

Traumatic Injuries to Anterior Teeth in School Children of Southern India

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Abstract

Traumatic dental injuries to children and their sequelae are of concern to both the clinicians and the parents of the affected children. Most of the available retrospective studies on trauma in children present a contrasting volume of data. The present study is aimed at determining the prevalence of traumatic injuries to anterior teeth in 30,000 school children in the Karnataka State, Southern India and to determine the common etiology and place of occurrence of trauma. Children aged between 4-16 years were surveyed. The children were divided into preschool, primary school and high school category.

The findings of the present study can be employed in an organized municipal effort to educate school teachers, school children and their parents about dental trauma, its prevention and emergency management of the same.

Keywords: Traumatic injuries; Play; Anterior teeth trauma; Accidents; School children.

Introduction

Quality of life is an important factor in children's well being and health, when certain conditions have an impact on quality of life of children, it tends to become a public health problem.¹ Oral injuries are the fourth most common area of bodily injuries among 7 - 30 years old.² Traumatic dental injuries can become an important health problem not only because their prevalence is high but they have high impact on individuals daily life.³ They continue to be one of the leading reason for odontological emergencies.⁴ Many authors have pointed out that a fractured permanent tooth is tragic experience for both child and parents.⁴ This is because of psychological

discomfort, pain, loss of function poor esthetic.^{2,3} Secondly, cost and time required for treatment of such condition is large and also lack of availability of trained persons in handling these conditions is one of the obstacle leading to misdiagnosis and often wrong treatment.

Majority of dental injuries in the primary and permanent dentitions involve the anterior teeth, especially the maxillary central incisors. Dental injuries can occur at any age starting from one year of life which tends to increase as child starts to crawl, stand or walk with peak incidence being school age. The review of trauma in different age group has reported two prevalent age group of 2-5 years and 8-12 years. In 2-5years when, children are learning to walk and run, they have tendency to fall due to lack of properly developed co-ordination and judgment^{5,6,7} and in the age group of 8-12 years as a result of increased outdoor activities and participation in sports.^{8,9,10}

Hence it is important to know the prevalence of traumatic dental injuries and their causative factors. Retrospective studies are one of the most important tools to gather data regarding prevalence of these injuries. This study details the type and prevalence of traumatic dental

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injuries to anterior teeth in school going children of Southern India. The findings of which could be helpful in planning out effective educational programmes targeting the teachers, school children and also their parents.

Methods

Thirty thousand children aged 4-16 years from schools in southern India participated in this study. The children for present study were selected using multistage-cluster-systemic random sampling from four states namely Karnataka, Andhra-Pradesh, Kerala and Tamil-Nadu. The children were divided into the preschool (4-6yrs), primary (7-12yrs) and high school (13-16yrs) group. A total of 4717 children belonged to the pre-school group, 22,550 were from the primary school group and 2,733 were from the high school group. A division was also made into the urban and rural school group. The survey was done by the investigators to check for traumatic injuries to anterior teeth. WHO Type III survey examination was carried out to examine and record the observations. When the investigators came across trauma cases, questions like HOW? WHEN? And WHERE? were asked to the children to know about the exact etiology of the trauma. Modification of Ellis classification by Mc Donald, Avery and Lynch (1983) of traumatic injuries was used. Class I to Class IV were used and Class V was modified to include deciduous tooth trauma to carry out the survey. The collected data was statistically analyzed. The statistical analysis of the results was done using Pearson Chi - square test was performed to assess the association between two attributes. Statistical significance was set at 5% [$p < 0.05$].

Results

The results showed that out of 30,000 children 615 (2.05%) children had traumatic injuries. Out of 615, 372 boys and 243 girls

had traumatic injuries giving a ratio of 1.53:1. Prevalence of trauma was highest among primary school category around 17% of boys and 15% of girls had trauma and both high school and preschool children had comparatively lesser trauma experience (Table I), and there was no statistically significant difference between girls and boys in distribution of traumatic injuries (p -value= 0.5951). Among etiological factors for trauma during playing (Girls 24.5%, Boys 35.6%) was the most common factor followed by accidents and fights (Table II) and no statistically significant difference was observed between these attributes (p -value= 0.1902). Inter-comparison between place and type of trauma, showed that most number of class II trauma had occurred in play ground around 21% and also highest number of class I trauma was experienced in play ground 11% followed by home, class room and the road (Table III). Following study also revealed that (Table IV) prevalence of traumatic injuries was more in rural population (Girls 29.26%, Boys 30.89%) when compared to urban population (Girls 10.24%, and Boys 29.59%) and there was statistically significant difference was observed between location of children and type of trauma (p -value= 0.0). Most commonly involved tooth was maxillary right central incisor with 47% followed by maxillary left central incisor 24% and none of the lower right lateral incisors was involved, among primary teeth maxillary right central incisor (9%) was most commonly involved (Table V).

Discussion

Dental trauma is a common form of injury, especially in children and its prevalence in school children is a continuing clinical and dental health problem.¹¹ Andreasen FM, (1990)¹² have stated that traumatic injuries are on the rise and are third largest cause for the mortality of teeth, in many cases are cause of aesthetic, psychological, social and therapeutic problems. Such an alarming increase in the number of traumatic injuries has now cautioned the pediatric dentists to take up the

Table I: Distribution of Traumatic Dental Injuries among Boys and Girls

	GIRLS	BOYS
Pre - School	41	66
Primary School	182	267
High School	20	39
TOTAL	243 (39.5%)	372 (60.4%)
X ² = 1.0389,	p-value= 0.5951,	Non significant

p-value was set at 0.05

Table II: Inter comparison between Type and Etiology of Trauma in both the Sex

Type of trauma	Etiology of trauma					
	Accident		Fight		Play	
	Girls	Boys	Girls	Boys	Girls	Boys
Class 1	13	25	12	10	38	57
Class 2	26	40	13	37	74	78
Class 3	7	13	2	2	14	28
Class 4	2	1		1		11
Class 5	8	12	9	12	25	45
Total	56	91	36	62	151	219
Percentage %	9.1	14.79	5.85	10.08	24.5	35.6
X ² = 11.2081,	p-value= 0.1902,		Non significant			

p-value was set at 0.05

Table III: Inter comparison between Type and Place of Trauma in both sex

Type of trauma	Place of trauma									
	Class Room		Field		Ground		Home		Road	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Class 1	16	08		08	26	42	15	26	06	08
Class 2	13	30	04	06	53	75	32	32	11	12
Class 3	03	00		04	10	24	05	09	05	06
Class 4	00	00		00	00	11	02	00	00	02
Class 5	05	13		03	25	32	09	15	03	06
Total	37	51	4	21	114	184	63	82	25	34
Percentage (%)	6.01	8.29	0.65	3.41	18.5	29.9	10.2	13.3	4.0	5.52

issue seriously and to plan out a proper treatment protocol.

Tovo MF *et al* (2004)¹³ have stated that most of the studies worldwide present a contrasting volume of data that may be attributed to differences in experimental design among the studies, differences in the population studied and variation in the age or sample size.

Research have also been carried out in India with varied results.^{14,15,16} But unfortunately there are no previously published large scale reports available regarding dental trauma. Thus this study details the type, prevalence and etiological factors of traumatic dental injuries to anterior teeth in school going children.

Table IV: Inter comparison between Type and Location of Trauma in both the Sex

Type of trauma	Location			
	Rural		Urban	
	Girls	Boys	Girls	Boys
Class 1	38	52	25	40
Class 2	94	84	19	71
Class 3	20	23	03	20
Class 4	0	0	02	13
Class 5	28	31	14	38
TOTAL	180	190	63	182
Percentage (%)	29.26	30.89	10.24	29.59
X²= 30.2740,	p - value= 0.0000,		significant	

p-value was set at 0.05

Table V: Distribution of Traumatic Injuries based on Tooth Number

Tooth Number	11	12	21	22	31	32	41	51	52	61	62
Total	289	47	146	13	4	2	3	57	13	39	2
Percentage (%)	46.99	7.64	23.74	2.11	0.65	0.33	0.49	9.27	2.11	6.34	0.33

Amongst 30,000 children surveyed, 615 had trauma to incisor teeth giving a prevalence of 2.05%. One of the study also showed a similar prevalence.¹⁷ But most of the earlier studies have reported much higher prevalence of trauma than the present study.^{15,18,19,20,21} Traumatic injuries to teeth are of cumulative nature, increased in relation to the children examined and are more frequent for boys than girls. The composition of the sample is therefore of considerable importance when comparing the results; differences in age and sex distribution in the basic material will result in differences in the frequency of injuries. Remarkably high prevalence have been reported in certain special groups, in delinquent children, in ice-hockey players and in individuals using narcotics.²² The classification used in the study did not include root fractures and soft tissue injuries; which may have accounted for the lower prevalence of trauma. Bateson EB, Freer TJ, McNamara JR (2000)²⁰ have also stated that such a study design has a major disadvantage because of other type of injuries such as alveolar fracture and soft tissue injuries may not always be evident at the time of the examination if the injuries occurred sometimes beforehand.

It was also observed that boys were more affected than girls, with a ratio of 1.53:1 (Table I). Some of the earlier studies have shown that boys had significantly higher number of injuries as compared to girls.^{23,24,25} However there are some reports showing an equal distribution.^{26,27} The present study result may be explicable by the fact that in the modern world girls are at par with boys in almost all the fields including play and sports. Yet, in the Indian scenario cultural trends still have a role to play in the slight decrease in the prevalence of trauma in females, as adolescent girls tend to venture out to play less than adolescent boys.²⁸ Vanderas AP *et al* (1999)²⁹ has pointed out that higher levels of epinephrine, dopamine and emotional stress in boys may also be one of the causes for the slight increase in the occurrence of trauma

Among the injured children, it was evident that in the primary school group girls had significantly higher occurrence of trauma as compared to the other two categories (Table I). In the primary age group outdoor sport activities are usually at the peak and then gradually reduces as age increases. The preschool girls are generally involved in indoor play, such as playing with dolls, toys, creative exercises like drawing etc which are less

injurious as compared to boys' activities who play games that involve hopping, running, jumping that invariably is more susceptible to injury. This could explain the reduced occurrence of trauma in the preschool girls as compared to the primary girls. Similarly when the boys were considered the preschool boys had significantly higher trauma as compared to the other two categories. The developing motor co-ordination may be the reason for increase in traumatic injuries in this age group.³⁰ Although play and sports activities goes on increasing with age upto adolescence, reduction in the prevalence of trauma in both the sexes in the high school group could probably be attributed to more maturity, sense of balance and control over aggression which comes with age. These reasons may be responsible for the variation in the order of occurrence of trauma in between the sex and the various age group selected. Class 2 type of trauma was the most common type of traumatic injury observed. Some studies have reported that dental injuries were found to be more common in the primary school category^{20,21,31} whereas some authors found higher frequency of trauma in younger when compared to older age group.³⁰

The etiological factors of trauma have been categorized into play, fights and accidents (Table II) out of which play was found to be most common cause (Girls = 24.5%, Boys = 35.60%) followed by accidents (Girls = 9.10%, Boys = 14.79%) and then fights (Girls = 5.85%, Boys = 10.08%). Few studies have reported a similar pattern of occurrence^{13,14,32} whereas few studies showed a varied pattern. There is one difference in the category of cause of trauma i.e, most of the studies divided the cause of trauma into falls and sports activities and considered them separately, whereas, in the current study play was considered as a single entity. Most of the time falls and some times sports activities were reported as the most common cause in these earlier studies.^{23,33} Play was most common cause of trauma in the present study. Since children tend to get involved more in sports activities, play seems to be the most common etiology. Children are supervised by teachers or caretakers in school

premises. Thus the chances of children getting injured due to accidents and fights are less as compared to play although no significant correlation was seen between the type and etiology of trauma. It was also observed that class 2 type of trauma was most common. Ravn and Rossen (1969) study in a school service, Garcia Godoy *et al* (1979) in a private pediatric dental practice and Garcia Godoy *et al* (1985) in randomly examined school children reported enamel- dentin fractures (class 2) as the most predominant injuries. In epidemiologic studies of population samples, one aspect that should be taken into consideration is that injuries such as concussions, intrusions, extrusions and luxations may have been missed and also the lack of reliability of the methods used to collect and process the data.

The most common place of occurrence of trauma was play ground (Girls= 18.5%, Boys = 29.9%) followed by home (Girls= 10.2%, Boys=13.3%), classroom (Girls =6.01%, Boys =8.29%), road (Girls =4.06%,Boys =5.52%) and field (Girls =0.65%, Boys =3.41%) (Table III). Children spend most of their outdoor play time in the school ground. In the present study play was the most common etiology of traumatic dental injuries. At home children would be more involved in homework and indoor games. This could be the reason for increased injuries in the school ground than at home. As children spend less amount of time in field as they spend most of their time in school and home, so field seems to be the least likely place where school children could be traumatized. In many of the studies reported earlier greater prevalence of trauma was reported at home followed by other places.^{20, 32, 34}

Among the 615 traumatic injuries, a significant number affected the rural population (Girls = 29.26, Boys = 30.89%) as compared to the urban population (Girls = 10.24%, Boys = 29.59%) (Table IV). Although the sample size consisted more of urban population prevalence of traumatic injuries was more in the rural population. This may be due to involvement of rural children in more aggressive sports activities such as kabaddi and hockey as compared to the urban

children who mostly play indoor games like badminton, computer games, board games etc. The inter comparison between the location and the class of trauma was significant that is class 2 type of trauma in the rural population was most common as compared to the others. The class 2 fracture was reported as the most frequent type of injury in earlier reports.^{35, 36}

According to the FDI Tooth numbering system, 11 (46.99%) was the most commonly injured teeth followed by 21 (23.74%), 12 (7.64%) and 42 did not have any trauma. Among primary teeth 51 (9.27%), 61 (6.34%) followed by the rest of the teeth (Table V). Some of the earlier studies have found maxillary central incisors to be the most commonly affected tooth.^{23,24,25,36} In the preschool category, the maximum number of tooth to be injured was the right deciduous maxillary central incisor with majority of the injuries occurring in boys. It can be noticed from the (Table V) that the maxillary teeth were more commonly injured than the mandibular teeth. It can be explained by the fact that in the vertical plane, the maxillary arch is located more anteriorly than the mandibular arch as a result of which the impact of injury would be more on the maxillary arch. In addition, upper jaw is fixed to the skull which makes it rigid, while lower jaw, being a flexible part, tends to reduce the impact forces directed on the lower anterior teeth by its movement. Within the arch the reason for increase in number of trauma to central incisors compared to lateral incisors can be explained by the fact that the central incisors are more proclined and forwardly placed than the lateral incisors in the vertical plane.³⁷ In all the 3 categories males were affected more than the females and deciduous teeth were less commonly affected than the permanent. Again increase in trauma to permanent teeth may be due to the increase in the sport and play activities with increasing age.

Conclusion

The present study was a retrospective collection of data on traumatic injuries to

anterior teeth which is seen very commonly in day to day practice. The frequency and causes of traumatic injuries to anterior teeth is important for identification of risk groups, treatment needs and cost involved in order to allow establishment of effective preventive measures. It also helps in formulation of educational campaigns in order to inform teachers, parents and health professionals about the best emergency measures and reduce the time elapsed between dental trauma and the immediate dental care which is very crucial in treatment outcome.

Recommendations

- Use of protective mouth-guards during play or sport activities.
- Development of special dental trauma management guidelines for school teachers to aid in better management of traumatic injuries.
- Special courses to be framed for physical education teachers regarding general first-aid and dental first-aid trauma management.

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