

## Traumatic dental injuries in primary school children of South India – a report from district-wide oral health survey

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**Abstract** – *Aim:* The aim of this study was to investigate the prevalence of dental trauma among primary school children aged 6–11 years in Belgaum, India. *Materials and methods:* A sample of 13 200 children from primary schools of Belgaum district was examined for dental trauma. WHO classification of dental trauma was used. *Results:* Total number of children suffering from dental trauma was found to be 1946 (14.74%). A significant gender influence on the occurrence of dental trauma was observed, with more boys (17.26%) experiencing dental trauma than girls (12.29%). More than 3 mm overjet and incompetent lips were also significantly associated with dental trauma in children. *Conclusion:* The findings of this study show that dental trauma has a moderately high prevalence among Indian primary school children. Community, especially parents and school teachers, should be educated about prevention and early management of dental trauma in children.

**Key words:** child; dental trauma; permanent tooth; prevalence; prevention

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Dental caries has been synonymous with dental diseases in children, and most of the resources at individual and professional level are channelled to prevent and treat this disease (1). Dental trauma which is a continuing clinical and dental public health problem has largely been neglected by clinicians and policy makers alike (2). In the early 90s, Andreasen (3) hypothesized that dental trauma in the foreseeable future will probably exceed dental caries and periodontal diseases. Since that hypothesis was made, several studies conducted in different populations report 7–50% of the child population to have sustained an oro-dental injury by the age of 15 years (4). This information supports the concept that traumatic dental injuries are widespread among children. Epidemiological investigations suggest that the incidence of fractured teeth varies greatly depending on the population under study with regard to nationality, age, sex and the fracture classification system utilized (5, 6). According to WHO, oro-dental trauma poses a serious public health problem, and reliable data on its frequency and severity are still lacking in most countries, particularly in developing countries (7, 8). Latin American nations report dental trauma ranging from 12.2% to as high as 72% in

permanent as well as primary teeth (9–13). Prevalence rates of 5–12% are found in children aged 6–12 years in the Middle East. Recent studies from certain industrialized countries revealed that the prevalence of dental traumatic injuries is on the increase, ranging from 16% to 40% and 4% to 33% among 6-year-old and 12–14-year-old children, respectively. ([http://www.who.int/oral\\_health/disease\\_burden/global/en/index.html](http://www.who.int/oral_health/disease_burden/global/en/index.html). Last accessed on: 27/08/2011). This data may provide a basis for the evaluation of the concepts of effective treatment, prevention, resource allocation and planning within any health environment (14). India is a big country with more than 1.2 billion population and diverse sociocultural environment. Even though some studies have been conducted sporadically (15–18), there is a lack of adequate information regarding dental trauma epidemiology in Indian children and a need for further research into dental trauma to establish a baseline for future preventive and management plans. The purpose of this paper was to measure the prevalence of traumatic dental injuries in primary school children and to determine the gender wise distribution and treatment needs of these traumatized teeth.

## Materials and methods

This study was a part of District Oral Health Mission Project (January 2010–December 2010) undertaken by KLE VK Institute of Dental Sciences, Belgaum, India. Administration of Belgaum District is divided into 11 talukas namely Belgaum, Khanapur, Saudatti, Athani, Gokak, Nippani, Bailhongal, Hukkeri, Ramdurg, Raibag and Chikkodi. A taluka consists of a city or town that serves as its headquarters, possibly additional towns, and a number of villages. This multidimensional project included screening and treatment of about 85 000 primary government school children of Belgaum city and all talukas. As all the schools, parents and children were well informed in advance; this number represented more than 90% of the children studying in government primary schools. However, for this study, data of 1200 children from randomly selected schools from each taluka were analysed, thus forming a total sample of 13 200 children.

Each taluka of Belgaum district has 200–300 primary schools. A complete list of primary schools in each taluka was obtained from the deputy director of public instructions (DDPI), Belgaum and Chikkodi. Permission to conduct the study was granted by the regional and district educational authorities, while parents' and children's consent was obtained through the heads of schools.

A detailed schedule was prepared for screening and treatment of the government school students. School authorities and parents were notified in advance about the examination dates so that maximum number of students can avail the opportunity. A public notice was given in the local newspapers to maximize the attendance.

Twenty examiners were trained in diagnosis of dental trauma under a professor, which included several lectures and using coloured photographs as well as clinical cases of traumatic dental injuries, in the department of Public Health Dentistry of the college. Calibration of these trained examiners was carried out in field during the pilot study, in a school that was not selected for the main study. For testing inter-examiner reliability, 100 children were examined by all the 20 examiners, and then agreement between the examiners was checked. Intra-examiner reliability was determined by re-examining a group of 50 children (randomly selected from 100 children previously examined) after an interval of 7 days by the 20 examiners and then checking for agreement between the two successive diagnoses of the same examiner. Inter- and intra-examiner reliability was checked using kappa statistics and was found to be satisfactory (average 0.7 and 0.8, respectively).

A self-designed screening form along with informed consent was prepared and was tested for validity and reliability in the pilot study. The survey form was divided into four parts – socio-demographic data, chief complaint, soft tissue status (gingiva, mucosa and lips) and hard tissue status (caries, malocclusion and dental trauma). The children were examined on site by 20 examiners who were trained (as explained earlier) in the use of the examination methods.

All the children from the primary schools who were present on the day of visit were examined. Clinical

examinations were carried out in the classroom under natural light with the patient seated on a stool and the examiner standing or seated on a chair behind the subject. Children were interviewed for the socio-demographic data. All existing permanent maxillary and mandibular teeth were examined. Only visual examination of teeth was performed and no radiographs were taken. WHO classification of dental trauma was used (19). Trauma was recorded when one or more of the followings were observed: trauma including fracture of enamel only/enamel chipping, fracture of crown without pulpal involvement, fracture of crown with pulpal involvement, fracture of root, fracture of crown and root, fracture of tooth-unspecified (treated fractured teeth), luxation, intrusion or extrusion, avulsion and other injuries including laceration of oral soft tissues. Injuries to root such as fractures involving the root and cementum were excluded, as radiographs were not taken during the examination. Lip coverage was recorded on visual inspection as adequate if lips covered the maxillary incisors in rest position, and as inadequate if two-thirds of the crown height was exposed and visible. Subjects with clinical evidence of traumatic dental injuries were interviewed for details of the injury event, such as the cause and place of injury.

All the survey sheets were bundled according to respective schools and the bundles were numbered. These bundles were further segregated according to talukas. 10–12 bundles from each taluka were randomly selected using table of random numbers till the required number of 1200 children was obtained. Thus, the final sample consisted of 13 200 children from 11 talukas. This data was entered into a excel sheets and analysed using SPSS for windows, version 17; SPSS Inc. Chicago, IL, USA.

## Results

A sample of 13 200 children (1200 from each taluka) among whom 6512 boys and 6688 girls were interviewed and examined for traumatic dental injuries. Total number of children suffering from dental trauma was found to be 1946 (14.74%) (Table 1).

Dental trauma was significantly associated with male sex, >3 mm overjet and incompetent lips ( $P < 0.001$ ) (Tables 2 and 3). Most of the injuries were accrued in

Table 1. Distribution of traumatic injuries according to various talukas

Name of the Taluk	Frequency of children with dental trauma (%)
Belgaum	133 (11.08)
Bailhongal	324 (27)
Athani	152 (12.66)
Chikkodi	245 (20.41)
Hukkeri	142 (11.83)
Gokak	154 (12.83)
Khanapur	145 (12.08)
Nippani	195 (16.25)
Raibag	146 (12.16)
Ramdurg	171 (14.25)
Saudatti	139 (11.58)
Total	1946 (14.74)

Table 2. Prevalence of traumatic dental injuries by gender, over jet and lip coverage

Characteristics	Number	Traumatic dental injuries		Chi-square <i>P</i> value
		Injury present	Injury absent	
Gender	Males 6512	1124 (17.26%)	5388 (82.74%)	<0.001*
	Females 6688	822 (12.29%)	5866 (87.71%)	
Over jet	>3 mm 1664	932	732	<0.001*
	≤3 mm 11 536	1014	10 522	
Lip coverage	Incompetent 1892	634	1258	<0.001*
	Competent 11 308	1312	9996	

\*Statistically significant.

Table 3. Prevalence of dental trauma by age group and sex

Age	Sex	<i>N</i>	Trauma present	%	Chi-square <i>P</i> -value
6–7 years	Boys	2503	401	16.02	<0.001*
	Girls	2821	322	11.41	
	Total	5324	723	13.58	
8–9 years	Boys	1749	368	21.04	<0.001*
	Girls	1835	269	14.65	
	Total	3584	637	17.77	
10–11 years	Boys	2260	355	15.70	<0.001*
	Girls	2032	231	11.36	
	Total	4292	586	13.65	

\*Statistically significant.

falls and collisions, while other notable causes were sports, violence and biting on hard objects (Table 4). Table 5 shows the rough distribution of traumatic injuries and treatment needs. A higher percentage of urban female school children suffered dental trauma when compared to rural female school children (Table 6). Most of the children suffered traumatic injuries to anterior teeth (Table 7).

## Discussion

Studies have revealed that one of two children sustain traumatic dental injuries in the age group of 8–12 years, which when not treated at the opportune time may lead to lasting damage and sometimes loss of the tooth (20). Children with untreated trauma to permanent teeth exhibit greater impacts on their daily living than those without any traumatic injury (21).

Table 4. Traumatic dental injuries classified according to the type of injuries

Cause of injury	Frequency (%)
Fall	720 (37)
Collision	545 (28)
Traffic	39 (2)
Sports	195 (10)
Violence	214 (11)
Biting on hard objects	175 (9)
Miscellaneous	58 (3)

Table 5. Distribution of traumatic dental injuries trauma categories and treatment needs

Trauma category	Number of children affected	Treatment need
Trauma including fracture of enamel only/enamel chipping, fracture of crown without pulpal involvement	1479	Restoration of teeth without pulp therapy
Fracture of crown with pulpal involvement	390	Restoration of teeth with pulp therapy
Avulsion	77	Prosthesis
Total	1946	

Table 6. Differences in distribution of dental trauma among males and females in rural and urban areas

Females		Males	
Urban	Rural	Urban	Rural
498 (60.58%)	324 (39.42%)	501 (44.57%)	623 (55.43%)
822		1124	
Total = 1946			

Table 7. Distribution of children according to trauma to anterior and posterior teeth

Injury only to anterior teeth	Injury only to posterior teeth	Injury to both anterior and posterior teeth	Total
1502 (77.18%)	395 (20.29%)	49 (2.51%)	1946

Primary health centres, the basic unit of primary health care in India, do not have the provision for dental care (22), and so traumatic injuries usually go unnoticed and untreated. The purpose of this study was to determine the extent to which dental trauma is present in the primary school children and to assess the gender wise distribution and treatment needs of these traumatized teeth. This study also served as a platform to make the parents and teachers aware of such an injury.

The average number of children suffering from dental trauma was found to be 14.7% in the study population

(Table 1). It was similar to prevalence reported in Davangere, India (23). It was much lower than the prevalence of dental trauma reported in Tanzania (21%) (4) and Saudi Arabia (33%) (24), but much higher than the prevalence reported in Spain (6%) (25) in similar age groups. The cause might be the relative scarcity of preventive options and awareness in Tanzania and Saudi Arabia compared to their abundance in Spain. Latin American countries have reported dental trauma ranging from 12.2% to 72% (9–13).

A very high prevalence (72.2%) has been found in 4-year-old children of Monterrey, Mexico (9). Subsequently, downward trend in prevalence of dental trauma has been observed in these countries, as age increases and person reaches adolescence. Even though awareness about dental trauma and its treatment is low in South American countries, adolescents are conscious about aesthetics, which is the main reason for seeking treatment, resulting in a decreased prevalence of dental trauma in this group.

Some Indian studies report a lower prevalence of dental trauma (5.28–13.8%) among school children (17, 18). This finding may be ascribed to the fact that these studies only took anterior/incisal tooth injuries into account while all existing permanent teeth were examined in this study. Exclusive posterior tooth trauma accounted for a little above 20% in this study which explains slightly higher percentage of tooth trauma reported by us when compared to other studies (Table 7). Prevalence of dental trauma in Indian visually impaired school children was found to be much higher (32.5%) which is understandable as these children are more susceptible to falls and collisions (16).

As the children, parents and school authorities were informed beforehand about the scheduled school visits (through newspaper advertisement, individual notices to school principals and verbal appeals), turnout of children was more than 90%.

Boys were found to be more affected by dental trauma than girls as they tend to be more aggressive and more likely to engage in hostile games and violent behaviours (Table 2). Also, Indian families especially in rural areas tend to restrict the female children to indoors as governed by cultural and social factors (23). Consequently, traumatic dental injuries were more prevalent in urban female school children than their rural counterparts (Table 6).

Overjet more than 3 mm and incompetent lips were significantly associated with dental trauma (Table 2). This is in accordance with other studies that have established these two factors as significant risk factors for dental trauma (26–29). Increased overjet and lip incompetency render the teeth vulnerable to external environment thus making them more prone to traumatic damage. It is desirable that these children be given suitable orthodontic treatment at appropriate time to prevent such injuries. Mouthguards could be provided during contact sports.

Various studies report that knowledge of school teachers about proper management of traumatic dental injuries is by and large, inadequate (30, 31). As school teachers are first to know after a child gets injured in

school, it is important that school teachers be trained in primary management of tooth injuries (32).

Owing to gigantic nature of the study population and limited manpower, we were not able to record the finer points of traumatic dental injuries such as type of trauma, number of teeth affected and any soft tissue injury associated with the trauma. Highest treatment need was recorded for every child who experienced dental trauma in accordance with our study objectives (Table 5). Knowledge of parents regarding these types of trauma could not be assessed as well.

This study provided us with a tangible piece of evidence that dental trauma among Indian children is moderately high. Knowledge, attitude and practices of parents and school teachers can be assessed to develop a need-oriented health education programme. Subsequently, concrete steps aiming towards educating children, parents and school teachers are needed to reduce the incidence and to promote speedy management of traumatic dental injuries.

#### Conflict of interest

None.

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