



PREVALENCE, RISK FACTORS AND TREATMENT NEEDS OF TRAUMATIC DENTAL INJURIES TO ANTERIOR TEETH AMONG 6-15 YEAR OLD SCHOOLCHILDREN

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ARTICLE INFO

Article History:

Received 15th November, 2017

Received in revised form 21st December, 2017

Accepted 23rd January, 2018

Published online 28th February, 2018

Key words:

Permanent anterior teeth, prevalence, schoolchildren, traumatic dental injuries

ABSTRACT

Aims and Objectives: Traumatic dental injuries (TDIs) of the permanent anterior teeth among the school children are quite prevalent but often the neglected problem. The objective of the present study was to assess the prevalence of the TDIs of the permanent anterior teeth among 6-15 years schoolchildren attending government and private schools of Bhopal city.

Methodology: Descriptive cross-sectional study was conducted among 2671, 6-15 years old schoolchildren of Bhopal city. Andreasen's epidemiological classification (2004) for assessing the TDIs, Angle's classification with Dewey's modification for assessing the occlusal relationship, and the World Health Organization Basic Oral Health Survey (1997) guidelines for measuring the overjet were used. Data were tabulated and statistically analyzed using Chi-square, Mantel-Haenszel common odds ratio (OR), and binary logistic regression for adjusted OR.

Results: The prevalence of TDIs was 8.6%. Falls (61.1%) were the most common cause of TDIs, mainly at home (55.9%). Boys were more affected than girls. Government children sustained higher number (4.7%) of injuries than their private counterparts. The adjusted results revealed that TDIs were significantly associated with overjet (OR = 6.6, 95% confidence interval [CI]: 3.66-8.23) and lip coverage (OR = 1.8, 95% CI: 1.28-2.48). Conclusion: Overall the study results showed lower but significance prevalence of TDIs of permanent anterior teeth compares to previous studies, but there was considerable negligence in seeking care for these injuries.

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INTRODUCTION

In current terms, the word trauma implies a reasonable severe, non-physiological lesion to any part of the body. Any thermal, chemical, or mechanical lesion that affects the dentition should be analyzed as a dental trauma and its effect as a traumatic dental injury (TDI).¹ In addition to pain and possible infection, consequences of trauma include alteration in physical appearance, speech, restriction in biting, and psychological and emotional impacts. TDIs can thus have a significant impact on a child's quality of life. Children with untreated fractured were very significantly more dissatisfied with the appearance of their and experienced a significantly greater impact on their daily life than children without any TDI. Epidemiological

studies indicate that dental trauma is a significant problem in young people and in near future, the incidence of trauma will exceed that of dental caries and periodontal disease in the young population.² Furthermore, most treatments needed for TDIs are more complex and expensive than treatment of caries.³ According to Andreasen, oral injuries are the fourth most common bodily injuries among the 7-30 years age group.⁴ Several studies confirmed that treatment of TDI often is neglected. Prevention of TDI is also largely neglected despite the fact that they can often be prevented.⁵⁻⁷ The prevalence of traumatic injuries to anterior teeth has been reported in several developed countries, but relatively fewer studies have so far been reported in developing countries like

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India, especially in this part where no published results are available on the prevalence, causes, and risk factors associated with TDI. Hence, the objective of the present study was to compare the prevalence and associated factors of TDI to permanent anterior teeth among 11-15 years old children of government and private schools of Bhopal city and to assess unmet treatment need of these schoolchildren.

METHODOLOGY

The ethical clearance was obtained from the Ethical Committee of Peoples College of Dental Sciences, Bhopal. Written permission was obtained from the District Educational Officer in June 2014 to conduct the survey in various schools of the district. Written approvals and informed consent were also obtained from school authorities before scheduling the survey. A cross-sectional survey was carried out on for a period of 2-month (July-August) on a sample of 2671 male and female children aged 6-15 years attending government and private schools in Bhopal city. A pilot survey was done on 75 schoolchildren of this age group in government schools from 20% prevalence of TDI was found. So, minimum sample size came to be 1500. Here, the allowable error was 10% of prevalence.⁸

Sample size was calculated according to the formula

$$n = \frac{4pq}{e^2} \quad \text{where } p = \text{expected prevalence}$$

$$q = 1 - p$$

$$e = \text{permissible error}$$

Stratified cluster sampling was used, in which schools were selected randomly using lottery method from the list of schools as obtained from the district education department. First, stratification was done according to government and private schools, then a total of 18 schools (clusters) were selected, in which 9 government schools were selected using the simple random technique. For selecting 9 private schools, private school near to the government school was chosen to obtain more representative sample. The children present on the day were considered for the examination. Approximately 70-80 children were examined. The investigator was trained and calibrated in the Department of Public Health Dentistry, Peoples College of Dental Sciences and Research Centre to limit the diagnostic variability. A group of 15 subjects in the age group of 6-15 years with the history of TDIs was chosen from a preventive program conducted by Department of Public Health Dentistry, Peoples College of Dental Sciences. These subjects were examined in the department, and the observations were recorded in the self-designed pro forma. The results so obtained were subjected to kappa statistics. The calibration exercise and the kappa value (0.8) showed good agreement for these observations and measurements in terms of intraexaminer variability which validated the examination procedure.

Inclusion criteria

Children in the age group of 6-15 years from the selected schools were included in the study.

1. Subjects showing clinical evidence of trauma.
2. Subjects who have received treatment for traumatic dental injuries.

Exclusion criteria

Primary teeth
Special group children
Supernumerary teeth
Teeth with developmental defects
Loss of teeth other than traumatic injuries
Children with history of orthodontic treatment
Children with all missing upper incisors

Root fractures were excluded as radiographs were not taken during the clinical recording. Demographic details included age, gender, type of school, and socioeconomic status of the child. Age was recorded as age at last birthday. In cases where children were unable to report appropriately, estimation was made on the basis of stage of tooth eruption. Socioeconomic status (SES) was obtained using modified Kuppuswamy SES scale.⁹

History of dental trauma was also recorded along with examination for traumatized teeth using Andreasen's epidemiological classification (2004) including World Health Organization (WHO) codes.³

Code	Injury
Code 0	No injury
Code 1	Treated dental injury
Code 2	Enamel fracture only (N 502.50)
Code 3	Enamel/dentin fracture (N 502.51)
Code 4	Pulp injury (N 502.52), (N 502.53), (N 502.54), (N 503.20), (N 503.21)
Code 5	Missing tooth due to trauma (N 503.22)
Code 9	Excluded tooth

Overjet was measured from the linguo-incisal line angle of the most prominent maxillary incisor to the buccal aspect of the corresponding mandibular incisor. Occlusion was classified according to Angle's classification and lip-closure competence using Jackson's method, which measures lip position at rest in relation to maxillary central incisors.¹⁰ Children were seated on a chair, and a Type III examination (Dunning, 1986) was carried out using a mouth mirror and community periodontal index probe under adequate illumination.¹¹ Strict infection control measures were used. Treatment need was assessed according to nature of the injury and recorded in accordance with treatment options given by Andreasen.³

Statistical analysis of the results

The data were transformed from pre-coded survey form to computer. SPSS version 17.0 was used for the statistical analyses. Chi-square test and Fischer exact test were applied to compare qualitative data and determine the statistical significance. The level of statistical significance was set at $P < 0.05$. The strength of association between the variable (lip coverage, molar relationship, and incisal overjet) and the outcome was calculated using the binary logistic regression analysis and adjusted odds ratio (OR) was calculated.

RESULTS

Out of 2671 schoolchildren examined 1520 (56.9%) were boys and 1151 (43.1%) were girls, in which 11-15 years school children accounted for the highest percentage of total sample (56.3%). More than half of the children belonged to private schools (54.2%). Overall prevalence of TDIs was 229 (8.6%). The mean age of dental trauma was 12.98 ± 1.47 years, peak of which occurred at 12 years children in the age group 11-15 years, and 37 (16.1%) fractured teeth were present in 12 and 15 year ages. [Table 1, Figure 1].

Table 1 Prevalence of TDIs according to demographic variables

Children's characteristics	Number	Traumatic dental Injuries (%)		P Value	
		No Injuries	With Injuries		
Age	6-10 yrs (I)	1166	1098 (94.2)	68 (5.8)	P = 0.000*
Groups	11-15 yrs(II)	1505	1344 (89.3)	161 (10.7)	
Gender	Boys	1520	1362 (89.6)	158 (10.4)	P = 0.000*
	Girls	1151	1080 (93.8)	71 (6.2)	
Type of School	Government	1225	1100 (89.8)	125 (10.2)	P = 0.008*
	Private	1446	1342 (92.8)	104 (7.2)	

A statistically significant difference was seen in the prevalence of TDIs to boys and girls where the ratio of prevalence between boys and girls was 2.22:1. Boys had 1.7 times higher risk of getting dental trauma than girls (OR = 1.7, P < 0.001).

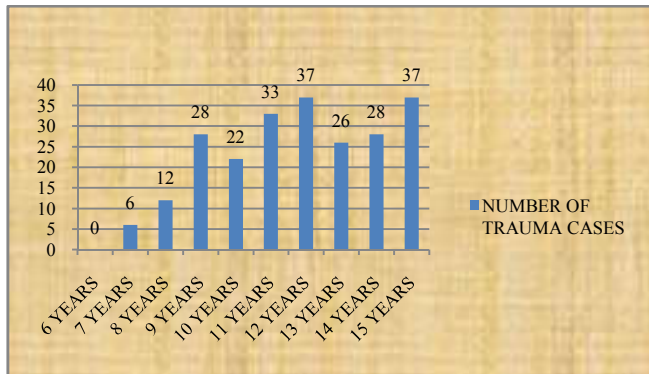


Figure 1 Distribution of traumatic dental injuries according to individual ages

[Table 1] When school settings were compared, government children sustained higher number (4.7%) of injuries than their private counterparts, although this was not statistically significant (P = 0.8). [Table 1, Figure 2] Out of 229 fractured cases, 163 (71.2%) showed an overjet of <5.5 mm.

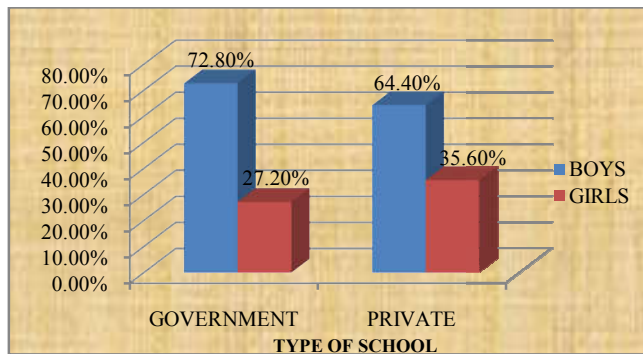


Figure 2 Distribution of traumatic dental injuries according to type of school

When compared to 2442 non-trauma cases, where 122 (5%) had overjet >5.5 mm [Table 2].

Table 2 Prevalence of TDIs according to risk factors

Children's characteristics	Number	Traumatic dental Injuries (%)		P Value	
		No Injuries	With Injuries		
Overjet	>5.5 mm	189	123 (65)	66 (35)	P = 0.000*
	<5.5 mm	2482	2319 (93.4)	163 (6.6)	
Lip Coverage	Inadequate	122	53 (43.5)	69 (56.5)	P = 0.000*
	Adequate	2549	2389 (93.7)	160 (6.3)	
Malocclusion	Class I	2093	1956	137	P = 0.000*
	Class I Type 1	424	360	64	
	Class I Type 1	12	8	4	
	Class I Type 2	12	8	4	

This means children having overjet >5.5 mm were at 6.6 times higher risk of getting dental trauma (adjusted OR = 6.6, confidence interval [CI] = 3.66-8.23, P = 0.000). Inadequate lip coverage was also a significant risk factor for getting dental trauma (OR = 1.8, CI = 1.28-2.48) [Table 2]. There were more number of fractured cases in Angel's Class I malocclusion 137(60.3%) and Class I Type 1 10(5.3%), i.e., crowded dentition. This was significant when compared to non-trauma cases (P = 0.000) [Table 2].

Most (55.9%) of the injuries occurred at home [Figure 3] and fall was the most important cause (61.1%) followed by sporting activities (14.8%) [Figure 4].

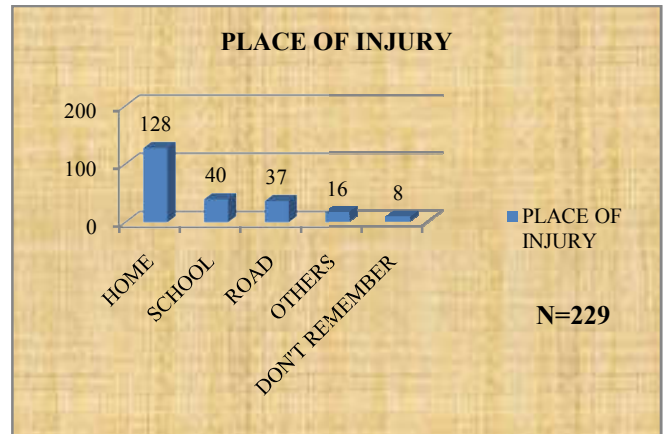


Figure 3 Distribution of traumatic dental injuries according to place

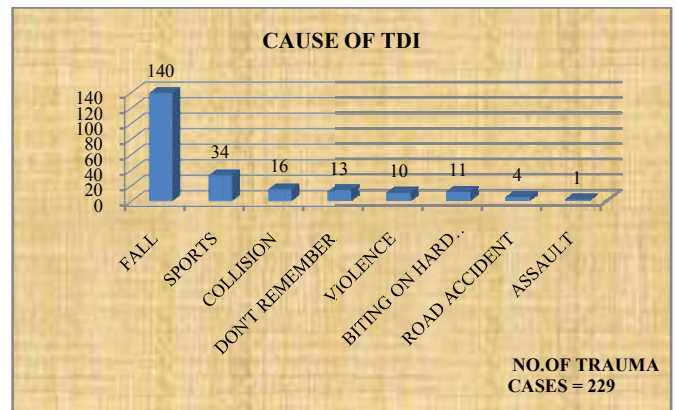


Figure 4 Distribution of traumatic dental injuries according to cause

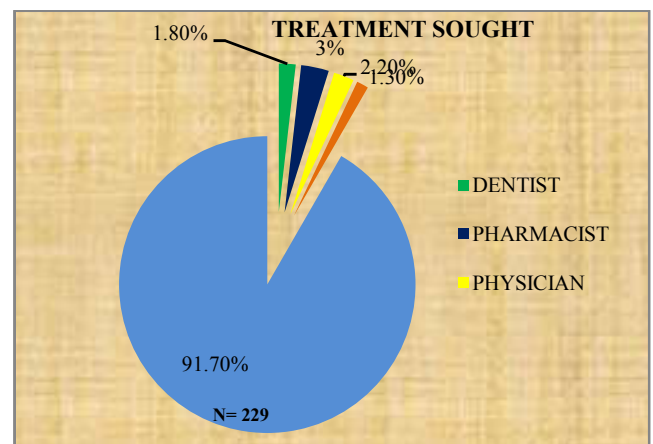


Figure 5 Distribution of subjects seeking treatment

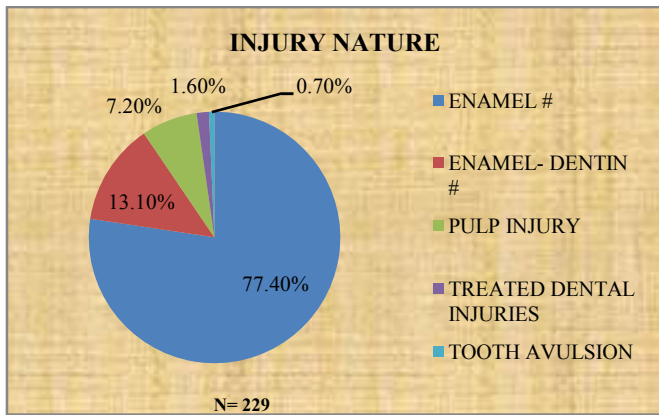


Figure 6 Distribution of type of Injury nature

Only 19 (8.3%) of children with trauma sought for the treatment [Figure 5]. Overall 305 teeth presented with TDI. 76% injuries were single tooth type and 24% multiple tooth type found. Maxillary central incisor was the most affected tooth (62.8%) and enamel fracture (77.4%) was the common injury nature [Figure 6]. Restoration (266) was the most common treatment need [Figure 7].

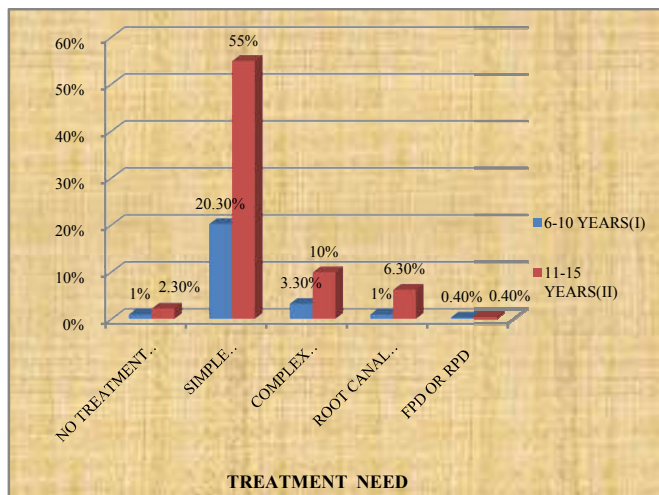


Figure 7 Distribution according to treatment need

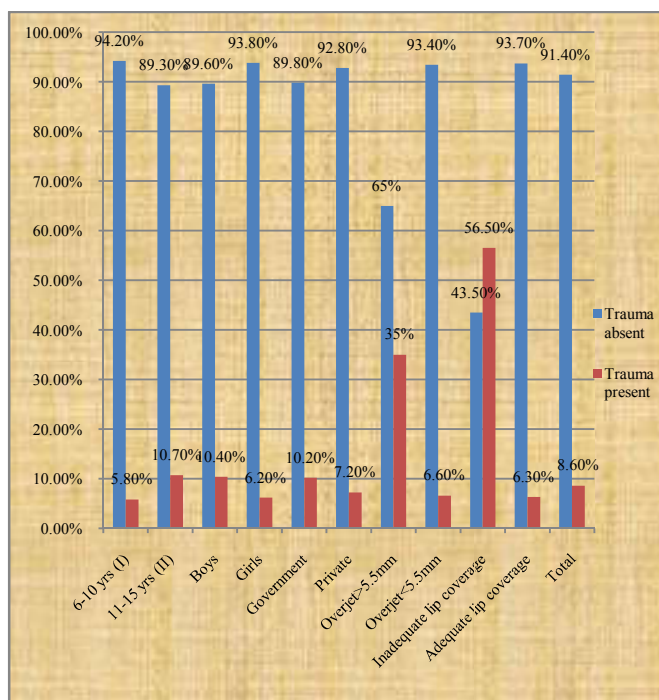


Figure 8 Prevalence of traumatic dental injuries in trauma and non trauma cases

DISCUSSION

TDIs may occur at any point of time in an individual's life, but these are particularly common and unsolved problem among the schoolchildren throughout the world. TDI is not an end result of disease but an outcome of a number of factors that will accumulate throughout life if not appropriately treated. The trend in TDIs is not as clear and well documented as the trend in dental caries. Moreover; there is substantial variation in the prevalence of TDIs. This has been attributed to the factors such as the type of study, classification of dental trauma, and the dentition studied.³ For this study, children between 6–15 years of age were chosen, as during this period there is the maximum physiologic growth and development and the children are actively involved in lot of outdoor activities and there will be wide coverage of the ages. Schoolchildren constitute an accessible natural group that can be looked upon for such survey. Both government and private schools were taken into account so as to make the sample more representative, which will cover children from all the social, economic, and cultural communities. In the present study, among 2671 schoolchildren examined, 229 children had TDIs, giving the overall prevalence rate of 8.6%. This result was similar to that found by Chen *et al.*¹² (7.1%). Lower prevalence rate than the present study was reported by Faus-Damiá *et al.*¹³ (6%) Valencia, Spain, & Azodo and Agbor¹⁴ (2%) in Cameroon, whereas higher prevalence rate was reported by Ajayi *et al.*¹⁵ (10.77%) in Ibadan and Chopra *et al.*¹⁶ in Panchkula. The great variation in reported rates can be attributed to a number of different factors, including types of study, trauma classification, methodology, study size and population, geographical location and differences in cultural behavior.¹⁷ The prevalence of TDIs in schoolchildren at various ages has been reported by many authors. When all the individual ages were considered, 12 (23.3%), 15 (22.7%), and 11 (20.9%) year ages had a higher number of dental trauma to anterior teeth similar to as reported by Bilder *et al.*¹⁸ Although an exact pattern of increase in dental trauma with age is not evident, it clearly shows that the prevalence of TDIs increases with age may be due to a cumulative effect. Children are usually more active in this period of life and involved in intense outdoor activities. As they grew up the proneness to TDIs significantly reduced.¹⁹ Boys were found to have significantly higher number of fractures than girls in all the age groups. These indicate that boys are more prone for fracture than girls. Recent studies have also supported this fact.^{18,20} This can be attributed to the fact that girls are more restrictive in their behavior than boys, who tend to be more energetic and participate in vigorous physical activities, aggressive games and engaged in rough outdoor events than girls. Studies done by Rocha and Cardoso²¹ also showed an increasing trend of TDIs among girls because of their increasing participation in sports or activities formerly practiced by boys only. Cavalcanti *et al.*²² reported almost similar frequency of TDIs in boys and girls, i.e., 21.9% and 20%, respectively. In the present study, government schoolchildren had more (4.7%) number of TDIs than private schoolchildren (3.9%). These findings are contrasting to the findings of Frujeri *et al.*²³ reported contrasting findings, in which the prevalence of injuries in private schools was higher than in public schools. One possible reason for this may be attributed to the environment provided in the private schools in which better facilities for sporting activities might be present. Good supervision role of teachers in the private schools also keeps a check on the activities of

children. Literature suggests that TDI may have a causative social factor associated with it. Deprivation may alter the behavior of children and result in higher frequency of injuries in such group.³

The cause of TDI usually varies according to age gender, environment, and socioeconomic status of the children. In this study, two most common causes of traumatic injuries were “fall” followed by “sports” which was similar to the findings of Ravishankar *et al.*¹⁰ The percentage of schoolchildren that did not remember the cause of trauma were grouped in “cannot remember” category which was high (5.7%) and could have resulted in the underreporting of other etiologic factors. Most of the injuries occurred at home followed by at school which was in agreement with many studies.^{8,10,15,16} This result may be due to the fact that most of the students spend approximately 60% of their time in the house rather than in school or playground.²⁵ Injuries occurring during holidays or summer vacation could also explain this finding. The present study demonstrated that maxillary central incisors were the most affected teeth with enamel fracture the most common injury nature which confirmed to the previous literature.²⁶ Protrusiveness, early eruption and vulnerable position of these teeth could be possible explanation.²⁷ After adjusting for other factors, binary logistic regression revealed that a higher overjet of >5.5 mm and inadequate lip coverage was significantly related with the occurrence of TDI and proved to be important risk factors. Children with overjet of more than 5.5 mm were at 6.6 times more risk of getting dental trauma as compared to overjet 5.5 mm (28.8%) as reported in previous studies by Ravishankar *et al.*¹⁰ and Patel and Sujan.⁸ However, Sabuncuoglu *et al.*²⁸ and Rouhani *et al.*²⁹ showed that lip incompetence did not affect the prevalence of TDIs. Protruded, forwardly placed front teeth with limited shielding effects of lips play a part in getting dental trauma.^{30,31} Children with Class I (60.3%) followed by Class I Type 1 (27.9%) exhibited the higher number of dental injuries compared to another type of occlusal relationships. This was in accordance to the result of Faus-Damiá *et al.*¹³ in which highest frequency of TDIs was of Class I malocclusion (41.2%). A high degree of unmet treatment need was seen in the present study where only 8.3% children sought for the treatment similar to the results of and Chen *et al.*¹², Azodo and Agbor,¹⁴ and Bilder *et al.*¹⁸ The low rates of treatment provided observed worldwide may be because TDIs are not perceived as a disease. In contrast to the above findings, 63% children received treatment in Valencia, Spain as reported by Faus-Damiá *et al.*¹³ Another aspect that could enhance treatment neglect is the lack of knowledge regarding the treatment of TDIs among the dentists. In addition, dental school curricula and health authorities tend to focus resources on other oral health condition but not on the treatment of TDIs. Epidemiological studies too often include only visual assessment, and therefore, tend to underestimate the need for treatment. In the present study, treatment need for traumatized teeth was also evaluated in which most of the teeth were requiring restoration of the fractured segment. Only 22 (7.3%) teeth required root canal treatment. Economical and social status of the patients also may be some other factors due to which people do not seek immediate dental treatment. Moreover, low level of awareness regarding dental trauma and its effects among masses may well be one other explanation to this. The “WHO Health Promoting Schools Programme” offers a broad solution for dental trauma as a public health problem, where a “Health Promoting School” constantly strengthens its

capacity as a healthy setting for living, learning, and working³² Main limitations of the study were retrospective data collection and accuracy of patient’s history.

CONCLUSION

The prevalence of TDIs of permanent anterior teeth was 10.7%. Children with normal overjet, with adequate lip coverage and the children with Class I and Class II Division 1 occlusal relation exhibited more number of dental injuries. Increased incisor overjet and incompetent lips were the significant predisposing factors to anterior TDI. There was a considerable negligence in seeking care for these injuries and problem has not received any necessary attention by the dental profession. Public health dentist should make an effort to ensure correct diagnosis, monitoring, and applying a preventive role in such TDIs of schoolchildren to alert parents and guardians to the risks of neglecting treatment with its possible future consequences in child life.

Recommendations

1. Screening programs could be conducted for schoolchildren to identify those with a high anatomic and behavioral risk of traumatic injury to the anterior teeth and motivated to seek orthodontic care
2. Educational program should be conducted for the teachers to increase their awareness regarding dental trauma, its risk factors and the importance of anterior teeth.
3. Role of educating parents about TDIs and its consequences is also very crucial as significant numbers of injuries occur at home. This can be done at regular teacher – parents meetings at monthly intervals
4. Usage of mouth guards should be encouraged during sports.

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How to cite this article:

Manoj Gupta et al (2018) 'Prevalence, Risk Factors And Treatment Needs Of Traumatic Dental Injuries To Anterior Teeth Among 6-15 Year Old Schoolchildren', *International Journal of Current Medical and Pharmaceutical Research*, 4(2), pp. 2958-2963.
