The Prevalence of Traumatic Dental Injuries: A 24-month Survey

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ABSTRACT

The aim of the present investigation was to assess the prevalence of dental traumatic injuries in children referred to Queen Fabiola Children's Hospital, Free University of Brussels, Belgium. This study was based on the clinical data of 457 traumatized teeth in 214 children. Most injuries involved 2 teeth (51%). Of these, maxillary central incisors were the most affected teeth (89%). The highest frequency of trauma occurred between 2 and 4 years of age. Falls were the most common cause of injury in both girls and boys. The most common type of injury in the primary and permanent teeth was subluxation. Gingival and mucosal laceration was the most common type of soft tissue lesion (61%). Only 42% of children came for dental treatment on the same day that they were injured. (J Dent Child 2007;74:194-9)

KEYWORDS: TRAUMA, DENTAL INJURY, TEETH, PRIMARY, TEETH, PERMANENT

Some have hypothesized that, in the future, dental injuries will be more prevalent among children and adolescents than dental caries and periodontal disease.[1] The resulting pain and/or permanent aesthetic and functional impact of such injuries can have a serious psychological effect on both children and parents. Various studies from different parts of the world have reported the prevalence of such traumatic dental injuries, indicating that such injuries represent a serious public health risk.[2-7]

For these reasons, evaluating the frequency of orofacial injuries in the target population would seem to make sense to identify the, places where the risk of injury is highest, groups that are most at risk, and cost of treating the injuries. This information could then be used by researchers to formulate preventive programs designed to reduce the personal and financial impact of the trauma. In response to this need for information, the purpose of this study was to assess the prevalence of traumatic dental injuries in children treated by the maxillofacial surgery and pediatric dentistry service of the Queen Fabiola Children's Hospital in Brussels, Belgium.

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METHODS

Between September 1, 2003 and August 31, 2005, 214 children (90 girls and 124 boys) with orofacial trauma were treated in the service of pediatric dentistry at the Queen Fabiola Children's Hospital in Brussels. Pediatric dentists performed clinical and radiographical examinations to evaluate each patient's trauma. In addition to information about the patient demographics (name, age, gender), the following information about the traumatic injuries was also collected, time, place, cause of injury, injury circumstances, absence or presence of soft tissue lesions, previous dental injuries, elapsed time between injury and dental treatment, and type and number of affected teeth.

The dental trauma was classified, according to a modified World Health Organization[8] classification system proposed by Andreasen and Andreasen,[9] as:

1. enamel fracture;
2. enamel-dentin fracture;
3. complicated crown fracture;
4. uncomplicated crown-root fracture;
5. complicated crown-root fracture;
6. root fracture;
7. concussion;
8. subluxation;
9. lateral luxation;
10. intrusive luxation;
11. extrusive luxation; and
12. avulsion.

The statistical tests used for dealing with the discrete variables were the Pearson chi-square test or the exact chi-square test with the Monte Carlo procedure. The statistical tests used for dealing with the continuous variables were the Student t test and the 1-way analysis of variance.

The level of significance for all tests was set at $P<.05$. Statistical analyses were performed using SPSS v. 13.0 (SPSS Inc., Chicago, Ill) and StatXact v. 5.0 (CYTEL software corporation, Cambridge, Mass).

RESULTS

PREVALENCE

The 214 patients presented 457 traumatized teeth: 285 (62%) in primary dentition and 172 (38%) in permanent dentition. Of the total number of patients:

a. 43 (20%) children had 1 traumatized tooth;
b. 108 (51%) had 2 traumatized teeth;
c. 28 (13%) children had 3 traumatized tooth;
d. 22 (10%) had 4 or more traumatized teeth; and
e. 13 (6%) children (8 girls and 5 boys) had no dental injuries at all (Table 1).

In addition to these injuries, 4 children presented mandibular and maxillary fractures. There is no significant difference between boys and girls in terms of the injury distribution.

Table 1. The Distribution of Injuries According to Affected Tooth Number *

1 affected tooth		2 affected tooth		3 affected tooth		4 affected tooth		Total
Girls (N, %)	Boys (N, %)	Girls (N, %)	Boys (N, %)	Girls (N, %)	Boys (N, %)	Girls (N, %)	Boys (N, %)	
19 (9)	24 (11)	44 (21)	64 (30)	13 (6)	15 (7)	6 (3)	16 (7)	201

** Chi-square=4.37; P=.368.*

AGE

The patients' ages ranged between 10 months and 16 years, with a mean age of 5.32 years. The distribution of injuries in terms of age is shown in Figure 1. For both girls (N=30; 3%) and boys (N=35; 28%), most of the traumas occurred between 2 and 4 years of age. There was no significant difference between boys and girls for the different ages.

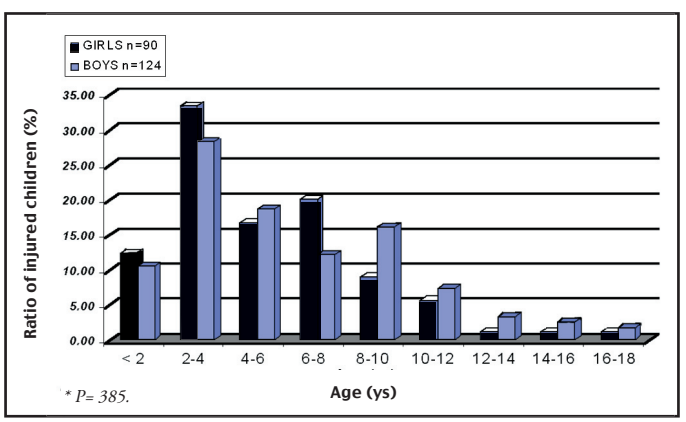

*Figure 1. Distribution of patients according to age and sex.**

TOOTH TYPE

All the traumatized teeth were anterior. Of the total number, 410 (90%) teeth were maxillary and 47 (10%) were mandibular. The maxillary central incisors were the most affected (89%). In both primary and permanent dentition, the left central upper incisor appeared to be the most affected tooth (Figures 2 and 3).

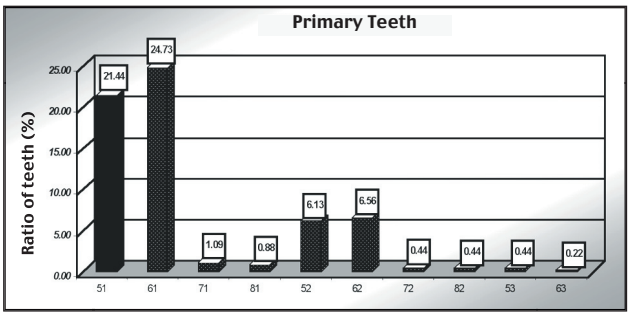

Figure 2. Distribution of injuries according to tooth type.

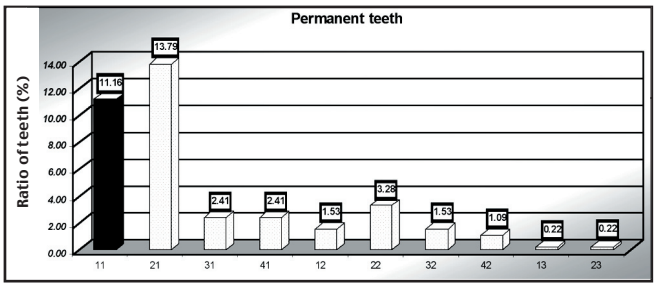

Figure 3. Distribution of injuries according to tooth type.

ETIOLOGY

Falls were the most common cause of injury in both girls (N=64; 71%) and boys (N=83; 67%). Falls were followed by collisions (8%) and traffic accidents (8%) in girls and by collisions (14%) and sports (8%) in boys. The distribution of injuries in terms of the etiology is shown in Figure 4, which demonstrates that no significant difference exists between girls and boys.

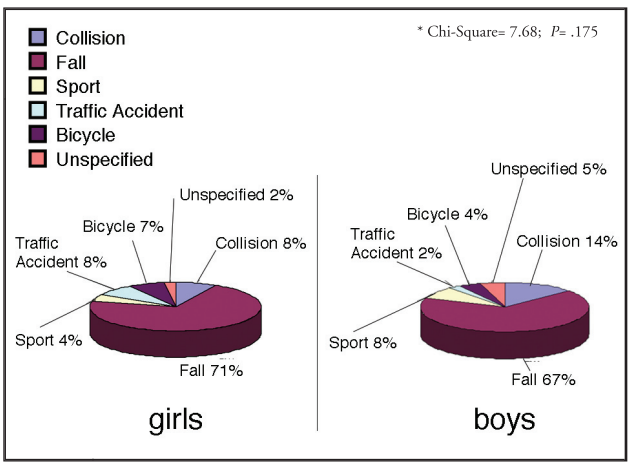

*Figure 4. Distribution of injuries regarding the etiology.**

ANDREASEN'S CLASSIFICATION

The distribution of traumatized teeth according the Andreasen classification system is presented in Table 2. The

Table 2. Distribution of Injured Teeth According to Andreasen's classification*

Classification	GIRLS Primary (N)	GIRLS Permanent (N)	BOYS Primary (N)	BOYS Permanent (N)	TOTAL Primary (N, %)	TOTAL Permanent (N, %)	Total (N, %)
1	3	1	8	6	11 (3)	7 (3)	**18 (3)**
2	9	24	12	43	21 (6)	67 (25)	**88 (14)**
3	4	10	5	6	9 (3)	16 (6)	**25 (4)**
4	0	0	0	0	0	0	**0**
5	1	0	0	0	1 (<1)	0	**1 (<1)**
6	2	2	9	6	11 (3)	8 (3)	**19 (3)**
7	15	15	20	23	35 (10)	38 (14)	**73 (12)**
8	50	29	75	68	125 (36)	97 (36)	**222 (36)**
9	27	8	29	9	56 (16)	17 (6)	**73 (12)**
10	15	0	17	2	32 (9)	2 (1)	**34 (6)**
11	5	2	14	5	19 (6)	7 (3)	**26 (4)**
12	9	2	14	7	23 (7)	9 (3)	**32 (5)**
Totals	**140**	**93**	**203**	**175**	**343**	**268**	**611**

** P<.001*

number of traumatized primary teeth was more significant than the number of permanent teeth (*P*<.001). In primary dentition, subluxation was the most common injury, followed by intrusive luxation. In permanent dentition, subluxation was also most common, followed by enamel-dentin fracture. Table 3 shows that gingival and mucosal laceration (N=80; 61%) was the most common type of soft tissue lesion, followed by contusion (N=49; 37%).

Table 3. Soft Tissue Injuries

Laceration	Contusion	Abrasion
80 (61%)	49 (37%)	3 (2%)

ELAPSED TIME

Out of 214 patients, 174 (79%) arrived in the dentistry service within a period ranging from 30 minutes to 2 days. Figures 5 and 6, respectively, show the distribution of the elapsed time and the number of patients treated in the dentistry service each month. The highest numbers are for the month of May (13%). There was no difference between the number of girls and boys treated each month.

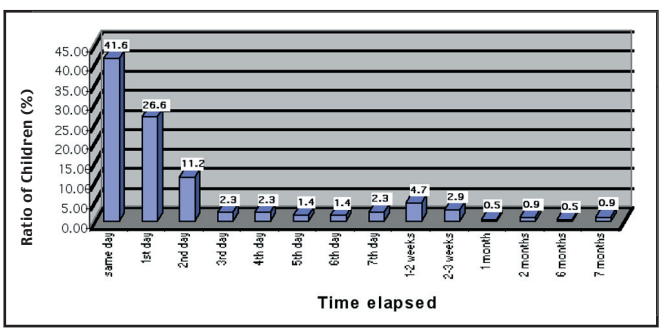

Figure 5. Distribution of children according to time elapsed.

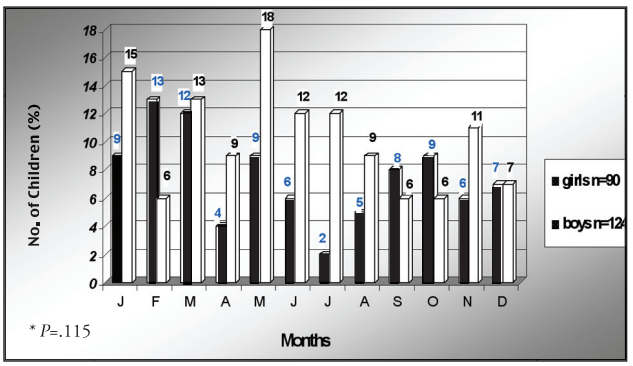

Figure 6. Distribution of children according to monthly attendance.*

PLACE OF INJURY

For both girls and boys, the most common places where traumatic orofacial injuries occurred were the school and the home (Table 4). There is no significant difference between girls and boys in terms of place of injury and time elapsed (Figure 7).

Table 4. Distribution of Patients by Sex and Place of Injury

	Girls N (%)	Boys N (%)	Total N (%)
School	41 (46)	45 (36)	86 (40)
Home	29 (32)	48 (22)	77 (36)
Traffic Accident	7 (8)	3 (2)	10 (5)
Street	10 (11)	24 (19)	34 (16)
Unspecified	0	1 (1)	1 (<1)
Nursery	3 (3)	3 (2)	6 (3)
Total	90	124	214

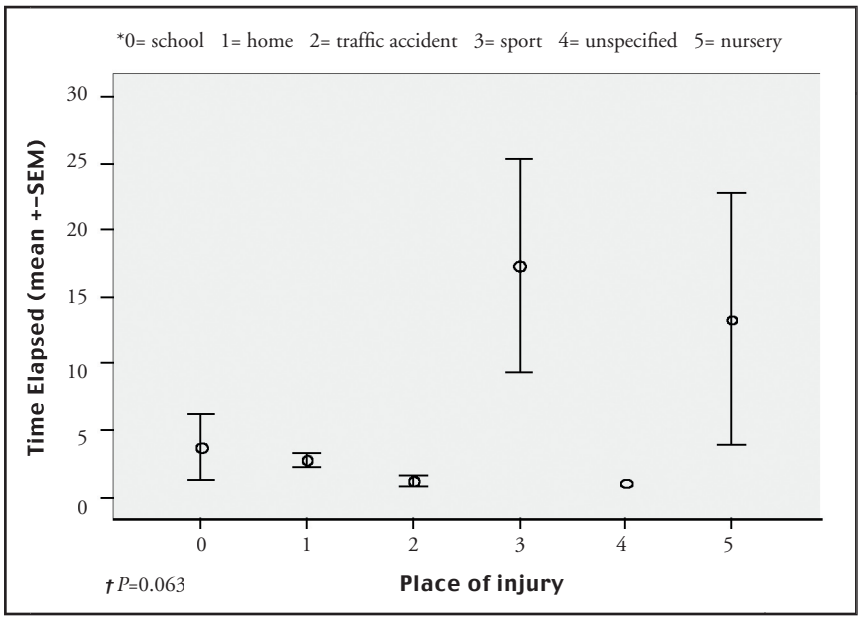

*Figure 7. Distribution of time elapsed according to place of injury *†*

TREATMENT PROVIDED

Table 5 presents a list of the treatments provided. The most common treatment for primary teeth was the dental exam alone. Restoration and extraction were the next most frequent. For permanent teeth, however, restoration was the most frequent treatment.

Table 5. Treatment Provided

Treatment	Primary (N)	Permanent (N)	Soft Tissue
Restoration	27	79	0
Exam only	226	50	98
Cvek pulpotomy	0	4	0
Pulpectomy	5	3	0
Direct pulp capping	0	3	0
Apexification	0	6	0
Reposition	2	18	0
Reimplantation	0	8	0
Splint	2	22	0
Debride/clean	0	0	23
Extraction	25	1	0
Sutures	0	0	11

DISCUSSION

The data obtained in this study showed that boys suffered more traumatic injuries than girls, at a 1.38:1.0 ratio, though there was no significant difference between boys and girls, as noted on the "prevalence" section of results. That boys tended to suffer more injuries might be related to the fact that, in general, boys tend to participate more actively and aggressively in games. This study's results fall in the range of those reported by others studies, in which the number of traumas in boys ranged from 0.9 to 2.3:1.[7,10-13]

The incidence of dental trauma found in this study increased considerably with age, peaking between 2 and 4 years of age, the period when children learn to walk, run, and explore their environments confirming of other studies.[13-15] The most frequent cause of injury in both sexes appeared to be simple falls, which backs up results from several previous studies.[16-19] Falls were followed by collisions in boys and collisions and traffic accidents in girls. Though age appears to affect the incidence of trauma, there was no significant seasonal variation in the trauma rate, which could be related to the cloudy and rainy climate.

School playgrounds (40%) and home environments (36%) represented the primary places of injury. Falls occurred in both places while the children were playing or running, both with or without supervision. Given that early, optimal management of orofacial injuries is critical to the treatment success, it is crucial to inform parents and school personnel—who are both in direct contact with children—about the importance of early intervention. In addition, both parties must be made aware of practices that promote dental trauma and the methods for decreasing such trauma. Encouraging the use of mouthguards during sports and bicycle riding.

Subluxation and luxation with displacement were the most common type of injury to primary teeth, and subluxation and enamel-dentin fracture were the major injuries to permanent teeth. Many authors[20,21] have reported that primary teeth are more often displaced than permanent teeth because of the flexibility of young bones and periodontal ligaments. This study's results confirm other studies.

The results concerning the number of teeth affected per patient varied from study to study. Most trauma studies reported only 1 affected tooth.[11,19,22] In this study, however, 2 teeth were frequently injured rather than either 1 tooth or more than 2 teeth. The most affected teeth in this study for both primary and permanent dentition was the upper central incisors, which replicates the data of several other authors.[2,16,19,23,24] The next most affected tooth was the upper lateral incisor; no molars were affected. Several authors[25,26] have reported a significant frequency of injured maxillary incisors in patients with an increased overjet and/or incomplete lip closure.

A total of 89 (42%) children came for dental treatment on the same day they were injured. Eighty-one children (38%) came only 2 days after the injury, often because their parents did not take the injuries seriously enough. The few studies that have analyzed the relationship between dental

injuries and socioeconomic status have produced conflicting results.[27-29] Further research needs to be done to clarify the role of socioeconomic status and family structure in dental injuries and in the treatment of dental injuries. In any case, given that health insurance, including dental coverage, is obligatory in Belgium for all citizens and part of the mandatory Social Security coverage, and that the third-party payment scheme is applied by the authors' hospital, as well as the majority of dental offices in Brussels, cost should not be a factor. In fact, the authors believe that this study's results underline the fact that parents are not always aware of the importance of emergency dental treatment, nor do they realize that an injury could lead to complications. This points to the real need for educational campaigns aimed at parents and care givers to increase their knowledge of the emergency procedures required when dental injuries occur.

Early dental visits could provide an opportunity for parents and care givers to receive preventive instructions, counselling, and anticipatory guidance their children's oral health.

CONCLUSION

According to several studies, traumatic orofacial injuries in children and adolescents are a common problem around the world. To facilitate effective data collection and avoid interpretation errors, it would also be useful to standardize, trauma classifications, terminology, and definitions.

REFERENCES

1. Andreasen JO, Andreasen FM. Dental traumatology: quo vadis. Endodo Dent Traumatol 1990;6:78-80.
2. Onetto JE, Flores MT, Garbarino ML. Dental trauma in children and adolescent in Valparaiso, Chile. Endod Dent Traumatol 1994 ;10 :223-7.
3. Kaste LM, Gift HC, Bhat M, Swango PA. Prevalence of incisor trauma in persons 6 to 50 years of age : United States, 1988-1991 . J Dent Res 1996;75(Spec Issue):696-705.
4. Marcenes W, Al Beiruti N, Tayfour D, Issa S. Epidemiology of traumatic injuries to the permanent incisors of 9-12-year-old school children in Damascus, Syria. Endod Dent Traumatol 1999;15:117-23.
5. Nicolau B, Marcenens W, Sheiham A. Prevalence causes and correlates of traumatic dental injuries among 13-year-olds in Brazil. Dent Traumatol 2001;17:213-7.
6. Skaare AB, Jacobsen I. Dtal injuries in Norwegians aged 7-18 years. Dent Traumatol 2003;19:67-71.
7. Sandalli N, Cildir S, Guler N. Clinical investigation of traumatic injuries in Yeditepe University, Turkey during the last 3 years. Dent Traumatol 2005;21:188-94.
8. Application of International Classification of Diseases and Stomatology, IDC-DA, 3rd edn. Geneva: World Health Organization, 1992.
9. Andreasen JO, Andreasen FM. Textbook and atlas of traumatic injuries to the teeth. 3rd edn. Copenhagen: Munksgaard;1994. p.151-5.
10. Perez R, Berkowitz R, McIlveen L, Forrester D. Dental trauma in children: a survey. Endod Dent Traumatol 1991,7:212-3.
11. Oulis CJ, Berdouses ED. Dental injuries of permanent teeth treated in privet practice Athens. Endod Dent Traumatol 1996;12:60-6.
12. Alonge OK, Narendran S, Williamson DD. Prevalence of fractured incisal teeth among children in Harris County, Texas. Dent Traumatol 2001:17:218-21.
13. Soporowski NJ, Allred EN, Needleman HL. Luxation injuries of primary anterior teeth: Prognosis and related correlates. Pediatr Dent 1994;16:96-101
14. Bijella MF, Yared FN, Bijella VT, Lopes ES. Occurrence of primary incisor traumatism in Brazilian children: a house-by-house survey. J Dent Child 1990;57:424-7.
15. Cardoso M, de Carvalho Rocha MJ. Traumatized primary teeth in children assisted at the federal university of Santana Catarina, Brazil. Dent Traumatol 2002;18:129-33.
16. Cunha RF, Pugliesi DM, Mello Vieira AE. Oral trauma in Brazilian patients aged 0-3 years. Dent Traumatol 2001;17:210-2.
17. Canakci V, Akgul HM, Akgul N, Canakci CF. Prevalence and handedness correlates of traumatic injuries to the permanent incisors in 13-17 year-old adolescents in Erzurum, Turkey. Dent Traumatol 2003;19:248-54.
18. Llarena del Rosario ME, Acosta AV, Garcia-Godoy F. Traumatic injuries to primary teeth in Mexico City children. Endod Dent Trauamtol 1992;8:213-4.
19. Caliskan MK, Turkun M. Clinical investigation of traumatic injuries of permanent incisors in Izmir, Turkey. Endod Dent Traumatol 1995;11:210-3.
20. Wilson CF. Management of trauma to primary and developing teeth. Den Clin North Am 1995;39:133-67.
21. Meadow D, Needleman HL, Lindner G. Oral trauma in children. Pediatr Dent 1984;6:248-51.
22. Stockwell AJ. Incidence of dental trauma in the western Australian school dental service. Community Dent Oral Epidemiol 1988;16:294-8.
23. Zaragoza AA, Catalá M, Colmena ML, Valdemoro C. Dental trauma in schoolchildren six to twelve years of age. J Dent Child 1998;65:492-4, 439.
24. Hargreaves JA, Cleaton-Jones PE, Roberts GJ, Williams S, Matejka JM. Trauma to primary teeth of south African preschool children. Endod Dent Traumatol 1999;15:73-6.
25. Kania MJ, Keeling SD, McGorray SP, Wheeler TT, King GJK. Risk factors associated with incisors injury in elementary school children. Angle Orthod 1996;66:423-32.
26. Burden DJ. An investigation of the association between overjet size, lip coverage, and traumatic injury to maxillary incisors. Eur J Orthod 1995;17:513-7.
27. Cortes MIS, Marcenes W, Sheiham A. Prevalence and correlates of traumatic injuries to the permanent teeth of schoolchildren aged 9 to 14 years in Belo Horizonte, Brazil. Endod Dent Traumatol 2001;17:22-6.

28. Marcenes W, Murray S. Social deprivation and traumatic dental injuries among 14-year-old school children in Newham, London. Dent Traumatol 2001;17:17-21.
29. Marcenes W, Alessi ON, Trabert J. Causes and prevalence of traumatic injuries to the permanent incisors of schoolchildren aged 12 years in Jaragua do Sul, Brazil. Int Dent J 2000;50:87-92.
30. American Academy of Pediatric Dentistry. Policy on the dental home. Pediatr Dent 2005; 27 (reference manual):18-9.
31. American Dental Association. ADA positions and statements. ADA statement on early childhood caries. Trans 2000:454.