

Research Paper: The Evaluation of The Etiology and Risk Factors Associated with Anterior Teeth Crown Fracture in North of Iran



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ABSTRACT

Introduction: Considering the importance of anterior teeth in chewing, speaking and esthetics, as well as the high prevalence of crown fracture among various traumatic injuries to the teeth, this study aimed to evaluate the etiology and risk factors associated with crown fractures of anterior teeth in 7-12 years old children.

Materials and Methods: This descriptive cross-sectional study was performed on a total of 742 children. Gender, current age, the age at which the dental trauma occurred, the type of the dental trauma, the etiology, the location, overjet, overbite and lip coverage were recorded for each child. The Chi-Square and Mann-Whitney tests were used to analyze the data with SPSS 16 software. The level of significance was set at 0.05.

Results: Among 742 children, 84 children (11.3%) had crown fractures of permanent anterior teeth. Of the 84 children, 54 were boys (64.3%) and 30 were girls (35.7%), showing a ratio of boys to girls 1.8 to 1. The most common type of crown injury was enamel fracture (67.8%). Most injuries occurred at home (46.4%) and in summer (41.7%). The most common cause of anterior teeth crown fracture was falling (45.2%). Increased overjet and overbite and lip incompetency were found as predisposing factors for anterior teeth crown fracture.

Conclusion: Considering the importance of the anterior teeth, preventive educational programs should be instituted directing parents and school teachers to inform them about the dental trauma and its complications.

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Introduction

Dental traumas as a serious dental public health problem are prevalent at childhood.(1) Studies reported that the prevalence of dental trauma is 15-23% in the USA, 23-35% in Europe, 4-35% in Asia and 15-21% in Africa.(2,3) Dental trauma can happen at home, at school, or outdoors.(4) The occurrence is more common in boys compared to girls, affecting maxillary central incisors more frequently followed by maxillary lateral incisors and canines.(5,6)

Dental traumas may affect children's mastication, pronunciation and speaking; lead to life-lasting physical, aesthetic and psychological problems; and cause stress for both children and the parents.(7,8) Dental complications such as hypoplasia, discoloration, delayed tooth eruption and malocclusion may occur as the result of dental trauma.(9,8) Dental traumas are the most frequent at the age ranges of 2-3 years old for starting autonomously moves and 7-10 years old for doing sports and activities.(1,9)

As the prevalence of dental trauma is high among children and is accounted as an emergency, this study aimed to assess the etiology and risk factors of dental trauma associated with anterior teeth in 7-12 years old children.

Materials & Methods

In this descriptive cross-sectional study, 742 children aged from 7 to 12 years old were included. Parents were given a complete explanation of the aims of the current study and signed written consent. Demographic data such as gender, current age, the age at which the dental trauma occurred and the following information were recorded. The type of the dental trauma was categorized following Ellis et al. According to their category, class (CI) 1 crown fracture was the fracture of enamel, CI 2 crown fracture was the fracture of enamel and dentin, CI 3 and CI 4 crown fracture were described as the fracture of enamel and dentin with and without pulp exposure respectively. The etiology of the dental trauma was recorded as falling, riding a bicycle, doing an exercise, fighting, getting hit with a for

eign body and others. The location was reported as at home, school, street, playground and others. Overjet was measured as increased, normal and decreased. The overbite was recorded as deep bite, normal and open bite. Lip coverage was categorized as adequate and inadequate.

To analysis the data SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) was used and Chi-square, Mann-Whitny and Kruskal Wallis tests were applied at the significance level of 0.05.

Results

In this study, 742 children were included. 50% (371) of children were girls and 50% (371) were boys.

The average age of the children was 9.81 ± 1.68 . The mean age of girls was 9.73 ± 1.76 and of boys was 9.89 ± 1.65 . The occurrence of dental trauma was the most at the age of 9 and was the least at the age of 7. (Table 1)

Table 1: The age of dental trauma

Occurrence of dental trauma	Age
7 years old	4.8% (4)
8 years old	16.7% (14)
9 years old	34.5% (29)
10 years old	20.2% (17)
11 years old	14.3% (12)
12 years old	9.5% (8)

11.3% (84) of patients had crown fractures in their anterior teeth and 88.7% (658) had no crown fractures. (Table 2)

Table 2: The frequency of crown fracture in percent (number)

	Girls	Boys	Total
Crown fracture	4.04% (30)	7.27% (54)	11.3% (84)
No crown fracture	45.96% (341)	42.73% (317)	88.7% (658)
Total	50% (371)	50% (371)	100% (742)

The assessment of crown fracture classification showed that, the most prevalent crown fracture was CI 1 (67.8%) and the least prevalent was CI 4 (1.2%). (Table 3)

Table 3: The type of crown fracture

Crown fracture	Percent (Number)
Cl 1: Enamel fracture	67.8% (57)
Cl 2: Enamel and dentin fracture/ without pulp involvement	27.4% (23)
Cl 3: Enamel and dentin fracture/ with pulp involvement	3.6% (3)
Cl 4: Crown loss	1.2% (1)

The etiology of dental trauma was evaluated in this study. The reason for dental trauma in 45.2% (38) of children was falling, followed by getting hit with a foreign body (22.6%) and doing exercise (13.1%). (Table 4)

Table 4: The etiology of dental trauma

	Boys	Girls	Total
Falling down	40.7% (22)	53.3% (16)	45.2% (38)
Car accident	3.7% (2)	3.3% (1)	3.6% (3)
Riding a bicycle	11.1% (6)	3.3% (1)	8.3% (7)
Doing an exercise	13% (7)	13.3% (4)	13.1% (11)
Fighting	7.4% (4)	0% (0)	4.8% (4)
Getting hit with a foreign body	22.2% (12)	23.3% (7)	22.6% (19)
Others	1.9% (1)	3.3% (1)	2.4% (2)

The accident which caused dental trauma mostly occurred at home. (46.4%) (Table 5)

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	Boys	Girls	Total
Home	46.3% (25)	46.7% (14)	46.4% (39)
School	16.7% (9)	26.7% (8)	20.2% (17)
Street	27.8% (15)	20% (6)	25% (21)
Playground (?)	7.4% (4)	3.3% (1)	6% (5)
Others	1.9% (1)	3.3% (1)	2.4% (2)

The analysis of the data revealed that the prevalence of dental trauma was significantly different in boys and girls. (P 0.005) So that, dental trauma was more common in boys compared to girls.

According to the results, children with increased overjet experienced dental trauma more frequently compared to children with normal and decreased overjet. (P 0/16) So it can be stated that increased overjet had a significant relation with the occurrence of dental trauma. Cl 1 crown fracture was significantly more common in children with increased overjet. (P 0.016) (Table 7)

Also, a significant relation was found between overbite and crown fracture. So that, more children with deep bites experienced crown fracture compared to children with normal and open bite. (P 0.002) Cl 1 crown fracture was significantly more common in deep bite children. (P 0.020) (Table 7)

Results showed that children with inadequate lip coverage were reported to experience crown fracture more than children with adequate lip coverage. (P 0.013) Cl 1 and Cl 2 crown fracture was significantly more common in children with inadequate lip coverage. (P 0.041) (Table 7)

Discussion

The prevalence of dental trauma is high among children and is accounted as an emergency requiring quick and correct actions to reach the best possible prognosis and treatment. The current study was performed to assess the prevalence of dental trauma in children and determine its relation with age and gender.

11.3% of children in the current study had a history of anterior teeth crown fracture. In the study of Rouhani et al. the prevalence was 22.9%, in the study of Vejdani et al. was 15.2% and in the study of Dua et al. was 14.5%. Govindarajan et al. and Patel et al. reported the prevalence to be 10.13% and 8.79% respectively.7,(10–12)

In this study, the most frequent crown fracture was the fracture of enamel. (67.8%) In agreement, Cl 1 fracture was stated to be the most frequent crown fracture with the prevalence

Table 6: Crown fracture based on overjet, overbite and lip coverage

		Without crown fracture			With crown fracture		
		Boys	Girls	Total	Boys	Girls	Total
Overjet	Normal	88.3% (280)	88% (300)	88.1% (580)	79.6% (43)	76.7% (23)	78.6% (66)
	Increased	10.7% (34)	11.1% (38)	10.9% (72)	20.4% (11)	76.7% (23)	78.6% (66)
	Decreased	0.9% (3)	0.9% (3)	0.9% (6)	0% (0)	0% (0)	0% (0)
Overbite	Normal	80.1% (254)	80.6% (275)	80.4% (529)	68.5% (37)	56.7% (17)	64.3% (54)
	Deep bite	16.7% (53)	16.1% (55)	16.4% (108)	27.8% (15)	40% (12)	32.1% (27)
	Open bite	3.2% (10)	3.2% (11)	3.2% (21)	3.7% (2)	3.3% (1)	3.6% (3)
Lip Coverage	Adequate	89.9% (285)	90% (307%)	90% (592)	81.5% (44)	80% (24)	81% (68)
	Inadequate	10.1% (32)	10% (34)	10% (66)	18.5% (10)	20% (6)	19% (16)

Table 7: Type of crown fracture based on overjet, overbite and lip coverage.

		Cl 1: Enamel fracture	Cl 2: Enamel and dentin fracture/ without pulp involvement	Cl 3: Enamel and dentin fracture/ with pulp involvement	Cl 4: Crown loss
Overjet	Normal	74.2% (49)	24.2% (16)	1.5% (1)	0% (0)
	Increased	44.4% (8)	38.9% (7)	11.1% (2)	5.6% (1)
	Decreased	0% (0)	0% (0)	0% (0)	0% (0)
Overbite	Normal	77.8% (42)	20.4% (11)	1.9% (1)	0% (0)
	Deep bite	51.9% (14)	40.7% (11)	3.7% (1)	3.7% (1)
	Open bite	33.3% (1)	40.7% (11)	3.7% (1)	3.7% (1)
Lip Coverage	Adequate	73.5% (50)	23.5% (16)	1.5% (1)	1.5% (1)
	Inadequate	43.8% (7)	43.8% (7)	12.5% (2)	0% (0)

of 80.3% in the study of Vejdani et al., 76.5% in the study of Patel et al., 65% in the study of Al-Bajjali et al., 51% in the study of Sharma et al. and 50% in the study of Dua et al. in contrary, Gupta et al. claimed that Cl 3 crown fracture (fracture of enamel and dentin without the pulp exposure) was observed more frequently in the children. (43.1%) 7,12–16

Results of this study revealed a significant relationship between gender and the prevalence of dental trauma. The prevalence of crown fracture was more in boys compared to girls which are in agreement with and Vejdani et al., and was unlike the results of Patel et al.(7,13) The prevalence of dental trauma was more at the age of 9 according to this study which was in accordance with the studies of Ghandehari et al. and Vejdani et al. who claimed that dental trauma was more frequent at the age

of 9.1 and 10 years old, respectively, as the children are more active at this age.(17,18)

The most common etiology of dental trauma was falling in this study. (45.2%) Gupta et al., Paiva et al., Ghandehar et al., Patel et al. and Vejdani et al. also found that the most frequent reason for dental trauma was falling with the prevalence of 54.5%, 49.7%, 44.5%, 41.2% and 48.3% respectively.(7,13,16,18,19) This study, Vejdani et al. and Paiva et al. claimed that dental trauma mostly occurred at home. (46.4%, 49% and 48.2% respectively)(7,19)

The results showed that increased overjet, deep bite and inadequate lip coverage had significant relations with the occurrence of dental trauma. Also, it was found that the Cl 1 crown fracture was more common in children with increased overjet, deep bite and inadequate lip coverage. Rouhani et al. also found a signifi)

Important relation between crown dental trauma and inadequate lip coverage. Vejdani et al. reported that increased overjet had significantly increased the prevalence of dental trauma. Govindarajan et al. confirmed the findings of the above-mentioned studies. Vejdani et al. reported that children with deep bite, open bite or inadequate lip coverage are more prone to dental traumas. (7,10,11

Conclusion

In this study the most frequent crown fracture was the fracture of enamel; mostly occurring in boys; mainly happening at home, at the age of 9 years old as a reason of falling. Increased overjet, deep bite and inadequate lip coverage had significantly increased the occurrence of dental trauma.

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