Dental Traumatology

Dental Traumatology 2013; **29**: 297–302; doi: 10.1111/edt.12003

Prevalence and treatment demand after traumatic dental injury in South Brazilian schoolchildren

Helena Silveira Schuch[1], Marília Leão Goettems[2]*, Marcos Britto Correa[3], Dione Dias Torriani[2], Flávio Fernando Demarco[3]

[1]Federal University of Pelotas, Pelotas, Brazil; [2]Department of Social and Preventive Dentistry, Federal University of Pelotas, Pelotas, Brazil; [3]Department of Operative Dentistry, Federal University of Pelotas, Pelotas, Brazil

Key words: epidemiology; permanent dentition; tooth injuries; dental care; pediatric dentistry

Correspondence to: Marília Leão Goettems, Faculdade de Odontologia/UFPel, Rua Gonçalves Chaves 457, 4º andar, Centro, Pelotas-RS 96015560, Brazil
Tel./Fax: +55 53 32226690
e-mail: mariliagoettems@hotmail.com

Accepted 31 August, 2012

Abstract – *Background*: Evaluation of the frequency and need for treatment of dental trauma is critical for both planning and establishing dental services and preventive programs. *Aim*: This cross-sectional study evaluated the prevalence of dental trauma, need for treatment and factors associated with dental visits after an injury. *Subjects and Methods*: A multistage sample of children aged 8–12 years, from 20 private and public schools in Pelotas/Southern Brazil, was considered. Socioeconomic information was collected from parents, and data regarding traumatic events were obtained from the children. Clinical examinations were conducted using validated criteria. Descriptive analysis and logistic regression were used to assess the factors associated with search for treatment after injury. *Results*: A total of 1210 children were included, 153 (12.6%, 95% CI 10.8–14.6) of whom suffered dental trauma, with a total of 175 traumatized teeth. The most frequently observed type of injury was enamel fracture, affecting 129 (73.7%) teeth, of which 107 did not require restorative treatment. A total of 68 (38.8%) teeth required care, of which 24 (13.7%) received treatment. Of the children who recalled the trauma, 39 (36.5%) sought treatment, which was significantly associated with both higher maternal education (OR 2.75; 95% CI 1.18–6.41) and trauma severity (OR 7.71; 95% CI 3.17–18.75). *Conclusions*: The prevalence of traumatic injuries was relatively high in this population. Although most of the traumatized teeth did not require treatment, dental care was neglected, as most of the children were not taken to a dentist for evaluation. Also, there was a considerable demand for treatment, most of them of low complexity. Special attention should be given to children whose mothers have completed fewer years of education, as the mother's level of education was an important predictor of evaluation by a dentist after injury.

Traumatic dental injuries (TDIs) are common events in children, with a prevalence of 2.4% (1, 2) to 58.6% (3). In recent years, there has been increasing concern about this oral health problem, because of both the high prevalence and cost involved in its treatment (4), including long-time follow-ups (5). Dental trauma is an irreversible injury, which occurs in varying forms from small enamel cracks to tooth loss. It is recommended that treatment be performed soon after injury to restore function, relieve pain, and prevent complications such as loss of vitality (6). In addition, because of a TDI, some aspects of the child's quality of life may be compromised. Because a majority of such injuries involve the anterior teeth, TDI may lead to restriction in masticatory function and difficulty in speaking clearly, as well as embarrassing esthetic deformities (6).

Studies suggest that falls are the primary events causing dental trauma, followed by sports and collisions with objects and people, all of which are common events in the daily routine of children (7–9). Physical and demographic factors that predispose dental injury include male gender and age, being older children significantly more affected than young children. Increased age is particularly relevant, as the effects of these injuries are cumulative (10, 11). Important biological factors contributing to TDI include increased overjet and inadequate lip coverage (12, 13).

Although several studies have examined dental trauma, few have specifically addressed treatment required for trauma and demand for professional service for trauma treatment. Studies investigating the need for treatment demonstrated that generally, the most commonly required treatment is a direct adhesive composite restoration for uncomplicated crown fractures (5); however, most injuries remain untreated (14). It is important to investigate both treatment requirements and barriers to treatment. Epidemiological studies evaluating a representative sample using a rigorous methodology can help to accurately determine the occurrence of injuries and the need for treatment due

© 2012 John Wiley & Sons A/S

to trauma; this data can then be utilized in the development of public health programs for trauma prevention in schoolchildren. The aim of this study was to evaluate the occurrence of, the need for treatment of, and the demand for care after dental trauma in schoolchildren aged 8–12 years in Pelotas, Brazil.

Subjects and methods

This school-based cross-sectional study assessed children aged 8–12 years, living in the urban area of Pelotas and who were enrolled in public and private schools in 2010. The study protocol was approved by the Human Research Ethics Committee of Federal University of Pelotas, under protocol no. 101/2009.

A multistage sampling technique was used for subject recruitment. The first-stage unit comprised 15 private and five public schools in Pelotas in order to ensure selection of a representative sample of both public and private schools in the city. Schools were randomly selected, depending on the number of children enrolled in each school. The second-stage unit comprised five randomly selected classes in each school. A minimum sample size of 922 children was required as estimated using the EPI INFO 6.0 software (Centers for Disease Control and Prevention, Atlanta, GA, USA), after considering dental trauma prevalence of 10%, standard error of 3%, a confidence level of 95%, a design effect of 2, and an increase of 20% in the sample size to account for non-response.

Data collection consisted of a socioeconomic questionnaire for parents and interviews and clinical examinations of children. To be included in the survey, a child required to have mixed or permanent dentition, with at least half of the crown of the incisors erupted. The study excluded children with physical and/or mental disabilities. The questionnaires were sent to the parents via their children. The questionnaire included an informed consent form, which explained the aim, features, and importance of the study in addition to requesting their participation. After the return of the questionnaires, previously trained dental students interviewed the children at school, and dentists performed dental examinations. Schools were visited as many times as was required to ensure an absentee rate of maximum of 10%.

The family income was calculated in Brazilian reals and dichotomized into two categories: above and below the median income. Information on maternal education was collected in years of study and dichotomized into two groups: mothers with 8 years of formal education, which in Brazil corresponds to completion of primary school, and those with <8 years of formal education. Demographic information (gender and age) and questions regarding the presence of dental trauma (location and etiology) were collected from the children. Children were also asked if they had visited a dentist upon TDI occurrence.

Six dentists with experience in epidemiological studies performed the oral clinical examination. Examination was performed in school chairs using individual artificial light, a buccal mirror, and WHO probe. The criteria for traumatic dental injuries adopted were from United Kingdom Children's Dental Health Survey (four upper incisors and four lower incisors). The evaluation of dental structures followed a systematic protocol: first, the upper were examined, and then, the lower teeth. Thus, the examiner began assessing the patient's right lateral incisor, moved to the patient's left lateral incisor, and finally moved to the lower jaw. For each tooth, the examiner noted the type of injury, need for treatment, and treatment administered. The need for treatment was recorded in subjects with untreated injury and also those who underwent functionally unsatisfactory treatment, when there was lack of material or fracture of the restoration, irrespective of the esthetic component. In the absence of other signs, small untreated enamel fractures were not considered for treatment to avoid overestimation of DTI. In order to further simplify the data analysis, the type of trauma was categorized as mild trauma, when limited to the enamel and not requiring restorative treatment, and as severe trauma, when involving at least the dentin and requiring treatment for reasons other than improving the esthetic appearance (15).

Prior to data collection, interviewers and examiners were trained. After a theoretical explanation of the criteria, an *'in lux'* calibration exercise was performed with 20 pictures. Kappa statistics were used to measure interexaminer reliability. The minimum kappa value was 0.89 for type of trauma and 0.80 for treatment need, and the mean interexaminer kappa was 0.92 for type of injury and 0.84 for treatment need.

Data were entered in duplicate using the EPIDATA 3.1 version (EpiData Association, Odense, Denmark) and analyzed using STATA 10.0 (Stata Corporation, College Station, TX, USA). Descriptive and logistic regression analyses were used to obtain the odds ratio (OR) and 95% confidence interval (CI) to identify factors significantly associated with the demand for treatment after injury.

Results

A total of 1744 questionnaires were delivered to parents by their children; of these questionnaires, 1325 (76.0%) were returned. One hundred and fourteen (8.6%) children were excluded from the sample because of absence from school during data collection, and one child refused to be examined. Thus, final sample included was 1210. Prevalence of dental trauma was 12.6% (95% CI 10.8–14.6). Table 1 shows the distribution of the sample and prevalence of dental trauma according to demographic and socioeconomic characteristics.

In the 153 children who suffered dental injuries, 175 teeth were traumatized (18.33 per 1000 teeth examined). The most commonly affected tooth was the patient's left upper central incisor (72 teeth; 41.1%), followed by the right upper central incisor (63 teeth; 36.1%). The upper lateral incisors (17 teeth; 9.7%), inferior central incisors (14 teeth; 8.0%), and inferior lateral incisors (9 teeth; 5.1%) were also commonly affected.

History of dental trauma was reported by 457 children; however, in 348 children, no sign of dental

© 2012 John Wiley & Sons A/S

Table 1. Description of the sample. Pelotas/2010 (n = 1210)

Variable	Total	Number of subjects with trauma	
		n%	(95% CI)
Sex			
Male	574	82	14.3 (11.5–17.4)
Female	636	71	11.2 (8.8–13.9)
Age			
8	181	13	7.2 (3.9–12.0)
9	312	36	11.5 (8.2–15.6)
10	295	35	11.9 (8.4–16.1)
11	259	34	13.1 (9.3–17.9)
12	163	35	21.5 (15.4–28.6)
Type of school			
Private	253	34	13.4 (9.5–18.3)
Public	957	119	12.6 (10.6–14.9)
Maternal schooling			
>8 years	623	77	12.4 (9.9–15.2)
≤ 8 years	553	69	12.5 (9.8–15.5)
Family monthly income (R$)			
0–770	534	68	12.7 (10.0–1.9)
771–12 000	503	67	13.3 (10.5–16.6)
Total	1210	153	12.6 (10.7–14.6)

1 R$ = 0.54 USS at the time of data collection.

trauma was detected on clinical examination. Of the 153 children in whom TDIs were detected, 109 (71.2%) remembered the event. The most frequent cause was collision with people or objects (Fig. 1), and most events occurred inside homes (Fig. 2).

The most common type of injury was enamel fracture, involving 129 teeth (73.7%), of which 107 (82.9%) did not require treatment. Regarding treatment, 24 teeth had been treated, while 44 were not treated or presented functionally unsatisfactory restorations that should be replaced (Table 2). Of the treatments performed, 19 were composite restorations, two were endodontic therapies and restorations, one was removable prosthesis insertion, and two were other treatments. At the time of examination, 42 teeth required composite restoration, and two teeth required endodontic treatment and restoration.

Of the children who had clinical signs of dental trauma and remember the event (109), 107 provided

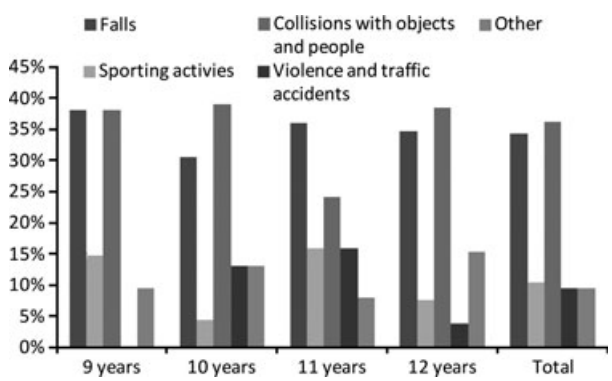

Fig. 1. Causes of dental trauma according to age groups. Pelotas/2010.

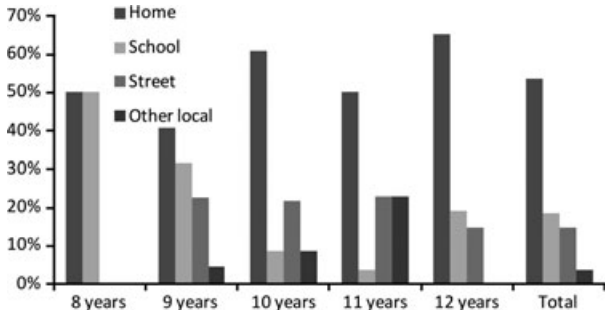

Fig. 2. Trauma place of occurrence according to age groups. Pelotas/2010.

information on search for treatment after a TDI. Among these, 39 (36.5%) visited a dentist after the injury. Table 3 shows the association between the search for dental treatment and the independent variables tested in this study. Children whose mothers had more than 8 years of education had a significantly higher probability of visiting a dentist (OR, 2.75; 95% CI 1.18–6.41) than children whose mothers had eight or less years of education. The search for treatment was also associated with the severity of the injury as most children (80.6%) with severe trauma, at least involving dentine, visited a dentist (OR, 7.71; 95% CI 3.17–18.75) (Table 3).

Discussion

Signs of dental trauma were present in 12.6% of the children included in this study. In addition to the prevalence of the injury, the need for treatment and the type of treatment conducted were also assessed. Our results indicate that most of the injuries were of low severity and therefore did not require treatment. However, among the cases in which treatment was required, treatment negligence was common. The results of this study highlight the importance of epidemiological studies including normative assessment of dental trauma that prevents overestimation of the need for treatment and provides information that can help in the planning and implementation of health services. One of the major strengths of the present study is the external validity of the sample analyzed, which is supported both by information from the local authorities, indicating that nearly all children in this age range in Pelotas are enrolled in schools, and by methodological procedures, which ensured a representative sample of the population. Other aspects of the study, such as the high response rate and the high interexaminer reliability reinforce the internal validity of the research. In addition to careful sample selection, socioeconomic information was collected using questionnaires for parents. A limitation of the study is the possibility of recall bias, as information about the injury was collected retrospectively from children. Perhaps, if recollection of the events was recorded from the parents, more reliable data could be obtained.

The criteria used in this study, which were developed in the United Kingdom for the Children's Dental

© 2012 John Wiley & Sons A/S

Table 2. Distribution of the teeth affected by trauma, according to the type of injury and treatment performed or required. Pelotas/2010. (N = 175)

Type of injury	Total number	Needs treatment (n)	Treated (n)	No treatment required (N)
Enamel fracture	129	20	2	107
Enamel and dentin fracture	39	22	17	0
Fracture with pulp involvement	3	1	2	0
Avulsion	1	0	1	0
Others	3	1	2	0
Total	175	44	24	107

Health Survey in 1993, comprise one of the most widely utilized diagnostic indexes, which allows for comparison with other studies published worldwide. The prevalence identified in this study is within the range of prevalence observed in other studies that investigated similar age groups (13, 16, 17); however, the prevalence is slightly lower than that observed in a study in the same geographical region (14). The most prevalent injury—enamel fracture—which is considered a mild injury (15), has been noted to be the most common injury in previous studies (13, 18). In addition, our finding that most TDIs occur inside homes and involve collisions corroborates previous reports (19, 20).

Of the 175 teeth that sustained TDI, 107 did not require treatment as they were minor injuries only involving the enamel. In a study conducted by Traebert et al. (13), few (5.7%) of the traumatized teeth that suffered small enamel fractures required restorative treatment. On the other hand, of 68 injuries that should have received treatment, only 24 received proper care. Previous studies revealed similar findings. Marcenes and Murray (3) performed a study to accurately estimate the need for treatment and confirmed that treatment tends to be neglected: 56% of the incisors that suffered damage in their study would require treatment. Even when the normative treatment need was considered in their study, the rate of treatment provision was low. In a study conducted in Nigeria, involving 1532 secondary school students aged 12–19 years, 93.1% of the traumatized teeth were never presented for dental assessment after the injury (21), a finding supported by multiple studies (8, 13).

Studies of dental trauma generally consider treated injuries while estimating the prevalence of dental injuries. Even though treated dental trauma is not considered pathological, it is a marker of the past injuries, and exclusion of this category would underestimate the prevalence of trauma. In the present study, most of the treatments performed were composite restorations. Regarding the type of treatment required, it was also observed that of the 44 children, a vast majority (42 children) needed composite restoration. Adhesive composite restorations restore the tooth function and may partially recover the resistance to fracture of the restored tooth (22). Most of the injuries in our study did not require treatment, and most of the treatments required could be performed by dentists in a primary-care setting in the Public Health System and would not require specialized professional expertise or very complex equipment.

Of the 153 children in whom TDI was detected, only 109 (71.24%) recalled the inciting event, which we expected in this age range. In the study conducted by Hargreaves, an attempt was made to gain a detailed story of the injuries, but this was abandoned as few

Table 3. Factors associated with the search for treatment after traumatic dental injury occurrence. Pelotas/2010 (N = 107)

	Visited dentist						
	No		Yes				
Variable	n	%	n	%	OR	95% CI	P
Sex							
Male	31	55.4	25	44.6	1	0.21–1.05	0.067
Female	37	72.6	14	27.4	0.47		
Type of trauma							
Mild	54	80.6	13	19.4	1	3.17–18.75	<0.001
Severe	14	35.0	26	65.0	7.71		
Family monthly income (R$)*							
First (0–770)	31	64.6	17	35.4	1	0.46–2.43	0.893
Second (771–12 000)	31	63.3	18	36.7	1.06		
Type of school							
Private	18	78.3	5	21.7	1	0.83–7.23	0.105
Public	50	59.5	34	40.5	2.45		
Maternal schooling*							
≤ 8 years	37	75.5	12	24.5	1	1.18–6.41	0.019
>8 years	28	52.8	25	47.2	2.75		
Total	68	63.5	39	36.5			

1 R$ = 0.54 USS at the time of data collection.
*The values do not total up to 107 because of missing responses.

© 2012 John Wiley & Sons A/S

children could provide this information. Such responses may be provided as a result of negative past experiences in conveying such events or merely due to recall bias (23). It is also possible that some children were not aware of the enamel fractures.

In comparison, 348 children stated that they had sustained a dental injury; however, no sign of dental trauma was detected upon clinical examination. Wendt et al. (24) observed that dental trauma history was also reported in children who did not show any clinical signs of trauma. Spontaneous healing of support tissue trauma, which may not be detected on examination, may contribute to this phenomenon. Other injuries could also be missed if signs and symptoms do not exist at the time of the examination (25). Concussions and subluxations, for example, are injuries that are also often overlooked in epidemiological studies.

Children were also asked if they had visited a dentist after the injury, and we assessed factors associated with the search for treatment. Only 39 (36.5%) of the children who perceived the injury visited the dentist. Similar figures were observed in another study (8). The low rate of seeking evaluation or treatment of damage may be related to low socioeconomic status associated with an inability of parents to take time off from work to visit the dentist (21).

Higher maternal education was associated with a higher probability of children visiting a dentist after a TDI. The mother's education is a socioeconomic indicator often used as a predictor of the health of children (26). In this case, it can be concluded that mothers with higher levels of education are more concerned about the consequences of dental injuries for their child's oral health. Family income or the type of school, on the other hand, was not associated with the probability of visiting a dentist. This is in disagreement with a study on preschool children in Pelotas, which revealed a higher rate of dental care visits after dental trauma in private schools (76.3%) as compared with county schools (44.4%) (24).

When the influence of the type of trauma on the search for care was assessed, it was discovered that the group of children who had severe trauma had a higher probability of visiting a dentist. Garcia-Godoy et al. (27) reported that the post-trauma search for dental care varies according to the type of injury, in which, in the case of crown fractures, is due to esthetics. It is recognized that children with fractured teeth are more likely to report its impact on oral health-related quality of life as compared with children without any traumatic injury (6). The majority of injuries in this study may have a low perceived negative impact on oral health because the majority of TDIs in this study affected only the enamel.

The low demand for treatment detected is troubling, as any dental trauma should receive clinical and radiographic examination by a dentist, which includes regular monitoring as there may be asymptomatic sequelae or long-term complications (28). Also, it is possible that most of the enamel fracture detected that did not require restorative treatment, should receive grinding. Thus, it should be emphasized that the prognosis of some injuries depends on timely administration of the correct treatment. Thus, it is important that lay people (e.g., parents, teachers, school nurses, health-care professional, and physical trainers) who are more likely to provide first aid be aware of the importance of children visiting a dentist after an injury to permanent teeth. Although TDIs occur accidentally in most of cases, and because it is difficult to prevent an accident, it is essential to raise awareness and increase education about dental trauma. This can be accomplished by creating and using tools to disseminate information to the public about the proper management of TDI. For example, it has been demonstrated that sports practice is often associated with a higher prevalence of dental trauma (29, 30), but most coaches and physical education teachers do not recommend or require the use of mouthguards (31). In another study conducted in Brazil, children from health-promoting schools had a lower frequency of dental injuries than those from other schools, highlighting the importance of a commitment to health and safety at school to prevent injuries (32). It is important to note that public health policies should be developed with the goal of establishing prevention strategies, in an effort to reduce the prevalence of trauma and damage caused by traumatic events.

The prevalence of traumatic injuries was relatively high in this population. Although most of the traumatized teeth did not require treatment, dental care was neglected, as most of the children were not taken to a dentist for evaluation. Also, there was a considerable demand for treatment, most of them of low complexity. Special attention should be given to children whose mothers have completed fewer years of education, as the mother's level of education was an important predictor of evaluation by a dentist after injury.

Acknowledgements

The authors acknowledge the Brazilian Government Agency for Science Developing (CPNq) for the research funding grant no. 402350 to the PI (FFD) and the PhD scholarship (MLG). Moreover, the authors would like to thank the State Research Funding Agency (FAPERGS) and the Brazilian Agency for the Improvement of Higher Education Professionals (Capes) for the undergraduate scholarship (HS) and for the PhD scholarship (MBC), respectively.

References

1. Grimm S, Frazao P, Antunes JL, Castellanos RA, Narvai PC. Dental injury among Brazilian schoolchildren in the state of Sao Paulo. Dent Traumatol 2004;20:134–8.
2. Alonge OK, Narendran S, Williamson DD. Prevalence of fractured incisal teeth among children in Harris county, Texas. Dent Traumatol 2001;17:218–21.
3. Marcenes W, Murray S. Social deprivation and traumatic dental injuries among 14-year-old schoolchildren in Newham, London. Dent Traumatol 2001;17:17–21.
4. Borum MK, Andreasen JO. Therapeutic and economic implications of traumatic dental injuries in Denmark: an estimate based on 7549 patients treated at a major trauma centre. Int J Paediatr Dent 2001;11:249–58.

© 2012 John Wiley & Sons A/S

5. Glendor U, Halling A, Andersson L, Andreasen JO, Klitz I. Type of treatment and estimation of time spent on dental trauma–a longitudinal and retrospective study. Swed Dent J 1998;22:47–60.
6. Cortes MI, Marcenes W, Sheiham A. Impact of traumatic injuries to the permanent teeth on the oral health-related quality of life in 12–14-year-old children. Community Dent Oral Epidemiol 2002;30:193–8.
7. Celenk S, Sezgin B, Ayna B, Atakul F. Causes of dental fractures in the early permanent dentition: a retrospective study. J Endod 2002;28:208–10.
8. Marcenes W, al Beiruti N, Tayfour D, Issa S. Epidemiology of traumatic injuries to the permanent incisors of 9–12-year-old schoolchildren in Damascus, Syria. Endod Dent Traumatol 1999;15:117–23.
9. Tapias MA, Jimenez-Garcia R, Lamas F, Gil AA. Prevalence of traumatic crown fractures to permanent incisors in a childhood population: Mostoles, Spain. Dent Traumatol 2003;19:119–22.
10. Shulman JD, Peterson J. The association between incisor trauma and occlusal characteristics in individuals 8–50 years of age. Dent Traumatol 2004;20:67–74.
11. Bendo CB, Paiva SM, Oliveira AC, Goursand D, Torres CS, Pordeus IA et al. Prevalence and associated factors of traumatic dental injuries in Brazilian schoolchildren. J Public Health Dent 2010;70:313–8.
12. Artun J, Behbehani F, Al-Jame B, Kerosuo H. Incisor trauma in an adolescent arab population: prevalence, severity, and occlusal risk factors. Am J Orthod Dentofacial Orthop 2005;128:347–52.
13. Traebert J, Bittencourt DD, Peres KG, Peres MA, de Lacerda JT, Marcenes W. Aetiology and rates of treatment of traumatic dental injuries among 12-year-old school children in a town in Southern Brazil. Dent Traumatol 2006;22:173–8.
14. Hunter ML, Hunter B, Kingdon A, Addy M, Dummer PM, Shaw WC. Traumatic injury to maxillary incisor teeth in a group of South Wales school children. Endod Dent Traumatol 1990;6:260–4.
15. Sgan-Cohen HD, Megnagi G, Jacobi Y. Dental trauma and its association with anatomic, behavioral, and social variables among fifth and sixth grade schoolchildren in Jerusalem. Community Dent Oral Epidemiol 2005;33:174–80.
16. Cortes MI, Marcenes W, Sheiham A. Prevalence and correlates of traumatic injuries to the permanent teeth of schoolchildren aged 9–14 years in Belo Horizonte, Brazil. Dent Traumatol 2001;17:22–6.
17. Levin L, Samorodnitzky GR, Schwartz-Arad D, Geiger SB. Dental and oral trauma during childhood and adolescence in israel: occurrence, causes, and outcomes. Dent Traumatol 2007;23:356–9.
18. Tovo MF, dos Santos PR, Kramer PF, Feldens CA, Sari GT. Prevalence of crown fractures in 8–10 years old schoolchildren in Canoas, Brazil. Dent Traumatol 2004;20:251–4.
19. Garcia-Godoy F, Sanchez R, Sanchez JR. Traumatic dental injuries in a sample of dominican schoolchildren. Community Dent Oral Epidemiol 1981;9:193–7.
20. Cetinbas T, Yildirim G, Sonmez H. The relationship between sports activities and permanent incisor crown fractures in a group of school children aged 7–9 and 11–13 in Ankara, Turkey. Dent Traumatol 2008;24:532–6.
21. Ajayi MD, Denloye O, Abiodun Solanke FI. The unmet treatment need of traumatized anterior teeth in selected secondary school children in Ibadan, Nigeria. Dent Traumatol 2010;26:60–3.
22. Demarco FF, Fay RM, Pinzon LM, Powers JM. Fracture resistance of re-attached coronal fragments–influence of different adhesive materials and bevel preparation. Dent Traumatol 2004;20:157–63.
23. David J, Astrom AN, Wang NJ. Factors associated with traumatic dental injuries among 12-year-old schoolchildren in South India. Dent Traumatol 2009;25:500–5.
24. Wendt FP, Torriani DD, Assuncao MC, Romano AR, Bonow ML, da Costa CT et al. Traumatic dental injuries in primary dentition: epidemiological study among preschool children in South Brazil. Dent Traumatol 2010;26:168–73.
25. Bastone EB, Freer TJ, McNamara JR. Epidemiology of dental trauma: a review of the literature. Aust Dent J 2000;45:2–9.
26. Victora CG, Facchini LA, Barros FC, Lombardi C. Pobreza e saúde: Como medir nível sócio-econômico em estudos epidemiológicos de saúde infantil. Campinas: Anais do I Congresso Brasileiro de Epidemiologia; 1990. p. 303–15.
27. Garcia-Godoy F, Garcia-Godoy FM. Reasons for seeking treatment after traumatic dental injuries. Endod Dent Traumatol 1989;5:180–1.
28. Flores MT, Andersson L, Andreasen JO, Bakland LK, Malmgren B, Barnett F et al. Guidelines for the management of traumatic dental injuries. I. Fractures and luxations of permanent teeth. Dent Traumatol 2007;23:66–71.
29. Perunski S, Lang B, Pohl Y, Filippi A. Level of information concerning dental injuries and their prevention in swiss basketball–a survey among players and coaches. Dent Traumatol 2005;21:195–200.
30. Yamada T, Sawaki Y, Tomida S, Tohnai I, Ueda M. Oral injury and mouthguard usage by athletes in Japan. Endod Dent Traumatol 1998;14:84–7.
31. Correa MB, Schuch HS, Collares K, Torriani DD, Hallal PC, Demarco FF. Survey on the occurrence of dental trauma and preventive strategies among Brazilian professional soccer players. J Appl Oral Sci 2010;18:572–6.
32. Moyses ST, Moyses SJ, Watt RG, Sheiham A. Associations between health promoting schools' policies and indicators of oral health in Brazil. Health Promot Int 2003;18:209–18.

© 2012 John Wiley & Sons A/S

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.