

Prevalence of traumatic injuries to maxillary permanent teeth in 9- to 14-year-old school children in Yazd, Iran

Alireza Navabazam¹, Shokoufeh Shahrabi Farahani^{2,3}

¹Faculty of Oral and Maxillofacial Surgery, Dental School, Shahid Sadoughi University of Medical Sciences, Yazd, Iran; ²Harvard School of Dental Medicine, Boston, MA, USA; ³Oral and Maxillofacial Pathology, Dental School, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Correspondence to: Shokoufeh Shahrabi Farahani, 49 Worthington Street, Unit # 7, Boston, MA 02120, USA
Tel.: +818 914 9292
Fax: +818 757 1685
e-mail: shokoufeh_shahrabifarahani@hsdm.harvard.edu

Accepted 31 October, 2009

Abstract – Aim: Trauma to maxillary anterior teeth is a common reason for emergency room visits among children; therefore, the goal of this study was to evaluate the prevalence and related factors of such trauma among 9- to 14-year-old children in Yazd. **Materials and methods:** A sample of 1440 schoolchildren aged 9–14 years old, consisting of 720 boys and 720 girls, were randomly selected from 24 schools in Yazd. Ellis classification was used to record the dental injuries. **Results:** The prevalence found was 27.56%. The occurrence of trauma was significantly higher in male patients; furthermore, most of the dental trauma occurred in children between 9 and 10 years of age (47.38%). The most common type of injury was the ‘enamel only’ fracture; falls being the main cause of trauma. The most affected tooth was the maxillary central incisor. **Conclusions:** The prevalence and most common causal factor of traumatic injuries to the maxillary anterior teeth in schoolchildren living in Yazd was approximately the same as that found in other countries.

Epidemiological studies indicate that dental trauma is a significant problem in young people and that the incidence of trauma will exceed that of dental caries and periodontal disease in a population (1, 2).

Traumatic dental injuries can become an important public health problem (1) not only because their prevalence is relatively high (2–6) but also because they have a substantial impact on a child’s quality of life (1, 4). The majority of dental injuries involve the anterior teeth (7), which may lead to restriction in biting, difficulty speaking clearly and feeling embarrassed to show one’s teeth (7).

Few population-based studies have been carried out relating the prevalence and aetiology of dental trauma in Iran. Given that traumas involving maxillary anterior teeth are the cause of aesthetic and psychological problems for children and their parents in Iran, and given the high levels of traffic accidents in Yazd, the aim of the present study was to determine the prevalence, aetiology and type of injury to maxillary permanent teeth among 9- to 14-year-old children living in Yazd, Iran.

Materials and methods

This was a cross-sectional study, and in the first stage of sampling, 24 schools including 12 elementary schools and 12 junior high schools from two areas of Yazd education and training organizations were chosen equally according to sex and type of school (elementary

or junior high school) by random selection. Random samples were obtained using a list including all of the schools enrolled in each area. The second stage included the selection of 9- to 14-year-old children in three educational classes. Furthermore, lists of names were provided by the school administrators and a random sample consisting of 20 students was obtained from each class for a total of 1440 children aged 9–14 years old (720 boys and 720 girls) being examined.

Two dentists, who participated in a training and calibration exercise for the criteria used to identify dental injuries, carried out dental examinations. The children were examined during school hours at their respective schools. Mouth mirrors and explorers were used to examine participants under natural light using visual and digital examination. Radiographic examination was not carried out; furthermore, root fractures and class 5 injuries were not recorded.

Following Ellis classification (8) as modified by Holland et al. (9) was used:

Class 1: Fracture of enamel only

Class 2: Fracture of enamel and dentine, without pulp involvement

Class 3: Fracture of enamel and dentine with pulp involvement

Class 4: Discolouration of the tooth as a result of concussion to the tooth, with or without a sinus tract

Class 5: Displacement, extrusion, intrusion and lateral displacement

Class 6: Tooth loss as a result of trauma

Class 7: Tooth restored by composite or crown restoration following fracture

Each child was questioned regarding the cause of injury; parents were not present during the examination. In the reimplanted, post-traumatic avulsion cases, a letter was sent to parents asking permission for their child to be seen in dental school.

Prevalence of dental injuries to maxillary anterior teeth was evaluated according to sex, age, tooth, injury type and cause. The SPSS package was used to analyze the data. Data analysis involved descriptive statistics including a frequency distribution. Statistical significance for the association between the occurrence of dental trauma and gender was carried out using chi-square test. The level of significance was set at 5%.

Results

A total of 1440 children were examined and interviewed, with the equal percentage of boys and girls. The prevalence of dental injury in the study population was 27.56%. Boys (33.05%) experienced more dental injury than girls (22.08%). The overall ratio between girls and boys was approximately 1:1.5 and this difference was statistically significant ($P = 0.000002$; Table 1).

The smallest percentage of children with teeth trauma was found among the 14-year-olds, the largest among 10-year-olds. Prevalence of dental injuries according to sex and age has been shown in Table 2.

The most common type of injury in both sexes was enamel fracture only (70.45%), followed by enamel–dentine fracture without pulp involvement at 20.45%. Other types of injuries were less common (Table 3).

The prevalence of injury was highest in left central incisor (51.9%) followed by right central incisors (49.4%). The right canines were the least affected.

Table 1. Prevalence of dental injuries to maxillary permanent incisors in 9- to 14-year-old children, Yazd, Iran

Gender	Dental injury <i>n</i> (%)	No dental injury <i>n</i> (%)	P (χ^2 -test)
Boys	238 (33.05%)	482 (66.95%)	0.000002*
Girls	159 (22.08%)	561 (77.92%)	
Totals	397 (27.56%)	1043 (72.44%)	

*Significant.

Table 2. Prevalence of dental injury according to sex and ages

Age	M + F (%)	M (%)	F (%)
7	4.94	3.49	7.09
8	9.63	10.91	7.74
9	23.43	24.01	22.58
10	23.95	23.14	25.16
11	20.83	20.08	21.93
12	8.07	7.42	9.03
13	6.77	7.86	5.16
14	2.34	3.05	1.29

Table 3. Distribution of different classes of injury in children

Class of injury	M + F <i>n</i> (%)	M <i>n</i> (%)	F <i>n</i> (%)
1	279 (70.45%)	163 (68.48%)	116 (73.41%)
2	81 (20.45%)	54 (22.68%)	27 (17.08%)
3	3 (0.75%)	3 (1.26%)	0
4	3 (0.75%)	2 (0.84%)	1 (0.63%)
6	8 (2.02%)	6 (2.52%)	2 (1.26%)
7	22 (5.55%)	10 (4.20%)	12 (7.59%)

The most common cause of injury was falls; followed by collision against objects or people, sport accidents and bicycling (Table 4).

Only three children (0.75%) had a history of tooth avulsion, and in two of them, reimplantation had been carried out. In one of the cases, a radiographic lesion had developed after 14 months and was attributed to the lack of maintaining the tooth in an appropriate media following avulsion.

Discussion

This study identified a prevalence of 27.56% of dental trauma among 9- to 14-year-old schoolchildren in Yazd, Iran. We used modified Ellis classification (8, 9) for our study, although this classification is old and there are other classifications such as Andreasen's classification (7). Ellis classification is a simplified classification and has been used by various studies for recording dental trauma and as we did not evaluate injuries to the alveolar socket and fracture of the jaws or laceration of gingiva or oral mucosa, we preferred to use this simple classification rather than Andreasen's classification.

In this study, parents were not involved, but all of the children who had suffered dental injuries described their accident quickly and in detail and it was felt that their answers were reliable. Prevalence of traumatized permanent incisor teeth varied from the lowest rate at 2.6% (10) to the highest rate at 50% (11); the prevalence rate of the present study falls within this range. According to the study of Marcenes et al., a prevalence of 5.2% (at the ages of 9 years) reaching 11.7% (at the age of 12 years) among children in Damascus was obtained (2). In Iraq, it reached 19.5% and 16.1% for boys and girls (at the age of 12 years), respectively (12). Regarding to

Table 4. Frequency distribution of causes of dental injury in children

Cause	M + F <i>n</i> (%)	M <i>n</i> (%)	F <i>n</i> (%)
Fall	121 (30.47%)	69 (28.87%)	52 (32.91%)
Bicycling	23 (8.81%)	23 (9.62%)	12 (7.59%)
Sport accidents	79 (19.89%)	56 (23.43%)	23 (14.46%)
Traffic accidents	15 (3.77%)	5 (2.09%)	10 (6.32%)
Collision against objects or people	85 (21.41%)	48 (20.08%)	37 (23.41%)
Biting	22 (5.54%)	11 (4.60%)	11 (6.96%)
Violence	20 (5.03%)	15 (6.27%)	5 (3.16%)
Iatrogenic	3 (0.75%)	0	3 (1.89%)
Unknown	17 (4.28%)	12 (5.02%)	5 (3.16%)

age, our results differed from those reported above. The great variation in reported prevalence may be due to a number of different factors such as the type of study, the trauma classification, the dentition studied, difference in methodology, limited age groups and geographical and behavioural differences between study locations and countries.

The finding that boys sustained more dental injuries than girls also agrees with other studies from different parts of the world, which suggest a prevalence ratio between boys and girls of about 1.7:1 (13). The relatively low prevalence of trauma among girls can be explained by the fact that girls are generally more mature in their behaviour than boys, who tend to be more energetic and inclined towards vigorous outdoor activities.

This study identified the 9–10 age range as the period of life when most of the dental trauma occurs. These results corroborated the findings of previous studies such as Forsberg & Tedestam (14), Petti & Tarsitani (15) and Marcences (2).

Our results also confirm finds in other studies; showing that enamel fracture is the most frequent injury to the permanent dentition (10, 11, 13–17). Conversely, other studies have reported that the most common type of injury was dentin fracture (18, 19) or luxation (14, 20, 21). In line with previous studies, maxillary central incisors are the teeth most frequently traumatized (13, 17, 22).

In this study, the main types of accidents that resulted in dental injury were falls and collisions with objects and people; these findings are similar to those found in previous studies (15, 22, 23). There is some variation between studies and countries regarding the predominant causes of dental trauma. This may be attributed to differences in local customs; however, accidents because of falls appear to be the most common factor in both primary and permanent dentition (2, 7, 13, 22–24). Overall, our results are comparable to previous studies.

Because of the lack of proper facilities for children to play in the city of Yazd, and considering the strong impact of traumatic dental injury in children daily life, there is a need for specific public health policies to be set in place. For example, providing specific and appropriate public places for leisure and sports activities which contain impact-absorbing surfaces around the items from and on which children are most likely to fall. Furthermore, guidelines, legislation or both should be developed in respect to housing, furniture, playgrounds and toy design and construction. In addition, mouth protectors should be strongly recommended for children participating in contact sports because they are especially at risk during these types of activities. Finally, national and local campaigns and programmes should increase efforts social awareness towards dental injury.

The prevalence of traumatic dental injuries in Yazd is high and their expected impact on children's daily life in terms of physical and psychological discomfort may be great. It is for these reasons that we can conclude that injuries to the permanent dentition have great potential to be considered as an emerging public health concern. If fractured incisors are to remain a natural consequence of growing up, it is very vital that the dental profession

provides the highest possible standards of care for affected children.

Moreover, it is very important to highlight the need of more complete studies, including other clinical and socioeconomic aspects in order to clarify the impact of dental trauma on children's daily life.

Acknowledgements

The authors thank Dr Mehri Fallah Tafti and Dr Pejman Zohrabi for their kind contribution in examination of study participants, Dr Hossein Fallahzadeh for statistical consultation and also a special thanks to Dr Imanol Golshirazian for his contributions to edit the manuscript.

References

1. Andreasen JO, Andreasen FM. Dental traumatology: *quo vadis*. Endod Dent Traumatol 1990;6:78–80.
2. Marcences W, Beiruti N, Tayfour D, Issa S. Epidemiology of traumatic dental injuries to permanent incisors of schoolchildren aged 9–12 in Damascus, Syria. Endod Dent Traumatol 1999;15:117–23.
3. Marcences W, Murray S. Social deprivation and traumatic dental injuries among 14-year-old school children in Newham, London. Endod Dent Traumatol 2000;16:1–5.
4. Marcences W, Alessi ON, Traebert J. Causes and prevalence of traumatic injuries to the permanent incisors of schoolchildren aged 12 years in Jarague do Sul, Brazil. Int Dent J 2000;50:87–92.
5. Borssen E, Holm AK. Traumatic dental injuries in a cohort of 16-year-olds in northern Sweden. Endod Dent Traumatol 1997;13:276–80.
6. Kaba AD, Marechaux SC. A 14-year old follow-up study of traumatic injuries to the permanent dentition. J Dent Child 1989;56:417–25.
7. Andreasen JO, Andreasen FM. Text book and color atlas of traumatic injuries to the teeth, 3rd edn. Copenhagen: Munksgaard; 1994.
8. Ellis RG. The classification and treatment of injuries to the teeth of children. Chicago: Year Book Medical Publishers; 1945.
9. Holland T, O'Mullane D, Clarkson J, O'Hickey S, Whelton H. Trauma to permanent teeth of children aged 8, 12 and 15 years in Ireland. J Pediatr Dent 1988;4:13–6.
10. Macko DJ, Grasso JE, Powell NJ. A study of fractures teeth in a school population. J Dent Child 1979;46:130–3.
11. Marcus M. Delinquency and coronal fractures of anterior teeth. J Dent Res 1951;30:513–4.
12. Baghdady VS, Ghose U, Enke H. Traumatized anterior teeth in Iraqi and Sudanese children: a comparative study. J Dent Res 1981;60:677–80.
13. Mamdan MA, Rock WP. A study comparing the prevalence and distribution of traumatic dental injuries among 10–12-year-old children in an Urban and in a rural area of Jordan. Int J Pediatr Dent 1995;5:237–41.
14. Forsberg CM, Tedestam G. Traumatic injuries to teeth in Swedish children living in an urban area. Swed Dent J 1990;14:115–22.
15. Petti S, Tarsitani G. Traumatic injuries to anterior teeth in Italian schoolchildren: prevalence and risk factors. Endod Dent Traumatol 1996;12:294–7.
16. Andreasen JO, Ravn JJ. Epidemiology of traumatic dental injuries to primary and permanent teeth in Danish population sample. Int J Oral Surg 1972;1:235–9.
17. O'Mullane DM. Some factors predisposing to injuries of permanent incisors in school children. Br Dent J 1973;134:328–32.

18. Zerman N, Cavalleri G. Traumatic injuries to permanent incisors. *Endod Dent Traumatol* 1993;9:61–4.
19. Garcia-Godoy F, Morban-Laucer F, Corominas LR, Franjul RA, Noyola M. Traumatic dental injuries in preschool-children from Santo Domingo. *Community Dent Oral Epidemiol* 1983;11:127–30.
20. Andreasen JO. Etiology and pathogenesis of traumatic dental injuries. *Scand J Dent Res* 1970;78:329–42.
21. Liarena Del Rosario ME, Acosta Alfarop VM, Garcia-Godoy F. Traumatic injuries to primary teeth in Mexico City children. *Endod Dent Traumatol* 1992;8:213–4.
22. 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.
23. Trabert J, Peres MA, Blank V, Boell RS, Pietruza JA. Prevalence of traumatic dental injury and associated factors among 12-year-old schoolchildren in Florianopolis, Brazil. *Dent Traumatol* 2003;19:15–8.
24. Bastone EB, Freer TJ, McNamara JR. Epidemiology of dental trauma: a review of the literature. *Aust Dent J* 2000;45:2–9.