

TRAUMATIC DENTAL INJURIES AND ASSOCIATED FACTORS AMONG BRAZILIAN PRESCHOOL CHILDREN AGED 1-5 YEARS

Ana F. Granville-Garcia¹, Ítala Tarciane de Almeida Vieira²,
 Maria J. Pereira da Silva Siqueira², Valdenice Aparecida de Menezes²,
 Alessandro Leite Cavalcanti¹

¹ Department of Pediatric Dentistry, School of Dentistry, State University of Paraíba, Campina Grande, Paraíba, Brazil.

² Department of Pediatric Dentistry, School of Dentistry, Higher Education Association of Caruaru, Pernambuco, Brazil.

ABSTRACT

The aim of this study was to evaluate the prevalence of dental trauma in children aged 1 to 5 years old and its associated factors (gender, age group, malocclusion and labial-closing), interviewing parents and guardians for additional information on the trauma occurrence.

A transversal study of 820 preschool children from the City of Caruaru, Pernambuco, Brazil was conducted. Data were collected by means of a clinical examination and a structured interview. The statistical analysis included a distribution of frequencies, a bi- and a multi-variate analysis at a significance level of 5%.

Trauma prevalence was 20.1%, tooth 61 was the most often affected, and enamel fractures followed by the fractures of the enamel and the dentine were the most frequent alterations.

Trauma prevalence was highest in 3- to 5-year-old males with malocclusion (open bite and protrusion) ($p < 0.05$). According to most parents and/or guardians, the most usual etiology was falling and the place most often cited was home. All the variables studied, except for lip coverage, were associated with dental trauma.

The outcome of the present study showed high prevalence of dental trauma in a pediatric population under the age of 5 years. Falls and accidental collisions were the etiological factors most often cited. The front upper incisors were the teeth most often affected, and enamel fracture was the trauma most often observed.

Key words: pediatric dentistry, epidemiology, tooth injuries, primary dentition.

TRAUMATISMOS DENTÁRIOS E FATORES ASSOCIADOS ENTRE PRÉ-ESCOLARES BRASILEIROS DE 1 A 5 ANOS DE IDADE

RESUMO

O objetivo deste estudo foi avaliar a prevalência de trauma dentário em crianças de 1 a 5 anos de idade e os fatores associados (gênero, faixa etária, maloclusão e selamento labial), por meio de entrevistas com os pais e responsáveis para a obtenção de informações adicionais sobre a ocorrência do trauma.

Um estudo transversal com 820 pré-escolares foi realizado na cidade de Caruaru, Pernambuco, Brasil. Os dados foram coletados por meio de exame clínico e de uma entrevista estruturada. A análise estatística incluiu a distribuição de frequências, análise bi e multi-variada com um nível de significância de 5%.

A prevalência de trauma foi de 20,1%, sendo o dente 61 o mais afetado e as fraturas de esmalte e fraturas de esmalte e dentina as alterações mais frequentes. A prevalência de trauma foi

maior nos meninos de 3 a 5 anos com maloclusão (mordida aberta e protrusão) ($p < 0,05$). De acordo com a maioria dos pais e responsáveis, a etiologia mais frequente foi a queda, e o lugar da ocorrência a residência. Todas as variáveis estudadas, exceto o selamento labial, mostraram-se associadas com o trauma dentário.

Este estudo revelou uma alta prevalência de traumatismo dentário na população infantil abaixo dos 5 anos de idade. Quedas e colisões acidentais foram os fatores etiológicos mais frequentemente citados. Os incisivos centrais superiores os dentes mais atingidos e a fratura de esmalte o trauma mais observado.

Palavras chave: odontopediatria, epidemiologia, traumatismo dentário, dentição decidua.

INTRODUCTION

The high prevalence of dental trauma in preschool children has become a public health concern¹. The main objectives of diagnosis and treatment of traumatic injuries affecting children with primary dentition

are pain management and prevention of possible damage to the developing tooth germ².

The age-group and gender of higher risk are controversial in the literature³⁻⁶. The most common age group in which primary tooth injury occurs

is 1.5 to 2.5 years. Injuries to the dentition of infants are infrequent during the first year of life because infants' teeth do not start erupting until the child is 6 months of age, and infants are limited in their ability to move about in their environment⁷.

Protrusion of upper incisors, open bite, lip closure and epilepsy are among predisposing factors^{3,8}. Maxillary teeth are more frequently traumatized than mandibular teeth and there is general agreement that maxillary central incisors are injured most frequently, probably due to their vulnerable position⁹. When they are lost at the beginning or even in the middle of their biological cycle, there are esthetic alterations, with a reduction of the child's self-esteem, making speech difficult or even contributing to install deleterious habits¹⁰.

The purpose of this retrospective study was to determine the prevalence of traumatic injuries to primary anterior teeth and associated factors in preschool children from the city of Caruaru, Pernambuco, Brazil. The analysis of the oral health conditions of different groups and age ranges contributes information that is essential for planning and establishing health promotion action.

MATERIAL AND METHODS

Population

A transversal and an analytical epidemiological study were performed with retrospective components in an interview with parents and/or guardians. The sample was composed of 820 children aged 1 to 5 years, regularly enrolled in 7 municipal day care centers of the city of Caruaru, in Pernambuco State, located in the northeast of Brazil. The clinical examinations were performed in the first semester of 2007. Ethical consent for the study was obtained and written consent for participation was obtained from at least one of each child's parents prior to the study, according to the ethical guidelines of the Declaration of Helsinki.

Examinations

Children were examined in predetermined order in selected rooms under natural light. During the clinical examination, children sat on school desks, in plain natural light. Children under two years old went through a foot-foot, or knee-knee system¹¹. A mouth mirror #3, tweezers for cotton and a CPI periodontal probe were used in the examination,

prior to which dental biofilm was removed using antiseptic gauze.

The classification suggested by Hinds and Gregory¹² was used for recording traumas. The criteria are discoloration, enamel fracture, enamel and dentin fracture; enamel, dentin and pulp fracture; avulsion, lateral luxation, intrusive and extrusive, restoration caused by trauma; combined traumas. Immediately prior to the examination, lip coverage was recorded (adequate or not) with facial musculature in apparent rest, when the child was distracted and unaware of the occurrence of the examination¹³.

Overjet was measured with teeth in centric occlusion; the probe parallel to the occlusal plane to register dental protrusion (protrusion greater than 3mm). When there was no contact between the anterior teeth and the posterior teeth remained in occlusion, open bite was diagnosed¹⁴.

Examination criteria were diagnosed and standardized in order to ensure precise results and minimize the occurrence of intra-examiner error. The examiner repeated the clinical examination on 10% of the children in the sample within 24 hours in order to determine intra-examiner agreement, which was thus found to be greater than 0.90.

When trauma was diagnosed, parents or guardians were interviewed individually in order to obtain additional information. Standardized or structured interviews were used, and the reliability of the results was tested using the "face" validation method in 10% of the interviews¹⁵.

Statistical Analysis

All recorded data were analyzed with the software SPSS version 11.0. Entire distributions, uni- and bi-variate percentages (descriptive statistics techniques) were obtained to analyze data, and the Pearson independence Chi-square test was performed. Odds Ratio (OR) values and reliability ranges were obtained to study the link between independent and dependent variables in a bi-variate study, considering the first or the last category as reference values. In order to determine the influence of independent variables upon the dependent variable (child with trauma), two sample techniques of logistic regression were adjusted along with the three independent variables selected during the bi-variate study that were significant with the dependent variable or the answer at the level of 5.0%.

Table 1: Trauma prevalence assessment according to age and gender.

Variable	Trauma						Value of p	OR (IC at 95%)
	Yes		No		Total			
	n	%	N	%	n	%		
Age (years)								
1	3	4.2	69	95.8	72	100.0	p(1) = 0.002*	1.00
2	26	16.5	132	83.5	158	100.0		4.53 (1.32-15.50)
3	45	23.0	151	77.0	196	100.0		6.85 (2.06-22.82)
4	40	21.1	150	78.9	190	100.0		6.13 (1.83-20.52)
5	51	25.0	153	75.0	204	100.0		7.67 (2.31-25.42)
Total Group	165	20.1	655	79.9	820	100.0		
Gender								
Male	97	22.8	329	77.2	426	100.0	p(1) = 0.049*	1.00
Female	68	17.3	326	82.7	394	100.0		1.41 (1.00-2.00)
Total Group	165	20.1	655	79.9	820	100.0		

(*): Significance at 5.0%; (1): Based on Pearson's Chi-square test.

RESULTS

Table 1 shows that trauma prevalence increases with age, from 4.2% for one-year-olds to 25.5% for 5-year-olds. The link between trauma and age group becomes important according to the value of p, to the value of OR and to the OR intervals excluding the value 1.00. Trauma prevalence was 5.5% higher among boys than girls ($p < 0.05$; $OR = 1.41 [1.00-2.00]$).

Enamel fracture was the most frequent type of trauma, representing 56.4% of the cases, followed by 17.6% with fracture of the enamel and the dentine, intrusion (7.9%) and avulsion (7.3%). The teeth most often affected by trauma were 61 and 51, making up 62.4% and 58.8% of the sample with trauma, respectively (Table 2).

Trauma prevalence was very similar in children with adequate or inadequate lip coverage (20.9% x 19.4%) and there is no major association between the two variables ($p > 0.005$; $OR = 1.10 [0.78-1.55]$). Trauma prevalence was higher in children with isolated open bite (23.7%), or in those with both open bite and dental protrusion (31.2%), showing a significant link between the type of occlusion and trauma ($p < 0.05$) (Table 3).

Table 4 shows that the majority of parents or guardians of children who suffered trauma (79.9%) did not react immediately; 4.9% sought help later, and only 15.2% acted promptly. The two places where the child suffered trauma most often cited were at home (42.4%) and at school (38.2%). Falls

and accidental collisions were the etiological factors most often cited, with percentages of 64.8% and 20.6%, respectively.

Table 5 shows a logistic regression. The OR values in the table show that the probability of a child suffering a trauma increases with age, especially for boys with both open bite and protrusion.

Table 2: Relative and absolute distribution of the type of trauma and affected tooth (52, 51, 61 and 62).

Variable	n	%
Type of trauma		
Discoloration	9	5.5
Enamel Fracture	93	56.4
Enamel and dentine Fracture	29	17.6
Enamel, dentine and pulp Fracture	1	0.6
Avulsion	12	7.3
Lateral luxation	2	1.2
Intrusion	13	7.9
Combined traumas	6	3.6
TOTAL	165	100.0
Trauma affected tooth		
52	11	6.7
51	97	58.8
61	103	62.4
62	11	6.7
BASE⁽¹⁾	165	

(1): Because a single child can be affected by more than one tooth with trauma, the base is used to calculate percentages instead of the total.

Table 3: Trauma prevalence assessment according to age and gender.

Variable	Trauma						Value of p	OR (IC at 95%)
	Yes		No		Total			
	n	%	N	%	n	%		
lip coverage								
Adequate	91	20.9	345	79.1	436	100.0	p(1) = 0.594	1.00 1.10 (0.78-1.55)
Inadequate	74	19.4	308	80.6	382	100.0		
Group Total	165	20.2	653	79.8	818	100.0		
Occlusion								
With protrusion	72	17.3	343	82.7	415	100.0	p(1) = 0.003*	1.00 0.67 (0.33-1.36) 1.48 (0.99-2.20) 2.16 (1.30-3.58)
With dental protrusion	10	12.3	71	87.7	81	100.0		
With open bite	54	23.7	174	76.3	228	100.0		
Open bite/Dental Protrusion	29	31.2	64	68.8	93	100.0		
Group Total	165	20.2	652	79.8	817	100.0		

(¹): Significance at 5.0%; (1): Through Pearson Chi-square test.

Table 4: Trauma assessment, according to parents' behavior, location and etiology.

Question	n	%
<i>What did you do after the trauma?</i>		
Sought help immediately	25	15.2
Sought help later	8	4.9
Did nothing	131	79.9
TOTAL⁽¹⁾	164	100.0
<i>Where did the trauma occur?</i>		
School	63	38.2
Home	70	42.4
Other	15	9.1
Don't remember	17	10.3
TOTAL	165	100.0
<i>How did the trauma occur?</i>		
Fall	107	64.8
Accidental Collision	34	20.6
Sports/traffic accidents	7	4.2
Don't remember	17	10.3
TOTAL	165	100.0

(¹): This information is unavailable for the subject.

DISCUSSION

This research was motivated by the high prevalence of dental trauma in childhood and the small number of Brazilian studies on this topic in primary dentition. The literature shows that it is at the preschool age that children are most vulnerable to trauma, either due to not yet having fully-developed motor skills, or due to their increased curiosity and inde-

pendence during this phase. Therefore, the exploration of this topic as well as the knowledge of factors related to trauma occurrence will contribute to its prevention through health care policies^{5,6,9}.

Hinds and Gregory's classification in the final report of *National Diet and Survey: children aged 1 ½ to 4 ½ years* was selected for this study. This classification takes into account the findings, according to the clinical aspects, of accidents that affected teeth, and is therefore appropriate and useful for epidemiological purposes and adequate for this study, in the absence of an X-ray examination¹². The prevalence of trauma found in this study was 20.1%. No agreement exists on the prevalence of traumatic dental injuries, as it has differed from study to study and from country to country⁹. Retrospective and prospective studies report frequencies ranging from 9.4 to 41.6%^{1,3-6,8,9,16,17}. These differences are probably due to the population tested, the methodology or the type of classification used.

Enamel fracture was the most frequent type of alteration (56.4%), followed by enamel and dentine fracture (17.6%). This result is similar to those in others studies^{1,4,5,8,9,17}. It is important to point out that because this study was performed at day care centers, the frequency of small-scale traumas was higher than in hospitals.

Most studies of dental traumas involve front upper teeth due to the discreet prevalence of teeth with trauma in the inferior arch^{5,16,18}. Based upon that, the teeth most often affected were 61 and 51 and

Table 5: Logistic regression results for trauma prevalence.

Variables included in the sample	Trauma		Unadjusted Odds ratios and IC (95%)	P-Value	Adjusted Odds ratios and IC (95%)	Value of p in adjusted sample
	n	%				
Gender						p = 0.040*
Male	97	32.9	1.00	p(1) = 0.049*	1.00	
Female	68	32.6	1.41 (1.00-2.00)		1.45 (1.02-2.06)	
Age group						p = 0.024*
1 year old	3	69	1.00	p(1) = 0.002*	1.00	
2 years old	26	13.2	4.53 (1.32-15.50)		4.33 (1.26-14.89)	p = 0.020*
3 years old	45	15.1	6.85 (2.06-22.82)		6.52 (1.92-22.11)	p = 0.003*
4 years old	40	15.0	6.13 (1.83-20.52)		5.62 (1.65-19.10)	p = 0.006*
5 years old	51	15.3	7.67 (2.31-25.42)		6.99 (1.99-22.59)	p = 0.002*
Occlusion						p = 0.032*
Without protrusion	72	34.3	1.00	p(1) = 0.003*	1.00	
Open bite	10	71	0.67 (0.33-1.36)		0.54 (0.26-1.11)	p = 0.095
With protrusion	54	17.4	1.48 (0.99-2.20)		1.18 (0.78-1.78)	p = 0.431
Open bite and protrusion	29	64	2.16 (1.30-3.58)		1.72 (1.02-2.91)	p = 0.042*

(^o): Significance level 5.0%.

these results are similar to previous studies^{5,6,19}. However, there are no studies in the literature on deciduous teeth showing that the left side is more often affected in dental traumas.

The age group was a variable related to dental trauma ($p < 0.05$). Trauma occurrence increased with age, with 3- to 5-year-olds being the most affected. This is supported by previous studies in Brazil^{5,6,8,9} and Cuba¹. These results were confirmed in the logistics regression analysis.

Regarding gender, there was a significant link with dental trauma, where males were the most affected ($p < 0.05$). Studies maintain that there is no gender difference related to traumas in the age group studied^{8,17,19}. However, it is shown here that boys are more often affected by trauma^{1,5,9}, with the likelihood of boys having dental trauma being 1.45 times higher than for girls (Table 5).

There are few studies of malocclusion, lip coverage and traumas in primary dentition in the literature. Dental protrusion, open bite and inadequate lip coverage are not trauma predisposing factors in primary dentition³. In this study, the facts showed no relationship between lip coverage and trauma, but did show a relationship between type of occlusion and trauma for the age group studied ($p < 0.05$). The logistic regression analysis confirmed that children with open bite and dental protrusion are 1.72 times more likely to have dental traumas (Table 5).

School and home were the places most often cited for the occurrence of dental trauma. These are the places where children in this age group spend most time²⁰. Falls were the etiological factor most often mentioned by parents, in agreement with many studies in the literature^{3,5,16,17}.

Only 15.2% of parents sought immediate help after trauma, while 4.9% did so later. Negligence regarding the treatment of children in relation to this problem has been mentioned^{3,5,8}. This is probably due to the fact that little attention is paid to primary dentition and that there is a lack of information about possible damage to permanent dentition as well.

There is a need to provide adequate preventive and treatment care for preschool children⁹. Therefore, prevention and orientation campaigns regarding common risk factors such as accidents must be prioritized and incorporated in health care general instructions.

CONCLUSION

The outcomes of the present study showed a high prevalence of dental trauma in a pediatric population under the age of 5. Falls and accidental collisions were the etiological factors most often cited. The front upper incisors were the teeth most often affected and enamel fracture was the trauma most frequently found.

CORRESPONDENCE

Ana Flávia Granville-Garcia
 Rua Capitão João Alves Lira, 1325/410
 Bela Vista, Campina Grande, Paraíba, Brasil
 58101281
 Tel: +55- 21- 83- 3341-0268
 e-mail: anaflaviagg@hotmail.com

REFERENCES

- Rodriguez JG. Traumatic anterior dental injuries in preschool Cuban children. *Dent Traumatol* 2007;23(4):241-242.
- Flores MT. Traumatic injuries in the primary dentition. *Dent Traumatol* 2002;18(6):287-298.
- Bijella MFT, Yared FNFG, Bijella VT, Lopes ES. Occurrence of primary incisor traumatism in Brazilian children: a house-by-house survey. *J Dent Child* 1990;57(6):424-427.
- Kramer P, Zebruski C, Ferreira SH, Feldens CA. Traumatic dental injuries in Brazilian preschool children. *Dent Traumatol* 2003;19(6):299-303.
- Granville-Garcia AF, Menezes VA, Lira PIC. Dental trauma and associated factors in Brazilian preschoolers. *Dent Traumatol* 2006;22(6):318-322.
- Ferreira JM, Fernandes de Andrade EM, Katz CR, Rosenblatt A. Prevalence of dental trauma in deciduous teeth of Brazilian children. *Dent Traumatol* 2009;25(2):219-223.
- Wilson CFG. Management of trauma to primary and developing teeth. *Dent Clin North Am* 1995;39(1):133-167.
- Oliveira BL, Marcenes W, Ardenghi TM, Sheiham A, Bönecker M. Traumatic dental injuries and associated factors among Brazilian preschool children. *Dent Traumatol* 2007;23(2):76-81.
- Beltrão EM, Cavalcanti AL, Albuquerque SS, Duarte RC. Prevalence of dental trauma children aged 1-3 years in Joao Pessoa (Brazil). *Eur Arch Paediatr Dent* 2007;8(3):141-143.
- Rocha MJC, Cardoso M. Federal University of Santa Catarina endodontic treatment of traumatized primary teeth - part 2. *Dent Traumatol* 2004;20(6):314-326.
- Pinkham JR, Casamassino PS, Fields HW, Mctigue D, Nowak A. *Pediatric dentistry - Infancy Through Adolescence*. 4th ed. WB Saunders, United Kingdom, 2005. 768p.
- Hinds K, Gregory JR. *National diet and nutrition survey: children aged 1 ½ to 4 ½ years*. Volume 2 Report of dental survey. HMSO, London, 1995. 144p.
- Burden DJ. An investigation of the association between overjet size, lip coverage, and traumatic injury to maxillary incisors. *Eur J Orthod* 1995;17(6):513-517.
- Petti S, Tarsitani G. Traumatic injuries to anterior teeth in Italian schoolchildren: prevalence and risk factors. *Endod Dent Traumatol* 1996;12(6):294-297.
- Frankfort-Nachimias C, Nachimias D. *Research methods in the social sciences*. 4th ed. London: Edward Arnold, 1992. 144p.
- Sanchez AV, Garcia-Godoy F. Traumatic dental injuries in 3- to 13-year-old boys in Monterrey, Mexico. *Endod Dent Traumatol* 1990;6(2):63-65.
- Jorge KO, Moysés SJ, Ferreira e Ferreira E, Ramos-Jorge ML, de Araújo Zarzar PM. Prevalence and factors associated to dental trauma in infants 1-3 years of age. *Dent Traumatol* 2009;25(2):185-9.
- Andreasen JO. Etiology and pathogenesis of traumatic dental injuries. A clinical study of 1,298 cases. *Scand J Dent Res* 1970;78(4):329-342.
- Wilson S, Smith G, Preisch J, Casamassimo PS. Epidemiology of dental trauma treated in an urban pediatric emergency department. *Pediatr Emerg Care* 1997;13(1):12-15.
- Mestrinho HD, Bezerra AC, Carvalho JC. Traumatic dental injuries in Brazilian pre-school children. *Braz Dent J* 1998;9(2):101-104.