



## Prevalence of traumatic dental injuries of anterior tooth with associated risk factors in children in Patna

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### Abstract

One of the greatest assets a person can have smile that shows beautiful, natural teeth. An untreated and unsightly fracture of an anterior tooth can affect the behaviour of a child, his progress in school, and can have more impact on their daily living. In Patna city no published literature is available on the prevalence of traumatic injuries in children. Hence, this study was carried out with following aim and objective. To assess the prevalence of traumatic dental injuries of anterior teeth with associated risk factor in children in among 2820 school children between the age of 7 to 14 years in various schools at Patna.

A total 2820 children (1551 male and 1269 female) were selected. The children were from patna city age between 7-14 years, in various schools as well as who had attended to department of Paedodontics and Preventive dentistry in Buddha Institute of Dental Science and Hospital Kankarbagh, Patna. The selected children and their parents were explained regarding the nature of study. Informed consent was obtained from parents to allow their children to participate in study. Exclusion Criteria: Children below 6 years medically compromised children; Children who have not undergone traumatic injury to anterior teeth Extremely Uncooperative child Loss of teeth other than traumatic injuries Patient who gave incomplete History.

The prevalence of traumatic dental injuries of permanent anterior teeth is 5.5%. Boys are usually more affected than girls in case 2:1 of anterior tooth trauma. Prevalence of traumatic dental injuries was more in the age group of 10-12 years followed by 13-14 years and 7-9 years. Falls during playing were the major causes for anterior teeth fracture. Children with increased proclination of maxillary central incisors (more than 3.5-5.5mm) over sjet were significant of all traumatic dental injuries. Single tooth trauma is the commonest of all types of injuries. Crown Infraction fracture (WHO's classification) are predominant of all types of tooth injuries. Subjects with Angle's class II Div I malocclusion is more prone to anterior teeth trauma in comparison to Angle's class I and class III molar relation. Injuries occur more in patient with increased over jet and with incompetent lips.

**Keywords:** traumatic dental injuries, anterior tooth, childrens, etc

### Introduction

Traumatic injuries of permanent anterior teeth and their supporting structures, which occur because of different reasons, constitute a true dental emergency and require immediate assessment and management, because many young, permanent teeth continue their development in those ages [1]. The patients, who are exposed to trauma, are not only physically, but also psychologically affected [2]. Dental trauma is also a source of distress for the parents of those children. Fractured permanent tooth is a tragic experience for both child and parents, who are more concerned with the aesthetic rather than the symptomatic aspects of the problem.

During childhood the development of the occlusion both functionally and esthetically is dependent on the satisfactory presence of teeth. Unfortunate and disastrous results can occur when a trauma is inadequately treated. Causing conditions like malformed or malpositioned teeth, premature tooth loss and pulpal death with abscess formation. Often the prognosis for success depends on the rapidity with which the tooth is treated after the injury, regardless of whether the procedure involves protecting a large area of exposed dentin or treating a vital pulp exposure.

Several factors can be considered common to all type of

injuries to the anterior teeth. The child should be carefully assessed regarding treatment needs before commenting to parents because many cases are not as bad as they first appear. Initial reassurance to both parent and child is of great value. Trauma may leave deficit that affects the self-esteem and quality of life of the patient. Multiple causes contribute to tooth trauma with the major focus on falls and collisions, sporting activities, domestic violence, automobile accidents and assaults. Each causative factor presents with unique circumstances and combined with the age of the univocal, a mosaic of traumatic injuries can emerge and apart from this, predisposing factors are also essential to consider [4, 5, 6].

Any traumatic injury which marks the appearance of the face with disproportionate swelling may hamper the normal growth of the child as the child is in a dynamic state of growth and development. Improper intervention may lead to longstanding damage to the orofacial structures. Boys experience more dental injuries than girls [7]. The majority of dental injuries involved the anterior teeth [8] which may lead to restriction in biting, difficulty speaking clearly, and feeling embarrassed to show the teeth. There is agreement that traumatic injuries occur more often to the maxillary than the mandibular incisors [9] and that the central incisors

are affected more often than the lateral incisors. The causes of dental injury are known. The main causes of injuries to the permanent incisors are falls and collisions [10], sporting activities, violence, and traffic accidents. All sporting activities have an associated risk of orofacial injuries due to falls, collisions, and contact with hard surface [11]. Furthermore, the risk of injury to the maxillary incisors has been shown to increase with incisal overjet (OJ) and inadequate lip coverage. Information on the prevalence and severity of dental trauma in various age groups of a population has significance for planning public dental care strategies in that population. In addition, information about associations between morphologic characteristics and incisor injuries is of general significance for orthodontic treatment [9].

One of the greatest assets a person can have smile that shows beautiful, natural teeth. An untreated and unsightly fracture of an anterior tooth can affect the behaviour of a child, his progress in school, and can have more impact on their daily living. In patna city no published literature is available on the prevalence of traumatic injuries in children. Hence, this study was carried out with following aim and objective. To assess the prevalence of traumatic dental injuries of anterior teeth with associated risk factor in children in among 2820 school children between the age of 7 to 14 years in various schools at Patna.

**Methodology**

A total 2820 children (1551 male and 1269 female) were selected. The children were from patna city age between 7-14 years, in various schools as well as who had attended to department of Pedodontics and Preventive dentistry in Buddha Institute of Dental Science and Hospital Kankarbagh, Patna. The selected children and their parents were explained regarding the nature of study. Informed consent was obtained from parents to allow their children to participate in study. Exclusion Criteria: Children below 6 years medically compromised children; Children who have not undergone traumatic injury to anterior teeth Extremely Uncooperative child Loss of teeth other than traumatic injuries Patient who gave incomplete History.

A survey was systematically scheduled to spread over a period of 1 year. A detailed weekly and monthly schedule was prepared well in advance by informing and obtaining consent from authorities of respective study areas. Even though a detailed schedule plan was prepared well in advance, few adjustments and changes had to be made while working it out practically. The examination of the subjects was carried out in concerned Dental Hospital premises, under chair light condition 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 a visual inspection of lip coverage, examination for measurement of overjet, occlusal relationship using WHO's classification. 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. The proforma including the demographic data and questions regarding history of injury to detect the cause, place, duration of trauma to anterior teeth as well as those seeking the treatment for concerned problem were recorded.

For investigation disposable mouth masks and gloves are

used. Instruments are sterilized by chemical method of disinfection by using solution. After each days survey, all the instrument are sterilized by boiling. Prior to the intraoral examination and without the subject's awareness, the lips coverage of the incisor teeth was recorded for each child. If the lips covered the upper incisor in the rest position, the lip coverage is considered to be adequate. If however the lips failed to cover the upper incisors and the majority of their crown height was exposed and clearly visible, the lip coverage was recorded as inadequate. Traumatic injuries affecting the teeth are clinically recorded based on objective signs and classified according to WHO's classification of Dental Trauma 1981 with and without the use of radiographs and pulp vitality testing

**Results & Discussion**

Traumatic dental injuries may occur throughout the life. But they are particularly common, unresolved problem among the school children throughout the world and the trend in traumatic dental injuries is not as clear and well documented as the trend in dental caries [12, 13]. Literature reviews shows that the prevalence of dental caries is falling more rapidly than traumatic dental injuries. If this trend continues traumatic dental injuries may become more prevalent than dental caries [14]. The epidemiological studies from various countries indicate that there is considerable variation in the prevalence of traumatic dental injuries. This has been attributed to the factors such as the type of study, classification of dental trauma, and the dentition studied [12].

**Table 1:** Gender distribution of the patients

Gender	No. (n=982)	%
Male	540	55.0
Female	442	45.0

**Table 2:** Age distribution of the patients

Age in years	No. (n=982)	%
<6	11	1.1
6-8	89	9.1
9-11	484	49.3
≥12	398	40.5

**Table 3:** Age and gender distribution of the patients

Age in years	No. of patients	Male		Female	
		No.	%	No.	%
<6	11	5	45.5	6	54.5
6-8	89	44	49.4	45	50.6
9-11	484	278	57.4	206	42.6
≥12	398	213	53.5	185	46.5

**Table 4:** Distribution of the patients according to etiology of injury

Etiology	No. (n=982)	%
Fall	720	73.3
Contact sports	28	2.9
RTA	9	0.9
Fight	58	5.9
Chapakal	35	3.6
Ball	3	0.3
Bicycle	95	9.7
Banboo	5	0.5
Handpump	19	1.9
Head to head	10	1.0

**Table 5:** Etiology of injury according to age

Etiology	Age in years							
	<6		6-8		9-11		≥12	
	No.	%	No.	%	No.	%	No.	%
Fall	11	100.0	63	70.8	356	73.6	290	72.9
Contact sports	0	0.0	1	1.1	15	3.1	12	3.0
RTA	0	0.0	1	1.1	4	0.8	4	1.0
Fight	0	0.0	13	14.6	22	4.5	23	5.8
Chapakal	0	0.0	1	1.1	18	3.7	16	4.0
Ball	0	0.0	0	0.0	3	0.6	0	0.0
Bicycle	0	0.0	8	9.0	46	9.5	41	10.3
Banboo	0	0.0	1	1.1	4	0.8	0	0.0
Handpump	0	0.0	0	0.0	12	2.5	7	1.8
Head to head	0	0.0	1	1.1	4	0.8	5	1.3
Total	11	100.0	89	100.0	484	100.0	398	100.0

Chi-square=29.82, p=0.32

**Table 6:** Etiology of injury according to gender

Etiology	Gender			
	Male		Female	
	No.	%	No.	%
Fall	387	71.7	333	75.3
Contact sports	20	3.7	8	1.8
RTA	8	1.5	1	0.2
Fight	35	6.5	23	5.2
Chapakal	23	4.3	12	2.7
Ball	3	0.6	0	0.0
Bicycle	45	8.3	50	11.3
Banboo	3	0.6	2	0.5
Handpump	12	2.2	7	1.6
Head to head	4	0.7	6	1.4
Total	540	100.0	442	100.0

Chi-square=16.13, p=0.06

**Table 7:** Distribution of the patients according to type of tooth injury

Type of tooth injury	No. (n=982)	%
Injuries to the hard dental tissues and pulp		
Crown infraction	5	0.5
Uncomplicated crown fracture	435	44.3
Complicated crown fracture	298	30.3
Uncomplicated crown root fracture	25	2.5
Complicated crown root fracture	146	14.9
Root fracture	13	1.3
Total	922	93.9
Injuries to the periodontal tissues		
Concussion	4	0.4
Subluxation	39	4.0
Intrusive luxation	17	1.7
Total	60	6.1
Injuries of the supporting bone		
Fracture of the alveolar socket wall	15	1.5
Fracture of the alveolar process	2	0.2
Total	17	1.7

**Table 9:** Distribution of the patients according to nature of lip

Nature of lip	No. (n=982)	%
Competent	710	72.3
Incompetent	272	27.7

**Table 10:** Distribution of the patients according to overjet (maxillary incisor)

Overjet	No. (n=982)	%
≤3 mm	710	72.3
>3 mm	272	27.7

**Table 11:** Distribution of the patients according to overbite (maxillary incisor)

Overbite	No. (n=982)	%
Present	710	72.3
Absent	272	27.7

**Table 12:** Distribution of the patients according to Molar relation

Molar relation	No. (n=982)	%
Class I	510	51.9
Class II	404	41.1
Class III	68	6.9

The present study was carried on 2820 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, probable causes, occlusal relationship at Patna town. In view of large population of children to be examined, WHO classification for traumatic dental injuries for assessing the occlusal relationship was applied because of their ease and accuracy.

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 prevalence of traumatic dental injuries was studied by various authors based on the factors like age, sex, cause of trauma, and their place of occurrence of trauma.

In the present study among 2820 school children examined, 155 children had fractured teeth, giving the overall prevalence rate of 5.5%. This result was similar to that found by Rai SB and Munshi A K [15] (5.29%) in South Kanara. However, it was lower than the findings of other studies done by gauba M.L. (7.54%) [16], Lin H, Naidoo S (9.3%) [17] In Maseru, Evelyne pessoa Soriano *et al.* (10.5%) [18] In Brazil, Garcia-Godoy FM (10%) [19] In Mahendra Perea (14.9%) [20], Rajab LD (13.8%) [21] In south kanara district, Garcia-Godoy F (18.1%) [22] In Dominican, Naqvi A. and Ogidam O. (19.6%) [23] In Nigeria. *et al.* (35.0%) [24] In Thailand. This variation in the prevalence may be attributed to differences in sampling technique, application of different diagnostic criteria, different study setting with different age group.

The prevalence of traumatic dental injuries in school children at various ages have been reported by many authors. The result of the present study showed that the peak incidence of injury was 10-12 years (52.5%) followed by 13-14 years (29.5%). These results are comparable to the study done by Marcenes W. B. *et al.* [25] in their study. Marcenes Wand Sheiham A. (2001) [26] observed most of the injuries in 8-11 year old children, Petti S. and Tarsitani G. (1996) [27] found more affected cases among 9 years old. Garcia-Godoy F. Sanchez R. and Sanchez JR: (1981) [28] found that the 14 year olds followed by the 12 year old children sustained more traumatic injuries to their teeth. It shows clearly that the prevalence of traumatic dental injuries increases with age may be due to a cumulative effect.

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 and Sheiham A. (67.2% and 50.2%) [29], these indicate that boys are more prone for fracture than girls. 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. Behaviour can be very important factor in the occurrence of traumatic dental injuries among children, so this factor must always be taken into consideration in developing effective preventive strategies for preserving dental health, as behavioural risk factors frequently involve aggressive or violent attitudes, especially in the Boys. The restricted and mature behaviour of females enforced by conservative parents due to cultural and religious reasons could be a possible factor, which contributes to the low prevalence of trauma among Indian girls. But on the other hand this finding does not agree with a study conducted in the city of Santo Domingo, Dominican Republic done by Garcia- Godoy, *et al* (1985) <sup>[30]</sup> where, Girls (50.6%) are more affected by traumatic dental injuries than Boys (48.7%). Other studies done by Rocha MIC, Cardoso M (2001) <sup>[31]</sup> 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.

The causes of traumatic injuries to the teeth are many and varied. In the present study, 58% of the fractures had occurred due to fall during playing, and is in accordance with the results found in several studies in the literature that have demonstrated that falls are among the main causes of dental trauma as noticed by different authors like Cortes M.L Marcenés W, Sheiham A. (2001 and 2002) <sup>[32]</sup>, Garda-Godoy FM (1984) <sup>[33]</sup> Forsberg CM, Tedestam G, (1993) <sup>[34]</sup> Marcenés W, Alessi ON, Traebert J (1998) <sup>[35]</sup>, Rajab LD(2003) <sup>[36]</sup>, Traebert J *et al.* (2003) <sup>[37]</sup>. In the present study, the teeth most commonly affected are maxillary central incisors (91.6%) this compares well with the corresponding data, Because of its vulnerable position in the dental arch.

In the present study most of the affected children had predominance of single tooth injuries (85.5%). The results are in consistent with study reported by Marcenés *et al.* (1999) <sup>[38]</sup>, Hunter ML *et al.* (1991) <sup>[39]</sup>, Malikaew P, Watt RG, Sheiham A (2006) <sup>[40]</sup>. This may be due to less behavioral predisposition of the study group towards more vigorous events. However certain trauma events such as sports and automobile accidents favor multiple tooth injuries especially among children. In the present study, the most common type of injury was crown infraction fractures, which accounted for about 88.3%. This is in agreement with previous studies done by Jarvinen S. (1979) <sup>[41]</sup>, Naqvi A. (1990) <sup>[42]</sup> Marcenés W and Beirut N. (1999) <sup>[43]</sup>. Malikaew P, Watt RG, Sheiham (2006) <sup>[44]</sup> where the crown infraction fractures are the main type of traumatic injuries to permanent anteriors. This may be attributed to high behavioral predisposition of the study group might have made it vulnerable not only to the occurrence of injury but also increased tendency towards a more severe form of injury than compared to present study.

When the prevalence of traumatic dental injuries are assessed in relation to lip coverage 41% of the injured subjects had adequate lip coverage where as 59% of injured subjects showed incompetent lip. There was statistical difference found between traumatic dental injuries and inadequate lip coverage in this study compare to studies done in literature showed a definite statistical significant between the inadequate lip coverage and the prevalence of

traumatic dental injuries in the studies done by Soriano EP. (2004 and 2005) <sup>[45]</sup>. But the results of this study were in correspondence with the reports of previously done studies by Hunter *et al.* (1991) <sup>[46]</sup> Otuyemi OD (1994) <sup>[47]</sup> and Petti S, Tarsitani G (1996) <sup>[48]</sup> Showed that lip incompetence could affect the prevalence of traumatic dental injuries.

The relationship between traumatic dental injuries to anterior permanent teeth and the overjet size have been discussed by various authors. In the present study majority of the traumatic dental injuries were seen in children with overjet of 3.5-5.5 mm (66.1%) than those with a greater overjet of >5(2.1%) tended to result in such injuries as reported in previous studies by Soriano EP (2004 and 2005) <sup>[49]</sup>, Malikaew P (2006) <sup>[50]</sup>. Whereas the study done by Jarvinen S (1979) <sup>[51]</sup>. In the present study, significant relationship was found between the size of overjet and prevalence of trauma in those children whose overjet was increased beyond the normal range.

When the prevalence of traumatic dental injuries to occlusal relation were assessed, children with Class II div I showed a high prevalence rate (94%) followed by class I (49%) exhibited the highest number of dental injuries compare to other type of occlusal relationship. These results are in consistent with the results seen in the study done by Rai SB and Munshi AK <sup>[52]</sup> in the year 1998. This proves that protrusive anterior teeth are one of the major predisposing factors for the cause of trauma in the young children, because more protrusive teeth receives the main force of the blow while others may be much less severely damaged. Screening programs could be conducted for school children for early Orthodontic evaluations and appropriate preventive measures such as preventive orthodontic treatment and use of mouth guards can be performed, for the subjects with protrusive anterior, which favours the prevention of severe injury to the teeth.

Another aspect that could enhance treatment neglect is the lack of knowledge regarding the treatment of traumatic dental injuries among the dentist. In addition, dental school curricula and health authorities tend to focus resources on other oral health condition but not on treatment of traumatic dental injuries. Epidemiological studies too often include only visual assessment and therefore tend to underestimate the need for treatment. Marcenés and Murray evaluated the need for treatment in addition to assessing only untreated damage, and showed that not all untreated dental injuries needed treatment because some injuries were minor.

Marcenés *et al.* <sup>[53]</sup> have shown in their studies in Brazil and Syria that a majority of the traumatized teeth were not treated (58.9%) In another study done in Jaraguá do Sul, it was reported that nearly half of the sample who had experienced injuries to the permanent anterior teeth were not taken to the dentist for evaluation or treatment <sup>[54]</sup>.

One reason could be that on suffering any injury, the people usually rush to a nearby medical practitioner or hospital where dentists are not available or else the fear of the dentist keep them away. Economical and social status of the patients also may be some other factors due to which people do not seek immediate dental treatment. Accordingly, educational programs need to be instituted about the importance of ways of preventing dental trauma and the benefits of immediate seeking of the treatment for conservation of avulsed and fractured teeth. Such programs should be directed at the community levels as well as in the schools. Continuing educational programmes about the

latest technologies in the management of traumatized teeth should also be arranged for the dental practitioners. Traumatic dental injuries constitute a major public health problem creating not only physical, but also esthetic and psychological effects in children and their parents.

Unfortunately, the public is unaware of the risk and does not have enough information to avoid traumatic injuries to the teeth. On the other hand the health professionals, including dentists, underestimate the incidence of dental trauma and concentrate on the treatment rather than prevention of traumatic dental injuries. Although prevention of traumatic dental injuries is the most desirable action, it is essential that the oral health professionals must educate children parents, teachers and health care professionals in correct emergency care after a traumatic injury has occurred. Since most injuries occur at home or at school, education of key individuals should impact greatly on the prognosis after a traumatic injury.

The present descriptive cross sectional study was conducted among 2820, 7 to 14 years in various schools to assess the prevalence of traumatic dental injuries of the permanent anterior teeth in relation to different age group, probable causes, type of tooth injury, nature of lip and occlusal relationship at Patna town.

The total population comprised of 28,200 school children in age group between 7-14 years belonging to school children of Patna were considered for the study. The study population of 2820 school children were selected using the statistical software. To obtain desired sample size and the children are divided into three groups according to the schools they belonging to as group I (7-9 years), group II (10-12 years) and group III (13-14 years).

The data was collected using self designed proforma both by direct interview and through the clinical examination of the school children regarding the cause. Which also included WHO's classification for assessing the traumatic dental injuries. The data was tabulated and statistically analyzed using chi-square.

It was noted that the prevalence of traumatic dental injuries was 5.5%. Boys showed a higher prevalence of traumatic dental injuries (55%) than girls (45%) in all the age groups. Prevalence of traumatic dental injuries were more in the age group of 10-12 years (52.5%) than 13-14 years (29.5%) and 7-9 years (18%). Major cause of traumatic dental injuries to permanent anterior was fall during playing (58%) and collision (7%). Traumatic dental injuries of permanent anterior teeth involved maxillary teeth. Majority of traumatic dental injuries involved maxillary central incisors (97.2%). Crown infraction fracture were the highest (88.3%) followed by uncomplicated crown infraction (10.2%). Children with normal overjet of 0-3.5mm had less fractured teeth (31.7%) than with the over jet of 3.5-5.5 mm (61.1%) and >5mm (2.1%) and also children with adequate lip coverage had less fractured (41.1%) than children with inadequate lip coverage (59%). The number of children with injured teeth was highest in class II Div I (60.5%) occlusion and least in class II Div 2 (2.10%) Also, in children having class II Div I occlusion, 2.05 times greater chance of experiencing anterior tooth injury was found as compared to those having class I type (31.60%).

### Conclusion

Following conclusions can be drawn from the results of the present study; The prevalence of traumatic dental injuries of

permanent anterior teeth is 5.5%. Boys are usually more affected than girls in case 2:1 of anterior tooth trauma. Prevalence of traumatic dental injuries was more in the age group of 10-12 years followed by 13-14 years and 7-9 years. Falls during playing were the major causes for anterior teeth fracture. Children with increased proclination of maxillary central incisors (more than 3.5-5.5mm) over jet were significant of all traumatic dental injuries. Single tooth trauma is the commonest of all types of injuries. Crown Infraction fracture (WHO's classification) are predominant of all types of tooth injuries. Subjects with Angle's class II Div I malocclusion is more prone to anterior teeth trauma in comparison to Angle's class I and class III molar relation. Injuries occur more in patient with increased over jet and with incompetent lips.

Some proposed preventive measure to reduce the prevalence of traumatic injuries by taking into consideration of the followings.

1. The use of intraoral and extra oral devices which protects the face and teeth from trauma like custom made mouth guard/ protective head gear/helmet/knee cap while children on outdoor sports activity.
2. Educational program by providing information regarding the preventive and treatment aspects of this commonly occurring condition.
3. Safe play areas for children with soft surface under parental supervision.

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