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Determinant factors for immediate care seeking after traumatic dental injury among Brazilian children

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Abstract: The present study aimed to evaluate the frequency of immediate care seeking after traumatic dental injury (TDI) in primary dentition and its association with the children's characteristics, socioeconomic status, and TDI characteristics. This was a cross-sectional study with dental records of children aged 9 months to 6 years who attended a reference center in TDI in primary dentition between 2007 and 2018. Immediate care seeking after TDI, child's characteristics, sociodemographic conditions and TDI characteristics were collected. Descriptive statistics and Poisson regression analysis with robust variance were performed ($p < 0.05$; 95%CI). Among the 493 dental records, 61.1% (n = 301) were of males and 50.5% (n = 249) were from children aged 2 years or less. More than one third of the sample (36.9%; n = 182) sought immediate care after TDI. Among the types of TDI, the prevalence of soft tissue injuries was 59.0% (n = 291), while 51.7% (n = 255) were hard tissue injuries and 54.0% (n = 266) were supporting tissue injuries. Immediate care seeking after TDI was higher in children who needed suture (PR: 1.39; 95%CI: 1.01–1.92. p = 0.039), had luxation (lateral, intrusion, or extrusion) (PR: 2.36; 95%CI: 1.36–4.08. p = 0.002) or avulsion (PR: 2.18; 95%CI: 1.28–3.70. p = 0.004). The need for suture, luxation (lateral, intrusion and extrusion), and avulsion were determinant factors for the immediate care seeking after TDI, regardless of the child's characteristics and socioeconomic status.

Keywords: Emergencies; Tooth Injuries; Tooth, Deciduous; Dental Care.

Introduction

Traumatic dental injuries (TDI) are a common outcome in childhood, representing one of the main causes of emergency dental visits to hospital or specialized centers.[1,2,3] On a global scale, the prevalence of TDI in children with primary dentition reaches 22.7%[4] with its first peak of incidence at three years of age.[5,6] Complicated crown fractures, luxations, and avulsions can lead to pain, bleeding, loss of function, and esthetic problems, making TDI a distressing event for children and parents.[7] For a better prognosis, oral injuries must be carefully and immediately evaluated.[8]

Preventive measures and early diagnosis can allow less invasive and lower cost treatment of the most prevalent oral problems in childhood.[9,10,11] Emergency care seeking for TDI increases according to the severity of the injury,[12] but many patients still delay treatment seeking.[13]

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Immediate care is an important key to better prognosis of TDI. The identification of the factors that influence dental-care seeking within an appropriate time frame may contribute to the formulation of specific public health strategies to raise public awareness of its importance. Many parents are unaware of the need for emergency care in cases of dental trauma, and a delayed treatment may be linked to complications otherwise avoidable[14]. The hypothesis of this study was that more severe TDIs are associated with a higher prevalence of immediate care.

Therefore, the aim of this study was to evaluate the frequency of immediate care seeking after TDI in children with primary dentition and its association with children's characteristics, socioeconomic conditions, and TDI characteristics.

Methodology

The present study conformed to the Strengthening the Reporting of Observational studies in Epidemiology guidelines. A checklist for cross-sectional studies was performed (STROBE Statement).[15]

Ethical issues

The study was approved by the Ethics Committee on Research with Human Beings of the Federal University of Minas Gerais (protocol: 3.386.630). Parents and guardians authorized the children's participation by signing the free and informed consent form at the time of the first dental visit.

Study design

This was a cross-sectional study with dental records of children attended at the Trauma Center in primary dentition of the Universidade Federal de Minas Gerais, Belo Horizonte, in southeastern Brazil. The center was established on March 6, 2007 and is connected to the Brazilian Unified Health System. It is a reference center in the city for the treatment and follow-up of TDI in children with primary dentition. All patients are treated until complete root formation of successive permanent teeth.

Setting

This study was a census of the dental records of all children who attended the dental trauma clinic since it was established until the first half of 2018. At the first appointment, clinical data were collected by clinical examination and non-clinical data, by interviews with the child's parent/guardian. The inclusion criteria for the study was TDI in primary dentition in children from 9 months to 6 years old, and the exclusion criteria were TDI in teeth with dental caries and incomplete dental records. Memory bias and the filling of the dental record by undergraduate students working at the clinic may have influenced the results.

Measurement of non-clinical variables

The dependent variable was immediate care seeking, considered as treatment up to two hours after TDI occurrence,[16] dichotomized into yes or no. Previous dental trauma was considered as previous care seeking due to TDI, dichotomized into yes or no.[17]. The place of occurrence of the accident was dichotomized into at home or in other places (school, daycare etc), and the child supervision at the time of trauma was assessed through the question: "Who was with the child at the time of the accident?" categorized into no one, parents/guardians, and others.

The children's characteristics were gender (dichotomized into girls and boys), and age (dichotomized by the median into ≤ 2 years and > 2 years). Sociodemographic conditions were assessed by maternal schooling and monthly family income. Maternal schooling was considered as the number of years of study based on the division of the Brazilian education system,[18] classified by tertiles ≤ 8 years of study, between 9 and 11 years of study and ≥12 years of study. Monthly family income was determined based on the sum of all wages received by the economically active residents of the household and dichotomized by the median into > 207 US dollars or ≤ 207 US dollars.

Measurement of clinical variables

The TDI were classified according to Andreasen et al.[19] Hard tissue injuries were categorized as uncomplicated crown fracture/crown-root fracture (enamel fracture, enamel-dentin fracture, crown-root fracture without pulp involvement) and complicated crown fracture/crown-root fracture (enamel-dentin-pulp fracture and crown-root fracture with pulp

involvement). Soft tissue injuries were evaluated in the regions of the lips, mucosa, gums, palate, labial frenulum, and tongue, and dichotomized into absent or present. Supporting tissue injuries were categorized as concussion/subluxation, luxation (lateral luxation, intrusion, and extrusion), and avulsion.

The number of teeth with injury was classified by tertiles in none, one, and two or more. Dental mobility was dichotomized into absent and present (mild, moderate, and severe). Suture need was dichotomized into absent and present.

Statistical methods

Data analysis was carried out using the Statistical Package for the Social Sciences software (SPSS for Windows, version 21.0, SPSS Inc., Chicago, USA) and included frequency distribution and univariate and multivariate Poisson regression models. The dependent variable was immediate care seeking after TDI in primary dentition and the independent variables were the child's characteristics, socioeconomic conditions, and TDI characteristics. All associations between dependent and independent variables that obtained a significance level < 0.20 in the univariate model were incorporated into the adjusted Poisson regression model with robust variance. Then, prevalence ratio (PR) and confidence intervals (95%CI) were calculated and p-value < 0.05 was considered statically significant.

Results

From the 548 children attended at the clinic, 493 (89.9%) participated in this study. 55 children (10.1%) were excluded due to incomplete questionnaires, missing data records, or for presenting dental caries in the injured tooth. The majority were boys (61.1%; n = 301) and 50.5% (n = 249) were aged ≤2 years.

The frequency of immediate care seeking after TDI was 36.9% (n = 82). Among the types of TDI, the prevalence of soft tissue injuries was 59.0% (n = 291), while 51.7% (n = 255) was hard tissue injuries and 54.0% (n = 266) was supporting tissue injuries. Luxation (lateral, intrusion, and extrusion) was the most prevalent supporting tissue injury, with a prevalence of 30.4% (n = 150). The other values are described in Table 1.

Table 1. Characteristics of the attended children (n = 493) according to study variables.

Variables	Frequency, (n [%])
Non-clinical variables	
Characteristics related to TDI	
Immediate care seeking	
No	311 (63.1)
Yes	182 (36.9)
Previous dental trauma	
No	417 (84.6)
Yes	76 (15.4)
Place of occurrence of dental trauma	
At home	295 (59.8)
In other places (school, daycare etc.)	198 (40.2)
Who was with the child at the time of the accident?	
Parents/Guardians	388 (78.7)
Others	95 (19.3)
Alone	10 (2.0)
Characteristics of the child	
Gender	
Girls	192 (38.9)
Boys	301 (61.1)
Age	
> 2 years	244 (49.5)
≤ 2 years	249 (50.5)
Sociodemographic conditions	
Maternal schooling	
12 years or more of study	118 (23.9)
Between 9 and 11 years of study	264 (53.5)
8 years or less of study	111 (22.5)
Monthly family income	
> 207 US dollars	236 (47.9)
≤ 207 US dollars	257 (52.1)
Clinical variables	
Types of TDI	
Hard tissues injuries	
Uncomplicated crown fracture/ crown-root fracture	191 (38.7)
Complicated crown fracture/ crown-root fracture	64 (13.0)
Soft tissues injuries	
Absent	291 (59.0)
Present	202 (41.0)
Supporting tissues injuries	
Concussion/Subluxation	56 (11.4)
Luxation (lateral, intrusion and extrusion)	150 (30.4)
Avulsion	60 (12.2)
Clinical characteristics	
Number of teeth affected by trauma	
None	15 (3.0)
One	182 (37.0)
Two or more	296 (60.0)
Dental mobility	
Absent	290 (58.8)
Present	203 (41.2)
Need for suture	
Absent	465 (94.3)
Present	28 (5.7)

The final adjusted Poisson regression model with robust variance showed that children who needed sutures (PR: 1.39; 95%CI: 1.01–1.92. p = 0.039), with luxation (lateral luxation, intrusion, and extrusion) (PR: 2.36; 95%CI: 1.36–4.08. p = 0.002), and avulsion (PR: 2.18; 95%CI: 1.28–3.70. p = 0.004) had a higher prevalence of immediate care seeking after TDI (Table 2).

Discussion

The present study investigated the frequency of immediate care seeking after TDI in primary dentition and its association with children's characteristics, sociodemographic conditions, and TDI characteristics. The data showed that the need for sutures, luxation (lateral, extrusion, intrusion), and avulsion were the factors associated immediate care seeking.

In this study, 36.9% sought immediate care after TDI, a higher rate compared to other studies.[3,20,21,22] However, to date, there is little research available on the associated factors,[20,22-26] which makes it difficult to compare the results. The higher frequency may be related to the fact that our Trauma Center in primary dentition is a reference in the city and its region. A recent study[26] conducted with Brazilian children did not identify an association between clinical and sociodemographic factors with immediate care. It is important to note that this study evaluated children with deciduous dentition, while the previous study evaluated trauma in deciduous and permanent teeth. Considering that support tissue lesions are more prevalent in primary than in permanent teeth, this study could observe a higher prevalence of this type of injury, in addition to having a significantly larger sample.

Delayed care after TDI can lead to dental and systemic implications; therefore, appropriate management of TDI is crucial.[27] Guidelines have been created to offer recommendations for diagnosis and treatment of TDI in primary and permanent dentition.[27,28,29] In cases of TDI in primary dentition, treatment should aim pain and bleeding control and the preservation of permanent successors.[30] Children without adequate treatment can have a negative impact on the oral health-related quality of life due to the repercussions on daily activities such as difficulties in smiling, chewing, and brushing their teeth.[7,31]

Immediate care seeking was associated with the need for suture. More severe bleeding traumatic injuries that need suture have a greater involvement of soft tissues and, sometimes, these injuries can be associated with other types of traumas such as alveolar or bone fractures. Therefore, they can cause more anxiety in parents and children, who present themselves more readily for emergency dental care.[23,24] Likewise, the impact of the injury appearance and the pain experienced by the child play a decisive role in seeking treatment.[25]

When the trauma affected only soft tissues, it was not associated with immediate care seeking. Differently from a tissue injury of greater severity and extension, a small laceration does not have the visual impact of lesions that need suture, which may delay treatment. These results suggest the need to work on the importance of immediate care after TDI in the primary dentition, including in less severe cases, through educational measures and guidance to parents and caregivers.

Immediate care seeking after TDI was also associated with luxation (lateral, intrusion and extrusion) and avulsion. In fact, injuries involving tooth dislocation may cause a greater impact on children's quality of life due to pain, irritation, and functional difficulties, such as with eating,[32] in addition to impairing the harmony of the smile and causing esthetic discomfort as these injuries may suddenly change the teeth position.[33]

A previous study[34] revealed that caregivers have better knowledge about the urgency of treating avulsed teeth compared to fractured teeth, although the knowledge about critical aspects of handling avulsed primary teeth was insufficient. Uncertainties regarding the action to be taken in a situation of dental avulsion in primary dentition, in combination with clinical repercussions such as pain, bleeding, and the visual impact can lead to the immediate dental care seeking.

Although complicated crown and crown-root fractures can cause sudden pain, they were not associated with immediate care seeking. Pugliesi et al.[23] indicate that the time elapsed until treatment is longer for hard tissue injuries than for soft tissue injuries, and the shorter the time, the more

Table 2. Poisson regression model for association between immediate care seeking and the independent variables investigated in the studied children (n = 493).

Variables	Crude PR (95%CI)	p-value	Adjusted PR (95%CI)	p-value*
Non-clinical variables				
Characteristics related to TDI				
Previous dental trauma				
No	1			
Yes	0.794 (0.552–1.140)	0.212	-	-
Place of occurrence of dental trauma				
At home	1		1	
In other places (school, daycare, etc.)	1.169 (0.928–1.472)	0.186	1.196 (0.886–1.613)	0.242
Who was with the child at the time of the accident?				
Parents/Guardians	1		1	
Others	0.795 (0.572–1.104)	0.171	0.817 (0.552–1.210)	0.313
Alone	1.042 (0.483–2.248)	0.917	1.565 (0.876–2.795)	0.130
Characteristics of the child				
Gender				
Girls	1		1	
Boys	1.364 (1.058–1.758)	0.017	1.082 (0.825–1.419)	0.327
Age				
> 2 years	1			
≤ 2 years	0.859 (0.681–1.082)	0.197	0.898 (0.684–-1.179)	0.437
Sociodemographic conditions				
Maternal schooling				
12 years or more of study	1		1	
Between 9 and 11 years of study	1.490 (1.079–2.058)	0.015	1.077 (0.743–1.561)	0.695
8 years or less of study	1.256 (0.855–1.845)	0.245	1.216 (0.808–1.830)	0.348
Monthly family income				
> 207 US dollars	1		1	
≤ 207 US dollars	0.860 (0.682–1.083)	0.199	0.920 (0.706–1.199)	0.538
Clinical variables				
Types of TDI				
Hard tissues injuries				
Uncomplicated crown fracture/crown-root fracture	1			
Complicated crown fracture/crown-root fracture	1.229 (0.806–1.874)	0.339	-	-
Soft tissues injuries				
Absent	1		1	
Present	1.473 (1.172–1.851)	0.001	1.115 (0.844–1.473)	0.442
Supporting tissues injuries				
Concussion/Subluxation	1		1	
Luxation (lateral, intrusion and extrusion)	2.271 (1.340–3.850)	0.002	2.360 (1.363–4.087)	0.002
Avulsion	2.644 (1.529–4.575)	0.001	2.186 (1.287–3.715)	0.004
Clinical characteristics				
Number of teeth affected by trauma				
None	1			
One	0.742 (0.384–1.434)	0.374	-	-
Two or more	1.030 (0.546–1.944)	0.926	-	-
Dental mobility				
Absent	1			
Present	1.024 (0.811–1.294)	0.841	-	-
Need to suture				
Absent	1		1	
Present	2.166 (1.691–2.775)	<0.001	1.398 (1.017–1.923)	0.039

*Values were adjusted for place of occurrence of dental trauma, supervision at the time of dental trauma, characteristics of the child, sociodemographic conditions, soft tissues injuries, supporting tissue injuries, and need for suture.

severe the trauma is. Dental mobility was also not associated with immediate care seeking. Factors such as low valuation of the primary dentition and lack of knowledge of the deleterious consequences of "minor" injuries such as enamel or dentin fractures and non-displacement dental mobility may contribute to delayed treatment.[35] Previous dental trauma was not associated with immediate care seeking. Parents/guardians and patients often do not remember an earlier less serious episode of dental trauma, and therefore do not report it, or they may not have noticed or drawn importance to it.[36] However, it is important to highlight that even low intensity traumas can cause sequelae, making the prognosis less favorable.[36]

The place of the occurrence and the supervising person at the time of the trauma were not associated with immediate care seeking. However, most TDI occurred at home and in the presence of parents/guardians, corroborating previous studies.[37] This can be explained by the fact that preschoolers spend most of their time at home under the care of parents. Therefore, special attention should be given to safety measures in the homes.[37]

The rate of dental care in childhood has been linked to maternal education and the socioeconomic status of the child's family,[36,37] but these factors were not associated with immediate care seeking after TDI in our study. Some studies[14] have demonstrated that parents' lack of awareness, knowledge, and skills in relation to TDI in children is common.

These data reveals the importance of preventive measures and educational policies that aim to provide guidance to parents/guardians of young children on immediate care and adverse effects of TDI on primary dentition. Regardless of the financial and educational condition of the family, TDI in primary dentition seems to be a neglected problem.

It is crucial that qualitative studies be performed with parents/guardians in order to better understand the possible reasons associated with the late treatment of minor injuries. The results of these qualitative studies could be used as tools for the elaboration and planning of proposals that promote the awareness of parents and guardians to seek immediate care for children with injuries, regardless of severity. In addition, longitudinal studies would be relevant to assess the causality, or not, between immediate care and a favorable prognosis.

The present study had some limitations, such as its cross-sectional design that limits the causal inference. The sample did not represent the entire target group in Belo Horizonte. Possible biases are related to the filling of the dental record by undergraduate students working at the clinic, the lack of memory of elapsed time between the trauma and the first care, and the lack of parents' knowledge of the adverse effects of TDI on primary dentition and successor permanent teeth. Moreover, the year that the trauma occurred was not included in our study. Thus, we suggest that future studies incorporate this variable in data analysis, since this information can be useful to identify time trends.

The fact that the study was performed in a reference center had some advantages, such as high prevalence of immediate care, allowing the evaluation of the factors associated with it. The results of this study can be used as a guide for educational and preventive interventions for parents/caregivers in relation to the consequences of dental trauma in primary dentition, encouraging the immediate search for care. In addition, strategies directed to local public health aimed at improving access and use of dental services for TDI can be developed.

Conclusion

The need to suture, luxation (lateral, intrusion and extrusion), and avulsion were determining factors for immediate care seeking after TDI, regardless of the child's characteristics and socioeconomic status.

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