

Prevalence of Traumatic Injuries to Primary Anterior Teeth among Children aged 2–6 Years in National Capital Region of Delhi, India

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ABSTRACT

Aims: The aim of this study was to assess subject wise and tooth wise distribution and prevalence of traumatic injuries to the anterior teeth of 2- to 6-year-old children.

Materials and methods: A cross-sectional survey was performed. Primary maxillary and mandibular anterior teeth of 1,800 children aged between 2 years and 6 years, who attended 20 pre-schools in National Capital Region Delhi, India, were examined by a single examiner, and a questionnaire was filled in person by the parent/guardian. Andreasen's classification was used to classify the traumatic injuries. The Chi-square test was used to statistically analyze the variation in traumatic dental injuries (TDIs) with age and gender. Multiple logistic regression was used to determine the influence of independent variables on the occurrence of TDIs.

Results: The prevalence of TDIs was 17%. Significant and highly significant differences were found between boys and girls for cause and location of trauma ($p < 0.05$) and tooth type involved ($p < 0.001$) with boys being more prone to such injuries. The commonest cause of injury was due to falls and the location was playground. The teeth most commonly affected were the maxillary central incisors (36.9%) followed by maxillary lateral incisors (3.3%), and the least affected were the maxillary and mandibular canines (0.3%).

Conclusion: The prevalence of traumatic injuries to the anterior teeth in 2- to 6-year-old children in National Capital Region of Delhi, India, was 17%. There is a need to run educational programs to increase parents' awareness of the risks of dental trauma and emphasize preventive measures.

Clinical significance: Parents should be made aware of the widespread prevalence, risk factors, and consequences of trauma to primary dentition, so that they can seek appropriate care timely. The time elapsed between injury and dental care is of utmost importance.

Keywords: Anterior tooth trauma, Oral health, Pre-school children, Prevalence of dental injury, Primary teeth.

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INTRODUCTION

Traumatic dental injuries are a serious health problem not only for children but also for their parents. These injuries present a serious impact on the emotional well-being of the patients as its severity may lead to a lot of pain, loss of aesthetics, and functional impairment of the structures of mouth. Children may worry to have to face unpleasant comments due to compromised dental appearance as a result of a TDI.¹ A study showed that children with a 'normal' dental appearance were considered as better looking, more intelligent, were less aggressive, and more likely to make friends.² El-Kalla et al. showed that children with treated teeth gained improvement in esthetics, emotional well-being, and social interactions following crown restoration.³ The social judgements, hence made, may have life changing consequences in terms of relationship success, career prospects, and even judicial outcomes.⁴

Unfortunately, people are not well-informed about the risks of TDI in deciduous and permanent dentition and about the preventive measures to be taken.⁵ It is even seen that more attention has been given to injuries of permanent dentition than primary teeth, probably due to the misconception that primary teeth eventually exfoliate and therefore do not require greater care.⁶

Previous studies have shown that trauma to primary dentition may lead to potential developmental disturbances to the underlying successors.⁷⁻⁹ TDIs are presently the second most common reason for visiting a pediatric dentist after dental caries.¹⁰

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These injuries are caused by an external impact on the mineralized and supporting tooth tissues. In toddlers (1 and 2 years), falls are the most common cause, while in five years olds' jumping is one of the possible causes of TDI.¹¹ In 8- to 11-year-old, playground accidents and cycling are common causes, while in an adolescent sports activities and fights are often associated with TDI.¹² The anatomic factors consistently reported to increase the risk of occurrence of anterior teeth injuries that are substantial maxillary incisor overjet

and inadequate lip coverage of the anterior teeth.¹³ Gender is one of the socio-behavioral factors reported to increase the predisposition toward traumatic injuries to anterior teeth; men are more prone than women.¹³

Several studies have shown that one-third of all preschool children suffer TDIs involving the primary dentition, but variations have been reported between and within the countries.¹⁴ Prevalence ranges from 9.4 to 41.6%.¹⁴ These variations can be due to certain preferences in different countries like participation in contact sports or adventure games.¹⁵ Also, awareness regarding prevention of injuries and access to emergency care are responsible for these variations.^{15,16} It is important to understand the global similarities along with regional variations.¹⁶ Numerous studies have been reported from different part of India, which exhibited a prevalence of TDI ranging from 1 to 76%.¹⁷⁻²⁶ Looking at the clinical importance of the condition, it is important to consider the factors that might lead to TDI to the primary dentition and more important is to prevent children from trauma through awareness and collecting data from as many regions as possible. Therefore, to achieve this goal, this study has been undertaken, first, to record the subject wise and tooth wise prevalence of dental trauma in primary dentition and second to report the etiological factors of dental trauma in primary dentition in 2- to 6-year-old children in National Capital Region of Delhi, India.

METHODOLOGY

The study was conducted at Santosh Dental College and Hospital, Ghaziabad, Delhi-NCR. The study duration was 2 years.

ETHICAL CLEARANCE AND STUDY SAMPLE

Before the commencement of the study, permission from the ethical committee of Santosh Dental College and Hospital, Ghaziabad, Delhi-NCR was obtained for the examination of school children. The guidelines set up by ICMR (1994) and Helsinki declaration (modified 2000) were followed for all patients enrolled in the study. The parents of children involved in the research project were informed participants. Parents of each child were adequately informed of the aims, methods, the anticipated benefits and potential risks of the study, the discomfort it may entail to him/her, and the remedies thereof. Every precaution was taken to respect the privacy of the child, the confidentiality of the participant's information and to minimize the impact of the study on his/her physical and mental integrity and his/her personality. The parents of the participant were given the right to abstain from participation in the study or to withdraw consent to participate at any time of the study without reprisal. Due care and caution were taken at all stages of the research to ensure that the participant is put to the minimum risk, suffer from no irreversible adverse effects and, generally, benefit from and by the research or experiment. Written informed consent was obtained from parents of all the participants included in the study.

SAMPLE SIZE CALCULATION

In this cross-sectional study, 1,800 children from 20 pre-schools in Delhi National Capital Region of Delhi, India, were selected. Ten pre-schools each were randomly selected in rural and urban areas. The selection of sample size was based on probability sampling to truly represent the entire city. All the children enrolled in these pre-schools were invited to participate in the study. The duration of the study was 2 years.

DENTAL TRAUMA ASSESSMENT

The children were between 2 years and 6 years of age regardless of gender and only their anterior teeth were examined for TDIs. Children with mixed and permanent dentition exfoliated deciduous anterior teeth and injury to supporting bone and gingiva/oral mucosa were excluded. Only visual inspection was done using natural light and mouth mirror without any radiographic examination with the participant seated on an upright chair.

Only one examiner (HKS) was involved in conducting the clinical examination, and the examiner who was a postgraduate student was trained under the supervision of a consultant from the Department of Pediatric Dentistry, Santosh Dental College, Ghaziabad. The examination was conducted on a group of 10 subjects, and a wide range of TDIs according to Andreassen's classification were assessed such as injuries to hard dental tissues, pulp, alveolar process, and periodontal tissues. The examiner then to determine how consistently he could apply the diagnostic criteria examined a group of about 25 subjects twice on successive days and sometimes with a time interval of at least 30 minutes between examinations. These subjects were pre-selected from 20 pre-schools, so that they collectively represented the full range of conditions expected to be assessed in the actual survey. By comparing the results of the two examinations, the examiner could obtain an estimate of the extent and nature of his diagnostic variability. If the variability was large, the examiner reviewed the interpretation of the criteria and conducted additional examinations until acceptable consistency was achieved (WHO Oral Health Survey).²⁷

The following data were recorded:

- The cause of the trauma [classified into fall (group I), sports (group II), road accident (group III), and fight (group IV)].
- Type of tooth involved in dental injury.
- The prevalence and distribution of dental injuries.

STATISTICAL ANALYSIS

All data were processed and analyzed using an SPSS statistical program (version 16.0, Chicago, IL, USA). Chi-square was used to test the association between socio-demographic variables and oral factors and TDIs. Multiple logistic regressions were used to determine the influence of independent variables on the occurrence of TDIs. The level of statistically significant difference was set at p -value of ≤ 0.05 .

All TDIs involving the pulp or complicated crown fractures and crown-root fractures during the 2 years duration of this study were referred to Santosh Dental College and Hospital, Ghaziabad, India, for radiographic evaluation, follow-up, and free of cost treatment.

RESULTS

Table 1 showed distribution of total sample (children) according to gender in a total sample of 1,800 children ($n = 932$ boys, 868 girls). There was insignificant difference between the genders (boys = 51.78%, girls = 48.22%, $p = 0.75$).

Table 2 showed distribution of total sample (children) according to TDI. It showed the total number of children with TDI ($n = 306$, 17%) and those without TDI ($n = 1494$, 83%).

Table 3 showed comparison of TDI between boys and girls according to cause of TDI. It showed the distribution in the following groups: Falls (group I), road accidents (group II), sports (group III),

Table 1: Distribution of total sample (children) according to gender

Gender	Frequency	Percent	Cumulative percent	95% confidence limit (lower CL–upper CL)
Girls	868	48.22%	48.22%	45.92–50.53%
Boys	932	51.78%	100%	49.47–54.08%
Total	1800	100%	100%	

and assault (group IV). The frequency and percentages in the various groups were as follows: group I ($n = 112$, 36.6%; 60 boys and 52 girls), group II ($n = 24$, 7.84%; 8 boys and 16 girls), group III ($n = 109$, 35.62%; 57 boys and 52 girls), and group IV ($n = 61$, 19.93%; 31 boys and 30 girls). The p value was found to be insignificant, which is equal to 0.3.

Table 4 showed distribution of children with TDI according to cause of trauma and age. It showed highest scores in age 5 due to falls (17.65%), in age 3 due to road accidents, in age 4 due to sports (16.01%), and in age 5 due to assaults (10.78%). The overall etiology was seen maximum due to falls (36.6%) followed by sports (35.62%). The values were significant with $p = 0.47$.

Table 5 showed distribution of children with TDI according to type of teeth ($n = 306$). It showed frequency and percentage distribution of tooth predisposed to trauma. The right maxillary central incisor showed maximum percentage distribution of TDI (36.9%) followed by the left maxillary central incisor (35%). The mandibular canines were least involved in TDI with 0.3%.

Hence, according to this study, it was found that the prevalence of TDIs in children between 2 years and 6 years age-group was found to be 17% in Ghaziabad, India. 2- to 6-year-old children age group among which conclusion was the most common type. It was found that gender, age, and history of trauma were important predisposing factors for occurrence of dental trauma. There was a higher predisposition to trauma in men as compared to women. Also, occurrence of trauma was more in 5 years old as compared to others.

DISCUSSION

Epidemiological data form a basis for evaluation of the concepts of treatment, resource planning, and allocation within any health environment.²⁸ There have been limited number of studies and limited epidemiological data are available in the field of dental and oral trauma in India.

Estimating the prevalence of TDIs in a given population is a relatively simple task, and many studies have calculated the percentage of TDI in a given sub-population worldwide. Prevalence is defined as the number of events (number of children experiencing TDIs) in a given population at a designated time point.²⁹ The prevalence of TDIs in primary dentition has been found to vary considerably due to various factors such as classification of trauma, the dentition studies, and behavioral and geographical differences between study locations and countries.

The prevalence of dental trauma to primary dentition in a Brazilian study by Bijella et al. was found to be as high as 30% in children between 10 months and 72 months old.³⁰ Whereas, overall trauma prevalence in South African children was found to be 16% in primary school children in a study by Hargreaves et al.; 13% in the black population and 21% in the white population.³¹ Cunha³² studied prevalence of dental trauma in 1,654 patients, 0–3 years of age, in Brazil to be 16.3%. Contrary to the findings of our study, Deepak et al.³³ showed in overall prevalence of 76.13%

Table 2: Distribution of total sample (children) according to TDI

TDI	Frequency	Percent	Cumulative percent	95% confidence limit (lower CL–upper CL)
Absence of TDI	1494	83.00%	83.00%	81.19–84.66%
Presence of TDI	306	17.00%	100.00%	15.34–18.81%
Total	1800	100.00%	100.00%	

in 1,500 children, 4–6 years of age in Gulbarga city, India, and Robson et al.³⁴ showed a prevalence of 47% in 419 children, 1–4 years of age in Brazil.

In pre-school children, oral injuries make up as much as 17% of all bodily injuries.³⁵ A moderately high prevalence of 14.74% has been found among Indian primary school children aged 6–11 years by Ankola et al. in a district-wide oral health survey.³⁶ Shekhar and Mohan reported a prevalence of 6.2% of injuries among deciduous anterior teeth in a sample of 1,126 pre-school children in Chennai.³⁷ Another study by Rai et al. involving pre-school as well as school children between the ages of 3–16 years reported a prevalence of 5.29% of incisors and canine fractures in Karnataka.³⁸

TDIs to deciduous teeth have been defined and classified by Andreasen in 1981, WHO in 1978, Garcia-Gordoy in 1981, and Ellis in 1970.^{9,27,39,40} Comparison or accumulation of data from different studies is extremely difficult due to the differences in the definitions and classifications followed in the various studies. Andreasen's classification has been followed in our study. This system is a modification of World Health Organization's classification hence, a more comprehensive system which allows for minimal subjective interpretations.⁹

The difference in sex distribution has not been so obvious. Bijella et al. showed a difference of 1.3:1 between men and women, while Onetto et al. found a male:female ratio of 0.9:1 for children less than 7 years old.^{30,41} The findings of the present study corroborate with these studies. However, on the contrary, according to Deepak and Tarulatha et al., significant difference was found between the genders, with TDIs more prevalent in men than women.³³

As the age of the child increased from 2 to 5 years of age, the incidence of TDIs also increased in the present study. This is in accordance to the finding of Beltrao et al. who also observed an upward trend in the TDI in children from 2 years and 3 years.⁴²

Etiology of dental trauma to primary teeth may vary widely. There are variations between studies and countries regarding the predominant cause of dental trauma although falls have been found to be the most common factor in both primary and permanent dentition.⁴³ This supports the finding of the present study where fall dominates the etiological factors.⁴⁴

The most common location to cause TDIs in children of 2–6 years is likely to be in places where they spend maximum time. These locations recorded in our study were home, school, and playground. This could be due to children being in their developmental stage and learning. The injuries in 5 and 4 years old in our study correlate with Chalissery et al. and Deepak and Tarulatha^{33,45}

Various other studies have been compared with the prevalence of TDIs, but the same standardized classification systems have not been followed uniformly in all; therefore, accurate prevalence might not have been calculated. Patient's recall of injury may not have been accurate if the injury happened months or years before

Table 3: Comparison of TDI between men and women according to the cause of TDI

Cause of TDI	Gender				Total	Total
	Boys		Girls			
	n	Percentage (%)	n	Percentage (%)		
Falls	60	19.61	52	16.99	112	36.60
Road accident	8	2.61	16	5.23	24	7.84
Sports	57	18.63	52	16.99	109	35.62
Fight	31	10.13	30	9.80	61	19.93
Total	156	50.98	150	49.02	306	100.00

Chi-square = 3.3675, Df = 3, Probability = 0.3384

Table 4: Distribution of children with TDI according to cause of trauma and age

Cause of trauma	2 years	3 years	4 years	5 years	6 years	Total
Falls	11 (3.59%)	20 (6.54%)	14 (4.58%)	54 (17.65%)	13 (4.25%)	112 (36.60%)
Road accidents	2 (0.65%)	9 (2.94%)	3 (0.98%)	10 (3.27%)	0 (0%)	24 (7.84%)
Sports	15 (4.90%)	20 (6.54%)	17 (5.56%)	49 (16.01%)	8 (2.61%)	109 (35.62%)
Assault	7 (2.29%)	12 (3.92%)	6 (1.96%)	33 (10.78%)	3 (0.98%)	61 (19.93%)
Total	35 (11.44%)	61 (19.93%)	40 (13.07%)	146 (47.71%)	24 (7.84%)	306 (100%)

Chi-square = 11.6147, Df = 12, Probability = 0.4771

Table 5: Distribution of children with TDI according to type of teeth (n = 306)

Tooth type	n	Percentage (%)
Right maxillary central incisor	113	36.9
Right maxillary lateral incisor	10	3.3
Right maxillary canine	1	0.3
Left maxillary central incisor	107	35.0
Left maxillary lateral incisor	9	2.9
Left maxillary canine	1	0.3
Right mandibular central incisor	24	7.8
Right mandibular lateral incisor	8	2.6
Right mandibular canine	1	0.3
Left mandibular central incisor	25	8.2
Left mandibular lateral incisor	6	2.0
Left mandibular canine	1	0.3
Total	306	100

the examination. Specific sub-populations such as children from pre-schools in a given geographical area could only be examined in this study.

CONCLUSION

Thus, analyzing the results obtained it can be concluded gender; age and history of trauma were important predisposing factors for occurrence of dental trauma. There was a higher predisposition to trauma in boys as compared to girls. Also, occurrence of trauma was more in 5 years old as compared to others. The prevalence of TDIs in children between 2 years and 6 years age group was found to be 17% in Ghaziabad, India.

More epidemiological studies from standardized classification systems are needed to study the relation of TDIs in children with various etiological factors and to help implement preventive measures and educational programs.

DISCLOSURE STATEMENT

All the authors of this manuscript have nothing to disclose.

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