ETIOLOGY AND TYPE OF DENTO-ALVEOLAR INJURIES IN PRESCHOOL CHILDREN

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Abstract

The aim of this study was to identify the etiology and type of dento-alveolar injuries in children. The study involved 2492 children (1344 boys, 1148 girls) aged 1-5 years examined. Injuries were classified according to drawings and texts based on the WHO classification system, as modified by Andreasen and Andreasen.

Boys accounted for a higher percentage of injuries than girls. The difference in cause of injury between younger children (1-2 years) and older children (2-5 years) was statistically significant ($p<0.001$). The difference in affected teeth by cause of injury was statistically significant ($p=0.021$).

The most common type of injury in children aged 1-2 years, 2-3 years and 3-4 years was subluxation, whereas the most common type of injury in children aged 4-5 was intrusive luxation. The difference in type of injury by age group was also statistically significant ($p<0.001$). However, there was no significant difference in type or rate of injury by sex ($p=0.771$).

Children between 2-3 years of age had the highest rate of traumatic dental injuries.

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Introduction

Orofacial trauma represents a complex problem for child orodental and general health due to the possible medical, esthetic and psychological consequences it can have on children, as well as their parents.[1-5]

Epidemiological studies indicate that approximately 30 percent of all children under age seven have sustained injuries to one or more of their primary incisors[6,7] and that most injuries to primary dentition, as well as most serious injuries, occur among children aged 1-3 years.[1]

Epidemiological research has reported a high incidence of injuries to primary dentition related to accidents within and around the home, which is the site of most dental trauma occurring as a result of falls among children ages 1-3.[8-11]

The type and extent of traumatic tooth injury depend on the direction and intensity of the acting force. An intrusive injury is caused by the impact of a force in an axial direction that results in displacement of the tooth into the socket, whereas an avulsion is the result of a blunt impact and is associated with the high resilience of tooth-supporting structures.[8,12] Although exact mechanisms are as yet unknown, it is agreed that lateral luxations are the result of a direct impact on the incisal edge in an axial/lateral direction, the energy from which can lead to crown fracture.[12] Intrusion and avulsion are the most severe types of injuries to affect primary dentition in children up to 2 years of age.[13-15]

Injury to primary dentition is serious because of the potential for periapical sequelae, which can adversely affect the developing occlusion as well as the development of permanent teeth.[16,17]

Treatment of oral and maxillofacial injuries requires fastidious diagnosis and coordination between all treating professionals from the moment of injury. Prompt and appropriate management can significantly

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improve the prognosis for many dento-alveolar injuries.[14] Complications can be reduced with the correct diagnosis.[13,14]

The aim of this study was to identify the etiology and type of dento-alveolar injuries among children aged 1-5 years treated at the Gulhane Medical Academy Department of Pediatric Dentistry's Centre of Dental Sciences in Ankara, Turkey in order to develop a basis for determining optimal treatment approaches and teaching needs. Attention was focused on primary dentition due to the frequency with which primary teeth are affected by traumatic injury.

Materials and methods

This cross-sectional survey was carried out at the Gulhane Medical Academy Department of Pediatric Dentistry's Centre of Dental Sciences in Ankara, Turkey in 2007. The study involved 2492 children (1344 boys, 1148 girls) aged 1-5 years (mean age: 3.42±1.03) examined at the clinic over a one-year period.

Examination for traumatic dental injuries included maxillary and mandibular primary incisors only. Injuries were classified according to drawings and texts based on the WHO classification system, as modified by Andreasen and Andreasen.[2]

Patient records were examined with regard to age (at the time of injury to the primary tooth), gender, number and type of teeth involved, cause of injury (falling while walking or running; bicycle/tricycle accident; impact against a hard object; other causes, including traffic accidents, self-inflicted, earthquake, unknown) and type of injury (crown discoloration, enamel fracture, enamel/dentin fracture, enamel/dentin/pulp fracture, subluxation, lateral luxation, intrusive luxation, extrusive luxation, avulsion).

Statistical analysis was carried out using the SPSS computer program. Chi-square tests were used to determine significant differences in data (P<0.05).

Results

Of the 2492 children included in this study, a total of 355 traumatic primary teeth injuries were observed among 210 children. Boys accounted for a higher percent of these children (54.8%) than girls (45.2%), and children aged 2-3 had more traumatic dental injuries than children in the other age groups included in the study. (Examination of children under age 1 revealed no injuries to primary incisors; therefore, findings pertaining to this age group were excluded from the study results.)

Of the 210 children with injuries, 107 children had injured 1 primary tooth, 78 children had injured 2 primary teeth, 8 children had injured 3 primary teeth and 17 children had injured 4 primary teeth. The most frequently injured teeth were the maxillary central incisors (74.6%), with the maxillary right central incisor accounting for 43.9 percent of all injured teeth (Table 1).

Tooth, FDI system	53	52	51	61	62	63
NO	0	40	156	109	25	0
NO	0	0	14	11	0	0
Tooth, FDI system	83	82	81	71	72	73

FDI: Federation Dentaire Internationale.

Table 1. Distribution of injured primary teeth (n=355).

Table 2 shows the cause of injury. Falling while walking or running accounted for the greatest number of traumatic dental injuries (97 children, 46.2%; 151 teeth, 42.5%) followed by impact against a hard object (54 children, 25.7%; 95 teeth, 26.8%), bicycle/tricycle accident (33 children,15.7%; 56 teeth, 15.8%) and other causes (traffic accident, earthquake, self-inflicted, unknown) (26 children, 12.4%; 53 teeth; 14.9%). In children aged 1-2, impact against a hard object was the most common cause of dental trauma (44.7%), whereas falling while walking or running was the most common cause among children aged 2-3, 3-4 and 4-5 years (63.1%, 32.2% and 46.2%, respectively). This difference was statistically significant (p<0.001).

Cause of injury	Number of affected children (%)	– teeth (%)
Fall while walking or running	97 (46.2)	151 (42.5)
Impact against a hard object	54 (25.7)	95 (26.8)
Bicycle/tricycle accident	33 (15.7)	56 (15.8)
Other	26 (12.4)	53 (14.9)
Total	210 (100)	355 (100)

Table 2. Cause of injury in primary dentition

Table 3 shows the distribution of injured teeth by tooth type. Tooth No. 51 (FDI notation) was the tooth most affected by falls, impact with a hard object and other types of injuries, whereas Tooth No. 61 was the most affected in the case of bicycle injuries. The difference in cause of

injury by tooth type was statistically significant (p=0.021).

Cause of injury	Tooth, FDI system					
	51 (%)	52 (%)	61 (%)	62 (%)	71 (%)	81 (%)
Fall while walking or running	47.0	10.1	23.5	6.0	6.7	6.7
Impact against a hard object	41.4	13.1	34.3	7.1	1.0	3.1
Bicycle/tricycle accident	39.3	10.7	44.6	3.6	0	1.8
Other	45.1	9.8	33.3	9.8	2.0	0.0
Total	43.9	11.0	31.3	6.5	3.1	3.9

Table 3. Distribution of injured teeth by cause of injury

Table 4 shows the distribution of injured teeth by age and sex. Children aged 2-3 were found to have the highest rate of traumatic injury (30.9%). Among the overall sample, boys were found to have a higher rate of traumatic injuries than girls; however, when analyzed by age group, no significant difference was observed in injury rates between boys and girls (p>0.05).

Age and sex	Dental injuries, n (%)	Affected teeth, n (%)
1-2 years		
Boys	29 (13.8)	45 (12.7)
Girls	18 (8.6)	35 (9.8)
All	47 (22.4)	80 (22.5)
2-3 years		
Boys	35 (16.6)	63 (17.7)
Girls	30 (14.3)	48 (13.6)
All	65 (30.9)	111 (31.3)
3-4 years		
Boys	30 (14.3)	55 (15.5)
Girls	29 (13.8)	40 (11.3)
All	59 (28.1)	95 (26.8)
4-5 years		
Boys	21 (10.0)	33 (9.3)
Girls	18 (8.6)	36 (10.1)
All	39 (18.6)	69 (19.4)
Total		
Boys	115 (54.8)	196 (55.2)
Girls	95 (45.2)	159 (44.8)
All	210 (100.0)	355 (100.0)

Table 4. Distribution of injured teeth by age and sex.

Table 5 shows the distribution of injured teeth by type of injury. Overall, the most common injuries in children were subluxations (31.0%), followed by intrusive luxations (17.5%), extrusive luxations (12.7%), crown discoloration (12.1%), lateral luxations (9.6%), enamel/dentin fractures (7.6%), enamel fractures (5.3%), avulsion (2.8%) and enamel/dentin/pulp fractures (1.4%).

Looked at by age group, subluxation was the most common type of injury in children aged 1-2 years, 2-3 years and 3-4 years, whereas intrusive luxation was the most common type of injury in children aged 4-5 years. The difference in type of injury by age was statistically significant (p<0.001). No significant difference was found in type of injury by sex (p=0.771).

Traumatic Dental injuries	Boys, n(%)	Girls, n(%)	Total, n(%)
Crown discoloration	29 (8.2)	14 (3.9)	43 (12.1)
Enamel fracture	9 (2.5)	10 (2.8)	19(5.3)
Enamel/dentin fracture	16(4.5)	11(3.1)	27 (7.6)
Enamel/dentin/pulp fracture	3(0.8)	2(0.6)	5 (1.4)
Subluxation	62(17.5)	48(13.5)	110(31.0)
Lateral luxation	17(4.8)	17(4.8)	34(9.6)
Intrusive luxation	32(9.0)	30(8.5)	62(17.5)
Extrusive luxation	22(6.2)	23(6.5)	45(12.7)
Avulsion	6(1.7)	4(1.1)	10(2.8)
Total	196(55.2)	159(44.8)	355(100.0)

Table 5. Distribution of injured teeth by type of injury and sex.

Discussion

Dental trauma is a frequent occurrence among young children. Rodriguez (2007) has stated that traumatic injuries occur mainly during early infancy.[16] Although some earlier studies have reported an equal distribution of traumatic dental injury in young children between boys and girls,[1,18] the present study is in line with other studies[19-22] among children aged 1-5 that showed boys sustained injuries more often than girls. The higher incidence of injuries found among boys than girls may be explained by more vigorous play.[23]

Because of their exposed position in the dental arch, the maxillary central incisors are affected by traumatic injury at significantly higher rates than other teeth. The next-most frequently affected are the maxillary and mandibular lateral incisors and the upper canines.[24,25] In this study, 74.6 percent of injured teeth were maxillary central incisors and 18.3 percent were maxillary lateral incisors. These rates are consistent with the rates reported in the literature.[15,18,20,21]

In this study, of those children with traumatic dental injuries, the majority (51.0%) had one damaged tooth, 37.1 percent had two damaged teeth, 3.8 percent had three damaged teeth and 8.1 percent had four damaged teeth. These rates are also similar to those reported in the literature.[18,26]

The main causes of traumatic injury found in this study were falling while walking or running (46.2%); impact by a hard object (25.7%); a bicycle or tricycle accident (15.7%); and other causes, including traffic accidents, self-inflicted and earthquakes, or unknown reasons (12.4%).

These findings, as well as findings from the literature related to age and cause of traumatic injury, suggest that primary tooth trauma frequently occurs as children begin to learn to walk and run,[2,27,28] making it difficult to prevent. Most of the traumatic injuries in this study occurred at home or at pre-school, either indoors or outdoors.

Active participation in sporting activities such as cycling, especially among small children, often increases the risk of traumatic injuries to dental and oral tissue.[28,29] In this study, the left primary central incisor was the most commonly affected tooth in traumatic bicycle injuries, whereas the right primary central incisor was the most commonly affected tooth in all other injuries. We believe the main reason for this difference is that children are less able to control their movement in the case of a fall from a bicycle in comparison to other situations resulting in traumatic injury. The difference may also be attributed to developing motor coordination.[16]

According to the literature, crown fracture is the most common type of injury among permanent dentition, whereas luxation is the most common among primary dentition. [24,30,31] In the present study, the most frequently observed type of injury was subluxation (31.0%), followed by intrusive luxation (17.5%), extrusive luxation (12.7%) and crown discoloration (12.1%). Significantly higher rates of crown fracture were observed in other retrospective studies conducted with pre-school children by Garcia-Godoy et al (83%),[32] Otuyemi et al (66.8%)[33] and Hargreaves et al (71.8%).[34] Careful attention should be paid when analyzing type of injury, which has been shown to vary according to study setting, i.e. hospital, private practice, or educational institution.[32,35]

The main objectives in the diagnosis and treatment of traumatic injuries involving primary dentition are pain management and the prevention of possible damage to the developing tooth germ.[15] In such cases, treatment strategy is dictated by a concern for the safety of the permanent dentition.[30] According to Dale,[36] a dentist should be consulted immediately after dental trauma. In some cases, an interval of less than 1 h between traumatic incident and examination can increase the chances of successful treatment and minimize the likelihood of pain, sequelae and additional costs. As a general rule, if the apex is displaced toward or through the labial bone plate, the tooth can be left for spontaneous re-eruption.[37,38] However, if the apex is displaced toward the permanent tooth germ, the tooth should be extracted.[37,38]

A high risk of potential dental and oral injury exists during childhood and adolescence. In order to understand the complexities of dental trauma etiology and to allow for the implementation of preventive strategies to reduce the increasing frequency of trauma, more epidemiological studies of representative populations that employ standardized trauma classifications are required.

Conclusions

1. Among children aged 1-5 years, children between 2-3 years of age had the highest rate of traumatic dental injuries.
2. Boys suffered traumatic dental injuries slightly more often than girls.
3. The most frequently injured primary tooth was the right central maxillary incisor (43.9%).
4. The most common cause of traumatic dental injuries was falling while walking or running either indoors or outdoors.

Declaration of Interest

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