

Relationship of Traumatic Dental Injuries to the Permanent Anterior Teeth in Relation to Occlusal Relationship among 7-14 Years Old School Children - A Cross Sectional Survey

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ABSTRACT

Introduction: Dental trauma is an irreversible pathology and it is a commonly encountered problem in school children which after occurrence is characterized by lifelong debilitating effects because of physical, psychological discomfort and pain. Thus a study was conducted to assess the prevalence of the traumatic dental injuries to the permanent anterior teeth in relation to occlusal relationship among 7-14 years old school children in Chitradurga town

Material and Methods: Descriptive cross sectional study was conducted among 3,363, 7-14 years old school children of Chitradurga Town. WHO (ICD-DA) 1995 Classification was used for assessing traumatic dental injuries and Angle's classification with Dewey's Modification was used for recording occlusal relationship. Fifteen Primary and Higher Primary Schools and Five High schools were selected using simple random sampling procedure. Children aged 7-14 years were included in the study. Data was recorded using specially designed proforma. The collected data was subjected to statistical analysis.

Results: Among 3,363 children examined prevalence rate was 5.5% with higher prevalence in boys than girls. Prevalence of traumatic dental injuries was more in the age group of 10-12 years. Traumatic injuries of permanent anterior teeth involved both maxillary and mandibular teeth with the higher prevalence in Maxillary anterior's. Enamel fracture was the highest (87.8%). Children with Class I type 2 and class II division 1 occlusal relation exhibited very highly significant number of dental injuries.

Conclusion: Prevalence of traumatic dental injuries was more in the age group of 10-12 years. Children with Class I and class II division 1 occlusal relation exhibited very highly significant number of dental injuries than other type of occlusal relationship

Keywords: Traumatic Dental Injuries, School Children, Permanent Anterior Teeth, Occlusal Relationship.

INTRODUCTION

Importance of anterior permanent teeth regarding esthetic and functions during mastication cannot be over emphasized. Anterior permanent teeth have significant effect on the individual facial profile. Facial trauma that results in fractured, displaced or lost teeth can have significant negative functional, esthetic and psychological effect on children.¹ There is a consensus that the anterior teeth are the most commonly traumatized.² The prevalence of traumatic injuries increases with age due to cumulative effect and it is more during the very active age range of 7-14 years as a result

of bicycle, skateboard, playground and sports accidents, and peak for injuries to permanent dentition.^{3,4} The prevalence of traumatic injuries to anterior teeth has been reported in several developed countries, but a relatively small number of studies have so far been reported in developing countries like India. Proportion of children suffering traumatic injuries and also the types of injury, vary greatly from country to country.⁵ According to literature, the upper and lower centrals are more commonly traumatized because they tend to be the first to receive a direct blow producing fracture. The second most frequently injured teeth are maxillary lateral incisors and Mandibular central and lateral incisors.

Orthodontists have long realized that a large percentage of fractures of anterior permanent teeth occur in children with protruding maxillary incisors. From documented data it can be said that traumatic injuries are widespread in the population and can cause a serious dental public health problem. But most importantly they are preventable. Therefore, early reduction of maxillary protrusions is considered as one of the essential preventive measures for decreasing the incidence of fractures of the permanent anterior teeth. Although the clinical treatment of fractured anterior teeth has received considerable attention yet little importance has been given to the study of correlation between the incidences of fracture of the permanent anterior teeth.⁶ To allow implementation of preventive strategies to reduce the increasing frequency of dental trauma, community effort is very much necessary in educating school children and their parents, sport teachers, teachers and health personnel's regarding awareness towards prevention of traumatic dental injuries. Hence a study was conducted to assess the prevalence of traumatic dental injury to occlusal relationship.

Study aimed to assess the prevalence of the traumatic

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dental injuries to the permanent anterior teeth in relation to occlusal relationship among 7-14 years old school children in Chitradurga town.

MATERIAL AND METHODS

A descriptive cross sectional survey was conducted to assess the prevalence of the traumatic dental injuries to the permanent anterior teeth in relation to occlusal relationship among 7-14 years old school children in Chitradurga town, using the WHO (ICD-DA) Classification for assessing the traumatic dental injuries⁷, Angle's classification with Dewey's modification for occlusal relationship .

ORGANISATION OF THE SURVEY

Approval from the authorities: he ethical clearance was obtained from the ethical committee of The Oxford Dental College, Hospital and Research centre prior to the start of the study. Permission to examine the school children was obtained from the Education Department (DDPI) of Chitradurga and from the concerned school authorities.

Required information about the study areas: All the required and relevant information regarding the schools and children population was obtained from Deputy Director of Public Instruction Office / Statistical Department, Chitradurga.

Training and calibration of the examiner: For the purpose of understanding and application of the examination criteria the investigator was trained and calibrated. A group of 10 subjects in the age group of 7-14 years with the history of traumatic dental injuries were chosen from the school oral health program conducted by Public Health Dentistry Department, Oxford Dental College. The calibration exercise and the kappa value (0.8) showed good agreement for these observations and measurements in terms of intra examiner variability which validated the examination procedure.

Pilot study: A pilot study was undertaken to check the feasibility and relevance of proforma, to have prior idea regarding the estimation of the time taken to examine each patient and to plan survey accordingly. Modifications were made in the recording proforma to overcome the particular

problem.

Sample Size: Using statistical sample software based on the total population i.e. 33,630 school children with the age group between 7-14 years and keeping 95% confidence interval and 2% marginal error and taking the account of prevalence of traumatic dental injuries in Indian studies as 10%, the sample size was determined to be 3,363.

To obtain this desired sample size of 3,363 school children of age group between 7-14 years, the study was conducted on school children of primary, Higher primary, and High schools enrolled in Government, Aided, and Non Aided schools of Chitradurga. Taking the average of population in individually listed school, 15 primary and higher primary schools and 5 high schools were selected by simple random sampling from the list of schools obtained from DDPI office, Chitradurga. Sample size from each of different schools was proportional to the total number of 7-14 year-olds in that school.

Children are divided into three age groups according to different schools (primary, higher primary, and high school) they are more commonly available and proportionate sample of 10% was taken according to the population in each age group as follows ----

Group I = includes 14,230 children aged 7-9 years = 1,423 were selected.

Group II = includes 13,250 children aged 10-12 years = 1,325 were selected.

Group III = includes 6150 children aged 13-14 years = 615 children were selected.

Inclusion criteria

Children in the age group of 7-14 years from the selected schools were included in the study.

Exclusion criteria

- Primary teeth,
- Special group children
- Supernumerary teeth,
- Teeth with developmental defects
- Loss of teeth other than traumatic injuries,
- Children with history of orthodontic treatment
- Root fractures are excluded as radiographs were not

Age in years	Boys		Girls		Total	
	No	%	No	%	No	%
7-9 years	802	42.4	621	42.3	1423	42.3
10-12 years	728	38.4	597	40.5	1325	39.4
13-14 years	362	19.2	253	17.2	615	18.3
Total	1892	100	1471	100	3363	100

Table-1: Distribution of study population (school children) according to age and gender

Age group (years)	Total number of children	Children with traumatic dental injuries	Percentage
7-9 years	1423	33	2.31
10-12 years	1325	98	7.30
13-14 years	615	55	8.94
Total	3363	186	5.5

$\chi^2=45.5$, $df=2$, $P < .05$, Significant

Table-2: Prevalence of traumatic dental injuries according to age

taken during the clinical recording.

Schedule of The Study: A survey was systematically scheduled to spread over a period of 6 months. A detailed weekly and monthly schedule was prepared well in advance by informing and obtaining consent from authorities of respective study areas. On an average, 60 subjects were examined each day.

Examination of the subjects: The examination of the subjects was carried out in concerned school premises, under natural daylight conditions or using artificial illumination with subjects seated comfortably on ordinary chair with back rest and the examiner sitting in front of the child.

Clinical examination included occlusal relationship using Angle’s classification with Dewey’s modification, and Traumatic dental injuries to the Maxillary and Mandibular permanent teeth were recorded according to WHO’s (ICD-DA). Informed consent was obtained from parents of the children and Assent was obtained from participating children in the study before the start of the survey.

Method of obtaining the data: A specially prepared, and pre tested proforma designed for collecting all the required and relevant general information and clinical findings was used for recording the data.

Courtesy Reporting Survey findings were reported to the respective school authorities after the completion of the survey in each school

STATISTICAL ANALYSIS

The data was transformed from pre-coded survey form to computer. A master file was created for the purpose of data analysis. SPSS version 15.0 (SPSS Pty Ltd, Chicago, IL, USA) was used for the statistical analyses. Chi-square analysis was applied during the statistical evaluation of the data. Significance value was set at P<0.05.

RESULTS

The survey was carried out on 3,363 school children in the age group of 7-14 years to study the prevalence of traumatic dental injuries to permanent anterior teeth in relation to different age group and occlusal relationship and in Chitradurga town.

Distribution of study population(school children) according to age and gender: Among 3,363, 7-14 years old age group, 1423 (42.3%) children belonging to Group I (7-9 Years), out of which 802 (42.4%) were boys

Type of injury	Number of teeth	Age distribution			Group III 13-14 years	Group II 10-12 years	Group I 7-9 years	Tooth *11*	Tooth *12*	Tooth *13*	Tooth *21	Tooth *22*	Tooth *23*	Tooth *33*	Tooth *32*	Tooth *31*	Tooth *41*	Tooth *42*	Tooth *43*	Total%	
		Group I 7-9 years	Group II 10-12 years	Group III 13-14 years																	
I. Enamel fracture	190 (88.3%)	33	106	51																	
II. Crown fracture without pulpal involvement	22 (10.2%)	02	08	12																	
III. Crown fracture with pulpal involvement	3 (1.3%)	0	1	2																	
Total	215	35	115	65																	
[I vs. II +III] $\chi^2=9.02$, df=2, P=<0.05, Significant																					
WHO (ICD-DA) Trauma Codes	Type of fracture	Tooth *13*	Tooth *12*	Tooth *11*	Tooth *21	Tooth *22*	Tooth *23*	Tooth *33*	Tooth *32*	Tooth *31*	Tooth *41*	Tooth *42*	Tooth *43*	Total%							
S02.50	Enamel fracture	0	5	72	101	4	0	0	0	3	3	0	0	189 (87.8%)							
S02.51	Crown fracture without pulpal involvement	0	0	5	16	2	0	0	0	0	0	0	0	23 (10.7%)							
S02.52	Crown fracture with pulpal involvement	0	1	0	2	0	0	0	0	0	0	0	0	3 (1.4%)							
	Total %	0 (0%)	6 (2.8%)	78 (35%)	119 (55.6%)	6 (2.8%)	0 (0%)	0 (0%)	0 (0%)	3 (1.4%)	3 (1.4%)	0 (0%)	0 (0%)	215 (100%)							

Table-4: Distribution of type of fracture and tooth involved

Angle's occlusal classification criteria	Group I (7-9 Years)	Group II (10-12 Years)	Group III (13-14 Years)	Total %
Class I without anterior malocclusion	16	25	17	69(31.18%)
Class I type 1	7	9	2	18(9.67%)
Class I type 2	1	19	15	35(18.81%)
Class I type 3	1	0	0	1(0.5%)
Class I type 4	0	0	0	0
Class I type 5	0	0	0	0
Class II	0	1	2	3(1.6%)
Class II div 1	4	38	13	56(30.10%)
Class II div 2	1	1	2	4(2.15%)
Class III	0	0	0	0
Class III type 1	3	5	2	10(5.37%)
Class III type 2	0	0	0	0
Class III type 3	0	0	1	1(0.5%)

Table-5: Relation of traumatic dental injuries to occlusal relationship

Angel's occlusal classification criteria	S02.50 Enamel fracture	S02.51 Crown fracture without pulpal involvement	S02.52 Crown fracture with pulpal involvement	Total %
Class I without anterior malocclusion (n=58)	62	7	0	69 (31.30%)
Class I type 1(n=18)	18	0	1	19 (8.87%)
Class I type 2(n=35)	30	11	1	42 (18.69%)
Class I type 3(n=1)	1	0	0	1 (0.5%)
Class I type 4(n=0)	0	0	0	0 (0%)
Class I type 5(n=0)	0	0	0	0 (0%)
Class II(n=3)	3	0	0	3 (1.40%)
Class II div 1(n=56)	59	5	1	65 (28.97%)
Class II div 2(n=4)	5	0	0	5 (2.33%)
Class III(n=0)	0	0	0	0 (0%)
Class III type 1(n=10)	10	0	0	10 (4.6%)
Class III type 2(n=0)	0	0	0	0 (0%)
Class III type 3(n=1)	1	0	0	1 (0.5%)
Total	189	23	3	215

Table-6: Type of traumatic dental injuries to occlusal relationship

and 621(42.3%) were girls. 1325(39%) children belonging to Group II (10- 12 Years), out of which 728 (38.4%) were boys, 597(40.5%) were girls. 615 (18%) children belonging to Group III (13-14 years), out of which 362 (19.2%) were boys, 253 (17.2%) were girls respectively. [Table 1]

Prevalence of traumatic dental injuries according to age: Out of 3,363 children, 186 (5.5%) children had fractured permanent anteriors. Total of 33(2.31%) children had fractures in group I, Total of 98(7.30%) children had fractures among group II, and Total of 55(8.94%) children had fracture in group III respectively. [Table 2].

Type of fracture in relation to age group: Out of 215 injured teeth, 190(88.3%) teeth had only Enamel fracture, 22(10.2%) teeth had crown fracture without pulpal involvement, and 3(1.3%) teeth had crown fracture with pulpal involvement. [Table 3]

Distribution of type of fracture and tooth involved: The left maxillary central incisor was the most common tooth involved which accounted for 55.6% of the injuries followed by the right maxillary central incisor. The mandibular

teeth accounted for 2.8% of the injured teeth with the both central incisors are commonly and equally affected. [Table 4]

Relation of traumatic dental injuries to occlusal relationship: Out of 186 fractured cases, class I without any anterior malocclusion showed 58(31.18) fractured cases, 56(30.10%) fractured cases were seen having class II div 1 occlusion, 35(18.81%) fractured cases in class I type 2. [Table 5]

Relation of type of traumatic dental injuries to occlusal relationship: When relating the type of traumatic dental injuries to occlusal relationship, out of 215 fractured teeth 69 (31.30%) teeth were fracture in class I without any anterior malocclusion, Total of 42 (18.69%) teeth fractured in class I type 2 out of which 30 were enamel fracture, 11 teeth with crown fracture without pulpal involvement and one tooth with pulpal involvement. Out of 65 (28.97%) fracture teeth in class II div1, 59 teeth were showed enamel fracture, 5 teeth crown fracture without pulpal involvement, 1 tooth with pulpal involvement.[Table 6]

DISCUSSION

Traumatic dental injury is not a result of disease but it is a consequence of several factors that will accumulate to form the third largest cause for the mortality of the teeth. The present study was carried on 3,363 school children in the age group of 7-14 years to assess the prevalence of traumatic dental injuries to permanent anterior teeth in relation to different age group and occlusal relationship at Chitradurga town. In view of large population of children to be examined, WHO (ICD-DA) classification for traumatic dental injuries and Angle's classification with Dewey's modification for assessing the occlusal relationship was applied because of their ease and accuracy.

In the present study among 3,363 school children examined, 186 children had fractured teeth, giving the overall prevalence rate of 5.5%. This result was similar to that found by Rai S and Munshi A.K (5.29%)⁸ in South Kanara. However, it was lower than the findings of other studies done by Lin H, Naidoo S (9.3%)⁹ in Maseru, Evelyne Pessoa Soriano et al (10.5%)¹⁰ in Brazil, Garda-Godoy FM (10%)¹¹ in Dominican, and Pavan Baldava et al (14.9%)¹², Gupta K et al (13.8%)¹³ in South Kanara District, Garcia-Godoy F (18.1%)¹⁹ in Dominican, Naqvi A, Ogidam O (19.6%)¹⁴ in Nigeria. Malikaew Pet al (35.0%)¹⁵ in Thailand.

In the present study overall prevalence of traumatic dental injuries of permanent anterior teeth was more in boys (62%) compare to girls (38%). Boys were found to have significantly higher number of fractures than girls in all the age groups. This data is well comparable with the study done by Marcenes W et al (67.2% and 50.2%)¹⁶, This can be attributed to the fact that girls are more inhibited in their behaviour than boys, who tend to be more energetic and inclined towards vigorous physical activities, competitive athletics and engaged in rough outdoor activities than girls. involve aggressive or violent attitudes, especially in the Boys. But on the other hand this finding does not agree with a study conducted in the city of Santo Domingo, Dominican Republic done by Federico M. and Garcia- Godoy(1985)¹⁷ where, Girls (50.6%) are more affected by traumatic dental injuries than Boys (48.7%). Other studies done by Rocha et al (2001)¹⁸, also showed an increasing trend of traumatic dental injuries among girls, because of their increasing participation in sports or activities formerly practiced by boys only.

In the present study, the most common type of injury was enamel fractures, which accounted for about 88.3%. This is in agreement with previous studies done by Jarvinen S. et al (1979)¹⁹, Naqvi A et al (1990)¹⁴ Marcenes W and Beirut N (1999)¹⁶. Malikaew P et al (2006)²⁰ where the enamel fractures are the main type of traumatic injuries to teeth. However the study done by Garcia-Godoy et al¹⁷, Kaba AD et al²¹, showed enamel-dentine fracture (62.8%, 73% and 53%) as the most predominant injuries to permanent anteriors.

When the Prevalence of traumatic dental injuries to occlusal relations were assessed, children with Class II div 1 showed a high prevalence rate (30.10%) followed by Class 1 type

2 (18.81%) exhibited the highest number of dental injuries compare to other type of occlusal relationships. Several epidemiological studies confirmed that treatment of traumatic dental injuries was largely neglected as noticed by Marcenes W (2001)²², Marcenes and Beirut (1999)¹⁶, Cortes MI (2001)²³. Marcenes W (2001).²⁴

CONCLUSION

Following conclusions can be drawn from the result of the present study:

The prevalence of traumatic dental injuries of permanent anterior teeth is 5.5%.

Prevalence of traumatic dental injuries was more in the age group of 10-12 years followed by 13-14 years and 7-9 years. Children with Class I and class II division 1 occlusal relation exhibited very highly significant number of dental injuries than other type of occlusal relationship.

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