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Traumatic tooth injuries to primary teeth of children aged 0–3 years

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Abstract – The purpose of this study was to analyze data according to gender, age, cause, number of traumatized teeth, type of tooth and trauma, from the records of traumatized children (0–3 years) referred to the Ondokuz Mayıs University, Dental Faculty, Department of Pedodontics in middle Black Sea region of Turkey. A total of 563 boys and girls participated in the study. Traumatic dental injuries were recorded using the classification of the World Health Organization modified slightly by Andreasen & Andreasen. Traumatic dental injuries were identified in 17.4% of the children. The largest percentage of injuries were in the 13–18 months old children with no significant gender differences ($P > 0.05$). Periodontal tissue injuries were the most common (84.7%) with no statistical difference between different ages or gender ($P > 0.05$). The main etiological factor of traumatic dental injury was falls (73.5%) and it was not different between age and gender ($P > 0.05$). The maxillary central incisors were involved in a higher percentage of traumatic injuries (98%), with no differences between the right and the left sides ($P > 0.05$). Treatment was sought for 37.4% of children within 1–7 days. It is suggested that parents should be informed about prevention of traumatic injuries and to contact a dentist immediately.

Traumatic injuries of primary dentition are serious problems especially in young children because of their effect on appearance, chewing ability and the development of middle third of the face, leading to undesirable dental habits (1–3).In addition, because of the close anatomic relationship, primary teeth can transmit traumatic forces to developing permanent tooth germs and may cause structural defects on permanent teeth or affect their position (3–5). Later on, development of periapical inflammation due to infected pulp of traumatized primary incisors might affect the permanent succedaneous tooth (6, 7).

When young children begin to sit up, crawl, stand up, walk, run and explore their surrounding environments, the risk of traumas increases due to their lack of motor coordination and reflexes (4, 8). Children presenting disto-occlusion or open bite are also more prone to trauma (9). According to the epidemiological studies from different countries, the frequency of primary tooth injury ranges from 4% to 30%, depending on patient selection methods, injury registration procedures, and the diagnostic criteria applied. It can also depend on that some children suffer in fact from more dental trauma than others (4, 5, 8, 10). Previous investigations on traumatic dental injuries in Turkey included both permanent and primary dentition (11–14). Kirzioglu et al. (15) analyzed traumatic dental injuries of eighty-four children (9 months to 6 year old) attending a pediatric dentistry clinic of the dental faculty in the west-Mediterranean region of Turkey, over a 2 years period.

Traumatic dental injures to the primary dentition which occurs at ages 0-3 years are very important, because of the mineralization of the permanent incisors is still not fully completed until 3 years of age. The purpose of this study was to analyze data according to gender, age, cause, number of traumatized teeth, time elapsed before treatment, type of tooth, and trauma, from the records of traumatized children (0–3 years) referred to the Ondokuz Mayıs University, Dental Faculty, Department of Pedodontics from five cities (Samsun, Ordu, Giresun, Çorum, Amasya) in middle Black Sea region of Turkey.

Methods

The study was comprised 563 patients (0–36 months), who attended the Pediatric Dentistry Department of Ondokuz Mayıs University Dental Faculty because of caries and acute problems between September 2001 and May 2006. Children's age were recorded into five groups: 0–12, 13–18, 19–24, 25–30 and 31–36 months.

Information on patient's age (at the time of trauma), gender, type, cause and location of traumatic injury, time elapsed before treatment, and number of teeth injured was recorded according to the dental records.

Clinical examination of children was performed by the same investigator. Traumatic dental injuries were recorded using classification of the World Health Organization (WHO) slightly modified by Andreasen & Andreasen which included:

- Injuries to the hard dental tissue injuries and the pulp; Crown infraction, Uncomplicated and complicated crown fracture, Complicated and uncomplicated crown-root fracture and Root fractures.
- Injuries to the periodontal tissues (luxation injuries); Concussion, Subluxation, Lateral luxation, Extrusive and Intrusive luxation and Avulsion.

Statistical methods

All data were analyzed using the Chi-square test in the statistical analysis program SPSS 11. The level of significance was set at $P \leq 0.05$.

Results

Frequency

The number of children examined according to age and gender are shown in Table 1. Girls (48.3%) and boys (51.7%) were similarly distributed in different age groups ($P > 0.05$).

The distribution of dental injuries according to age and gender are presented in Table 2. Of a total of 563 children, 98 (17.4%) suffered some type of traumatic injury, with the largest number (26.5%) in the 13–18 months followed closely by 19–25 months (24.5%) age group. Overall, the frequency of traumatic injuries was higher in boys (59.2%) compared with girls (40.8%) by approximately 1:1.45. However, when each age group was analyzed separately there was no statistical gender difference ($P > 0.05$).

Most of the children (52.6%) had more than one traumatized tooth in all age groups. The number of injured teeth ($n = 150$) was higher than the number of traumatic injuries ($n = 98$) and there were no age or gender differences ($P > 0.05$).

Table 1. Distribution of examined injured children according to gender and age

Age group (In month)	Gender		Total [*n* (%)]
	Male [*n* (%)]	Female [*n* (%)]	
6–12	52 (9.2)	46 (8.2)	98 (17.4)
13–18	56 (10.0)	49 (8.7)	105 (8.7)
19–24	61 (10.8)	51 (9.1)	112 (19.9)
25–30	64 (11.4)	59 (10.4)	123 (21.8)
31–36	58 (10.3)	67 (11.9)	125 (22.2)
Total	291 (51.7)	272 (48.3)	563 (100)

Table 2. Distribution of traumatic dental injuries according to gender and age

Age group (In month)	Gender		Total [*n* (%)]
	Male [*n* (%)]	Female [*n* (%)]	
6–12	9 (9.2)	7 (7.1)	16 (16.3)
13–18	15 (15.3)	11 (11.2)	26 (26.5)
19–24	14 (14.3)	10 (10.2)	24 (24.5)
25–30	9 (9.2)	5 (5.1)	14 (14.3)
31–36	11 (11.2)	7 (7.1)	18 (18.3)
Total	58 (59.2)	40 (40.8)	98 (100)

Trauma localization

One hundred and forty seven maxillary teeth were involved in a higher percentage of traumatic injuries (98%), without any significant differences between the right and the left side in both genders ($P > 0.05$). Only two right and one left mandibular central incisors were affected by traumatic injury.

The distribution of traumatic dental injuries regarding the tooth affected is summarized in Table 3. The most common type of traumatized teeth was the maxillary right central incisors (45.3%) followed by the maxillary left central incisors (42.7%).

Etiology

The most common etiological factor was unspecific falling accident (73.5%) and to a lesser extent on striking objects (14.2%) (Table 4) and it was not different between ages or gender ($P > 0.05$).

Length of time elapsed between traumatic dental injuries and the treatment

Most of the children (37.8%) sought treatment within 1–7 days (Fig. 1). In five children, it was not possible to determine the length of time elapsed between traumatic dental injuries and the treatment. From the 98 patients, 32 presented our clinic within the first 24 h.

Type of traumatic injury

The most common type of traumatic injury was the periodontal tissue injuries (85%) in all age groups (Table 5). Mild periodontal tissue injuries and subluxation (44.0%) were dominant of all injuries. Hard tissue injuries were less frequent (15%) than periodontal tissue injuries. In this group, the most common type of injury was the uncomplicated crown fracture (8%), followed by crown infraction (4.7%) with no differences between age and gender ($P > 0.05$).

Discussion

In the present study, the overall frequency of traumatic dental injuries in children (0–3 years) showed that one in six (17.4%) of those children who visited the clinic because of the caries and acute problems during a period of 5 years had suffered traumatic injury. The investigations concerning the prevalence of injury involving the primary dentition show differences from each other, due to the environmental variation of the study design, study area and the classification used to categorize the traumatic dental injuries. It may also depend on that some children in fact are injured more than in other studies (8, 15–18).

Besides, the parent's anxiety in seeking dental care is higher for very young children, even after small acci-

Table 3. Distribution of traumatized teeth related to age

Age group (In month)	51 [*n* (%)]	52 [*n* (%)]	61 [*n* (%)]	62 [*n* (%)]	71 [*n* (%)]	72 [*n* (%)]	81 [*n* (%)]	82 [*n* (%)]	Total [*n* (%)]
6–12	11 (7.3)	–	10 (6.7)	1 (0.7)	–	–	–	–	22 (14.7)
13–18	18 (12)	3 (2.0)	17 (11.3)	2 (1.3)	1 (0.7)	–	1 (0.7)	–	42 (28.0)
19–24	16 (10.6)	2 (1.3)	16 (10.7)	1 (0.7)	1 (0.7)	–	–	–	36 (24.0)
25–30	10 (6.7)	1 (0.7)	9 (6.0)	1 (0.7)	–	–	–	–	21 (14.0)
31–36	13 (8.7)	3 (2.0)	12 (8.0)	1 (0.7)	–	–	–	–	29 (19.3)
Total	68 (45.3)	9 (6.0)	64 (42.7)	6 (4.0)	2 (1.3)	0	1 (0.7)	0	150 (100)

Table 4. Distribution of children according to etiological factor of traumatic dental injuries and age

	Age group					
Etiology	6–12 *n* %	13–18 *n* %	19–24 *n* %	25–30 *n* %	>30 *n* %	Total
Falls	12 (12.3)	19 (19.4)	18 (18.4)	10 (10.2)	13 (13.3)	72 (73.5)
Striking objects	2 (2.0)	4 (4.1)	4 (4.1)	2 (2.0)	2 (2.0)	14 (14.2)
Traffic accident	–	–	–	–	1 (1.0)	1 (1.0)
Child abuse	–	1 (1.0)	–	1 (1.0)	0 (1.0)	2 (2.0)
Unknown	2 (2.0)	2 (2.0)	2 (2.0)	1 (1.0)	2 (2.0)	9 (9.2)
Total	16 (16.3)	26 (26.5)	24 (24.4)	14 (14.2)	18 (18.4)	98 (100)

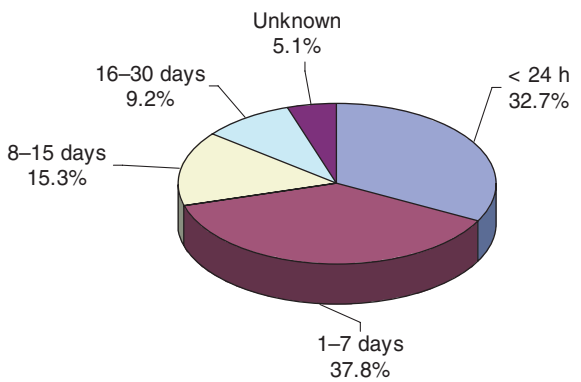

Fig. 1. Length of time elapsed between traumatic dental injuries and the treatment.

Table 5. Distribution of types of traumatized teeth injury related to age

	Age			
Type of injury	6–12 months *n*	13–24 months *n*	25–36 months *n*	Total *n* (%)
Hard tissue injuries	2	11	9	22 (15)
Crown infraction	2	3	2	7 (4.7)
Uncomplicated crown fracture	–	7	5	12 (8)
Complicated crown fracture	–	1	1	2 (1.4)
Uncomplicated crown-root fracture	–	–	1	1 (0.7)
Complicated crown-root fracture	–	–	–	–
Root fracture	–	–	–	–
Periodontal tissue injuries	20	67	41	128 (85)
Concussion	2	10	4	16 (10.7)
Subluxation	13	38	15	66 (44.0)
Lateral luxation	2	9	5	16 (10.7)
Intrusive luxation	3	7	4	14 (9.3)
Extrusive luxation	–	3	4	7 (4.7)
Exarticulation (avulsion)	–	–	9	9 (6.0)
Total	22	78	50	150 (100)

dents, which can affect the frequency of traumatic dental injuries in this age group (19, 20). In retrospective studies, some injuries may not be recorded, as they will be been registered only if signs and/or symptoms are evident at the time of examination. In prospective studies, injuries will be recorded only if the patient seeks dental care. For this reason, careful attention should be paid when comparing the investigations concerning this latter (19–24).

The present study showed that traumatic injuries to primary teeth occurred at as early as 7 months and it was highest (26.5%) in 13–18 months age group followed by 19–25 months group (24.5%). These observations are consistent with other studies (2, 10, 24, 25). However, other investigations suggested that traumatic injuries were more common in 2–4 years and 4–5 years olds in primary dentition (19, 26–28).

Present study showed that boys sustained injuries more often than girls overall as reported by others (2, 10, 12–14, 23, 26). But when considering each age group separately, there was no significant gender difference (11, 25, 29). Cunha et al. (10) showed that a higher number of boys (62.6%) sustained injuries than girls (39.9%) in 1–2 years old children. Skaare et al. (26) reported that boys outnumbered girls within all age groups, and this difference was statistically significant. On the other hand, Carvalho et al. (28) suggested that in the youngest age group, girls showed higher rates than boys.

The present study showed that the maxillary arch was involved in a higher percentage (98%) of trauma cases and the maxillary central incisors were the most affected teeth as shown by others (2, 3, 10, 15, 19–21, 23–29). This

observation probably relates to vulnerable position of the maxillary central incisors. In addition, these teeth are frequently protruded and may have inadequate lip coverage (12). Present study shows a small and insignificant difference between the right and left sides. Literature shows general agreement on this point. In contrast, Caldas et al. (30) showed significant differences between right and left sides.

Careful attention should be paid when analyzing the type of injury because it can vary according to place where the study is conducted (19). Present study shows that periodontal tissue injuries were more frequent than hard tissue injuries in primary dentition. This result agrees with earlier reports which conducted in a university pediatric dental clinic or in private pediatric practice (11, 12, 14–17, 19, 24, 26, 30). A high number of periodontal injuries and the low frequency of hard tissue injuries are most likely due to the more elastic alveolar bone and periodontal ligament in young children (20, 26). Studies, preformed in preschool children, reported that the fracture of the enamel was the most frequent injury of the primary dentition (19, 21–23, 27, 28). In addition, Cunha et al. (10) reported that the larger number of crown fractures observed in their study may be the results of the periodic visits of these patients to the baby clinics, a fact that favors the recording of these lesions, which otherwise might go undetected.

In disagreement with a study of Cunha et al. (10), present results show that the subluxations were the most frequent trauma type among the luxation injuries. While other studies indicates that concussions are the more frequent injuries, but are seldom reported due to their minor nature, with little or no bleeding, and the reluctance of parents to take children to the dentist for injuries that appear inconsequential (10, 12, 19, 20).

Present results also show that, in contrast to intrusive luxation, the extrusive luxation was seen on average 2 years later in both genders. Skaare et al. (26) in contrast, reported that, whereas boys dominated in all other diagnostic categories, girls experienced avulsion injuries significantly more often than the boys and these occurred at an older age.

Crown-root fractures are relatively rare in the primary dentition (10, 11, 25). We found no cases of crown-root fracture as shown by Şaroğlu et al. (12). There is inconsistency among the studies about the number of traumatized teeth per child. While corroborating our results, some investigators found that trauma to primary dentition involved more than one tooth with no age and gender differences (2, 25, 29). In contrast, other investigations reported that most of the children had one traumatized tooth (11, 15, 19, 27, 30).

The present study shows that parents visited a dental professional within 1–7 days (37.8%) of dental injury in most cases. In addition, similar to other studies (10, 29) we found that the percentage of patients who were attended at the dental clinic the day of the trauma was very low in contrast to (42.0%) Cardoso et al. (2). This could possibly reflect a change in parent's behavior, showing that they are giving more attention to primary teeth, or it may be because some of the traumas involved blood, which worried parents and to look for immediate help (12, 15, 26).

There is some variability between the studies and countries regarding the predominant etiological factors of dental trauma, although accidental falls appear to be the most common factor (2, 11, 13–15, 26, 29). In agreement with these studies, our results showed that the main etiological factor of the traumatic injury in the primary dentition was the accidental fall, followed by striking objects, which are explained by the developing motor coordination at the age of the study population. In agreement with Altay et al. (11), we found no significant relationship between the gender and the etiology of traumatic injuries.

In conclusion, it is suggested that an educational program about seeking dental treatment immediately after the traumatic injury and recalling regularly should be established for parents and health care workers.

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