Research Article

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Evaluation of traumatic dental injuries in patients attending the pediatric dentistry clinic: a retrospective study

Çocuk diş hekimliği kliniğine travmatik diş yaralanmaları nedeniyle başvuran hastaların değerlendirilmesi: retrospektif bir çalışma

Yıldırım Erdoğan, Arif Bolaca

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Abstract

Purpose: The purpose of this study was to evaluate the prevalence of traumatic dental injuries (TDIs), as well as to evaluate different factors associated with TDIs among children and adolescents referred over three-year period to the Pamukkale University, Faculty of Dentistry, Department of Pediatric Dentistry, Denizli.

Materials and methods: Dental trauma records of patients were reviewed regarding demographic data, affected teeth, type and etiology of TDIs, location and season of TDIs, time elapsed following TDIs and initial treatment, and treatment of TDIs.

Results: Data associated with 258 patients, 471 traumatized teeth (primary teeth:152, permanent teeth:319) were analyzed. Both the primary and permanent maxillary central incisors were the most common affected teeth by TDIs. Primary teeth showed a higher frequency of periodontal tissue injuries (75.00%) and lower frequency of dental hard tissue injuries (21.05%) compared with permanent teeth (49.84% and 58.62%, respectively). Falls were the main etiological factor of TDIs both in the primary (73.68%) and permanent (58.31%) teeth. Only 27 patients (5.49%) were referred to the clinic within one hour following TDIs.

Conclusion: Early management of TDIs is important to improve the prognosis of traumatized teeth and prevent post-traumatic complications. The low rate of early referral indicates the need for educational and preventive programs regarding TDIs among the patients, parents/legal guardians, and teachers.

Keywords: Dental trauma, epidemiology, permanent tooth, primary tooth.

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Öz

Amaç: Bu çalışmanın amacı, Denizli Pamukkale Üniversitesi Diş Hekimliği Fakültesi Çocuk Diş Hekimliği Anabilim Dalı'na üç yıllık bir süre boyunca başvuran çocuk ve ergenler arasında travmatik diş yaralanmalarının (TDY) prevalansını ve ayrıca TDY ile ilişkili farklı faktörleri değerlendirmektir.

Gereç ve yöntem: Hastaların diş travma kayıtları; demografik veriler, etkilenen dişler, TDY'lerin tipi ve etiyolojisi, TDY'lerin yeri ve mevsimi, TDY'ler ve ilk tedavi arasında geçen süre ve TDY'lerin tedavisi açısından incelenmiştir.

Bulgular: Toplam 258 hasta, 471 travmatize diş (süt dişi:152, daimi diş:319) ile ilgili veriler analiz edildi. Hem süt hem de daimi üst orta kesici dişler, TDY'lerden en sık etkilenen dişlerdi. Süt dişleri, daimi dişler ile karşılaştırıldığında (sırasıyla %49,84 ve %58,62) daha yüksek oranda periodontal doku yaralanması sıklığı (%75,00) ve daha düşük diş sert doku yaralanması sıklığı (%21,05) gösterdi. Düşmeler, hem süt (%73,68) hem de daimi (%58,31) dişlerde TDY'lerin ana etiyolojik faktörüydü. Sadece 27 hasta (%5,49) TDY sonrası bir saat içerisinde kliniğe başvurdu.

Sonuç: TDY'lerin erken müdahalesi, travmatize dişlerin prognozunu iyileştirmek ve travma sonrası komplikasyonları önlemek için önemlidir. Düşük erken başvuru oranı hastalar, ebeveynler/yasal temsilciler ve öğretmenler arasında TDY'ler ile ilgili eğitici ve önleyici programlara ihtiyaç duyulduğunu göstermektedir.

Anahtar kelimeler: Diş travması, epidemiyoloji, daimi diş, süt dişi.

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Yıldırım Erdoğan, Asst. Prof. Pamukkale University, Faculty of Dentistry, Department of Pediatric Dentistry, Denizli, Türkiye, e-mail: yldrmerdogan@hotmail.com (https://orcid.org/0000-0002-5054-1812)

Arif Bolaca, Asst. Prof. Pamukkale University, Faculty of Dentistry, Department of Pediatric Dentistry, Denizli, Türkiye, e-mail: bolacaarif@gmail.com (https://orcid.org/0000-0002-0786-1503) (Corresponding Author)

Introduction

Traumatic dental injury (TDI) is an injury type involving the hard and soft tissues surrounding the teeth, which usually develops suddenly and unexpectedly and requires immediate medical attention [1]. TDIs are common in children and young adults, representing 5% of all injuries [2]. It has been reported that one-third of all children experience TDIs in the primary dentition, one-fourth of all school-age children and one-third of all adults experience TDIs in the permanent dentition [3]. TDIs can affect both primary teeth and their successors, may lead to physical, emotional, psychological problems, and have a negative impact on the quality of life of both children and parents [4, 5]. Also TDIs are more complex problems in children and adolescents than in adults, due to immature teeth and continued facial growth [6].

The prevalence of TDIs has been reported vary between 6% and 58.6% [1]. This results might have derived from differences in study type, regional and behavioral variability, age of the study population, and differences in TDI classification [1, 7]. The course of treatment may depend on the attention, knowledge and intervention of the parents and surrounding adults, especially in severe luxation injuries and dental fractures [8, 9]. The lack of parental knowledge regarding TDIs and their consequences has highlighted the need for educating them about TDIs and the benefits of early management [10]. It is essential to know how and where TDIs occur, as well as the types and etiology of TDIs in order to inform parents and take preventive measures against dental traumas [10, 11]. For this reason, epidemiological studies are required to increase public awareness concerning TDIs and the necessary precautions [12].

Although there are several epidemiological studies on TDIs in Türkiye [7, 10-21], studies involving south-west region of Türkiye are limited [7, 15, 16, 21]. Therefore, the aim of this study was to evaluate TDIs profiles of children and adolescents who referred to Pamukkale University, Faculty of Dentistry, in Denizli, south-west region of Türkiye.

Materials and methods

This retrospective study was approved by the Ethics Committee of the Faculty of Medicine, Pamukkale University. The dental trauma records of 290 patients aged between 0-15 years old who referred Pamukkale University, Faculty of Dentistry, Department of Pediatric Dentistry with a complaint of traumatic dental injuries between June 2019 to December 2022 were evaluated. During the recording of the dental trauma forms, parents or legal guardians were informed about research study, and written consent was obtained. Among 290 dental trauma records, 32 were excluded because of incomplete data of records. A total of 471 traumatized teeth in 258 patients (female:119, male:139) were included in the study.

The data regarding gender, age, affected teeth, type of TDIs, location (home, school, street, park, hospital) and seasonal variations, etiology of TDIs (falls, impact against an object, bicycle/traffic accident, fight, intubation), time elapsed following TDIs, and treatment were obtained from patients' dental trauma records. TDIs types were classified according to Andreasen's classification system [22].

Statistical analyses were performed using SPSS 24.0 software (SPSS Inc, Chicago, IL, USA). Descriptive statistics were calculated, and chi-square test was used to compare categorical variables. The results were presented as the number of cases and frequencies (percentages). Statistical significance was set at $p<0.05$.

Results

A total of 258 patients, including 119 females (46.12%) and 139 males (53.88%) with a total of 471 traumatized teeth (primary teeth:152, permanent teeth:319) were evaluated. Patients' age ranged between 1-15 years old (mean ages, for primary teeth:3.55±1.90 and permanent teeth:10.07±2.18 years). Regarding age, the most common TDIs occured at the age of 8 years (n:35), followed by 9 (n:29), and 11 (n:27) years (Figure 1). Both the primary and permanent maxillary central incisors were the most common affected teeth by TDIs (Figure 2).

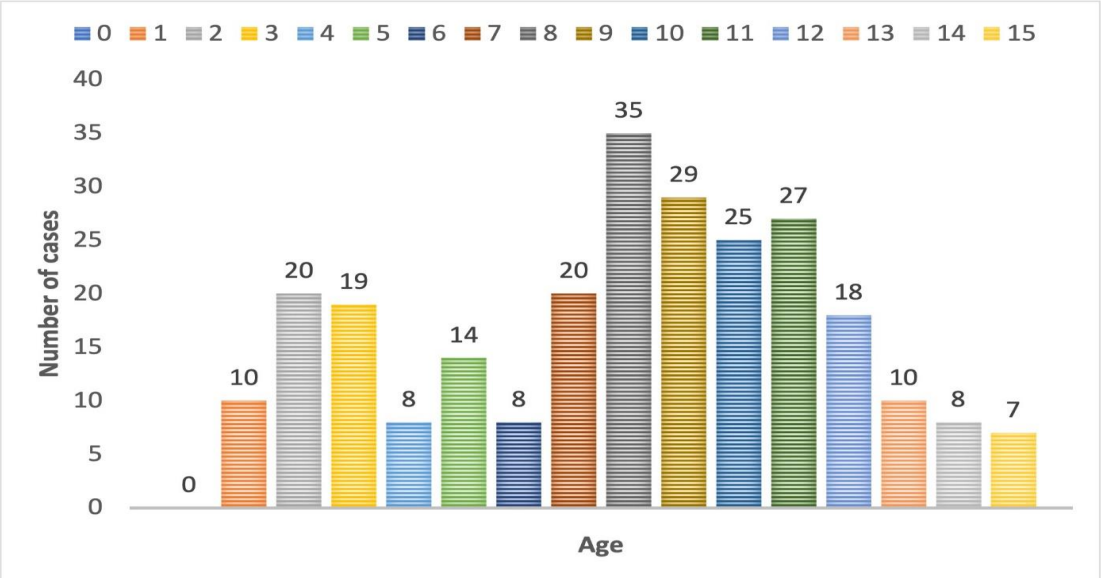

Figure 1. Distribution of TDIs by age

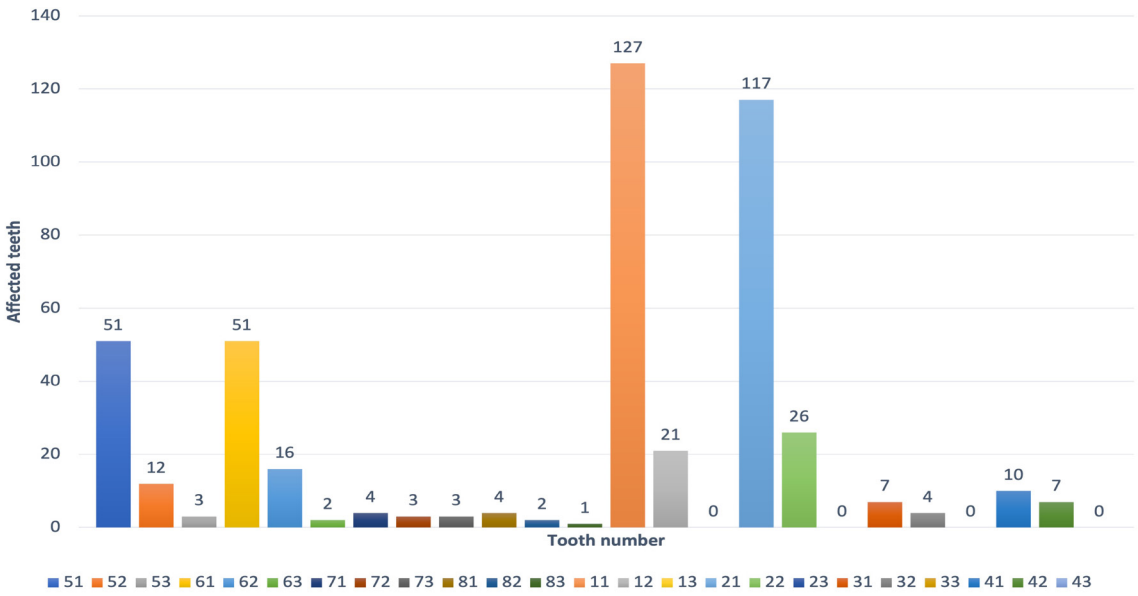

Figure 2. Distribution of TDIs by affected teeth

The distribution of the TDIs types is shown in Table 1. A statistically significant difference was observed between the primary and permanent teeth according to TDIs types. Dental hard tissue injuries occured more frequently in the permanent teeth, whereas periodontal tissue injuries were frequently observed in the primary teeth ($p<0.05$). It was observed that the most frequent TDIs type was enamel-dentin fracture in the permanent teeth (71.66%), and lateral luxations (36.84%) in the primary teeth (Table 1).

Regarding the location of TDIs, home (55.26%) was the most common location of occurrence in the primary teeth, and street (40.75%) was the most common location of occurrence in the permanent teeth. Patients' dental trauma records showed that the greatest number of TDIs were occured in the summer with regard to both primary (32.89%) and permanent (33.23%) teeth. In terms of location and seasonal variations, no statistically significant difference was observed between females and males ($p>0.05$) (Table 2).

Table 1. Distribution of the TDIs types in primary and permanent teeth

Type of TDIs	Primary teeth	Permanent teeth	Total	
	n (%)	n (%)	n (%)	*p*+
Dental hard tissue injuries	32 (21.05)	187 (58.62)	219 (46.50)	**0.0001**
Enamel infraction	-	2 (1.07)	2 (0.91)	0.999
Enamel fracture	1 (3.13)	6 (3.21)	7 (3.20)	0.999
Enamel-dentin fracture	5 (15.63)	134 (71.66)	139 (63.47)	**0.0001**
Enamel-dentin-pulp fracture	12 (37.50)	38 (20.32)	50 (22.83)	0.056
Crown-root fracture	9 (28.13)	2 (1.07)	11 (5.02)	**0.0001**
Root fracture	5 (15.63)	5 (2.67)	10 (4.57)	**0.005**
	Primary teeth	**Permanent teeth**	**Total**	
	n (%)	**n (%)**	**n (%)**	***p*+**
Periodontal tissue injuries	114 (75.00)	159 (49.84)	273 (57.96)	**0.0001**
Concussion	-	-	-	-
Subluxation	21 (18.42)	54 (33.96)	75 (27.47)	**0.007**
Lateral luxation	42 (36.84)	28 (17.61)	70 (25.64)	**0.0001**
Extrusion	6 (5.26)	9 (5.66)	15 (5.49)	0.887
Intrusion	28 (24.56)	9 (5.66)	37 (13.55)	**0.0001**
Avulsion	5 (4.39)	41 (25.79)	46 (16.85)	**0.0001**
Alveolar fracture	12 (10.53)	18 (11.32)	30 (10.99)	0.991

+, chi-square test; n, number; %, percent; TDIs, traumatic dental injuries

Table 2. Distribution of the location and season of TDIs according to gender and affected teeth

	Female	Male	Total	
Primary teeth - Location of TDIs	**n (%)**	**n (%)**	**n (%)**	***p*+**
Home	43 (58.90)	41 (51.90)	84 (55.26)	0.481
School	9 (12.33)	5 (6.33)	14 (9.21)	0.319
Street	17 (23.29)	20 (25.32)	37 (24.34)	0.919
Playground	4 (5.48)	13 (16.46)	17 (11.18)	0.059
Hospital	-	-	-	-
Primary teeth - Season of TDIs				
Winter (December/January/February)	16 (22.54)	18 (22.22)	34 (22.37)	0.963
Spring (March/April/May)	18 (25.35)	14 (17.28)	32 (21.05)	0.309
Summer (June/July/August)	21 (29.58)	29 (35.80)	50 (32.89)	0.521
Autumn (September/October/November)	16 (22.54)	20 (24.69)	36 (23.68)	0.904
Permanent teeth - Location of TDIs	**n (%)**	**n (%)**	**n (%)**	***p*+**
Home	21 (14.79)	20 (11.30)	41 (12.85)	0.449
School	46 (32.39)	68 (38.42)	114 (35.74)	0.318
Street	58 (40.85)	72 (40.68)	130 (40.75)	0.976
Playground	15 (10.56)	14 (7.91)	29 (9.09)	0.533
Hospital	2 (1.44)	3 (1.69)	5 (1.57)	0.837
Permanent teeth - Season of TDIs				
Winter (December/January/February)	24 (16.67)	23 (13.14)	47 (14.73)	0.468
Spring (March/April/May)	39 (27.08)	52 (29.71)	91 (28.53)	0.694
Summer (June/July/August)	49 (34.03)	57 (32.57)	106 (33.23)	0.875
Autumn (September/October/November)	32 (22.22)	43 (24.57)	75 (23.51)	0.761

+, chi-square test; n, number; %, percent; TDIs, traumatic dental injuries

The distribution of TDIs' etiology by gender and affected teeth is presented in Table 3. Falls were the main etiological factor of TDIs both in the primary (73.68%) and permanent (58.31%) teeth, followed by impact against an object (primary teeth:15.13%, permanent teeth:17.24%) (Table 3).

According to the time elapsed between TDIs and treatment, it was observed that the percentages of patients who referred to the clinic following TDIs within 1 hour was (5.49%), 1-6 hours (25.81%), 6-24 hours (33.33%), 1-7 days (23.37%), 1 week-6 months (8.74%), 6-12 months (1.63%), >1 year (1.63%). The distribution of the TDIs type with regard to the time elapsed between TDIs and treatment is presented in Table 4. Regarding the treatment of TDIs, the most common treatment choices were follow-up (46.05%) and extraction (39.47%) for primary teeth, and composite restorations (39.59%) for the permanent teeth (Table 5).

Table 3. Distribution of TDIs' etiology by gender and affected teeth

Etiology	**Female**	**Male**	**Total**	
Primary teeth	**n (%)**	**n (%)**	**n (%)**	***p*+**
Falls	47 (64.38)	65 (82.28)	112 (73.68)	**0.02**
Impact against an object	13 (17.81)	10 (12.66)	23 (15.13)	0.511
Bicycle accident	-	4 (5.06)	4 (2.63)	0.121
Traffic accident	13 (17.81)	-	13 (8.55)	**0.0001**
Fight	-	-	-	-
Intubation	-	-	-	-
Total	73 (100)	79 (100)	152 (100)	
Permanent teeth	**n (%)**	**n (%)**	**n (%)**	***p*+**
Falls	90 (62.94)	96 (54.55)	186 (58.31)	0.162
Impact against an object	24 (16.78)	31 (17.61)	55 (17.24)	0.963
Bicycle accident	21 (14.69)	31 (17.61)	52 (16.30)	0.581
Traffic accident	8 (5.59)	14 (7.95)	22 (6.90)	0.545
Fight	-	3 (1.70)	3 (0.94)	0.256
Intubation	-	1 (0.57)	1 (0.31)	0.999
Total	143 (100)	176 (100)	319 (100)	

+, chi-square test; n, number; %, percent; TDIs, traumatic dental injuries

Table 4. Time elapsed following TDIs and initial treatment

Type of TDIs	1 h n (%)	1-6 h n (%)	6-24 h n (%)	1-7 d n (%)	1 w-6 m n (%)	6-12 m n (%)	>1 y n (%)	Total n (%)
Enamel infraction	-	1 (0.79)	-	-	-	1 (12.50)	-	2 (0.41)
Enamel fracture	-	2 (1.57)	1 (0.61)	2 (1.74)	2 (4.65)	-	-	7 (1.42)
Enamel-dentin fracture	9 (33.33)	36 (28.35)	30 (18.29)	26 (22.61)	24 (55.81)	6 (75.00)	8 (100.00)	139 (28.25)
Enamel-dentin-pulp fracture	4 (14.81)	12 (9.45)	14 (8.54)	15 (13.04)	5 (11.63)	-	-	50 (10.16)
Crown-root fracture	-	2 (1.57)	4 (2.44)	4 (3.48)	1 (2.33)	-	-	11 (2.24)
Root fracture	1 (3.70)	2 (1.57)	3 (1.83)	3 (2.61)	-	1 (12.50)	-	10 (2.03)
Concussion	-	-	-	-	-	-	-	-
Subluxation	-	20 (15.75)	35 (21.34)	16 (13.91)	4 (9.30)	-	-	75 (15.24)
Lateral luxation	7 (25.93)	18 (14.17)	28 (17.07)	16 (13.91)	1 (2.33)	-	-	70 (14.23)
Extrusion	2 (7.41)	5 (3.94)	2 (1.22)	6 (5.22)	-	-	-	15 (3.05)
Intrusion	2 (7.41)	7 (5.51)	23 (14.02)	5 (4.35)	-	-	-	37 (7.52)
Avulsion	2 (7.41)	14 (11.02)	12 (7.32)	12 (10.43)	6 (13.95)	-	-	46 (9.35)
Alveolar fracture	-	8 (6.30)	12 (7.32)	10 (8.70)	-	-	-	30 (6.10)
Total	27 (5.49)	127 (25.81)	164 (33.33)	115 (23.37)	43 (8.74)	8 (1.63)	8 (1.63)	492 (100.00)

d: day, h: hour, m: month, n: number, %: percent, TDIs: traumatic dental injuries, w: week, y: year

Table 5. Treatment of TDIs according to type of teeth

Treatment	Primary teeth n (%)	Permanent teeth n (%)
Follow-up	70 (46.05)	31 (9.72)
Composite restoration	1 (0.66)	126 (39.50)
Reattachment of fractured tooth fragment	-	9 (2.82)
Cvek pulpotomy/Pulpotomy	3 (1.97)	21 (6.58)
Pulpectomy	6 (3.95)	24 (7.52)
Semi-rigid splint	4 (2.63)	42 (13.17)
Reposition+semi-rigid splint	8 (5.26)	34 (10.66)
Reimplantation+semi-rigid splint	-	20 (6.27)
Pediatric prosthesis	-	12 (3.76)
Extraction	60 (39.47)	-
Total	152 (100.00)	319 (100.00)

n, number; %, percent; TDIs, traumatic dental injuries

Discussion

During infancy, childhood and adolescence, children are susceptible to experiencing TDIs. TDIs represent a significant public health concern because of its high prevelance among children and adolescents, the negative psychosocial effects, and the costs of treatment [23]. Epidemiological studies provide useful information with regard to prevalence and related factors of TDIs. Therefore, retrospective studies are important to evaluate the prevalence and the different etiologies associated with TDIs, as well as development of preventive measures to reduce of TDIs [15, 16].

Results of this study showed that TDIs were more common in males (53.88%) than in females (46.12%). This result was in agreement with the previous studies [10, 11, 13-21, 24]. This can be explained by the fact that males being more energetic and participating more aggressive games and contact sports than females [11, 16, 17, 20].

Ritwik et al. [25] reported that most of TDIs occured in primary teeth at 2-4 years of age and in permanent teeth at 8-10 years of age. In the present study, the most affected age group was 2-3 year olds for primary teeth, and 8-9 year olds for permanent teeth (Figure 1). This results were in agreement with the previous studies [7, 13, 25, 26], and this can be related to the fact that children aged 2-3 years have insufficient motor coordination; hence, they are more prone to TDIs [18, 27], and in the 7-10 years old group, school-age children actively participate in social and sport activities which increase the risk of TDIs [27, 28]. The maxillary central incisors are more susceptible to TDIs due to their prominent position in the dental arch [13, 17, 26]. In agreement with the previous studies [7, 10-13, 16, 17, 26], the present study showed that the maxillary central incisors were the most common affected teeth by TDIs in both primary and permanent dentition.

Regarding the type of TDIs, there were significant differences among primary and permanent teeth. Dental hard tissue injury occured more frequently in the permanent teeth, whereas periodontal tissue injury was more frequently observed in the primary teeth (Table 1). It was found that enamel-dentin fractures were the most frequent type of TDIs in the permanent teeth, and lateral luxations were the most frequent type of TDIs in the primary teeth, which were in agreement with the previous studies conducted by Karabulut et al. [14], Eyupoglu et al. [29] and Cully et al. [30]. This may be associated with the resilience of supporting structure and short roots of the primary teeth [27, 31, 32]. Furthermore, the permanent teeth are firmly attached to the alveolar bone and thus more prone to fracture [33].

There were no statistically significant differences between females and males with regard to the distribution of the location and season of TDIs in both primary and permanent dentition. TDIs most frequently occured at home (55.26%) in the primary teeth, and at street (40.75%) in the permanent teeth. Similar to the previous studies [10-13, 19], TDIs most commonly occured during the summer season for both primary and permanent teeth. This result may be related to increased outside activities throughout the summer months. Children's physical activities can lead to increased TDIs when they play outside. Additionally, parents may find difficult to control their children's behaviour when they are allowed to run freely in large parks and/or playgrounds [10-12]. Consistent with the result of the previous studies [7, 10, 11, 13, 15-18, 29], the main etiological factor of TDIs in both primary and permanent teeth was falls (Table 3).

The time elapsed between TDIs and treatment has a significant impact on treatment choice and the prognosis of the injured teeth [34]. Unfortunately, in the present study, only 5.49% of the patients referred to the clinic within 1 h, 25.81% within 1-6 h, and 33.33% within 6-24 h following TDIs (Table 4). The low rate of early referral indicates that in our society, parents and/or guardians underestimate the importance of TDIs due to lack of knowledge about early management and possible complications, and they tend to delay in initial referral until acute symptoms of inflammation and esthetic problems appear [11, 16, 34]. Therefore, it is of great importance in order to increase awareness of parents/guardians about TDIs to improve the prognosis of traumatized teeth and prevent post-traumatic complications.

Similar to previous studies [10, 13, 29, 33], present study found that the most common treatment choice were follow-up (46.05%) and extraction (39.47%) in primary teeth, and composite restoration (39.50%) in permanent teeth (Table 5). Trauma records also showed that only twenty of forty-one avulsed permanent teeth were reimplanted because late referral of patients and lost of avulsed teeth. The significance of immediate reimplantation and necessity of storage media following avulsion injuries are often not well recognized not only by parents/guardians and teachers, but also by general dentists and physicians. Therefore, the public should be educated about the possibility of reimplanting the avulsed permanent teeth, and the preferred storage media, which are fresh milk or Hanks' Balanced Salt Solution (if available) [35].

Limitations of this study included the small sample size and relatively short study period. However, this is the first conducted study which evaluated the epidemiologic data related to TDIs in Denizli, south-west region of Türkiye. Based on the results of present study, further studies on long-term survival and complications of TDIs could be conducted.

In conclusion, the results of this study are in agreement with previous studies with regard to the distribution of factors associated with TDIs. The low rate of early referral to the clinic following TDIs highlights the need for education to the patients, parents/guardians, teachers about preventive program and the importance of emergency treatment against TDIs.

Conflict of interest: No conflict of interest was declared by the authors.

References

1. Lam R. Epidemiology and outcomes of traumatic dental injuries: a review of the literature. Aust Dent J 2016;61:4-20. https://doi.org/10.1111/adj.12395
2. Levin L, Day PF, Hicks L, et al. International association of dental traumatology guidelines for the management of traumatic dental injuries: general introduction. Dent Traumatol 2020;36:309-313. https://doi.org/10.1111/edt.12574
3. Glendor U. Epidemiology of traumatic dental injuries–a 12 year review of the literature. Dent Traumatol 2008;24:603-611. https://doi.org/10.1111/j.1600-9657.2008.00696.x
4. Berger TD, Kenny DJ, Casas M, Barrett EJ, Lawrence HP. Effects of severe dentoalveolar trauma on the quality-of-life of children and parents. Dental Traumatol 2009;25:462-469. https://doi.org/10.1111/j.1600-9657.2009.00809.x
5. Zaror C, Martínez Zapata MJ, Abarca J, et al. Impact of traumatic dental injuries on quality of life in preschoolers and school children: a systematic review and meta-analysis. Community Dent Oral Epidemiol 2018;46:88-101. https://doi.org/10.1111/cdoe.12333
6. Bourguignon C, Cohenca N, Lauridsen E, et al. International association of dental traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. Dent Traumatol 2020;36:314-330. https://doi.org/10.1111/edt.12578
7. Akyıldız MB, Doğusal G, Daloğlu M, Ulu Güzel G, Keleş S, Şaroğlu Sönmez I. Traumatic dental injuries of children in Aydın, Turkey: a retrospective study. Meandros Med Dent J 2017;18:189-193. https://doi.org/0000-0001-9714-7321
8. Flores MT, Andersson L, Andreasen JO, et al. Guidelines for the management of traumatic dental injuries. I. Fractures and luxations of permanent teeth. Dent Traumatol 2007;23:66-71. https://doi.org/10.1111/j.1600-9657.2007.00592.x
9. Andreasen JO. Challenges in clinical dental traumatology. Endod Dent Traumatol 1985;1:45-55. https://doi.org/10.1111/j.1600-9657.1985.tb00560.x
10. Gökcek M, Durmuşlar S, Köktürk F. Retrospective analysis of traumatic dental injuries in the Western Black Sea region of Turkey. Niger J Clin Pract 2020;23:84-90. https://doi.org/10.4103/njcp.njcp_230_19
11. Atabek D, Alaçam A, Aydintuğ I, Konakoğlu G. A retrospective study of traumatic dental injures. Dent Traumatol 2014;30:154-161. https://doi.org/10.1111/edt.12057
12. Elbay M, Elbay UŞ, Uğurluel C, Kaya C. Bir üniversite hastanesindeki pedodonti kliniğine başvuran 156 dental travma olgusunun değerlendirilmesi: retrospektif araştırma. Selcuk Dent J 2016;3:48-55. https://doi.org/10.15311/1441.272586
13. Gümüş H, Öztürk G, Kürem B. Profiles of traumatic dental injuries among children aged 0-15 years in Cappadocia, Turkey: a retrospective cohort study. Dent Traumatol 2021;37:419-429. https://doi.org/10.1111/edt.12648
14. Karabulut B, Doğan S, Özen B. Travmatik dental yaralanmaların oluş nedeni ve yeri açısından retrospektif analizi. Turkiye Klinikleri J Dental Sci 2021;27:233-241. https://doi.org/10.5336/dentalsci.2020-74860
15. Kırzıoglu Z, Oz E. Changes in the aetiological factors of dental trauma in children over time: an 18-year retrospective study. Dent Traumatol 2019;35:259-267. https://doi.org/10.1111/edt.12478

16. Zuhal K, Semra OE, Hüseyin K. Traumatic injuries of the permanent incisors in children in southern Turkey: a retrospective study. Dent Traumatol 2005;21:20-25. https://doi.org/10.1111/j.1600-9657.2004.00265.x
17. Toprak ME, Tuna EB, Seymen F, Gencay K. Traumatic dental injuries in Turkish children, Istanbul. Dent Traumatol 2014;30:280-284. https://doi.org/10.1111/edt.12092
18. Erdoğan Y, Çiftçi ZZ, Erken Güngör Ö, Karayilmaz H, Kirzioğlu Z. Evaluation the effects of home accidents to the traumatic dental injuries of the primary teeth. PJMHS 2021;15:3240-3243. https://doi.org/10.53350/pjmhs2115113240
19. Altun C, Ozen B, Esenlik E, et al. Traumatic injuries to permanent teeth in Turkish children, Ankara. Dent Traumatol 2009;25:309-313. https://doi.org/10.1111/j.1600-9657.2009.00778.x
20. Sarı ME, Ozmen B, Koyuturk A, Tokay U, Kasap P, Guler D. A retrospective evaluation of traumatic dental injury in children who applied to the dental hospital, Turkey. Niger J Clin Pract 2014;17:644-648. https://doi.org/10.4103/1119-3077.141438
21. Oz E, Kırzıoglu Z. Evaluation of dental luxation traumas in Turkish Western Mediterranean population between 1999 and 2017: a retrospective study. J Dent Indones 2020;27:67-76. https://doi.org/10.14693/jdi.v27i2.1134
22. Andersson L, Petti S, Day P, Kenny K, Glendor U, Andreasen JO. Classification, etiology and epidemiology. In: Andreasen JO, Andreasen FM, Andersson L ed. Textbook and color atlas of traumatic injuries to the teeth. 5th ed. New Jersey: Wiley Blackwell, 2019;252-282.
23. Cosme Silva L, Fernandes LA, Rosselli ER, Poi WR, Martins NDS, de Lima DC. Tooth injuries: knowledge of parents of public school students from the city of Alfenas, Minas Gerais, Brazil. Dent Traumatol 2018;34:93-99. https://doi.org/10.1111/edt.12381
24. Alhaddad B, Rózsa NK, Tarján I. Dental trauma in children in Budapest. A retrospective study. Eur J Paediat Dent 2019;20:111-115. https://doi.org/10.23804/ejpd.2019.20.02.05
25. Ritwik P, Massey C, Hagan J. Epidemiology and outcomes of dental trauma cases from an urban pediatric emergency department. Dent Traumatol 2015;31:97-102. https://doi.org/10.1111/edt.12148
26. de Paula Barros JN, De Araújo TAA, Soares TRC. Profiles of trauma in primary and permanent teeth of children and adolescents. J Clin Pediatr Dent 2019;43:5-10. https://doi.org/10.17796/1053-4625-43.1.2
27. Kurt A, Guduk OF, Erbek SM, Baygin O, Tuzuner T. Retrospective evaluation of patients admitted to Karadeniz Technical University Pediatric Dentistry clinic due to trauma. Eur Oral Res 2019;53:74-79. https://doi.org/10.26650/eor.20195236
28. Kizilci E, Demir P. Evaluation of epidemiology and etiology of dental injuries observed in children. Medicine Science 2015;4:2650-2663. https://doi.org/10.5455/medscience.2015.04.8260
29. Eyuboglu O, Yilmaz Y, Zehir C, Sahin H. A 6-year investigation into types of dental trauma treated in a paediatric dentistry clinic in Eastern Anatolia region, Turkey. Dent Traumatol 2009;25:110-114. https://doi.org/10.1111/j.1600-9657.2008.00668.x
30. Cully JL, Zeeb K, Sahay RD, Gosnell E, Morris H, Thikkurissy S. Prevalence of primary teeth injuries presenting to a pediatric emergency department. Pediatr Dent 2019;41:136-139.
31. Kirzioglu Z, Karayilmaz H, Ozay Erturk MS, Koseler Sentut T. Epidemiology of traumatised primary teeth in the west-Mediterranean region of Turkey. Int Dent J 2005;55:329-333. https://doi.org/10.1111/j.1875-595x.2005.tb00332.x
32. Mahmoodi B, Rahimi Nedjat R, Weusmann J, Azaripour A, Walter C, Willershausen B. Traumatic dental injuries in a university hospital: a four-year retrospective study. BMC Oral Health 2015;15:139(e1-7). https://doi.org/10.1186/s12903-015-0124-5
33. Sandalli N, Cildir S, Guler N. Clinical investigation of traumatic injuries in Yeditepe University, Turkey during the last 3 years. Dent Traumatol 2005;21:188-194. https://doi.org/10.1111/j.1600-9657.2005.00309.x
34. Zhang Y, Zhu Y, Su W, Zhou Z, Jin Y, Wang X. A retrospective study of pediatric traumatic dental injuries in Xi'an, China. Dent Traumatol 2014;30:211-215. https://doi.org/10.1111/edt.12075
35. Karayilmaz H, Kirzioglu Z, Erken Gungor O. Aetiology, treatment patterns and long-term outcomes of tooth avulsion in children and adolescents. Pak J Med Sci 2013;29:464-468. https://doi.org/10.12669/pjms.292.3283

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Authors' contributions to the article

A.B. and Y.E. constructed the main idea and hypothesis of the study. A.B. and Y.E. developed the theory and arranged/edited the material and method section. A.B. and Y.E. have done the evaluation of the data in the Results section. Discussion section of the article written by A.B. and Y.E. reviewed, corrected and approved. In addition, all authors discussed the entire study and approved the final version.