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Traumatic dental injuries among primary school children in Sulaimani city, Iraq

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A tooth injury is a fracture, Luxation or avulsion, although a combination of injuries may occur in the tooth (1). Facial trauma that results in fractured, displaced or lost teeth can have significant negative functional, esthetic and psychological effects on children (2). Further more, dental injury of primary teeth has been found to be responsible of complicated problems to underlying permanent teeth such as hypoplasia, discoloration, delay in eruption time and tooth malformation (3, 4). The decline in the prevalence and severity of dental caries amongst children in many countries may have made traumatic dental injuries a more serious dental public health problem among the young and dental trauma may exceed dental caries and periodontal disease as the most significant threat to dental health among young people (5, 6).

Accidents within and around the home and school were the major cause of dental injuries and the severity may vary from simple fractures to the total loss of the tooth (7–10). Studies have affirmed that the prevalence of traumatic dental injuries increases with increasing incisal overjet, increased overbite, open bite, inadequate lip coverage, Class II division 1 occlusal relation ship and obesity (8, 11, 12).

The subject of prevalence of dental trauma had been previously studied in Iraq, mainly in the central region of Iraq, with the majority of Arabic ethnic population. Baghdadi et al. (13) reported a prevalence of 7.7% for 6-12 years of age among primary school children in Baghdad city. A1-Sayyab (14) in his survey on traumatized anterior teeth in rural areas among 2- to 13-year-old children showed 15.3% of the sample had dental injuries and Al-Hayali (8) reported a prevalence of 29.6% among 4- to 15-year-old children in the central region of Iraq. On the other hand, E1-Samarrai (15) reported a prevalence of 27.82% among 4- and 5-year-old children in Baghdad. No studies are available in the northern region of Iraq, mainly in the Kurdish ethnic population regions and this study aims to outline traumatic dental injuries among Kurdish children in Sulaimani (as Sulaimaniya) city.

Material and methods

The sample consisted of 4015 pupils (6–13 years old) attending primary schools in the city of Sulaimani, northern Iraq. Permission and information regarding the number of primary schools, their locations and number of pupils were obtained from the Directorate of

Education in Sulaimani city. Sulaimani city was divided into 20 geographical areas and a primary school was selected from each area randomly. The selected school authorities were conducted and the purpose of the study was explained to ensure full cooperation.

Oral examination to identify the type of the traumatic injury was performed in classrooms; the students were examined seated, in straight back chair close to the wall under the normal day light. The traumatic dental injuries were assessed according to the criteria of Garcia-Godoy (10). Root fracture (score 5) was not recorded as no radiographs were taken. Criteria and coding of the treatment need were recorded according to the criteria used by El-Samarrai (13). The incisal (occlusal) relationship was recorded in accordance to the British Standard Classification (16). The upper lip position is classified according to the criteria described by Jackson (17). Statistical calculations were performed using chi-square tests.

Results

The sample consisted of 4015 primary school children with an age rage of 6–13 year old, 50.8% males and 49.2% females were distributed into four age groups (Table 1). The prevalence of traumatized children was found to be 6.1% and it was highly significantly associated with age and gender (P < 0.001) (Tables 2 and 3). The highest prevalence of traumatized children

Table 1. Distribution of the sample by age and gender

	Gender					
Age groups	Male, <i>n</i> (%)	Female, <i>n</i> (%)	Both, <i>n</i> (%)			
6–7 8–9 10–11 12–13 Total	641 (16) 630 (15.7) 594 (14.8) 175 (4.4) 2040 (50.8)	684 (17) 623 (15.5) 555 (13.8) 113 (2.8) 1975 (49.2)	1325 (33) 1253 (31.2) 1149 (28.6) 288 (7.2) 4015 (100)			

Table 2. Distribution of children with and without traumatized teeth by age

Age groups	Without trauma, n (%)	With trauma, n (%)	Total, <i>n</i> (%)	
6–7 8–9 10–11 12–13 Total	1273 (96.1) 1197 (95.5) 1047 (91.1) 255 (88.5) 3772 (93.9)	52 (3.9) 56 (4.5) 102 (8.9) 33 (11.5) 243 (6.1)	1325 (33) 1253 (31.2) 1149 (28.6) 288 (7.2) 4015 (100)	$\chi^2 = 47.002$ d.f = 3 P < 0.001

Table 3. Distribution of children with and without traumatized teeth by gender

Gender	Without trauma, n (%)	With trauma, n (%)	Total, <i>n</i> (%)	
Male Female	1890 (92.6) 1882 (95.3)	150 (7.4) 93 (4.7)	2040 (50.8) 1975 (49.2)	$\chi^2 = 12.338$ d.f. = 1 P < 0.001
Total	3772 (93.9)	243 (6.1)	4015 (100)	F < 0.001

was at the age of 12-13 years (11.5%) and the lowest was at the age of 6-7 years (3.9%) (Table 2). Males showed more traumas than females (odds ratio = 1.61) (Table 3).

The most common type of dental injury was found to be simple enamel fracture (score 1) (36.6%), followed by enamel-dentine fracture (score 2) (35.4%) and concussion (score 6) (11.5%). No enamel, dentine and cementum fracture (score 4) and extrusion (score 9) were recorded. The type of the dental injury was found to be highly significantly associated with age ($\chi^2 = 176.35$, d.f. = 18, P < 0.001). Concussion and luxation type injuries were more common in younger ages (6–7 years) (mostly primary teeth), while tooth fracture types of injuries were more common in the older age groups (mostly permanent teeth) (Table 4). Gender showed no association with the type of injury (P > 0.05) (Table 5).

Only 22 teeth (7%) had received treatment from the total (336) teeth traumatized and the results for the remaining teeth revealed that the majority of traumatized teeth did not need any treatment (48.7%), while the least treatment type needed was extraction (3.5%) (Fig. 1).

Dental trauma was the least (5.8%) among those children who had all the labial surface of their upper anterior teeth is covered by the upper lip (position 3) and was highest for those with position 1 (50.6%) (Fig. 2). Traumatized children with class II division 1 malocclusion were more common (70%) than with the other types of occlusion, followed by class I occlusion (26.7%) and class II division 2 malocclusion (3.3%). Finally, no traumatized children were found with class III malocclusion (Fig. 3).

The maxillary central incisors were found to be most affected by dental trauma followed by mandibular central incisors and the maxillary lateral incisors. The right side and the maxillary teeth were more affected than the left side and the mandibular teeth by dental trauma (Table 6).

The number of injured teeth per child was 1.38 (336 teeth in 243 children) and single tooth trauma was the most common type (69.5%) followed by two teeth trauma (25.1%) (Fig. 4). The most frequent setting for dental trauma was at home (60.9%) then at street (18.9%) followed by school (17.7%) (Fig. 5). The most common causes of dental trauma were falls followed by playing and struck by an object (Fig. 6).

Discussion

The prevalence of dental trauma in the current study was recorded to be about 6.1% and this was higher than that recorded by some studies (11, 18), but lower than those findings reported by some investigators (8, 10, 13–15, 19). This difference may be attributed to the age range differences from other studies. Males were highly significantly affected by dental trauma (7.3%) compared with females (4.7%). This result was in agreement with many studies (8, 11, 13, 14, 20) and this is may be due to the fact that males tend to participate in more strenuous activities with higher trauma risk, such as contact sports and more aggressive types of playing. Age was shown to

	Type of dental trauma							
Age groups	1	2	3	6	7	8	10	Total, <i>n</i> (%)
6–7, <i>n</i> (%)	4 (7.7)	3 (5.8)	1 (1.9)	26 (50.0)	7 (13.5)	8 (15.4)	3 (5.8)	52 (21.4)
8–9, <i>n</i> (%)	26 (46.4)	25 (44.6)	4 (7.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.8)	56 (23.0)
10–11, <i>n</i> (%)	44 (43.1)	43 (42.2)	12 (11.8)	2 (2.0)	0 (0.0)	0 (0.0)	1 (1.0)	102 (42.0)
12–13, n (%)	15 (45.5)	15 (45.5)	1 (3.0)	0 (0.0)	2 (6.1)	0 (0.0)	0 (0.0)	33 (13.6)
Total, <i>n</i> (%)	89 (36.6)	86 (35.4)	18 (7.4)	28 (11.5)	9 (3.7)	8 (3.3)	5 (2.1)	243 (100)

Table 4. Distribution of traumatized children according to the types of the dental trauma by age

Table 5. Distribution of traumatized children according to the types of the dental trauma by gender

	Type of dental trauma							
Gender	1	2	3	6	7	8	10	Total, <i>n</i> (%)
Male, <i>n</i> (%) Female, <i>n</i> (%) Total, <i>n</i> (%)	44 (29.3) 45 (48.4) 89 (36.6)	62 (41.3) 24 (25.8) 86 (35.4)	11 (7.3) 7 (7.5) 18 (7.4)	18 (12.0) 10 (10.8) 28 (11.5)	5 (3.3) 4 (4.3) 9 (3.7)	6 (4.0) 2 (2.2) 8 (3.3)	4 (2.7) 1 (1.1) 5 (2.1)	150 (61.7) 93 (38.3) 243 (100)

Table 6. Distribution of traumatized teeth according to the type and location of tooth

	Right (%)			Left (%)			
Position	Canine	Lateral	Central	Central	Lateral	Canine	Total (%)
Maxillary Mandibular Total	1 (0.3) 1 (0.3) 179 (53.3)	3 (0.9) 3 (0.9)	165 (49.1) 6 (1.8)	131 (39) 11 (3.3) 157 (46.7)	11 (3.3) 1 (0.3)	3 (0.9) 0 (0)	314 (93.5) 22 (6.5) 336 (100)



Fig. 1. Distribution of traumatized teeth in relation to type of dental treatment.



Fig. 2. Distribution of traumatized children according to upper lip positions.

be associated with dental trauma as being showed by other studies (8, 13, 19) and prevalence of trauma increased with increasing age. This may be attributed to



Fig. 3. Distribution of traumatized children according to the types of occlusion.



Fig. 4. Distribution of children with traumatized teeth according to the number of teeth involved.

the increasing mobility and activity with age or could be explained by that dental injury is a cumulative defect (21).



Fig. 5. Distribution of children with traumatized teeth according to the place of trauma occurrence.



Fig. 6. Distribution of children with traumatized teeth according to the cause of trauma.

As been shown by other studies, simple enamel fracture was the most common type of dental injury followed by enamel and dentine fracture without pulp exposure, then concussion (8, 13–15, 19). Variation in the types of dental injury found according to age as concussion and intrusion were found to be more common in younger ages and in primary dentition. This could be attributed to the ability of bone and periodontal ligament to absorb more energy of the impact, thereby favoring dislocations rather than fractures, beside that smaller crown of primary teeth and their shorter roots favor their dislocation rather than their fracture. This can also explain why among permanent teeth, enamel and dentine fracture increases, as with aging the resiliency of bone decrease and the impact of exposure will be on the tooth itself (21).

This study showed that only 7% of the traumatized teeth had received treatment. This result may be explained by the fact that the major types of trauma were simple enamel fractures and enamel and dentine fractures which were argued that minor damage did not require treatment and this was inline with other studies (8). Short upper lip had been frequently expressed in the literature as being an important predisposing factor for dental trauma and the effect of the upper lip on the prevalence of children with dental injury may be attributed to the fact that the upper lip makes a natural barrier against trauma to the teeth (8, 19). This was obvious in the results which showed more than half of the traumatized children had inadequate lip coverage.

Results of the present study showed that the prevalence of traumatized children was highest with class II malocclusion particularly division 1 (70%) compared with other types of occlusion and it's in agreement with other studies confirming the same results (8, 11, 22). The explanation of this result is that in cases with normal occlusion, the energy of the trauma is decreased by the larger contact area, the incisal contact of the upper and lower teeth and the protecting effect of the lip closure. While in cases with class II malocclusion, the lack of incisal contact, the location of this contact in the cervical part of the upper incisors or the uncompleted lip closure, all increases the risk of being traumatized in children with class II malocclusion (23).

Maxillary central incisors were the most common teeth affected by dental trauma followed by mandibular central incisors and the maxillary lateral incisors. This result agrees with most previous studies regarding the maxillary central incisors are the most common teeth to receive trauma (8, 15, 19, 24, 25). The prominent and vulnerable position of the maxillary incisors in the face is responsible for their more frequent involvement in fractures than the lower teeth (26). The number of traumatized teeth showed that single tooth trauma was the most common type (69.5%) followed by two teeth trauma (25.1%). This result is in agreement with other previous studies (15, 19, 22) showing that when one tooth or two teeth is traumatized the majority of the force of the impact is dispersed by the fractured tooth or teeth and no more teeth will be injured.

The most frequent injury setting was at home followed by the street and then at school, this result is similar to those recorded by Traebert et al. (27) and Al-Kassab (11) and in agreement with many other studies (10, 28, 29) that home is the most frequent place of occurrence of trauma. Dental trauma because of falls tended to be more frequent than the other causes of dental trauma followed by playing. This is in agreement with other investigations (13, 19, 30).

In conclusion, the present study revealed a relatively low prevalence of dental trauma, but still this figure represents a large number of children and also a high prevalence of dental treatment need due to trauma is presented. Prevention of dental injury is considered to be more important from every aspect of the problem than its treatment similar to other general and oral health problems. Therefore, educational programs are to be initiated for the community regarding causes, prevention and treatments of traumatic dental injuries.

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