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Original Research Article

Prevalence of Traumatic Dental Injuries and Their Relation with Predisposing Factors among 12 And 15 Years Old School Children of Balidih Industrial Area, Bokaro, Jharkhand, India: A Cross-Sectional Survey

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Abstract

Today traumatic dental injury (TDI) is one of major health problem in children. Reasons behind this are numerous like it usually take place at an early age of growth and development, due to frequent involvement of multidisciplinary approach in its treatment. The aim of this study were to determine the prevalence of TDI among the school children aged 12 and 15 years and to assess the relation among associated factors such as overbite, overjet, age and gender.

Methodology: A cross- sectional survey using modified Ellis classification of dental traumatic injuries was conducted on randomly selected 3993 children of age 12 and 15 years old to assess the dental trauma.

Results : The prevalence of TDIs were more common in 15-year-olds (11.6%) than in 12-year-olds (10.7%) children, but the difference was not statistically significant ($p = 0.065$). Similarly, TDIs were more common among boys (14.6%) than girls (9.4%); this difference was statistically significant (< 0.024).

Conclusion: The prevalence of TDIs is significantly more and summons the public health attention.

Keywords: Traumatic Dental Injuries, Gender, Overjet.

Introduction

When a condition is predominant and significantly affects the individual, and is preventable, [1] it should be considered as a public health concern. Traumatic dental injury (TDI) is one of major health problem in children nowadays. Reasons behind this are numerous like it usually take place at an early age of growth and development, due to frequent involvement of multidisciplinary approach in its treatment. TDI may affect a child's personality; as anterior teeth play an important role in esthetics and phonetics. Most dental injuries involving the anterior teeth result from simple falls, accidents and sports activities which were not intended to cause harm [2,3,4]. The prevalence among schoolchildren has been found to vary greatly across different regions. This variability may have various causes, including the type of study, trauma classification, strategy, study size and population, geographical area, and contrasts in cultural behaviour [4]. Oral factors such as increased overjet along with protrusion and incompetent lips, environmental determinant, and human behavior were found to increase the risk for TDIs. According to recent population-based studies, the prevalence of TDIs to permanent anterior teeth is high worldwide ranging from 4% to 58%. They showed that more than one billion living people have had TDI [5,6,7]. Although epidemiological data on TDI have been gathered in many countries, no information on this problem is available for Balidih, Industrial Area, Bokaro population in India. Hence, the objectives of this study were to determine the prevalence of TDI among the school children aged 12 and 15 years and to assess the relation among associated factors such as overbite, overjet, age and gender.

Methodology:

This cross-sectional descriptive study surveyed 3993 adolescents, aged 12 and 15 years, from 2017 to 2018. Subjects willing to participate, who were

permanent residents of Bokaro in Balidih Industrial Area, Jharkhand, India, and who lacked any obvious dental or facial anomalies were included in the study. Children with lost permanent anterior teeth due to caries or causes other than trauma, or with partial or complete anodontia involving permanent anterior teeth, were excluded. Medically compromised children, children with physical impediments, and/or mental disability were also excluded from the study. All parents were asked to sign a written informed consent form which explained about the aims, characteristics and importance of the study. Data collection was done through out-patient clinical evaluation of children registering for the the Free Dental Camp visit organised by Indian Dental Association, Bokaro in Balidih Industrial Area, Jharkhand, India. The records of clinical examination of the children attending the Dental Camp conducted by postgraduate dental surgeons of Indian Dental Association, Bokaro were assessed. Children were asked to seat on a chair and ADA type III examination was carried out using a mouth mirror and Williams Probe under adequate illumination. Strict infection control measures were used. The results were found to be reliable (kappa=0.95) during this phase. The teeth were examined by direct vision. Neither vitality nor radiographs were used to assess the extent of the fractured teeth. Modified version of Ellis classification was used (Ellis RG, 1970) [8] (Table 1). We preferred to use this classification instead of Andreasen's classification because it is a simplified classification and has been used in previous studies. The overjet was measured using a Community Periodontal Index probe which was dichotomised to ≤ 5 mm and > 5 mm during the analysis. The overjet was measured from the linguo-incisal line angle of the most prominent maxillary incisor to the buccal aspect of the corresponding mandibular incisors. CPI probe was used to measure the degree of overjet as described by the 1997 WHO basic Oral Health Survey Guidelines [9]. According to Burden criteria, lip coverage was recorded. Lip coverage was rated as adequate, if the lip covered the upper incisors during the rest position. If there was lip strain or greater part of the upper incisors was exposed, was evident upon closure, lip coverage was rated as inadequate [10].

Data analysis was performed using SPSS (IBM, Chicago, Il.). Chi-square tests were used to evaluate any difference in the distribution of TDIs according to the age and gender of children visiting the camp. For all tests, confidence intervals and p values were established at 95% and <0.05 respectively.

Results:

The minimum sample size to satisfy the requirement was estimated to be 3993 to achieve a level of precision with a standard error of 5%. A 95% confidence interval was used for the calculation of the sample size. The sample included , 2076 (52%) boys and 1917 (48%) girls.

Age distribution analysis indicated that these injuries were more common in 15-year-olds (11.6%) than in 12-year-olds (10.7%) children, but the difference was not statistically significant (p = 0.065). Similarly, TDIs were more common among boys (14.6%) than girls (9.4%); this difference was statistically significant (< 0.024). Boys were 1.24 times (95% CI = 0.94, 1.54) more prone to TDI than girls. Children with inadequate lip coverage had greater chance of suffering trauma to permanent teeth than those with adequate lip coverage p = 0.023). In terms of overjet i.e. >5.5 mm vs ≤ 5.5 mm, 27.3% and 7.8% respectively, showed TDI to the anterior teeth, (Table 2) which was statistically significant (p = 0.040).

Among boys and girls, TDIs were reported among 65% and 35%, respectively. Type 1 (enamel) fracture (68%) was the most common type of tooth fracture (Table 3), followed by Type 2 (enamel and dentin) fracture (22.14%), and Type 3 (enamel and dentin with pulp) fractures (3.35%). Type 1 fractures were significantly (p = 0.041) more common among girls (71.2%) than boys (62.3%). Non-vital teeth and tooth loss (2.9% each) were more often reported among boys and were statistically not significant. A few girls (2.9%) had fractures and restorations indicating that they had undergone treatment.

Table 1: The modified Ellis classification criteria for scoring traumatic dental injuries.

code	criteria	description
0	No trauma	
1	Enamel fracture	Simple fracture of crown, enamel only; involving little or no dentine
2	Enamel and dentine fracture	Extensive fracture of the crown involving considerable dentine but with no pulp involvement
3	Enamel and dentine fracture with pulp	Extensive fracture of the crown involving considerable dentine and exposing dental pulp
4	Non- vital tooth with discoloration	Traumatized tooth that is non-vital, and is discolored, with or without loss of crown structure
5	Displacement	Extrusion, intrusion, or lateral displacement
6	Total tooth loss	Absence of tooth due to complete ex-articulation
7	Fracture and restoration	Restored tooth with composite or crown following fracture of the crown

Table 2: Distribution of traumatic dental injuries in the study population.

Variables	Children examined n (%)	Traumatic Dental Injury	
		Absent n (%)	Present n (%)
Gender			
boys	2076(52%)	1772(85.4%)	303(14.6%)
girls	1917(48%)	1737(90.6%)	163(9.4%)
Age (years)			
12	2116(53%)	1889(89.3%)	226(10.7%)
15	1877(47%)	1668(88.4%)	219(11.6%)
Lip coverage			
Adequate	3598(90.1%)	3267(90.8%)	331(9.1%)
Inadequate	395(9.9%)	301(76.2%)	94(23.8%)
Overjet			
≤5.5 mm	3353(84%)	3093(92.2%)	262(7.8%)
>5.5 mm	640(16%)	465(72.7%)	175(27.3%)
Total	3993	3558(89.1%)	435(10.9%)

Table 3: Distribution of different types of traumatic dental injury (TDI) according to gender.

Types of TDI	Boys n (%)	Girls n (%)	Total n (%)
1	188(62.3%)	116(71.2%)	304(68%)
2	70(23.1%)	29(17.5%)	99(22.14%)
3	12(4.0%)	3(1.6%)	15(3.35%)
4	9(2.9%)	3(1.6%)	12(2.68%)
5	0(0)	0(0)	0(0)
6	9(2.9%)	3(1.6%)	12(2.68%)
7	0(0)	5(2.9%)	5(1.11%)
Total	288(65%)	156(35%)	447(100%)

Discussion

The most common type of facial injuries is traumatic dental injury accounting for as high as 18% of the all facial injuries [11]. Traumatic dental injury is a consequence of certain factors that will accumulate throughout life if not properly treated [12]. For this study the age between 12 and 15 years was chosen, as during this period there is maximum physiological growth and development and children are actively involved in lot of outdoor activities. In various epidemiological studies, the prevalence of TDI has been found to differ considerably, ranging from 4% to 58% [6]. In the present study, the prevalence of TDI to anterior permanent teeth was 10.9% in 12 and 15 year-old school children in Balidih Industrial Area. This proportion was somewhat lower than 13.8% reported by Gupta et al. [13], 14.5% reported by Dua and Sharma [14], 14.9% reported by Baldava and Anup [15], 15.1% reported by Ravishankar et al. [16], 18.7% reported by Jafferson Traebert et al [17] 22% Andreasen et al [18] and JarvinenS (19.8%) [19] among children of a similar age.. The prevalence noted is higher as compared to the studies done by Gauba (7.54%) (20), Nik-Hussain (4.1%) [21], Gupta et al (4.15%) [13] respectively, 8.79% was reported by Patel and Sujan, [12] and 9.3% was reported by Ain et al [22]. These variations in prevalence may be related to the study design, sample size, sampling procedure, diagnostic criteria, limited age-groups, and geographical and behavioral differences between the study locations. [23].

Studies have consistently shown that male individuals have a higher chance of TDI than female individuals. [12,24,25]. Similarly, in the present study, the prevalence of TDI was higher in boys than in girls. This might be due to behavioral factors. As compared to girls, the boys tending to be more energetic and inclined towards vigorous outdoor activities, contact sports and violence. The fact that boys had suffered more traumatic injuries may be also explained by cultural factors and social capital [26,27]. Our finding of a greater frequency of traumatic dental injuries in boys is supported by a majority of previous studies [26,28,29,30,31]. But no significant difference was observed by some studies [32,33,17]. Besides, girls can be exposed to traffic accidents and violence in the same way as boys [34]. Behavior is also very crucial factor when considering the occurrence of traumatic dental injuries in children and adolescents. Children with behavioral problems are more likely to be excitable, reckless and more willing to take risks, which increases their chance of getting into situations that result in injury [35].

According to this study the peak age to sustain injury was found to be 15 years. Traumatic dental

injuries increased with increasing age. This is because that as the child grows older there is an increase in injuries arising from sports, violence, and collision and biting on hard object. Some other studies in the previous year's showed similar results [32,28,40,41].

In the present study the most common TDI type was enamel fracture. This finding corroborated those of previous studies, [13,21,,36, 37, 38] but differed from that of Rajab et al [39], where the most common type of crown injury was enamel and dentin fracture. No cases of displacement of teeth and bone were encountered in the present study.

Like other studies [15,36], this study has also found inadequate lip coverage as an important risk predictor for such type of injuries. This is because of adequate occlusal contact area of maxillary and mandibular teeth in normal occlusion and shielding effect of lip closurethe shielding effect of lip closure tend to decrease the impacting force of trauma. [12].

The connection between overjet with TDI has been studied broadly by different authors. In this study, children with overjet more than 5 mm exhibited a significant association with and higher risk of TDIs than those with typical overjet. Other studies have also demonstrated this relationship. [42, 43, 44, 45] Patel and Sujan [12] have observed an average 3.5-fold increased risk of sustaining trauma to the anterior teeth among individuals with an overjet exceeding 3.5 mm. Petti et al [46] reported that individuals having normal overjet more than 3 mm had a 2.5-fold higher risk of TDI than individuals who had a normal overjet. Stokes et al [47] also found a significant difference between control and TDI group. Traebert et al [17] did not find any relationship between inadequate lip coverage and TDI in their investigation. Glendor revealed that these varying outcomes might be because of the interplay between oral predisposing factors and environmental and behavioral factors.

The present study followed a retrospective collection and cross sectional design of data on traumatic dental injuries. The shortcomings is the accuracy of history of patient which is particularly true in case of children. Cross sectional studies are important tools to identify risk factors which is to be included in further longitudinal assessment.

However, emphasis should be placed on education by using the most contemporary ways possible, such as the Internet and apps, on how to prevent and respond to a dental injury. Pedagogical studies on how best to approach this are also sorely lacking and would be most interesting [6].

Conclusion:

Study depicts the frequency and cause of traumatic injuries to permanent anterior teeth, which assists in identifying the risk group and treatment needs in order to establish effective preventive measures.

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