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FACTORS AFFECTING PREVALENCE OF DIFFERENT TYPES OF PERMANENT ANTERIOR TEETH FRACTURE IN SOME EGYPTIAN CHILDREN

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ABSTRACT

Objectives: Assessment of the factors affecting prevalence of different types of permanent anterior teeth fracture in a group of Egyptian children. Methods: Two hundred and ninety-six patient having five hundred and eighteen traumatized upper permanent anterior teeth were examined at the outpatient clinic of Pediatric Dentistry and Dental Public Health Department, Faculty of Oral and Dental medicine, Cairo University. Clinical and radiographic examination were done for all cases. Type of injury, amount of incisor display and interlabial gap were recorded for every child. Overjet and overbite were measured on study casts using digital Boley gauge. Results: No statistically significant association was found between age at time of trauma, gender, etiology of fracture and the type of

anterior teeth fracture. No statistically significant association was found between overjet value, overbite value, amount of incisor display, interlabial gap and type of anterior teeth fracture. Correlation was found between the tooth affected and type of fracture. Conclusion: Most of traumatic dental injuries are unintentional injuries, where falls, collisions with hard objects, and road traffic accidents are the most dominating causes. The type and severity of tooth fracture are not directly affected by certain factor, and the only factor that might contribute to the severity of tooth fracture is the intensity of the impact force directed to the tooth and the tooth position in the oral cavity.

KEYWORDS: Egyptian children, anterior teeth fracture, overjet, overbite, incisor display, Interlabial gap.

INTRODUCTION

Traumatic dental injuries are common health problem in child and adolescent population. Most of the traumatic dental injuries involve the upper anterior teeth. It may lead to eating restrictions, changes in physical appearance, speech defects and psychological impacts which affects the child's quality of life. Moreover, late complications may be presented as pulp necrosis, pulp canal obliteration, root resorption and loss of marginal alveolar bone (Saroglu and Sonmez, 2002). The etiology of dental trauma varies by age, socio-economic status, cultural and ethnic origins and education level of children. In the present violent world the children are exposed to trauma of different types and origins especially nowadays with the social and political circumstances children are subjected to new approaches of violence



wish risen the prevalence of tooth fracture (Abou El Yazeedet al., 2015).Traumatic injuries can be prevented, so there are needs to have a better understanding about the risk factors associated with trauma. Among other factors increased incisaloverjet, lip incompetence, open bite have been reported as the most important predisposing factors to traumatic dental injuries (Bendgudeet al.,2012 and Cortes et al., 2001).

SUBJECTS AND METHODS

Type of study:

This is a cross-sectional observational.

Subjects:

Two hundred and ninety-six patient having five hundred and eighteen traumatized upper permanent anterior teeth were examined from the outpatient clinic of Pediatric Dentistry Department, Faculty of Oral and Dental Medicine, Cairo University during the period from September 2013 to January 2015. The purpose and the procedures were explained to the parents and a written consent was taken from them before examination.

Inclusion criteria:

- + Patient age between 8-14 years old.
- + Patient having fractured or avulsed upper permanent anterior tooth.
- + Apparently medically free from any serious illness that might increase patient risk for dental trauma.

Exclusion criteria:

- + Patient who previously had root canal treatment or composite filling at site of trauma.
- + Patient with carious lesions enamel hypoplasia or hypocalcification at site of trauma.
- + Patient with luxation injury except avulsion.
- + Patient with partially erupted upper central incisors.

Patient personal data, medical and dental history was recorded for every child in his examination chart(Fig.1):

Clinical and Radiographic Examination:

- + Children were seated on dental chair and clinical examination was done in presence of the dental unit light source using sterilized dental mirrors, probes and tweezers.
- + Periapical radiographs were taken for all cases to check for the presence of root fracture at the site of trauma using bisecting angle technique(Figs. 2 &3).
- + Type of injury, amount of incisor display and interlabial gap were recorded for every child.

Type of injury:

Type of injury was recorded according to the modification of World Health Organization's Classification.

Lip coverage:

It was recorded (adequate or not) with facial musculature in apparent rest position through measuring amount of incisor display and interlabial gap in millimeters using metallic ruler.

Amount of incisor display:

- + If the lips cover the upper incisors in rest position and the amount of incisor display ranges from 0-3 mm then the lip coverage is considered adequate.
- + If the lips failed to cover the upper incisors and majority of the crown height is exposed "more than 3 mm" then lip coverage was recorded as inadequate.

Interlabial gap:

A more than 4 mm interlabial gap is outside the normal range and is considered as lip incompetence(Graber, 2005).

Study models:

- + Upper and lower impressions were taken in size 1 or 2 metallic dentulous trays using fast setting alginate, impressions were poured to have dental casts that helped in measuring overjet and overbite using digital boley gauge.
- + Wax bite was taken using pink wax to help in placing dental cast in centric occlusion (Fig.4).
- + Overjet and overbite were measured on orthodontic study casts using modified digital boley gauge (Figs.5&6).
- + In case of patients having both of their incisal edge broken, a composite build-up was done on their cast to restore the fractured part and allow measuring of overjet and overbite.
- + In case of avulsed tooth, overjet and overbite of neighbouring tooth is measured.
- + The normal value of overjet ranges between 1-3 mm(Proffit, 2000).
- + Normal overbite ranges from 1-3 mm(Proffit, 2000).
- + All patients received treatment needed for their fractured teeth in thepostgraduate clinic of Pediatric Dentistry Department, Faculty of Oraland Dental medicine, Cairo University.
- + Patients having abnormal overjet or overbite were referred to theOrthodontic Department, Faculty of oral and dental medicine, Cairo University after treatment of their fractured teeth.

Dental trauma examination sheet

Code No: _____ Date of examination: _____

1. Personal history:

- Name: _____
- Birth day: / /
- Age: _____
- Age at time of trauma: _____
- Gender: _____
- Address: _____
- Telephone number: _____

2. Medical history:

- Past medical history: _____
- Present medical conditions: _____

3. Past dental history: _____

4. Chief complain:

A. History of the dental trauma:

- Etiology: _____
- Location: _____
- Time elapsed since injury: _____

B. Clinical Examination:

E. Extra-oral Examination:

- Lip coverage:
 - i. Amount of incisal display at rest measured in millimeters:
 - Adequate "2-3 mm"
 - Inadequate "greater than 3 mm"
 - ii. Interlabial gap: _____

"It is the distance in millimeters between upper and lower lips in normal value ranges from 2-4 mm. A more than 4 mm interlabial gap is outside the normal range and is considered lip incompetence."

II. Intra-oral Examination:

- Soft tissue: _____
- Hard tissue:
 - i. Affected tooth: _____
 - ii. Type of injury: _____

"According to the currently accepted system which is based on the World Health Organization's Classification that is modified by Andreasen."

Enamel fracture	Coronary fracture without pulp exposure
Enamel fracture	Coronary fracture with pulp exposure
Enamel - dentin fracture	Root fracture
Enamel - dentine Pulp fracture	Avulsion

In case of crown or crown-root fracture, the coronal tooth fragments is:

- a) Attached
- b) Detached

Fig. 1: Dental trauma examination sheet.



Fig. 2: Clinical and radiographic picture of enamel and dentin fracture of upper right central incisor.



Fig. 3: Clinical and radiographic picture of crown root fracture with pulp exposure of upper left central incisor.



Fig. 4: Study cast and wax bite.

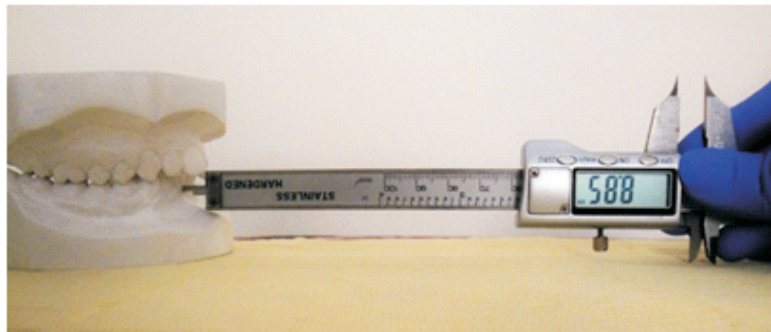


Fig. 5: Measuring Overjet using modified Boley gauge.

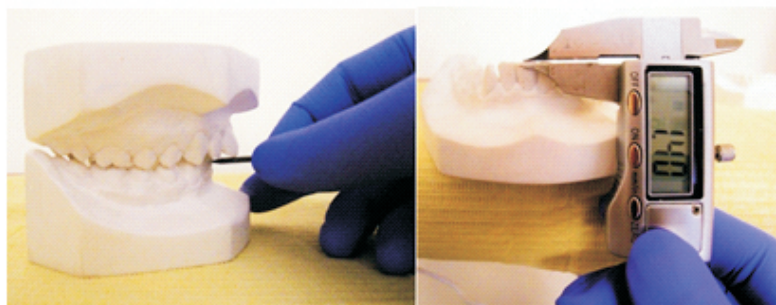


Fig. 6: Measuring overbite by drawing a mark on the cast then using the modified Boley gauge.

RESULTS

- 61.77% of the cases were in children with age range between 8 to 10 years old, 29.34% were in those of age 11 to 12 years, 6.56% were in those of age 13 to 14 years and only 2.33% were in those of age 7 years or less.

- The proportion of teeth affected in males was higher than that in females with 63.13% against 36.87%.
- 68.73% of injuries were due to falling, while 20.85% were due to collision with a hard object and 10.42% were due to road traffic accidents.
- The highest type of injury was the enamel dentin fracture with a percentage of 40.35% of the cases, enamel dentin pulp fracture with a percentage of 35.9%, then enamel fracture (18.73%), crown root fracture with pulp exposure (2.12%), avulsion (1.93%) and enamel infraction (0.97%).
- It was found that patients with two or more injured teeth have a higher proportion compared to those who have a single injured tooth with a percentage of 61.82% vs 38.18%.
- Among the 183 patients who have multiple injured teeth, the proportion of patients with different types of fractures was higher than those with the same type of fracture with a percentage of 72.13% versus 27.87%. This difference was found to be statistically significant (P value > 0.05).

Table 1: Correlation between age at time of trauma (years) and type of injury.

Variable	Age at trauma (years) n (%)			
	7 yrs or less	8-10	11-12	13-14
Enamel infraction	0 (0)	4 (1.25)	1 (0.66)	0 (0)
Enamel fracture	1 (8.33)	57 (17.87)	35 (23.03)	4 (11.43)
Enamel dentin fracture	9 (75)	130 (40.75)	52 (34.21)	18 (51.43)
Enamel dentin pulp fracture	2 (16.67)	115 (36.05)	58 (38.16)	11 (31.43)
Crown root fracture with pulp exposure	0 (0)	8 (2.51)	3 (1.97)	0 (0)
Avulsion	0 (0)	5 (1.57)	3 (1.97)	2 (5.71)
Total	12 (100)	319 (100)	152 (100)	35 (100)
Pearson's Chi-squared test				
Chi2*	p-value**		Interpretation	
16.4863	0.5586		No correlation	

*Statistical significance at p-value 0 . 0 5

Although there is a difference in proportions between different age categories regarding different types of fractures, this difference is not statistically significant (p-value= 0.5586).

Correlation between number of affected teeth in both genders and different types of injuries:

Among males, 38.8% of the teeth have enamel-dentin fracture. Among females, 42.9% of the teeth have enamel-dentin fracture. Although there is a difference in proportions between number of affected teeth in males and females regarding different types of fractures, this difference is not statistically significant (p-value=0.3008).

Table 2: Correlation between Etiology of dental trauma and types of injuries.

Variable	Etiology n (%)		
	Falling	Collision with hard object	Road traffic accident
Enamel infraction	5 (1.4)	0 (0)	0 (0)
Enamel fracture	59 (16.57)	28 (25.93)	10 (18.52)
Enamel dentin fracture	149 (41.85)	36 (33.33)	24 (44.44)
Enamel dentin pulp fracture	130 (36.52)	37 (34.26)	19 (35.19)
Crown root fracture with pulp exposure	6 (1.69)	5 (4.63)	0 (0)
Avulsion	7 (1.97)	2 (1.85)	1 (1.85)
Total	356 (100)	108 (100)	54 (100)
Pearson's Chi-squared test			
Chi ² *	p-value**	Interpretation	
18.545	0.4203	No correlation	

*Statistical significance at p-value 0 . 0 5

Table 3: Correlation between overjet categories and different types of injuries.

Variable	Overjet (X) mm n (%)			
	-3.5 = X < 1	1 = X = 3	3 < X = 7	7 < X = 12.5
Enamel infraction	0 (0)	1 (1.05)	4 (1.13)	0 (0)
Enamel fracture	2 (20)	17 (17.89)	69 (19.49)	9 (15.25)
Enamel dentin fracture	4 (40)	30 (31.58)	154 (43.5)	21 (35.59)
Enamel dentin pulp fracture	3 (30)	42 (44.21)	118 (33.33)	23 (38.98)
Crown root fracture with pulp exposure	1 (10)	2 (2.11)	5 (1.41)	3 (5.08)
Avulsion	0 (0)	3 (3.16)	4 (1.13)	3 (5.08)
Total	10 (100)	95 (100)	354 (100)	59 (100)
Pearson's Chi-squared test				
Chi ² *	p-value**	Interpretation		
18.7258	0.4089	No correlation		

*Statistical significance at p-value 0 . 0 5 .

Table 4: Correlation between overbite categories and different types of injuries.

Variable	Overbite (X) mm n (%)			
	5 = X < 1	1 = X = 3	3 < X = 5.5	5.5 < X = 8
Enamel infraction	0 (0)	1 (1.05)	3 (1.10)	1 (0.88)
Enamel fracture	2 (20)	17 (17.89)	52 (19.12)	22 (19.47)
Enamel dentin fracture	4 (40)	30 (31.58)	120 (44.12)	43 (38.05)
Enamel dentin pulp fracture	3 (30)	42 (44.21)	91 (33.46)	40 (35.40)
Crown root fracture with pulp exposure	1 (10)	2 (2.11)	4 (1.47)	2 (1.77)
Avulsion	0 (0)	3 (3.16)	2 (0.74)	5 (4.42)
Total	10 (100)	95 (100)	272 (100)	113 (100)
Pearson's Chi-squared test				
Chi ² *	p-value**		Interpretation	
19.6709	0.3516		No correlation	

*Statistical significance at p-value 0 . 0 5 .

Correlation between categories of Incisor display at rest and different types of injuries:

Among the adequate incisor display at rest category, 40.1% of the cases have enamel-dentin fracture. Among the inadequate incisor display at rest category, 40.9% of the cases have enamel-dentin fracture. Although there is a slight difference in proportions between adequate and inadequate categories of the incisor display regarding different types of fractures, this difference is not statistically significant (p-value= 0.9881).

Correlation between categories of Interlabial gap and different types of injuries:

Among the normal interlabial gap category, 43.63% of the cases have enamel-dentin fracture. Among the abnormal category, 40.68% of the cases have enamel-dentin fracture. Although there is a slight difference in proportions between normal and abnormal categories of the interlabial gap and the different types of fractures, this difference is not statistically significant (p-value= 0.9866).

As shown in Table (5), 42.24% of the injured upper left central incisors (UL1) have enamel-dentin-pulp fracture, while 46.9% of the injured upper right central incisors (UR1) have enamel-dentin fracture. And 48.28% of the injured upper left lateral incisor (UL2) and 64.52% of the injured upper right lateral incisor (UR2) both have enamel fracture. The results of the Chi-squared test show that there is a correlation between the type of tooth affected and the type of fracture (p-value < 0.0001); i.e. the difference in proportions between different affected teeth and different types of fractures is statistically significant. This means that the upper central incisors are affected with more severe types of injuries compared to the upper lateral incisors.

Table 5:Correlation between tooth affected and different types of injuries.

Variable	Tooth affected n (%)			
	UL1	UL2	UR1	UR2
Enamel infraction	2 (0.86)	1 (3.45)	2 (0.88)	0 (0)
Enamel fracture	33 (14.22)	14 (48.28)	30 (13.27)	20 (64.52)
Enamel dentin fracture	88 (37.93)	7 (24.14)	106 (46.9)	8 (25.81)
Enamel dentin pulp fracture	98 (42.24)	5 (17.24)	80 (35.4)	3 (9.68)
Crown root fracture with pulp exposure	6 (2.59)	0 (0)	5 (2.21)	0 (0)
Avulsion	5 (2.16)	2 (6.9)	3 (1.33)	0 (0)
Total	232 (100)	29 (100)	226 (100)	31 (100)
Pearson's Chi-squared test				
Chi ² *	p-value**		Interpretation	
81.4494	0.0000		Correlation exists	

*Statistical significance at p-value 0 . 0 5 .

DISCUSSION

The present study aimed to assess the factors affecting prevalence of different types of upper permanent anterior teeth fracture in a group of Egyptian children, as the exploration of this topic and the knowledge of these factors might contribute to prevention of dental trauma through health care policies. In the present study the age of 8-10 years was found to be the peak age of occurrence of traumatic dental injuries with 61.77% of the total number of fractured teeth. Skaare and Jacobsen(2003) found that children at 8-10 years of age were the most often injured. While Gupta et al.(2002) found that the age group of 11-14 years shows higher involvement in traumatic dental injuries. This difference in the peak age of occurrence of traumatic dental injuries might be due to different societies and areas where the study was conducted. From results of the present study it was found that the proportion of fractured teeth in males was higher than the number of fractured teeth in females with 63.13% in males against 36.87% in females. These findings are comparable to the increased ratio of traumatic dental injuries in males found in studies conducted by Gupta et al.(2002),Schatz et al.(2013) and Soareset al.(2014). On the contrary another study done by Rocha and Cardoso(2001) indicate an increasing trend of dental trauma among girls, because of their increasing participation in sports or activities formerly practiced by boys only. In the present study the primary causative factor in the occurrence of permanent anterior teeth fractures was falling with a percentage of 68.73% from total number of cases, while 20.85% were due to collision with hard objects and 10.42% were due to road traffic accidents. These findings are in agreement with Canakciet al.(2003), Dame-Teixeira et al.(2013) and Rouhaniet al.(2015) as they found that the leading cause of dental trauma was falls. Among dental injuries, the enamel dentin tooth fracture was the most frequent type of injury in this study with a percentage of 40.35% of the cases, the enamel dentin pulp fracture comes next with a percentage of 35.9%, then enamel fracture 18.73%, crown root fracture with pulp exposure 2.12%, avulsion 1.93% and enamel infraction (0.97%). These finding regarding the most frequent type of injury comes in agreement with the results of most studies as Stockwell(1988),Oulis and Berdouses(1996)and Bausset al.(2008) who states that the uncomplicated crown fracture without pulp exposure was the most common type of injury to the permanent dentition. On the contrary, Yehia(2009) in a study done in Egypt found that the most common type of injury was enamel

fracture, but this difference might be due to the different nature of both studies as his study was a survey done on Egyptian school children thus he might discover many unnoticed simple dental traumatic injuries that parents might not care about to seek for professional dental treatment. In the present study the most common affected tooth was the upper left central incisor with a percentage of 44.8% from total number of affected teeth, followed by the upper right central incisor 43.63%, and then comes the upper right and upper left lateral incisors with almost equal proportions 5.97% and 5.6% respectively. These findings comes in agreement with what was reported by Bastoneet al.(2000) in a review of literature concerning epidemiology of dental trauma, the maxillary central incisors were the most frequently injured teeth in all studies for both the primary and secondary dentitions and the second most frequently injured teeth were maxillary lateral incisors in all studies except one study that was done by Forsberg and Tedestam(1990) who found that the mandibular central incisors were the second most frequently injured teeth after the maxillary central incisors. In the present study cases with an overjet more than 3 mm and less than or equal to 7 mm represented (68.34%). Regarding the overbite cases had an overbite more than 3 mm and less than or equal to 5.5 represented (53.28%). The amount of incisor display at rest was adequate in 68.34% of cases while the interlabial gap was normal in 65.83% of cases. In the present study, the correlations that assessed the relationship between age at time of trauma and the type of anterior teeth fracture found that age does not affect the type of fracture although a difference in proportions was found between different age categories but this difference was not statistically significant. This is in contrast to Gupta et al.(2002) who found significant relationship between age and type of fracture, where severity of fracture increased with age. From the present study, the correlation between the number of affected teeth in both genders regarding different types of fractures showed a difference in proportions between males and females but this difference was not statistically significant, this result is consistent with that reported by Soriano et al.(2007) in his study that aimed to investigate the risk factors related to traumatic dental injuries in Brazilian school children, and Ahlawat et al.(2013) who reported that gender doesn't affect the occurrence of type of fracture in a study done on 10-17 years old school children in India, but it is diverging from previous study done by Gupta et al.(2002). In the present study, the correlation between the etiology of dental trauma across different types of anterior teeth fractures showed a difference in proportions between falls, collisions with hard objects, and road traffic accidents regarding different types of anterior teeth fractures but this difference was not statistically significant. In the present study, the correlations that assessed the relationship between overjet and the type of anterior teeth fracture found that overjet does not affect the type of fracture although a difference in proportions was found between different overjet categories but this difference was not statistically significant. These results comes in agreement with Gupta et al.(2002) and Schatz et al.(2013) who concluded that overjet did not have any effect on the type of trauma experienced by children in a Swiss child population. On the contrary Jarvinen(1978) reported that the severity of injuries was greater in children with extreme overjet exceeding 6 mm, and explained this by the lack of occlusal contact between upper and lower anterior teeth and the location of this contact in the cervical part of the upper teeth. Forsberg & Tedestam(1993) described a greater average overjet in patients with more severe injuries as root injuries or avulsions than in cases of simple enamel fractures. Schnyder & Eicke(1999) also showed a clear increase in the percentage of more severe injuries as overjet increased. While Al- khateebet al.(2005) in a study done in North Jordanian school children stated that the severity of coronal fracture increased significantly with the increase in overjet.

Comparing the results of different studies concerning overjet was difficult as there was no fixed value to increased overjet, each study has chosen different cut-off point of the increased overjet value, and what makes it more complicated is that some studies combined overjet with other factors in the statistical analysis as sex, age, and amount of lip coverage. It is worthy to mention that the overjet size recorded in the present study measures only the horizontal distance between upper and lower incisors, and it was found that the overjet value might not give an accurate indication about the proclination of maxillary central incisors as small value of overjet might be as a result of compensatory mandibular incisors proclination resulting in false

interpretation of maxillary incisors protrusion. Further investigations might be needed in the future to assess maxillary incisor protrusion through cephalometric radiographs and correlate it with type of anterior teeth fracture to uncover whether the inclination of maxillary incisor teeth rather than the overjet value contributes to the occurrence of traumatic dental injuries. In the present study no correlation was found between different overbite categories and types of fracture, which means that overbite value did not affect the type of fracture. On the contrary, Ahlawat et al. (2013) reported that overbite greater than 3 mm affected the type of fracture among a group of Indian school children. This difference between results might be due to different grouping of overbite categories, as Indian children were divided into two groups only, first group includes children with open bite and normal overbite below 3 mm, while the second group includes children having increased overbite above 3 mm. In the present study, no correlations were found between the amount of incisor display at rest, interlabial gap and types of anterior teeth fractures which means that the amount of lip coverage to anterior teeth does not affect the type of fracture, this result comes in agreement with study done by Ahlawat et al. (2013) who reported that inadequate lip coverage and lip seal are considered as a risk factor for occurrence of dental trauma but does not affect type of fracture, but it is diverging from a previous study done by Ghose et al. (1980) who reported an increase in the severity of incisor trauma when lip coverage is inadequate in a group of Iraqi and Sudanese school children. While Bausset et al. (2008) concluded that the quality of lip coverage has the main effect on the severity of incisor trauma and his explanation was that the upper lip has a protective function as it softens the impact force, absorbs energy and distributes it over a broader surface. In the present study, correlation was found between the tooth affected and the type of fracture, statistically significant differences were found between affected teeth and different types of fracture. This means that the upper central incisors were affected with more severe types of injuries compared to the upper lateral incisors as they tend to be the first to receive the direct blow because of their position. It was extremely difficult to compare the results of the different investigations of dental injuries, partly because some information is lacking as most of the previous studies were concerned about the predisposing factors affecting presence or absence of dental trauma not its influence on the type and severity of dental trauma, or the studies are based on specific groups with different age, location and predisposing factors and the main reason is that the trauma classification terminology and the data recorded differs substantially from study to another study, so it is desirable to unify recording standards to make effective use of data that may be compared with other similar studies. The present study showed that most of traumatic dental injuries are unintentional injuries, where falls, collisions with hard objects, and road traffic accidents are the most dominating causes. The type and severity of tooth fracture were not directly affected by certain factor, and the only factor that might contribute to the severity of tooth fracture is the intensity of the impact force directed to the tooth and the tooth position in oral cavity, where the intensity of impact forces might vary according to the complex interaction between the child's behavior and the safety of the surrounding environment. Presence of more than one type of traumatic outcome in the same patient supports the absence of correlation between the various anatomical variations and type of injury. It is necessary to raise awareness and knowledge about accidents that might cause dental trauma through orientation campaigns. A wide range of preventive actions and health care policies should be applied on all children as no specific group was found to be more prone to traumatic dental injuries. Educational efforts should be directed also to parents, teachers and physical trainers. Personal and social education of children that aims to change their behaviour and attitude during playing, and preventing school violence and bullying. Improved supervision at home and school yards is highly recommended precaution in addition to decreasing school crowding. Ensuring that the design of school playgrounds as well as public parks meets safety standards and promoting the use of intra-oral mouth guards during playing sports. These preventive strategies might help to reduce the severity of traumatic dental injuries.

CONCLUSIONS:

From the results of this study, it could be concluded that:

1. There is no correlation between age at time of trauma, gender, etiology of fracture and the type of anterior teeth fracture.
2. There is no correlation between overjet value, overbite value, amount of incisor display, interlabial gap and type of anterior teeth fracture.
3. There is a relationship between the tooth affected and type of fracture, where upper permanent central incisors were found to be affected with more severe types of injuries compared to the upper permanent lateral incisors.
4. Most of traumatic dental injuries are unintentional injuries, where falls, collisions with hard objects, and road traffic accidents are the most dominating causes.
5. The type and severity of tooth fracture are not directly affected by certain factor, and the only factor that might contribute to the severity of tooth fracture is the intensity of the impact force directed to the tooth and the tooth position in the oral cavity.

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