found between the type of tooth extracted and the age groups (χ^2 =434.836, p<0.05), as presented in Table 2.

Analysis of the patterns of extracted primary teeth in both jaws and sides of dentition in

relation to tooth type revealed that there were highly significant differences (χ^2 =5672.000, p< 0.05). For the jaw type, extraction of maxillary teeth (55.9%, 793/1418) was higher compared to mandibular teeth (44.1%, 625/1418). Among the maxillary teeth, the primary second molar was found to be the most frequently extracted (26.6%, 211/793), while the primary first molar was the most frequent of the mandibular teeth (33.3%, 208/625). In addition, the extraction of primary teeth was dominant on the right side of the jaw (50.5%, 760/1418) compared to the left (49.5%, 702/1418). The primary second molar was found to be the most frequently extracted tooth on the right side of the jaw (29.6%, 212/760), while primary first molar was the most common on the left side of the jaw (29.9%, 210/702), as shown in Table 2.

Table 2: Distribution of extracted primary teeth by tooth type, location and child's age

| | Type of tooth | | | | | | | |
|-------------|-----------------|-----------------|------------------|------------|--------------|------------|--|--|
| Variables | Central incisor | Lateral incisor | Canine First mol | | Second molar | Total | | |
| | N (%) | N (%) | N (%) | N (%) | N (%) | N (%) | | |
| Age (years) | | | | | | | | |
| 1–6 | 88 (37.0) | 28 (17.4) | 4 (2.1) | 34 (8.5) | 20 (5.2) | 174 (12.7) | | |
| 7–9 | 147 (61.8) | 113 (70.2) | 51 (26.8) | 203 (50.5) | 135 (35.2) | 649 (47.2) | | |
| 10–12 | 3 (1.3) | 18 (11.2) | 101 (53.2) | 151 (37.6) | 183 (47.7) | 456 (33.2) | | |
| 13–16 | 0 (0) | 2 (1.2) | 34 (17.9) | 14 (3.5) | 46 (12.0) | 96 (7.0) | | |
| Total | 238 (100) | 161 (100) | 190 (100) | 402 (100) | 384 (100) | 1375 (100) | | |
| p value | p=0.001 | | | | | | | |
| Location | | | | | | | | |
| Maxilla | 174 (12.3) | 101 (7.1) | 103 (7.3) | 204 (14.4) | 211 (14.9) | 793 (55.9) | | |
| Mandible | 71 (5.0) | 65 (4.6) | 89 (6.3) | 208 (14.7) | 192 (13.5) | 625 (44.1) | | |
| Total | 245 (17.3) | 166 (11.7) | 192 (13.5) | 412 (29.1) | 403 (28.4) | 1418 (100) | | |
| p value | p=0.001 | | | | | | | |
| Right side | 120 (8.5) | 86 (6.1) | 96 (6.8) | 202 (14.2) | 212 (15) | 716 (50.5) | | |
| Left side | 125 (8.8) | 80 (5.6) | 96 (6.8) | 210 (14.8) | 191 (13.5) | 702 (49.5) | | |
| Total | 245 (17.3) | 166 (11.7) | 192 (13.5) | 412 (29.1) | 403 (28.4) | 1418 (100) | | |
| p value | p=0.001 | | | | | | | |

This study also identified the reasons for the extraction of primary teeth in the different age groups and by tooth type. The overall analysis of the reasons for primary teeth extraction revealed that dental caries and its sequelae were the main reason (57.6%, 821/1426), followed by extraction due to shedding time (38.1%, 543/1426), retained deciduous tooth (2.0%, 29/1426), orthodontic

considerations (0.7%, 10/1426), dental trauma (0.1%, 2/1426), supernumerary tooth (0.7%, 8/1426), and other reasons, such as parents' request (0.9%, 13/1426). Significant variances were identified between the reason for tooth extraction and the age groups (χ^2 =106.932, p<0.05) as well as the type of tooth (χ^2 =299.788, p<0.05) (Table 3).

Table 3: Distribution of extracted primary teeth by reason, tooth type and child's age

| | Reason for extraction | | | | | | | | |
|-----------------|-----------------------|------------------|--------------------|--------------------|---------|----------|------------|--|--|
| Variables | Caries | Shedding time | Retained deciduous | Retained deciduous | Trauma | Other | Total | | |
| | N(%) | N(%) | N(%) | N(%) | N(%) | N(%) | N(%) | | |
| Age (Years) | | | | | | | | | |
| 1–6 | 110 (63.2) | 60 (32.5) | 1 (0.6) | 0 (0) | 1 (0.6) | 2 (1.1) | 174 (100) | | |
| 7–9 | 410 (63.2) | 230 (35.4) | 2 (0.3) | 1 (0.2) | 0 (0) | 6 (0.9) | 649 (100) | | |
| 10–12 | 241 (52.7) | 190 (41.6) | 13 (2.8) | 9 (2.0) | 1 (0.2) | 3 (0.7) | 457 (100) | | |
| 13–16 | 31 (32.0) | 52 (53.6) | 12 (12.4) | 1 (1.0) | 0 (0) | 1 (1.0) | 97 (100) | | |
| Total | 792 (57.5) | 532 (38.6) | 28 (2.0) | 11 (0.8) | 2 (0.1) | 12 (0.9) | 1377 (100) | | |
| p value | p=0.001 | | | | | | | | |
| Type of tooth | | | | | | | | | |
| Central incisor | 99 (40.4) | 137 (55.9) | 3 (1.2) | 0 (0) | 1 (0.4) | 5 (2.0) | 245 (100) | | |
| Lateral incisor | 63 (38.0) | 101 (60.8) | 0 (0) | 0 (0) | 0 (0) | 2 (1.2) | 166 (100) | | |
| Canine | 52 (27.1) | 120 (62.5) | 10 (5.2) | 9 (4.7) | 0 (0) | 1 (0.5) | 192 (100) | | |
| First molar | 295 (71.6) | 110 (26.7) | 3 (0.7) | 1 (0.2) | 0 (0) | 3 (0.7) | 412 (100) | | |
| Second molar | 312 (77.4) | 75 (18.6) | 13 (3.2) | 0 (0) | 1 (0.2) | 2 (0.5) | 403 (100) | | |
| Total | 821 (57.9) | 543 (38.3) | 29 (2.0) | 10 (0.7) | 2 (0.1) | 13 (0.9) | 1418 (100) | | |
| p value | p=0.001 | | | | | | | | |

DISCUSSION

In the present study, the dental records of patients aged under 16 years who had undergone primary tooth extraction under local anesthesia by undergraduate students between 2009 and 2019 were reviewed to identify the pattern of tooth extractions in the different age groups in children and the reasons for these. Knowing the characteristics of the patterns and reasons for dental extractions among children, as well as understanding the factors within each population, is always valuable to dental practitioners so that better services can be provided to the community by the authorities, and to improve the oral health outcomes in the country. To date, no such study has been conducted for Malaysian children.

This study identified the reasons for primary teeth extractions among children attending the Despite teaching clinic. the dramatic improvement in children's oral health over the last years, caries prevalence is still high among Malaysian preschool children, ranging from 87.1% in 1995, 76.2% in 2005, and 71.3% in 2015 [14]. Therefore, in the present study dental caries and its sequelae were the most common reasons for the extraction of primary teeth, particularly primary molars, while dental trauma was the least most common. This is attributed to a behavior problem with children. as most children are uncooperative with dental treatment, as well as to the progression of dental caries in primary teeth being rapid and potentially leading to pulp involvement quickly, which may end in a periapical abscess. Hence, caries with its subsequent complications were found to be the most common cause of extracted primary teeth in our study. This is consistent with most other studies [4, 5, 7–11] which reported that dental caries is the most common reason for tooth extraction in both developing and developed countries.

The reasons for extracted primary teeth varied among different age groups. However, extraction due to dental caries and its sequalae was remarkable for all age groups, with the highest number being in the age group 7–9 years, particularly the second primary molars, indicating the high incidence of dental caries.

For children in the under six years group, the cause was likely due to severe early childhood caries, whereas for the children over six years it may be due to the involvement of caries as well as the presence of some sign of physiological root resorption in the radiograph (near the exfoliation time). Therefore, it would be better to extract rather than perform restoration for a short period. Sometimes, the parents prefer to extract badly carious teeth with poor prognosis or when they know of the need for multiple visits treat the pulp (pulpotomy/ pulpectomy), as these teeth will be replaced by adult teeth. These findings are in line with other studies [1, 16]. This may be due to delayed visits to the dental clinic for routine checkup. Maintaining healthy primary teeth is essential to a child's overall oral and general development [17]. Plans for a child's dental examination at an early age can certainly assist in preventing the initiation of dental diseases throughout life [16]. This may be due to late visits to the dental clinic for routine checkup. Hence, improving parents' knowledge and attitudes toward their child's oral health care through effective dental health education is highly recommended.

Tooth extraction due to orthodontic treatment was very limited in this study. The highest number was among 10–12 year olds, for whom primary canines were the most frequently extracted teeth. Orthodontic management in the mixed dentition stage (9–12 years) is aimed at correcting occlusion of the children and accomplish aesthetic outcomes [18]. Similar findings were also reported by other researchers, who found that orthodontic considerations are more frequently the reason for extraction of primary canines, which are rarely extracted because of dental caries or trauma [10, 18].

Although this study yields evidence on patterns and reasons for primary teeth extraction, our study was not without limitations. It was conducted in one locality which is a teaching dental clinic, and this limits how generalizable our findings are to other teaching centers in Malaysia. Despite this, the results still showed that dental caries was the

main cause of primary teeth extraction, mostly of molar teeth in different age groups. Nonetheless, this work still provides a database for future research in Malaysia. It can be used to assist caries prevention activities in the population and minimize tooth loss due to dental caries and its sequalae.

CONCLUSIONS

There were significant differences in the patterns and reasons for the extraction of primary teeth in the different age categories in this sample of Malaysian children. Posterior teeth, particularly primary first molars, were the

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most frequent type of tooth extracted and lateral incisors were the least. Moreover, the highest percentage of extracted primary teeth was found in the mixed dentition period (7–12 years). Although extraction due to dental caries and its subsequent complications remain the most common reason for primary molars, this was not the case for primary incisors and canines. These were mostly extracted due to shedding time. The development of appropriate oral health educational programs on the importance of deciduous dentition for children and early dental examination to prevent tooth extraction is necessary.

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أنماط وأسباب قلع الأسنان الأولية عند الأطفال الذين يترددون على عيادة طب أسنان الأطفال

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الملخص

الخلفية والأهداف: إن فهم أنماط وأسباب قلع الأسنان الأولية عند الأطفال أمر بالغ الأهمية لتحسين نتائج صحة الفم بين الأطفال.وتهدفت هذه الدراسة بأثر رجعي إلى تحديد أنماط وأسباب قلع الأسنان الأولية عند الأطفال الذين يحضرون إلى عيادة طب الأسنان التعليمية في ماليزيا.

منهجية الدراسة: تم فحص سجلات أسنان المرضى الذين تقل أعمارهم عن 16 عامًا لأولئك الذين خضعوا لخلع الأسنان الأولية من قبل طلاب المرحلة الجامعية بين عامي 2009 و 2019. تم جمع عمر الطفل وجنسه ومؤشرات وسنة قلع السن ونوع السن المقلوع. تم إجراء الإحصاء الوصفي وتحليل الارتباط ثنائي المتغير. اعتبرت قيمة $2.00 \ge 1$ ذات دلالة إحصائية. النتائج: تم قلع 1785 سن. كان لدى الإناث قلع أسنان أكثر من الذكور. قلع الاسنان كان شائعا بين المجموعة العمرية من 7 الى 9 سنوات (47.2٪). الأكثر شيوعا قلع الضرس الأول كان الضرس الأول (19.1٪) بينما القاطع الجانبي كان الأقل تكرارا (11.7٪). كان الاستخراج بسبب تسوس الأسنان السبب الرئيسي بين جميع الفئات العمرية (57.5٪) يليه زمن السقوط (38.1٪). تم العثور على فروق ذات دلالة إحصائية بين أنماط وأسباب قلع الأسنان والفئات العمرية .($2.00 \ge 1$) ومع ذلك، لم يلاحظ أي فروق ذات دلالة إحصائية من حيث العمر وسنة الاستخراج.

الاستنتاجات: كانت الأضراس الأولى هي الأسنان الأكثر قلعًا. تظل تسوس الأسنان وعواقبها السبب الرئيسي لقلع الأسنان بين عينة من الأطفال الماليزيين. يوصى بتطوير برامج التثقيف الصحي الفموية المناسبة حول أهمية الأسنان الأولية وفحص الأسنان المبكر لمنع قلع الأسنان.

الكلمات الدالة: الأطفال، القلع، الأنماط، الأسنان اللبنية، الأسباب.

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