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Teeth fracture among visually impaired and sighted children of 12 and 15 years age groups of Udaipur city, India – a comparative study

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Abstract – *Aim:* To compare the prevalence of anterior teeth fracture among sighted and visually impaired children of 12 and 15 years ages in Udaipur city, India. *Materials and methods*: A cross sectional study was carried out among 508 children (83 visually impaired and 425 sighted children), which comprised of 55 males and 28 females among visually impaired and 348 females and 77 males among sighted. The survey was carried out using Andreasen's classification for teeth fracture. Data was analyzed using chi-square test, with keeping level of significance at $P < 0.05$. *Results:* It was found that, visually impaired children (32.5%) had significantly higher percentage of teeth fracture than that of sighted children (9.6%) ($P = 001$). Males had significantly higher percentage of teeth fracture than females in both groups ($P = 0.001$). It was observed that overjet of more than 3.5 mm had significantly increased risk of sustaining traumatic dental injuries among visually impaired (70.4%) than that of sighted individuals (46.3%) ($P = 0.043$). However, fracture of teeth was independent of age groups and lip coverage. *Conclusion:* Prevalence of traumatic dental injuries in a group of individuals with visual impairment was higher than that of sighted. This should alert caregivers to carry out a profound investigation of the events and suggest methods to reduce this type of morbidity.

Dental injuries may occur throughout life, but they are particularly common in childhood (1). The etiology of teeth injuries are variable and multiple with the dominant factors most likely to cause dental trauma are fall, sports injuries and accidents met at home or outside. Previous literature showed that school age children are considered to be at higher risk (7–15 years) to traumatic dental injuries (2). Incisors have an important role in esthetics, phonation, psychological aspects and in functional activities with 90% of traumatic dental injuries involving upper incisors (2). The major risk factors for dental injuries are increased overjet and inadequate lip coverage. In addition to pain and possible infection, the consequences of incisor trauma include alteration in physical appearance, speech defects and psychological/emotional impacts, thus affecting the child's quality of life (3). However, traumatic injuries to teeth can involve individuals irrespective, whether they belong to sighted or unsighted groups.

Blindness is one of the prevalent handicap condition worldwide, it occurs mainly in low income or developing countries like India. According to WHO estimates, approximately 314 million people worldwide live with low vision and blindness, of which about 5 million resides in India. The main causes of blindness include corneal scarring and inadequate sanitations (4, 5). Previous studies have noted that children with disabilities have higher levels of dental disease and lower levels of care (6, 7). It was also seen that traumatic dental injuries are more prevalent in children with visual incompatibility than the sighted children, with prevalence for traumatic dental injuries ranging from 9% to 36.4% among visually impaired (8–11).

The earlier available literature in relation to traumatic dental injuries among visually impaired individuals have estimated the prevalence of teeth fracture but associated risk factors for teeth fracture were not considered (8, 11). Moreover no literature was available comparing traumatic dental injuries among sighted and visually available individuals. Hence, this study was carried out with the aim to compare the prevalence of anterior teeth fracture among sighted and visually impaired children of 12 and 15 years ages in Udaipur city, Rajasthan, India.

Materials and methods

This cross sectional survey was conducted in schools of sighted and visually impaired children at Udaipur city, Rajasthan, India from November 2008 to January 2009. The list of schools (for visually impaired and sighted children) in the city was obtained from District Educational Board office. Before scheduling the survey,

official permission was obtained from the Ethical Committee of Pacific Dental College and Hospital, Udaipur and principals of respective schools. The list comprised of 64 schools for sighted children and 2 schools for visually impaired children. To obtain the sample for sighted children, Udaipur city was divided into four zones so that we can obtain equal number of schools from each zone (16 schools). Afterwards from each zone three schools were selected by simple random sampling technique using lottery method (in total twelve schools) together with available schools for visually impaired were also included in this study. All available children in the age groups of 12 and 15 years from both groups (sighted and visually impaired) who had given informed consent were included in this study. The subjects with restored fractured teeth, supernumerary teeth or those who were absent on the days of examination were excluded from the study. A total of 508 subjects (83 visually impaired and 425 sighted), which comprised of 55 males and 28 females among visually impaired and 348 females and 77 males among sighted formed the final study population. Both total and partial visually impaired were included in a single category as visually impaired. Before commencing the study, a pilot study was carried out on 100 sighted children and 30 visually impaired children. A survey form was prepared with the help of the modified WHO Oral Health Assessment Form (1997) (12). The form consisted of three sections: (i) demographic data; (ii) cause and place of the trauma; (iii) Andreasen's classification for anterior tooth trauma. The clinical examination was done using CPI probe and mouth mirror in natural day light in school premises (Type III Clinical Examination) by two previously calibrated public health dentists. The Cohen's Kappa values computed for examiners ranged from 0.86 to 0.89 for intra-examiner reliability and 0.87–0.91 for inter-examiner reliability. Statistical analysis was done using the SPSS version 11.5, chi-square test was used for estimation of statistical significance. The level of significance was set at $P < 0.05$.

Results

Of the visually impaired children, 43.3% and 56.7% belongs to 12 and 15 years respectively and among those of sighted children 65% were of 12 years and 35% belong to 15 years.

Prevalence and distribution of anterior teeth fracture

In the present study, visually impaired children (32.5%) had significantly higher percentage of teeth fracture than that of sighted children (9.6%) ($P = 0.001$) (Table 1).

There was no statistically significant difference in relation to anterior teeth fracture when two age groups were compared (12 and 15 years old) among both sighted (12 years – 75.6% and 15 years – 24.4%) and visually impaired children (12 years – 55.6% and 15 years – 44.4%) ($P = 0.072$). The percentage of anterior teeth fracture was significantly higher among males than in females among both sighted (78%) and visually impaired (51.9%) groups ($P = 0.001$) (Table 2).

Table 1. Number and percentage of study subjects with or without teeth fracture

Groups	No. of subjects with teeth fracture (%)	No. of subjects without teeth fracture (%)	*P*-value
1. Visually impaired children	27 (32.5)	56 (67.5)	0.001
2. Sighted children	41 (9.6)	384 (90.4)	

Table 2. Anterior teeth fracture among study population in relation to independent variables

Independent variables	No. of visually impaired children (%)	No. of sighted children (%)	*P*-value
Gender			
Male	14 (51.9)	32 (78)	0.001
Female	13 (48.1)	9 (22)	
Age			
12 years	15 (55.6)	31 (75.6)	0.072
15 years	12 (44.4)	10 (24.4)	
Lip coverage			
Adequate lip coverage	9 (33.3)	21 (51.2)	0.114
Inadequate lip coverage	18 (66.7)	20 (48.8)	
Overjet			
Overjet <3.5 mm	8 (29.6)	22 (53.7)	0.043
Overjet >3.5 mm	19 (70.4)	19 (46.3)	

None of the subjects had more than one tooth fracture and most commonly involved teeth were upper central incisors (92.6% for visually impaired and 68.3% for sighted children) followed by upper canines. Maximum number of the fractures among sighted children (56.1%) showed enamel involvement and those among visually impaired children (55.6%) had enamel and dentine involvement (uncomplicated crown fracture). Pulp involvement (complicated crown fracture) was observed only in one tooth fracture among both groups (Table 3).

Figure 1 showed that maximum injuries to teeth were due to fall (55.6% among visually impaired and 48.8% among sighted children) followed by collision against an

Table 3. Number of anterior teeth fracture according to type of injury (Andreasen's classification)

Groups	Upper incisors	Upper canines	Lower teeth (31–43)[1]
Visually impaired children			
Enamel fracture only	9	1	1
Enamel/dentine fracture (uncomplicated crown fracture)	15	0	0
Enamel/dentine fracture (complicated crown fracture)	1	0	0
Sighted children			
Enamel fracture only	16	5	2
Enamel/dentine fracture (uncomplicated crown fracture)	11	5	1
Enamel/dentine fracture (complicated crown fracture)	1	0	0

[1]FDI notation of teeth.

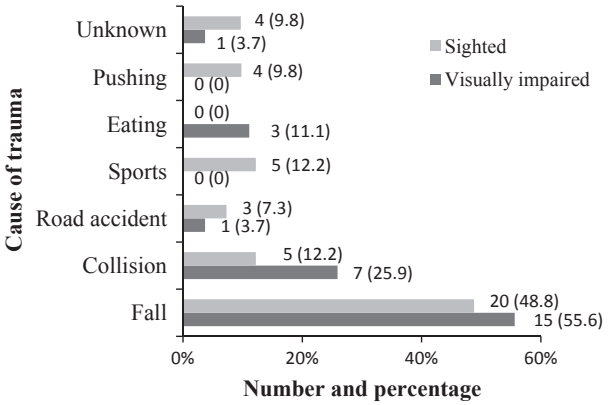

Fig. 1. Number (%) of study subjects with anterior teeth fracture related to cause of trauma.

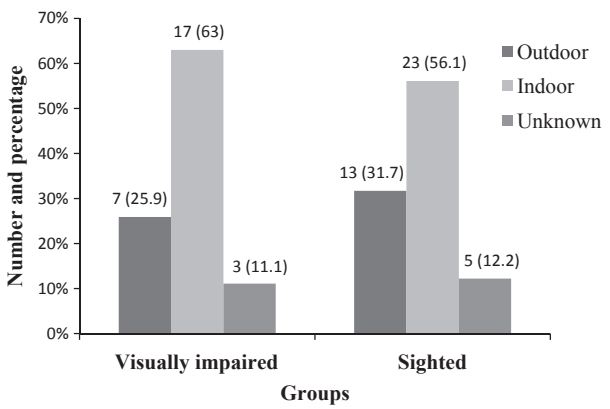

Fig. 2. Number (%) of study subjects with anterior teeth fracture related to place of trauma.

object and sport's activities. Maximum numbers of injuries were indoor among both groups (63% and 56.1% among visually impaired and sighted children respectively) (Fig. 2).

It was observed that overjet >3.5 mm had significantly increased risk of anterior teeth fracture among visually impaired children (70.4%) compared to the sighted individuals (46.3%) ($P = 0.043$). In relation to lip coverage, anterior teeth fracture among both groups was significantly high in those children with inadequate lip coverage (66.7% among visually impaired and 48.8% among sighted children) ($P = 0.114$) (Table 2).

Discussion

Our study revealed that prevalence of anterior teeth fracture among visually impaired was 32.5% which was in an agreement with the study conducted by Odonell (36.4%) (10), and higher than those reported by Maddi Shyam et al. (24.6%) (13) with study subjects similar in age and sex characteristics. The present study showed a prevalence of anterior tooth trauma among sighted children of 9.6% which was similar to the findings as 10.8%, 10.5% and 9.5% reported by Mojirade et al. (14), Sonario et al. (15) and Ceyhan Altun et al. (16) respectively. The reason behind high prevalence of teeth fracture among visually impaired children is due to a complex phenomenon which probably consists of their visual incompatibility, as they cannot take support during fall or may collide against an object in or outside their homes. The results showed that, children of 12 years age had more teeth fractures in comparison to 15 years old in both groups. The higher incidence of teeth fractures among 12 years old children may be explained by the fact that during these period children indulge in reckless boisterous activities and are unmindful of their personal safety (1). It was observed that boys experienced more injuries than girls in both groups. This can be attributed to the fact that girls are more inhibited in their behavior than boys, who tend to be more energetic and inclined towards vigorous activities (5). The restricted behavior of females enforced by conservative parents due to cultural and religious reasons could be possible factor which contributes to the less prevalence of dental trauma among Indian girls.

The observation of this study revealed that maxillary incisors were the most affected teeth in both groups irrespective of gender and age. As upper incisors being in front part of face and are in the direction of body movement that generally tend to receive far more trauma than the laterals. Moreover, earlier eruption of the incisors exposes them to the risk of fracture for a longer period of time. Another reason may be upper incisors are generally placed more forward than the lower incisors and tend to be the first to receive a direct blow producing a fracture. In addition, upper jaw is fixed to the skull which makes it rigid, whereas lower jaw, being flexible part, that tends to reduce the impact forces directed on the lower anterior teeth by its movement (13).

In the present study, enamel fracture (56.1%) was more often observed among sighted children when compared to visually impaired individuals who showed high enamel and dentine fracture without pulp involvement (55.6%). This may be due to fact that a high behavioral predisposition of the visually impaired group might have made it vulnerable for occurrence of severe form of injury. It may occur because sighted children could be able to take support during fall and protect their incisors by avoiding frontal crash. Moreover, results obtained in this study regarding canine fracture among sighted individuals were much higher than those reported in the earlier literature (1). This is because sighted individuals while taking hand support to avoid frontal crash and moving their heads to one side (either right or left) may lead to transfer of blow to canines.

The present study showed that, most fracture had occurred due to fall in visually impaired and sighted school children respectively. This observation was similar with Odonell (10) for visually impaired and Nooshen Asim Khan et al. (17), Sgan-Cohen et al. (18) and Rajab et al. (19) for sighted children. Another reason for traumatic dental injuries which has been obtained in this study among visually impaired was due to collision against the wall, it may be again due to a lack of vision in this group that make them unable to recognize objects in front of them.

Our study also showed that children with overjet of more than 3.5 were more likely to have traumatic dental

injuries in both groups. Same observations were reported by Nguyen et al. (20), Zaragoza et al. (21) and Burden (22) for sighted children. The present study also revealed that children with inadequate lip coverage had more number of teeth fracture among visually impaired than sighted children, which was in agreement with study conducted by Marcenes et al. (23). It could be due to the size of interlabial distance, as size increases, the support which lip provide to underlying tooth decreases and makes it more vulnerable to traumatic dental injuries.

This study revealed that common contributing factors for traumatic dental injuries were present among both groups but still the prevalence of teeth fracture was high among visually impaired subjects. This clearly suggests that visual incompatibility is one of the most important risk factor contributing to this high prevalence among this group. So, special attention should be paid by the caregivers especially of visually impaired population as traumatic dental injuries might add to their sufferings.

However, present study had some limitations. First, sample size of the study was small, secondly, cross-sectional nature of the study may fail to find more accurate causal relationship that may existed and thirdly, it might not able to explain the complex phenomenon that was present among visually impaired subjects leading to higher level of traumatic dental injuries. Hence, an analytical and prospective study is required to find out associations and risk factors of dental trauma among visually impaired population.

Conclusion

A higher prevalence of traumatic dental injuries to anterior teeth was found in the present study among visually impaired individuals than sighted.

So, there is a distinct need for strengthening of advocacy programs that will ensure the availability of comprehensive preventive and oral health care for both groups. It is important that preventive measures and instructions to be institutionalized at an early age. The Ministry of Health should provide in-service training to institutional staff, and to the parents to promote good oral health in children and adults and to help them in access care. Coordinated efforts between social service and oral health care providers should be strengthened to ensure that the profession adequately serves these children. Screening programs should be conducted for children to identify those with high anatomic and behavioral risk for occurrence of traumatic dental injuries to the anterior teeth, so that appropriate preventive measures such as early orthodontic treatment and use of mouth guards can be implemented.

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