Dental Traumatology

Dental Traumatology 2009; **25**: 219–223; doi: 10.1111/j.1600-9657.2008.00754.x

Prevalence of dental trauma in deciduous teeth of Brazilian children

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Accepted 9 October, 2008

Abstract – The aim of this study was to assess the prevalence of dental trauma as compared to the prevalence of dental caries in children aged 3–59 months. A cross-sectional study was carried out during the National Immunization Day for Polio in Recife, northeast Brazil. The sample comprised 3489 children under the age of 5. The clinical examination was performed by 123 previously trained dental students. The inter-examiner agreement for crown fracture was 90.32% and for tooth discoloration it was 83.87%. The prevalence of dental caries was assessed using the dmf-t index. The statistical methods included descriptive analysis and the chi-square test with a margin of error of 5%. A total of 56 142 teeth were examined and the prevalence of dental trauma was 14.9%. Dental fracture was the most prevalent injury observed in 516 teeth (0.9%), followed by discoloration in 191 (0.9%), intrusion in 12 (0.02%) and extrusion in five (0.008%). The most affected teeth were the upper central incisors. The prevalence of dental trauma increased significantly with age and family income ($P < 0.0001$). Dental trauma was most prevalent from 2 to 5 years of age. The prevalence of dental caries was 14.3%. This prevalence increased significantly with age ($P < 0.0001$) and with the reduction in family income ($P < 0.0001$). The results showed that the prevalence of dental caries and dental trauma was similar, and that both caused the same amount of damage to dental health for the target population.

Dental caries in 4- to 6-year-old children has always been reported to be the most prevalent dental disease among poor preschool children worldwide and dental trauma is the second most prevalent kind of dental injury affecting a single population. The decline in dental caries reported worldwide over the past 10 years (1–3) has highlighted the need for special care for preventing oral injuries and their impact on oral health.

Traumatic dental lesions are caused by an external impact on a tooth and surrounding tissues. Their severity varies according to the extension of the injury, which may involve the mineralized tissue and pulp (enamel chipping, fractures involving enamel, dentine and pulp); alveolar process (crown-root fractures, root and alveolar fractures); and periodontal damage (concussion, swelling, lateral swelling, intrusion, extrusion and avulsion) (4). Whether the result of an accident or physical aggression, dental injury may lead to aesthetic, functional and/or emotional damage.

The prevalence of traumatic lesions in deciduous teeth is said to range from 10% to 37% (Table 1). According to Brazilian studies, the prevalence of dental trauma for children aged 1–5 years is around 30% (5–7).

A house-to-house survey among children living in 66 neighbouring urban areas in Bauru, in the state of São Paulo, Brazil, found that subluxation was the most frequent kind of traumatic lesion in the deciduous dentition (5).

Swelling (5, 7) and coronary chipping (6, 8–11) were reported to be the most frequent traumas affecting the deciduous dentition. Several studies reported the highest prevalence of dental trauma in 3- to 5-year-old children (8–10, 12).

This study aimed to assess the prevalence of dental trauma and compare it with the prevalence of dental caries in children under 5 years of age in Recife, Brazil.

Material and methods

This cross-sectional study was conducted in the city of Recife, the state capital of Pernambuco, in the north-east of Brazil. The study was approved by the Ethics in Research Committee of the University of Pernambuco.

The inclusion criteria were children who came to health centres during the national immunization campaign day and whose parents or guardians agreed to sign the informed consent form and to have them undergo a dental examination. Those needing dental care were referred to the health care units or to the University of Pernambuco's School of Dentistry.

The sample comprised children of both genders under the age of 5. Recife is divided into six administrative zones. From each zone, two health centres were randomly selected; each in a different neighbourhood, chosen for its socio-economic level (family income ≤4 minimum wages and >4 minimum wages). Pernambuco is the Brazilian state with the widest vaccine coverage, reaching 100% of the target population.

The sample size was calculated using the Epi-Info 6.0 software program. The total population of children

Table 1. Prevalence of dental traumatic injuries in deciduous teeth according several studies

Author	Year	Country	Sample	Age	Dental trauma (%)
García-Godoy et al. (16)	1983	Dominican Republic	800	3–5 years	35.0
Yagot et al. (17)	1988	Iraq	2389	1–4 years	24.4
Bijella et al. (5)	1990	Brazil	576	10–72 months	30.2
Beltrão et al. (11)	2007	Brazil	293	1–3 years	10.2
Mestrinho et al. (6)	1998	Brazil	1853	1–5 years	30.0
Hargreaves et al. (8)	1999	South Africa	1466	1–5 years	15.0
Caldas and Burgos (10)	2001	Brazil	77	1–5 years	30.8
Kirzioğlu et al. (12)	2005	Turkey	84	9 months–6 years	29.7
Graville-Garcia et al. (9)	2006	Brazil	2651	4–6 years	36.8

under the age of 5 who had been immunized in the previous campaign in 2005 was 133 797. The estimated prevalence for dental trauma was 10%. The precision index adopted was 2% and the reliability index was 99%. The representative sample consisted of 1477 children.

The data were collected by 123 previously trained undergraduate students from the School of Dentistry of the University of Pernambuco. The inter-examiner agreement for crown fracture, intrusion and extrusion was 90.32%, for tooth discoloration 83.87% and for dental caries 93.54%.

The data were recorded on an electronic form using the model adopted by the Forsyth Institute (Boston, MA, USA) for optical reading. The questions on the response card had been previously validated in a pilot study. Mothers or guardians were asked about family income and the causes of the trauma.

The clinical examination was performed and charted under natural light, with the child held by the mother, in the knee-to-knee position in the courtyard or in rooms at the health unit. Caps, masks, gloves and gauze were used in accordance with the precepts of infection control.

The following kinds of injury were recorded: fracture of the crown, colour alteration, intrusion and extrusion. Reports on the history of trauma were presented by parents or those responsible for the child. The dmf-t index was used for the dental caries diagnosis. The reading of the electronic forms was performed by the Opscan 5 machine.

The STANTOOLS version 1.4 software program (National Computer Systems) was used for the reading of the marks, edition of errors and the generation of a text file in a Word document. The data from this text file were transferred to a spreadsheet on Excel software. The SAS (Statistical Analysis System) version 8.0 and SPSS (Statistical Package for the Social Sciences) Version 11.0 were used for the statistical calculations. The Pearson chi-squared test was used and a 5.0% margin of error was allowed in evaluating the reliability of the statistical tests.

Results

Of the 3489 children were examined, 1250 (35.8%) were males and 1120 (32.1%) were females. Due to a flaw in the reading of the optical files, 1119 children were not categorized as either male or female.

Half of the children (50.4%) were from families whose monthly income was one minimum national wage (US$ 140) or less; 15.5% were from families earning up to two minimum wages; 8.9% from those earning up to three minimum wages, and 25.2% from those earning four minimum wages (U$560) or more.

Table 2. Occurrence of dental trauma according to parents, clinical examination and kind of injury

Variable	Yes *n* (%)	No *n* (%)	Total *n* (%)
Occurrence of trauma reported by parents	512 (14.7)	2977 (85.3)	3489 (100)
Occurrence of trauma reported by clinical examination	520 (14.9)	2969 (85.1)	3489 (100)
Kind of injury[1]			
Fracture of crown	382 (11.0)	3107 (89)	3489 (100)
Colour alteration	138 (4.0)	3351 (96)	3489 (100)
Intrusion	12 (0.3)	3477 (99.7)	3489 (100)
Extrusion	9 (0.3)	3480 (99.7)	3489 (100)

[1]Considering that a child may present more than one kind of injury.

The prevalence of trauma in the deciduous dentition reported by parents or guardians was 14.7% ($n = 512$) and that recorded by the clinical examiners was 14.9% ($n = 520$) (Table 2). Regarding the kind of injury, the prevalences of crown fracture, colour alteration, intrusion and extrusion were 11.0%, 4.0%, 0.3% and 0.3% respectively (Table 2). In this study, the most affected teeth were the upper central incisors.

Table 3 exhibits the occurrence of trauma according to age and family income. As the administration of the polio vaccine starts from age zero, a few children with erupted teeth at the age of 3 months were also included in our study. The prevalence of dental trauma was 14.9% ($P < 0.0001$), a percentage that increased significantly with age and family income ($P < 0.0001$) (Table 3). In our study, dental trauma was most prevalent from 2 to 5 years of age.

Table 4 shows the prevalence of dental caries (14.3%), which also increased significantly with age ($P < 0.0001$) and with the reduction in family income ($P < 0.0001$).

Discussion

Parents were interviewed prior to the clinical examinations to explain issues related to family income and the occurrence of trauma. It is important to bear in mind

Table 3. Occurrence of dental injuries according to the variables age group and family income

Variable	Occurrence of trauma: Yes *n* (%)	No *n* (%)	Total *n* (%)	*P*-value	OR (95% CI)
Age group (months)					
3–24	61 (5.0)	1157 (95.0)	1218 (100)	<0.0001*	1.00
25–36	145 (18.9)	624 (81.1)	769 (100)		4.41 (3.22–6.04)
37–48	161 (20.4)	628 (79.6)	789 (100)		4.86 (3.56–6.63)
49–59	153 (21.5)	560 (78.5)	713 (100)		5.8 (3.79–7.09)
Total group	520 (14.9)	2969 (85.1)	3489 (100)		
Income (minimum wage)[1]					
≤4	409 (14.4)	2432 (85.6)	2841 (100)	<0.0001*	1.00
>4	111 (17.1)	537 (82.9)	648 (100)		1.44 (1.27–1.64)
Total group	520 (14.9)	2969 (85.1)	3489 (100)		
Income(minimum wage)[1]					
1	238 (13.5)	1521 (86.5)	1759 (100)	0.0585	1.00
2	77 (14.2)	464 (85.8)	541 (100)		1.06 (0.80–1.39)
3	48 (15.4)	263 (84.6)	311 (100)		1.17 (0.83–1.63)
4	46 (20.0)	184 (80.0)	230 (100)		1.60 (1.12–2.27)
5	32 (18.7)	139 (81.3)	171 (100)		1.47 (0.98–2.21)
6	20 (20.6)	77 (79.4)	97 (100)		1.66 (0.99–2.76)
7	59 (15.5)	321 (84.5)	380 (100)		1.17 (0.86–1.60)
Total group	520 (14.9)	2969 (85.1)	3489 (100)		

[1]Minimum wage at when the study was conducted (US$ 140).
*Significant association at the level of 5.0%.

Table 4. Occurrence of dental caries according to the variables age group and family income

Variable	Dental caries: Yes *n* (%)	No *n* (%)	Total *n* (%)	*P*-value	OR (95% CI)
Age group (months)					
3–18	17 (2.1)	809 (97.9)	826 (100)	<0.0001*	1.00
19–24	19 (4.8)	373 (95.2)	392 (100)		2.42 (1.24–4.72)
25–36	95 (12.3)	674 (87.7)	769 (100)		6.71 (3.96–11.35)
37–48	161 (20.4)	628 (79.6)	789 (100)		12.20 (7.32–20.33)
49–59	207 (29.0)	506 (71.0)	713 (100)		19.76 (11.72–32.32)
Total group	499 (14.3)	2990 (85.7)	3489 (100)		
Income (minimum wage)[1]					
≤4	481 (16.9)	2360 (83.1)	2841 (100)	<0.0001*	7.13 (4.42–11.51)
>4	18 (2.9)	630 (97.2)	648 (100)		1.00
Total group	499 (14.3)	2990 (85.7)	3489 (100)		
Income (minimum wage)[1]					
1	345 (19.6)	1414 (80.4)	1759 (100)	<0.0001*	13.00 (6.10–27.71)
2	78 (14.4)	463 (85.6)	541 (100)		8.98 (4.09–19.68)
3	39 (12.5)	272 (87.5)	311 (100)		7.64 (3.37–17.34)
4	19 (8.3)	211 (91.7)	230 (100)		4.80 (1.98–11.60)
5	9 (5.3)	162 (94.7)	171 (100)		2.96 (1.08–8.08)
6	2 (2.1)	95 (97.9)	97 (100)		1.12 (0.23–5.49)
7	7 (1.8)	373 (98.2)	380 (100)		1.00
Total group	499 (14.3)	2990 (85.7)	3489 (100)		

[1]Minimum wage at when the study was conducted (US$ 140).
*Significant association at the level of 5.0%.

that the incidence of dental trauma is always underreported, owing to bias resulting from the healing of symptoms or because mothers or children tend to forget incidents. In our study, reports on the history of trauma were clinically confirmed by parents or those responsible for the child. Some authors state that in many cases parents neither remember nor are aware of the injury and its causes (14, 15).

The prevalence of dental trauma found in this study was similar to that found in Hargreaves et al. (8). However, it was lower than the prevalence other authors have reported (5, 6, 9, 10, 12, 16, 17).

Regarding age, trauma affected the 2- to 4-year age group most frequently, which is in agreement with some studies (8, 10, 11). The most frequent injury to teeth was fracture of the crown, and the upper central incisors were the teeth most affected, a result also corroborated by other studies (6, 8, 11, 18, 19).

This investigation found that for ages from 3 to 59 months, dental caries and dental trauma prevalence values were similar; that there are striking disparities in dental caries by income; that poor children suffer twice as much dental caries as their more affluent peers, and that their disease is more likely to go untreated (20).

Epidemiological studies of population subgroups such as preschoolers are important to establish baselines for the incidence and prevalence of specific oral health problems with follow up to track progress in reducing or eliminating identified health disparities.

The prevalence of early childhood caries in the present study was lower than that reported in some previous investigations (21, 22), but the prevalence of dental trauma was in the same range as that found by Hargreaves et al. (8). However, it was lower than that mentioned in most other reports (5–7, 9, 13, 16, 17).

Dental caries was positively associated with a decrease in family income. Nadanovsky and Sheiham (23) indicated that socio-economic changes have a greater impact in reducing the rates of dental caries in populations than the health services alone. Their data, collected from 18 industrialized countries, showed that dental services, measured as the dentist/population ratio, accounted for only 3% of the reduction observed in the dmf-t in 12-year-old children in the 1970s and mid-1980s, while social factors accounted for 65%. Nevertheless, in Recife, the expansion of the primary health care services by the municipal government in 2000 has positively contributed to the decrease in caries. Likewise, the availability of health education to poor communities might also have positively affected the incidence of dental trauma.

Our results showed that the prevalence of dental trauma increased in line with family income. This finding is in agreement with Jamani and Fayyad (24) who verified in a study in Jordan that children in affluent families were more likely to experience dental trauma than those in low-income families.

The wider access of affluent children to swimming pools, bicycles, skates and skateboards, for instance, may perhaps account for their being at higher risk of dental trauma than are children in low-income families. Moreover, in developing countries such as Brazil, this young population tends to ignore safety norms by refusing to wear protective equipment. Such contradictory results suggest that the way the individual interacts with the milieu may play an important role in determining the occurrence of dental trauma.

The present findings are important for alerting local authorities to the need for providing healthy and safe public areas such as public recreation grounds to safeguard future generations from injuries caused by dental trauma, which can lead to aesthetic, social and functional disabilities in adult life.

Conclusion

Our results showed that children in the 3- to 5-year age group are the ones most frequently affected by dental trauma. Fracture of the crown was the most common type of dental injury and the upper central incisors were the most affected teeth. The results showed that the prevalence of dental caries and dental trauma was similar, causing the same amount of damage to dental health of children under the age of 5 in the city of Recife, Brazil.

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