Dental Traumatology

Dental Traumatology 2008; **24**: 458–461; doi: 10.1111/j.1600-9657.2008.00601.x

Dental trauma among 5th and 6th grade Arab schoolchildren in Eastern Jerusalem

Harold D Sgan-Cohen, Hillal Yassin, Alon Livny

Department of Community Dentistry, Hebrew University-Hadassah School of Dental Medicine, Jerusalem, Israel

Correspondence to: Harold D. Sgan-Cohen, Department of Community Dentistry, Hebrew University-Hadassah School of Dental Medicine, P. O. Box 12272, Jerusalem 91120, Israel
Tel.: 972-2-6758568
Fax: 972-2-6415574
e-mail: harolds@cc.huji.ac.il

Accepted 02 March, 2007

Abstract – Dental trauma is an irreversible pathology which after occurrence is characterized by life long debilitating effects. The objective of the study was to measure the prevalence of trauma in anterior permanent teeth among children and associations with independent variables. A total of 453 5th and 6th grade Arab Eastern Jerusalem schoolchildren participated. Trauma, incisal overjet and lip competence were measured by one examiner in the schools. Reasons and location of trauma were assessed by telephone interviews with the parents. The total prevalence of dental trauma was 33.8%. Severe trauma prevalence (involving dentine) was 12.6%. Severe trauma was more prevalent among boys (OR = 2.03, $P = 0.026$); children with lip incompetence (OR = 2.71, $P = 0.001$); and those with an overjet of 4mm or more (OR = 3.73, $P < 0.001$). The main reported causes for dental trauma were falling (29.1%), sports (16.4%), violence (20%) and playing (20%). According to the parents' reports, more fall-related injuries were reported at home, more sport injuries at school, more 'playing' injuries 'outside' ($P < 0.001$). Combination of results with a previous study among Jewish schoolchildren demonstrated: severe dental trauma was related to overjet (OR = 1.73, $P = 0.002$), lip incompetence (OR = 2.19, $P < 0.001$), gender (OR for males = 1.54, $P = 0.005$), but not to ethnicity (Arab or Jewish). The reasons for trauma observed in this study were potentially preventable. A community effort should therefore be pursued, with the aim of educating sports teachers, teachers, health personnel and schoolchildren regarding awareness of dental trauma prevention, with emphasis on utilizing mouthguards and early orthodontic intervention, when financially possible.

With the decrease in prevalence of caries (1, 2), dental trauma, an irreversible pathology, has now achieved more deserved attention by the dental profession (3). Dental trauma among children has been described in the literature in many countries, including the Middle East, and is related with gender, orthodontic factors, sport activities and psychosocial environments (4–8).

A previous study has described dental trauma among Jewish schoolchildren, exclusively, in Jerusalem (9). The objectives of the present study were: to assess the prevalence of dental trauma among a similar group of Arab schoolchildren in Eastern Jerusalem; to investigate associations with potential independent variables; and to analyze contributing variables among the combined two populations of Arab and Jewish children.

Material and methods

Population

There are about 15 000 Arab primary schoolchildren in Eastern Jerusalem. Sample size, calculated by the 'PEPI' program (Computer Programs for Epidemiologic Analyses v. 4.0), was 317. Allowing for a potential low compliance and absence levels and considering the average (small) class sizes, 20 classes in 10 schools (one 5th grade and one 6th grade class in each school) were purposively chosen in a cluster sample design (approximately 480 children).

All dental examinations were conducted within the schools, the child seated in a regular chair and the examiner standing. A standard dental mirror, small flashlight and a small millimeter ruler were employed. Informed consent was received from parents and the local authorities.

One examiner participated (H.Y) and was supervised by the first author. Calibration was conducted and level of agreement was over 90%.

Dependent dental variable

Previously employed classifications of dental trauma have included extensive lists of criteria (10, 11). The present study was conducted in field circumstances without optimal conditions. The criteria which were employed were based upon published classifications, but inclusion was limited to those categories pragmatically appropriate to the in-school field conditions: a simple and brief visual inspection and clear answers to interview. Based upon this rationale, we were unable to

© 2008 The Authors. Journal compilation © 2008 Blackwell Munksgaard

include diagnosis of root fracture, luxation, intrusion or extrusion. Trauma was scored in the following manner, as the previous study of Jewish Jerusalem children (9):

- 0 = no evidence of trauma
- 1 = trauma limited to the enamel
- 2 = trauma involving dentine
- 3 = trauma involving the pulp
- 4 = treated trauma, which had clearly involved (at the least) the dentine (usually treated with composite resin restoration)
- 5 = discoloration due to trauma (verified by interview)
- 6 = avulsed tooth due to trauma (verified by interview)

In subsequent data analysis, we operationally redefined and combined these categories into three groups. The basic rationale was whether teeth were healthy, had experienced mild trauma limited to the enamel, which did not imperatively demand immediate treatment (and which in practice often had not been treated), or teeth which had experienced trauma involving at least the dentine and which medically (not only due to aesthetic reasons) demanded treatment. Thus, the following categories were employed:

- 1 = no evidence of trauma (score 0)
- 2 = mild trauma (score 1)
- 3 = severe trauma (scores 2–6).

Independent dental variables:

a. Lip competence was recorded by observation of children's appearance as they entered the room (before being aware of the pending examination), and was defined as 'competent', or 'incompetent' if the lips were naturally closed or apart, respectively.

b. Anterior overjet was measured (in millimeters), employing a small ruler and measuring the horizontal distance between upper and lower central incisors.

Circumstances of injury event

Circumstances of dental injury events were evaluated by telephone interviews with parents of children who presented 'severe' trauma. These included the location of the traumatic incident (home, school, 'outside', other) and the cause of trauma (fall, sport, violence, play, blow from object, bicycle or skates, other).

For univariate statistical analysis among the study children, Pearson's chi-squared test was employed, when no evidence of trauma, mild and severe trauma were included. When calculating the odds ratio for severe trauma, simple logistic regression was used. In analysis of the combined group (Arab children of the present study and Jewish children in the previous study), logistic regression model was employed. Significance levels were chosen at $P < 0.05$.

Results

Twenty classes in 10 primary schools in Eastern Jerusalem participated in the study. All children present in sampled classes on the days of examination were requested to participate. Less than 5% of the children were absent from the schools due to illness, other reasons, or parents had not consented. A total of 453 children were present on the day of examination and none refused to participate. Of these, 60% were boys and 40% were girls. The ages of the 5th and 6th grade children ranged between 10 and 12 years. Data were not available regarding the absent children.

As illustrated in Fig. 1, among 66.2% of all the Arab children no trauma were detected, mild trauma was found among 21.2% and severe trauma among 12.6% of the examinees.

Table 1 demonstrates the distribution of trauma by gender. Boys had more severe trauma (23.6%) than girls (17.7%). This reached statistical significance (Pearson's chi-square: $P = 0.01$). According to logistic regression, boys had 2.03 chances (OR) of experiencing severe trauma, as compared to females ($P = 0.026$).

Table 2 demonstrates the distribution of trauma by lip competence. Children with incompetent lips had more severe trauma (22.5%) than children with competent lips (9.7%). This reached statistical significance (Pearson's chi-square: $P = 0.0002$). According to logistic regression, children with incompetent lips had 2.71 chances (OR) of experiencing severe trauma, as compared to children with competent lips ($P = 0.001$).

Table 3 demonstrates the distribution of trauma by anterior teeth overjet. Children with an overjet of 4 mm or more had more severe trauma (27.8%) than children with an overjet of less than 4 mm (9.4%). This reached statistical significance (Pearson's chi-square: $P = 0.00002$). According to logistic regression, children with an overjet of 4 mm or more had 3.73 chances (OR) of experiencing severe trauma, as compared to children with an overjet of less than 4 mm ($P < 0.001$).

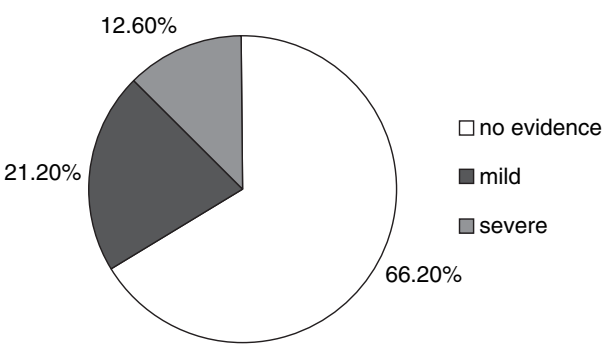

Fig. 1. Distribution of dental trauma among Arab children in East Jerusalem, by severity.

Table 1. Distribution of trauma by gender

Trauma	Males (%)	Females (%)	Total (%)
No evidence	165 (60.9)	134 (74.0)	299 (66.2)
Mild	64 (23.6)	32 (17.7)	96 (21.2)
Severe	42 (15.5)	15 (8.3)	57 (12.6)
Total	271 (100)	181 (100)	452* (100)

Pearson's chi-square, $P = 0.011$.
*one child with missing data.

© 2008 The Authors. Journal compilation © 2008 Blackwell Munksgaard

Table 2. Distribution of trauma by competence of lips

Trauma	Competent (%)	Incompetent (%)	Total (%)
No evidence	248 (70.7)	52 (51.0)	300 (66.2)
Mild	69 (19.7)	27 (26.5)	96 (21.2)
Severe	34 (9.7)	23 (22.5)	57 (12.6)
Total	351 (100)	102 (100)	453 (100)

Pearson's chi-square, $P = 0.0002$.

Table 3. Distribution of trauma by overjet of anterior teeth

Trauma	≤ 3mm (%)	≥ 4mm (%)	Total (%)
No evidence	260 (69.5)	40 (50.6)	300 (66.2)
Mild	79 (21.1)	17 (21.5)	96 (21.2)
Severe	35 (9.4)	22 (27.8)	57 (12.6)
Total	374 (100)	79 (100)	453 (100)

Pearson chi-square, $P = 0.00002$.

Table 4 presents results of the multiple logistic regression model, for severe trauma, combining data of the present study with the previous study of Jewish schoolchildren in Western Jerusalem (9). The odds ratio (OR) for severe trauma were: 1.73 for overjet of 4 mm or more, 2.19 for incompetent lips, and 1.54 for boys. All ratios were highly significant (< 0.005). No significant differences were detected between Arab and Jewish children.

The predominant cause reported for severe dental trauma was falling (29.1%: 44.4% at home, 20.0% at school, 23.5% 'outside'), followed by sport (16.4%: none at home, 40.0% at school, 5.9% 'outside'), violence (20%: 22.2% at home, 25.0% at school, 11.8% 'outside') and playing (20%: 16.7% at home, 15.0% at school, 29.4% 'outside'). The distribution by location of injury was statistically different: more falling events were reported at home, more sport injuries at school and more 'playing' injuries 'outside' ($P < 0.001$).

Table 4. Logistic regression analysis of severe trauma and maxillary incisal overjet, lip competence, gender and ethnicity*

	N	% Severe trauma	OR	*P*	95% CI adjusted OR
Overjet					
0–3	995	9.4%	1	0.002	1.23–2.45
4+	631	19.3%	1.73		
Lip competence					
Competent	1064	8.7%	1	<0.001	1.57–3.05
Incompetent	562	21.0%	2.19		
Gender					
Male	858	15.9%	1.54	0.005	1.13–2.09
Female	768	10.3%	1		
Ethnicity					
Jews	1174	13.5	0.79	Ns	0.55–1.12
Arabs	452**	12.6	1		

*Data combine the present study population of Arab children and the previous study population of Jewish children (9).
**One child with missing data.
Ns, not significant.

Discussion

Epidemiological surveys of dental trauma have reported a wide range of prevalence levels. The criteria for definition of dental trauma in many of the surveys are different, as are the age groups. Most indices usually differentiate according to level of dental tissue involved, i.e. enamel, dentine, pulpal exposure, extrusion, etc. (9–11).

The present scoring system was employed due to its simplicity and epidemiological field applicability. Categories could have been divided differently, but we preferred to differentiate in a manner comparable to the previous study (9). It should be noted that this type of index might underestimate or overestimate the clinical prevalence of trauma, and inadequately differentiate between categories, as compared with diagnoses conducted under optimal dental clinic conditions. For example, it was not possible to ascertain whether score 4 (treated trauma), could have included pulp and/or periodontal involvement.

Jerusalem, sociologically, is a multi-faceted city. In general, the Western side is populated by Jews and the Eastern by Arabs. Besides this, the city profile is even more diverse by religious and socio-economic levels among the two ethnic groups. In the Jewish population, no significant association had been revealed between dental trauma and socio-economic background (9). Among the Arab children, we were not able to investigate the potential associations with socio-economic variables. This should be attempted in further research.

The present study demonstrated a total dental trauma ('mild' and 'severe') prevalence of 33.8%. This prevalence is slightly higher than the 29.6% reported in the previous study (9). Severe trauma was found among 12.6% of the Arab schoolchildren (Fig. 1), a similar level compared to the 13.5% found among Jewish children.

Dental trauma was significantly more prevalent among children with larger incisal overjet, incompetent lips and among boys. These results were similar to those among the Jewish group. Among Arab children, the gender related risk was higher (OR = 2.03 vs OR = 1.45, among Arab and Jewish boys, respectively).

In general, the main reported cause for severe dental traumatic events in all surroundings was falling. Sports and violence were important reported causes at school and outside (but not at home).

In the present study, most sport-related injuries were reported to occur at schools ($P < 0.001$). Schools not only are one of the main locations of potential trauma, but also the environment where children's physical behaviours are often shaped. In this context, teachers, especially those involved in physical education, should be considered as important agents for public health interventions (3).

It should be noted that since parents were the source for these reported reasons, an information bias needs to be considered, such as the levels of reported violence and other possible causes of trauma at home. A potential additional bias might be the less than 5% absentee children on the day of examination. We were not able to ascertain the characteristics of this group.

© 2008 The Authors. Journal compilation © 2008 Blackwell Munksgaard

Surveys of dental trauma in other countries have demonstrated associations with gender, lip competence, anterior incisal overjet, other orthodontic variables and sporting activities, similar to the results of the present survey (8, 12).

In summary, data of this study indicated that 12.6% of this study population had severe dental trauma. The main associated variables were: gender, lip competence and anterior incisal overjet. When comparing results with a previous similar survey, no difference was revealed between Arab and Jewish children.

The data derived from this study are currently being employed in an organized municipal effort to educate teachers, especially those responsible for sports activities (3), public health nurses, family doctors and schoolchildren, regarding dental trauma. This includes the aetiology, rationale for preventive intervention, with emphasis on mouthguards (13), and early orthodontic treatment, where possible (8), and the treatment of teeth after traumatic experiences. All public health personnel should be impressed upon, regarding the general impact of dental trauma, including influence on all aspects of the adolescents' future life development (14). The Jerusalem community programme, as all public health efforts, is based upon and adapted to the social characteristics of the individual communities.

References

1. Sgan-Cohen HD, Rafalovitz G, Ron H, Mann J. Changing caries prevalence in primary and permanent teeth of children in a Jerusalem neighbourhood. Int J Paediatr Dent 1997; 7:167–70.
2. Sgan-Cohen HD, Katz J, Horev T, Dinte A, Eldad A. Trends in caries and associated variables among young Israeli adults over 5 decades. Community Dent Oral Epidemiol 2000;28:234–40.
3. Holan G, Cohenca N, Brin I, Sgan-Cohen HD. An oral health promotion program for the prevention of complications following avulsion: the effect on knowledge of physical education teachers. Dent Traumatol 2006;22:323–7.
4. 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.
5. Al-Majed I, Murray JJ, Maguire A. Prevalence of dental trauma in 5–6- and 12–14-year-old boys in Riyadh, Saudi Arabia. Dent Traumatol 2001;17:153–8.
6. Marcenes W, Murray S. Social deprivation and traumatic dental injuries among 14-year-old schoolchildren in Newham, London. Dent Traumatol 2001;17:17–21.
7. Hamdan MA, Rajab LD. Traumatic injuries to permanent anterior teeth among 12-year-old schoolchildren in Jordan. Community Dent Health 2003;20:89–93.
8. Kania MJ, Keeling SD, McGorray SP, Wheeler TT, King GJ. Risk factors associated with incisor injury in elementary school children. Angle Orthod 1996;66:423–32.
9. 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.
10. Andreasen JO, Andreasen FM. Textbook and color atlas of traumatic injuries to the teeth, 3rd edn. Copenhagen: Munksgaard; 1994.
11. Garcia-Godoy F. A classification for traumatic injuries to primary and permanent teeth. J Pedod 1981;5:295–7.
12. McNutt T, Shannon SW Jr, Wright JT, Feinstein RA. Oral trauma in adolescent athletes: a study of mouth protectors. Pediatr Dent 1989;11:209–13.
13. Levin L, Friedlander LD, Geiger SB. Dental and oral trauma and mouthguard use during sport activities in Israel. Dent Traumatol 2003;19:237–42.
14. Nicolau B, Marcenes W, Sheiham A. The relationship between traumatic dental injuries and adolescents' development along the life course. Community Dent Oral Epidemiol 2003;31:306–13.

© 2008 The Authors. Journal compilation © 2008 Blackwell Munksgaard

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.