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ORIGINAL ARTICLE

Prevalence and Risk Factors Associated with Dental Trauma in Schoolchildren in Birjand, Iran

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Abstract

Introduction: Teeth, especially anterior teeth, play a vital role in beauty, nutrition, chewing, social communication, and evolution in children. A total of 5% of the damage to the teeth follows the trauma and damage to different areas of the body due to severe collisions and accidents. This study investigated the dental trauma prevalence and its risk factors in 7-12-year-old children in Birjand, Iran, in 2021.

Methods: This cross-sectional study was conducted in Birjand on 7-12-year-old schoolchildren in 2021. The student's examination was performed in the classroom during the morning shift with mirrors, probes, and headlights. The fracture type, the injured tooth number, the amount of the overjet, the overbite, and the lip cover were recorded in the relevant checklist. Data were analysed using SPSS 26 and the Chi-square and Fisher's exact test at the significance level of α=0.05.

Results: The 699 children with an average age of 9.33±1.69 years participated in this study. The prevalence of dental trauma was 6.3% in the entire sample. Dental fracture damage was the most common type of trauma (39 (92.9%)), and the types of fractures and the trauma area were not significant in terms of gender (P=0.5), location place of residence (P=0.8), and age range (P=0.06). The mean scores of overjet and overbite in children were 2.18±1.60 and 2.68±1.44, respectively. The prevalence of traumatic injuries in children with normal overjet was less than in others (487 (94.6%)). Maxillary central teeth were mostly affected by trauma, and enamel fractures were the most dental trauma in children.

Conclusion: The present study, in line with other similar studies, showed that the most important factors affecting the tooth were lip coverage and overjet, and the maxillary central teeth were more exposed to trauma than other teeth.

Keywords: Children, Dental trauma, Risk factors

Introduction

Nowadays, accidents and disasters, with annually 5 million deaths, are the main causes of mortality and disability worldwide (1). According to the World Health Organization, accidents causing mortality will reach 8.4 million in the near future (2). Injuries are the primary cause of death in children, and they result in approximately 950,000 non-fatal hospitalizations worldwide each year (3). Children, due to weakness in risk diagnosis and behavioral and physical characteristics, are more prone to injuries. Moreover, an injured child is at risk of experiencing ongoing limitations in their physical abilities and may experience chronic pain and psychological issues, such as post-traumatic stress disorder (4). Their injuries cause harm to both their family and community networks (5). The United Nations Children's Fund reported that children's accidents and injuries have decreased by 50% in developed

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countries; however, these numbers are increasing.

Accidental or intentional traumatic dental injuries (TDIs) can happen at any age. Due to the high costs of treatment, potential for prevention, and long-term esthetic and/or functional effects on oral health, dental trauma in infancy and children is particularly relevant (6). TDIs in children affect their appearance, speech, and the position of teeth, and for this reason, it has become one of the most serious public health problems worldwide. TDI prevalences have been documented to be 2.4% to 58.6% in more than 30 countries. This large disparity in prevalence is due to the features of the research population, particularly the age range and the diagnostic criteria for TDI (7). Previous studies showed that one out of every hundred children suffers from TDIs, and common places where children get injured are home, school, street, and gym. Children are more likely to develop TDI if they exhibit male gender, obesity, socioeconomic conditions, behavioral variables, and occlusal traits, such as accentuated overjet and incompetent lip coverage (8). TDI could have an impact on all the structural components of the tooth, such as enamel, dentin, and pulp, as well as the supporting structures, such as the periodontal tissue and alveolar bone (9).

Knowledge of the prevalence and risk factors of dental injuries helps to design preventive strategies and identify treatment needs in a given population. Also, by comparing the results with other studies conducted around the world, it is possible to understand the causes of their occurrence. This study investigated the prevalence and risk factors of dental trauma in 7-12-year-old children in Birjand, Iran, in 2021.

Methods

This cross-sectional study was conducted in 2021 among students aged 7 to 12 years old in Birjand, Iran. The cluster sampling method was utilized for sampling while considering the design effect as 2. The minimum sample size was determined to be 512 children. This survey's methodology has been extensively reported elsewhere with detailed information (10). The inclusion criteria were the consent of the children's parents and school administrators to participate in the study and the ages between 7 and 12 years. On the other hand, the exclusion criterion was the lack of parental consent. Using cluster sample selection, the city was divided into two districts; from each one, two public schools for girls and two schools for boys were randomly selected. For randomization, we utilized a table of random numbers along with a list obtained from general education to select a simple random sample. In each of the mentioned schools, 6 classes were chosen, and 12 children were randomly selected from each class. Examination of the students was done by the researcher (a final year dental student) in the classroom in the morning shift of schools using a mirror, probe, and headlights.

At the start of the study, parents filled out an informed consent form. Children's demographic information, including age, gender, and educational level, was collected through interviews. The clinical examination was performed by the researcher in the classroom using a mirror, probe, and headlights. During the examination, the type of fracture, the number of damaged teeth, the amount of overjet, overbite, and lip coverage were recorded in the relevant checklist. The measurement of overjet was taken by determining the distance between the incisal edges of the central incisors on the maxillary labial and the central incisors on the mandibular labium, which was considered increased when it exceeded 3 mm. Lip competence was assessed while the lips were resting, and when they could close without noticeable strain, even for subjects who kept them apart during the exam, it was classified as present. The incompetent score was given to the evident strain on lip closure. To check overjet, children put their upper and lower teeth together, and using a calibrated periodontal probe, the distance between the incisal edge of the upper anterior teeth and the labial surface of the lower anterior teeth was measured.

To assess the overbite, children put their upper and lower teeth together, and then, parallel to the incisal edge of the upper teeth, the labial surface of the lower incisal teeth was marked with a pencil. Then, the size between the incisal edge of the lower front teeth and the marked line was considered overbite. The following criteria were used to examine the maxillary incisors: 0: no trauma; 1: discoloration; 2: fracture involving enamel; 3: fracture involving enamel and dentine; 4: fracture involving enamel, dentine, and pulp; 5: missing due to trauma; 6: acid-etch composite restoration; 7: permanent replacement including crown, denture, bridge Pontic; 8: temporary restoration; 9: the assessment was not possible due to the tooth being either missing or severely broken due to dental caries. The degree of overpressure was measured using firm plastic rulers.

The collected data were analysed by SPSS software version 26. Data were described with mean, standard deviation (SD), numbers, and percent. Analytical analyses were performed by Chi-square or Fisher's exact test at the significance level of 0.05.

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This study was approved by the Ethics Committee of Birjand University of Medical Sciences by IR.BUMS.REC.1400.037 code.

Results

In total, 669 children participated in the study with the mean age 9.33±1.69 years. The majority of participants were female (368 (55%)). The prevalence of dental trauma in the studied population was 6.3%. The frequency of trauma site and type of fracture in the studied children are listed in Table 1. The majority of children had trauma at the right maxillary central incisor (35.7%), right maxillary lateral incisor (14.7%), left maxillary central incisor (33.3%), and the fracture in other teeth was less than 5%.

Tables 2 and 3 tabulate the frequency distribution of the types of fractures and areas of trauma in participants according to demographic variables. There was no significant relationship between the types of fracture and the area of trauma in children in terms of age and place of residence (P>0.5).

Playing/running was the most common cause of dental trauma (19 (50%)), and the majority of dental trauma occurred in the summer (34.2%). Most cases of dental trauma (47.4%) occurred at home.

A total of 47 children (7%) had no measurable overjet and overbite. The mean scores of overjet and overbite in children were 2.18±1.60 and 2.68±1.44, respectively. The incidence of dental trauma was not significantly influenced by overbite or adequate lip coverage (P>0.05), while students with normal overjet experienced dental trauma significantly less than other groups (P=0.02) (Table 5).

Table 1: Frequency distribution of types of fractures of trauma in participants according to demographic variables

Variable		Number	Percent
Types of traumas	No Trauma	627	93.7
	Discoloration	2	0.3
	Tooth enamel fracture	21	3.1
	Fracture of enamel and dentin	15	2.2
	Fractures involving tooth enamel, dentin, and pulp	3	0.4
	Acid-etch composite restoration	1	0.1

Table 2: Frequency distribution of trauma fracture types in participants by demographic variables

Variable		No Trauma	Tooth enamel fracture	Fracture of enamel and dentin	Fractures involving tooth enamel, dentin, and pulp	Other types of traumas	P-value
Gender	Male	278 (92.4%)	13 (4.3%)	8 (2.2%)	1 (0.3%)	1 (0.3%)	0.5
	Female	349 (94.8%)	8 (2.2%)	7 (2.3%)	2 (0.7%)	2 (0.5%)	
Age	7-9	354 (95.9%)	7 (1.9%)	5 (1.4%)	2 (0.5%)	1 (0.3%)	0.06
	10-12	273 (91%)	14 (4.7%)	10 (3.3%)	1 (0.3%)	2 (0.7%)	
place of residence	District 1	234 (93.6%)	13 (3.6%)	8 (2.2%)	1 (0.3%)	1 (0.3%)	0.8
	District 2	293 (93.9%)	8 (2.6%)	7 (2.2%)	2 (0.6%)	2 (0.6%)	

Table 3: Frequency distribution of trauma areas in participants by demographic variables

Variable				P-value
Gender	Male	Maxillary central teeth	17 (73/.9%)	0.5
		Other teeth	7 (36.8%)	
	Female	Maxillary central teeth	12 (63.2%)	
		Other teeth	6 (26.2%)	
Age	7-9	Maxillary central teeth	11 (73.3%)	0.7
		Other teeth	4 (26.7%)	
	10-12	Maxillary central teeth	18 (66.7%)	
		Other teeth	9 (33.3%)	

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Table 4: Frequency distribution of fractures in the examined children according to overjet, adequate lip coverage, and overbite

Variable		With trauma, n (%)	Without trauma, n (%)	P-value
Overjet	<1 mm	3 (11.5)	23 (88.5)	0.02
	1-3 mm	28 (5.4)	487 (94.6)	
	4-5 mm	7 (13.5)	45 (86.5)	
	>6 mm	4 (13.8)	25 (86.2)	
Overbite	Less or equal to zero	1 (4.8)	20 (95.2)	0.6
	Between 1-2 mm (ideal)	22 (7.9)	257 (92.1)	
	More or equal to 3 mm	19 (5.9)	303 (94.1)	
Lip coverage	Yes	39 (6.2)	588 (93.8)	0.7
	No	3 (7.1)	39 (92.9)	

Discussion

This study's objective is to investigate the prevalence and risks associated with dental trauma among school children aged 7 to 12 in Birjand. TDIs are the result of several factors that might lead to tooth loss if not properly treated. In this study, the prevalence of traumatic injuries was calculated as 6.3% which confirms the results of similar previous studies. The frequency of TDIs in studies by Kaur et al. (11), Oldin et al. (12), Bendo et al. (13), Baldava et al. (14), Gupta et al. (15), Rouhani et al. (18), Eslamipour et al. (1), Rana et al. (16), Rueda et al. (2) were 14.5%, 37.6%, 17.1%, 14.9%, 13.8%, 22.9%, 23.8%, 11.3%, and 18.2%, respectively, which was more than that in our study. In the present study, there was no significant difference between the types of fractures and the area of trauma in terms of gender, while it was more prevalent in boys. Gupta et al. (15) reported that the history of trauma in males was almost twice that of females. Similarly, Rueda et al. (2) observed that males were more affected by trauma.

This higher percentage of TDIs in boys can be attributed to the fact that boys are more likely than girls to participate in leisure activities or sports of a more aggressive nature with a risk of accidents. In the present study, maxillary central teeth had the highest trauma in both genders and were higher in 10-12-year-old children (66.7%). Prasad et al. (17) showed that the maxillary central tooth was the most commonly affected in 671 school children (12.8%). Tumen et al. (18), Batra et al. (19), and Eslamipour et al. (1) reported that the frequency rates of trauma in maxillary central teeth were 29.3%, 72.3%, and 69.5%, respectively.

In the present study, although dental trauma was higher in children with adequate lip coverage, there was no significant relationship between overbite and adequate lip coverage and the incidence of dental trauma. Gupta et al. showed that children with adequate lip coverage (68.5%) had more TDIs than those with insufficient lip coverage (31.5%). In contrast, Batra et al. (19), Francisco et al. (20), Gupta et al. (21), Ramesh et al. (14), and Frujeri et al. (7) found that 13.6%, 14.8%, 43.2%, 7.3%, and 6.5% of children with a history of trauma had adequate lip coverage, respectively, whereas 23.1%, 30.9%, 56.8%, 41.0%, and 14.9% children with a history of trauma had insufficient lip coverage, respectively.

In the present study, children with overjet 4 and 5 mm (13.5%) and overjet 6 mm and more (13.8%) had more dental damage. Gupta et al. (21) found the most TDIs in children with an overjet of 3-5 mm (84.2%), followed by children with an overjet of more than 5 mm (15.8%). In the study by Gupta et al., the majority of children with TDIs (52.3%) had incisor overjet of 3-5 mm. Moreover, 11.5% and 47.7% of children with a history of trauma had more than 5 mm overjet. Rouhani et al. reported that children with an overjet greater than 3 mm had a higher likelihood of experiencing dental trauma (22).

In the current study, playing/running was the most frequent cause of dental trauma (50%) in the studied children, and most cases of dental trauma occurred in the summer (34.2%). Rana et al. (16), Gupta et al. (21), and Rouhani et al. (23) showed that 68.6%, 51.7%, and 42.9% of trauma cases were falling on the playground, respectively. Patel et al. (24), and Bhayya et al. (25) reported that 43.8%, and 40% of trauma cases were due to playing, respectively. However, falling was the most common cause of TDIs in studies by Prabhu et al. (26), Malikaew et al. (27), Baldava et al. (14), and Gupta et al. (21), with 58%, 42.2%, 49.9%, and 42% of cases, respectively.

In the present study, the most cases of dental trauma occurred in children's homes at 47.4% of cases, followed by the schools and streets with 15.8%. House was the most common place for TDIs in the studies conducted by Bendo et al. (41.8%) (13), Kaur et al. (35.4%) (11), Rouhani et al. (47.4%) (22), and Patel et al. (43.8%) (24). However, in the studies by Gupta et al. (21) and Batra et al. (19),

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57.3% and 38.7% of children were traumatized at school, respectively, which was not consistent with the present study. In head traumas, a fracture is more likely to occur in the face and teeth, which are the most exposed parts of the body. Permanent anterior teeth are frequently affected (11).

TDIs are commonly seen in 92% of patients presenting with oral trauma. Most studies have reported the prevalence of TDIs in the 0-6-year-old group ranging from 9.4% to 40% (28). The development of traumatic dental injuries into a public health issue has been impacted by the high levels of traffic accidents, violence, and greater participation of children in sports (3). Various conditions, such as malformed teeth, premature tooth loss, and death of the pulp are related to abscess formation. According to most studies, the maxillary central teeth are particularly susceptible to TDI, and predisposing factors include increased overjet, protrusion of maxillary central teeth, epilepsy, open bite, and insufficient lip coverage (29). Due to their vulnerable position, mandibular teeth are less likely to be impacted than maxillary teeth (30). To introduce appropriate preventive measures for traumatic injuries, the relationship between their prevalence and the risk factors involved should be better understood, which this study aimed to explore.

Our study had some limitations. To examine individuals and social factors that increase the risk of damage to anterior teeth, larger studies with larger sample sizes and more variables are necessary. To reduce the prevalence and cost of treatment of TDIs, relying on such information is necessary for the development and implementation of effective preventive strategies.

Conclusions

The study found that traumatic injuries were 6.3% prevalent, which was not significant in terms of gender, place of residence, and age of the children. Children with normal overjet had less trauma. The most frequent dental trauma in children was tooth enamel fracture, as trauma to the maxillary central teeth was more prevalent. The present study, in line with other similar studies, reported that the most important effective factors in dental trauma were the lip coverage and overjet of central maxillary teeth.

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Conflict of Interest

The authors declare that they have no competing interests.

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