Traumatic Injuries in the Primary Teeth of 4- to 6-Year-Old School Children in Gulbarga City, India. A Prevalence Study

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Abstract

Aims: The aims of the study were: to assess the prevalence of traumatic injuries to the teeth of 4- to 6-year-old children living in Gulbarga City, India, to determine prevalence of such dental traumatic injuries at the ages of 4, 5, and 6 years and to compare the prevalence of these injuries between male and female children.

Methods: A cross-sectional survey was performed. It consisted of a clinical examination of upper and lower deciduous anterior teeth by one examiner and an interview using a questionnaire with a sample of 1500 children aged 4 to 6 years who attended kindergarten and primary schools in Gulbarga city. Garcia-Godoy's (1981) classification was used to classify the traumatic injuries. Intra-examiner consistency was assessed by kappa values on tooth-by-tooth basis. The chi-square test was used to analyse any gender and age differences.

Results: The prevalence of traumatic dental injuries was 76.13%, of which crown fracture with enamel involvement of teeth was the most prevalent, followed by crown fracture with both enamel and dentine involvement. Significant and highly significant differences were found between boys and girls for discoloration of teeth (P<0.05), crown fracture involving enamel (P<0.001) and crown fracture involving both enamel and dentine (P<0.001). The prevalence of traumatic dental injuries in the 5-year-old children was higher than that in the 4- and 6-year-olds. The commonest cause of injury was due to a fall (60%) and in 40% of cases of traumatic injury, they occurred in a field/playground.

Conclusions: The prevalence of traumatic injuries to the anterior teeth of the 4- to 6-year-olds who took part in this study was very high. There is a need to run educational programmes to increase parents' awareness of the risks of dental trauma.

Key Words: Dental Trauma, Injury, Prevalence, Primary Teeth

Introduction

An injury to both the primary and permanent teeth and the supporting structures is probably, next to caries, one of the most common dental health problems seen in children [1]. Most of these injuries are preventable and steps taken to prevent them enhance the oral health status of the community [2]. Injury resulting from an external force is termed as trauma and it is one of the main reasons for dental emergencies [3,4]. It is one of the commonest health problems that children across the world face today. It has no significant predictable pattern of frequency and it may not only leave physical scars but also have a psychological impact on the victim [5]. A child is perceived to be in a dynamic state of growth, both mentally and physically. As he/she enters school this activity increases further. Curiosity about the surrounding environment and the urge to explore it may lead to dental injuries because the child has incompletely developed motor coordination [6]. The burden of the dental trauma has to be shared by both the child and the parents. It has been reported that one-third of preschool children and one-quarter of all school children suffer from dental traumatic injuries during the primary dentition stage and the permanent dentition stage, respectively [7].

Most of the published data to date on the prevalence of child dental injuries in India arise from studies of the permanent dentition [8-12] and

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there is a scarcity of published data on the prevalence of dental traumatic injuries in the primary dentition [13-15]. It was therefore decided to study the prevalence of dental injuries to the teeth of 4- to 6-year-olds in Gulbarga city, as such a study might provide an insight into the need for preventive measures, which in turn could improve the oral health status of children in this age group.

Aims

The aims of the study were:

- 1. To assess the prevalence of traumatic injuries to the teeth of 4- to 6-year-old children living in Gulbarga city.
- 2. To determine prevalence of such dental traumatic injuries at the ages of 4, 5, and 6 years.
- 3. To compare the prevalence of these injuries between male and female children.

Methods

The study was carried out as a part of a school dental health programme conducted by a non-governmental organisation (NGO). It took the form of a cross-sectional survey of 1500 school children aged 4 to 6 years, who attended different kindergartens and primary schools in Gulbarga city, India. Using a simple random sampling technique, lower kindergartens, upper kindergartens and first standards were selected from five different schools (all the three categories were included in each school). A lottery system was used to pick these five schools out of the ten primary schools in the area (all the ten school names were written on chits, which were shuffled and a child was asked to pick five). All the children were examined within the span of six months. The survey was conducted in two stages. In the preliminary stage, a questionnaire (*Figure 1*) was used in an interview with each child. All the children then attended the dental clinic of a primary health centre for a clinical examination. Parents and children were informed regarding the purpose of the study and informed consent was obtained from the parents. Ethical clearance for the study was obtained from the ethical committee of Parama Gowda Mallanan Gowda Nada Gowda Memorial Dental College and Hospital. A pilot study was performed on a sample of 10 children to test the validity of the questionnaire and the methodology used.

Only upper and lower anterior teeth deciduous teeth (central incisors, lateral incisors and canines) were examined by one trained and calibrated examiner using a mouth mirror and dental probe in natural light. Garcia-Godoy's (1981) classification [16] was used to classify traumatic injuries to these anterior teeth.

An intra-examiner consistency test was performed by examining a cohort of 25 children on two different occasions, one week apart, and the Kappa statistic was 0.83.

Prevalence of traumatic dental injuries was calculated. To compare the prevalence among different age groups and between males and females, the chisquare test was used; a value of P<0.05 was regarded as significant. Statistical analysis was performed by using software (Statistical Package for Social Sciences version 15.0; SPSS Inc, Chicago, USA).

Results

Within the overall total of 1500, 930 were male and 570 were female. Their distribution by age and gender within the sample is shown in *Table 1*.

Tab	le 1	. San	nple distril	oution	by gen	der and age
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Age (yrs)	Gender		Total
	Male	Female	
4	260	120	380
5	330	200	530
6	340	250	590
Total	930	570	1500

Of the 1500 children, 1142 (76.13%) had traumatic dental injuries to their deciduous anterior teeth. Of these children, 834 (55.6%) had a crown fracture with enamel involvement, 145 (9.6%) had a crown fracture with both enamel and dentine involvement, 78 (5.2%) had mobility of the teeth, and 55 (3.6%) had tooth discoloration. The least prevalent traumatic injury was found to be crown fracture involving enamel, dentine, and pulp (30; 2%) (*Table 2*).

Dental trauma was more prevalent in males than females, with significant differences found especially for crown fracture involving enamel (P<0.001) and crown fracture involving enamel and dentine (P<0.001). When gender difference between the different groups was considered, there was highly significant difference (P<0.001) between the 5- and 6year-old girls and boys (*Table 3*).

When age was considered, there was significant difference (P<0.001) in prevalence between different age groups. Highest prevalence of trauma was seen in the 5-year-old children (*Table 3*).

ident name:	Age:	Sex:
dress:	-	
hool name:		
te of the interview:		
1. Have you ever had an accident	that involved your mouth/teeth	?
(a) Yes	(b) No	
2. If yes, which tooth/teeth were af	ffected by the accident?	
3. When did the accident that dam	naged your tooth/teeth happen?	,
Month/Year		
4. How did the accident happen?		
(a) Fall from stairs	(b) Fall from window	(c) Fall from tree
(d) Fall from bicycling	(e) Other type of fall	(f) Traffic accident
(g) Collision against object	(h) Violence	(i) Other (specify)
5. What caused the accident that d	lamaged your tooth/teeth (e.g.,	pushing, tripping, slipping)?
6. Where did the accident happen'	?	
(a) Home	(b) School	(c) Street
(d) Field/Playground	(e) Park	(f) Other (specify)
7. Could you please describe in a f type, surroundings)?	few words the place where the a	accident happened (i.e., surface
8. As a result of the accidental dam school?	nage of your tooth/teeth did yo	u have to take any time off
(a) Yes		(b) No
((-)

Figure 1. The questionnaire.

Hole 2. I revalence of achial traumatic infantes				
Type of fracture	Male	Female	Total	<i>P</i> -value
	n (%)	n (%)	n (%)	
	(N=930)	(N=570)		
Discoloration of teeth	30 (3.2%)	25 (4.3%)	55 (3.6%)	< 0.05*
Crown fracture involving enamel	590 (63.4%)	244 (42.8%)	834 (55.6%)	< 0.001*
Crown fracture involving enamel & dentine	75 (8.0%)	70 (12.2%)	145 (9.6%)	< 0.001*
Crown fracture involving enamel,				
dentine & pulp	20 (2%)	10 (2%)	30 (2%)	< 0.05*
Mobility	50 (5.3%)	28 (4.9%)	78 (5.2%)	< 0.05*
Total	765 (82.2%)	377 (66.1%)	1142 (76.13%)	< 0.001*

Table 2. Prevalence of dental traumatic injuries

*Significant; †Highly significant

The interview results suggested that 60% of dental traumatic injuries occurred due to a fall, with the other possible answers accounting for the other 40%. In 40% of cases, the place of occurrence of the fall was reported to be in the fields/playground; the next commonest place was at school (25%) (*Table 4*).

Age in years (n)	Gender (n)	Prevalence N (%)	Total	Significance
4 (380)	Male (260)	192	282 (74%)	>0.05‡
	Female (120)	90		
5 (530)	Male (330)	287	425 (80%)	< 0.001†
	Female (200)	138		
6 (590)	Male (340)	265	435 (74%)	< 0.001*
	Female (250)	170		

Table 3. Prevalence of dental traumatic injuries by age and gender

‡Not significant; †Highly significant

Questions	Percentage of answers
1. Cause of the accident	
(a) Fall	60%
(b) Collision	20%
(c) Traffic accident	5%
(d) Violence	15%
2. Where the accident happened	
(a) Home	15%
(b) School	25%
(c) Street	5%
(d) Field/playground	40%
(e) Park	10%
(f) Other	5%

Table 4. Results of interview

Discussion

The present study was undertaken with the main aim of assessing the prevalence of tooth fracture in primary school children aged between 4 and 6 years living in Gulbarga city, and to determine whether or not there was any difference in the prevalence of such injury with regard to gender and age.

The overall prevalence of dental traumatic injuries in this group was 76.13%. This was high when compared to the findings of previous studies on different populations [8,17-24]. A recently published study of Indian preschool children found the prevalence of dental trauma to be 6%, which is very low in comparison to the present group of children [13]. This difference in prevalence for different populations may be due to factors such as the difference in sample size, frequency of exposure to contact sports and lack of physical activities, the socio-economic status of the parents and the age of the children. The locality in which the present group of children resided is inhabited by a large number of farming/agricultural families. Both parents leave early for the farming plots, leaving the children in the care of the grandparents. The interview results showed that in 60% of cases, dental trauma occurred due to a fall and the most the common place of occurrence of the injury was reported to be the field/playground. In typical Indian villages, unlike in Western countries, there is no such place as a formal, tarmac-covered playground. They are frequently a vast field devoid of weeds and shrubs where the hard, sun-baked ground presents potential danger to a child who is playing there. The most common games played are treemonkey (Mara-Kothi Atta)—in which the children climb a tree and hide from each other-and chasing the stick (lagori), where the children run chasing a stick to the particular destination by hitting it with a crude wooden bat. Such games and the other factors listed above may have contributed to the higher prevalence of dental traumatic injuries in the group of children from Gulbarga city.

In the current study, the prevalence rate was higher in males than females in all the age groups (4-, 5-, and 6-year-olds) and the difference was statistically significant. This finding was in common with the results of previous studies [14,17,21,25, 28] and may well have been due to the physical activities that young boys take part in. Nevertheless, one previous study reported a higher prevalence of dental trauma in girls than in boys [15] and other studies have reported no gender bias in the occurrence of dental trauma [18,19,23,24, 29].

The current investigation revealed that in the group studied, enamel fracture (55.6%) was most prevalent type of dental trauma, followed by dentine fracture (9.6%), and least prevalent were fractures involving pulp (2%) and tooth discoloration (3.6%). Several previous studies on different populations have produced similar results [19,24-26,31].

Other studies have reported different findings. One such study found that, in the deciduous dentition, discoloration of teeth was the most commonly seen problem other than enamel fractures [17]. Another study, which surveyed Turkish children, found that avulsion and crown fracture were the most frequent injuries in the group studied [31]. This finding was supported by the results of another Turkish study, which indicated that extrusive luxation was the most common dental injury in the primary dentition [32]. Furthermore, a study of Chilean children aged from 1 to 15 years reported subluxation and avulsion as the most common types of dental trauma [33]. This type of disagreement in the findings of different studies may be attributed to the different ethnicity of the population being examined. A study of children in a socio-economically deprived area of inner London suggested that in this group, overcrowded households and ethnicity were the predictors of dental traumatic injuries [34].

It seems that there are plethora of causes for dental injuries and recently it has been suggested that most common and most important cause for tooth fracture is an overjet of more than 6 mm and an anterior open bite [22]. However, this may not be true for all groups of children and in one study no correlation was found between overjet and the dental trauma in the primary dentition of the children of Saudi Arabia [20]. This may have been due to the fact that at this age overjet and open bite are less pronounced than in the permanent dentition. A further consideration may be the influence of a mesial step molar relationship as a predisposing factor for the dental trauma [13].

Traumatic injuries involving teeth can have a significant negative effect on the psychological, functional and aesthetic well-being of a child and all possible efforts have to be put in place to prevent such injuries by educating the parents as well as the child; for example, advising the wearing of guards during sports or parental presence during group play so that they can deter any kind of violence.

Even though in the current study the prevalence of traumatic injury was higher in the 5-year-old children, the prevalence in the 4- and 6-year-olds was also quite high. Similar findings have been reported in a Nigerian study [24]. It is possible that they are due to the fact that 5-year-olds have lived longer than 4-year-olds and therefore have had more exposure to the possibility of trauma. By the age of 6 years, the lower deciduous incisors are likely to have been exfoliated and their replacements may not be fully erupted. In the present study, no trauma to the lower permanent incisors was observed. This was hardly surprising, as many permanent lower incisors had not fully erupted.

In a Brazilian study, it was observed that the peak years for episodes of dental trauma were at the age of 3 to 4 years [29]. Notwithstanding this finding, the results of another study have suggested that 1 to 4 years of age are the most common ages during which dental trauma occurred [35] and similar results have also been reported in Australian rural children, Indian children and south Korean children, respectively [15,25,30]. As suggested previously, young children are more prone to trauma because of their increased physical activity and relatively poorly developed motor coordination skills [6]. Other contributing factors include falls, road traffic accidents, violence and contact sports. In a retrospective study on Brazilian children aged less than seven years, it was found that the home (43.5%) followed by school (10.1%) were the main places where dental trauma occurred [18] and falls (50.3%), followed by collisions with objects (18.2%), were the commonest causes of dental trauma [18]. In short, as previously mentioned, many factors come into play and as one author has suggested perhaps it is the activities one takes part in and the environment rather gender and age that determine the occurrence of dental trauma [7].

The question of treatment arises. In one of the studies on the prevalence of dental trauma in Indian children, it was reported that only 1.68% of these patients with traumatised teeth had undergone treatment [13]. This emphasises the need for prevention. One initiative to deliver it is via meetings with groups of parents to raise their awareness of the risk of dental trauma as well as other oral and general health problems. Trauma to the primary dentition can cause damage to the future permanent dentition, the most common problems being discoloration of enamel and/or enamel hypoplasia, cessation of root formation and retention due to ankylosis [35,36]. The timely treatment of dental trauma is therefore important but in Indian children, due to its cost and access problems, this has rarely happened.

Conclusions

In the group of 4- to 6-year-olds studied:

1. There was a high prevalence of traumatic injuries to the anterior teeth, which was significantly higher in the boys than in the girls.

- 2. The 5-year-olds showed a higher prevalence of dental injuries than the 4- and 6year-olds.
- 3. The most common cause of the dental traumatic injury was a fall and the most common place of occurrence of injury was in a field/playground.

There is a need to run educational programmes to increase parents' awareness of the risk.

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Contributions of each author

- DPB was responsible for administering the questionnaire, clinical examination of the children, and data reporting.
- TRS was responsible for recording and analysing the data and preparing the manuscript.

Statement of conflict of interest

In the opinion of the authors, there was no conflict of interests.

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