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Original Article

Dentistry Section

Traumatic Dental Injuries and Its Relation to Overweight among Indian School Children Living in an Urban Area

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ABSTRACT

Aim: The aim of the present study was to determine the prevalence of traumatic dental injuries to permanent incisors and explore the association between dental trauma and overweight in a sample of school children residing in an urban area. Our hypothesis was that there was a significant association between overweight and the presence of dental trauma among urban children.

Material and Methods: This cross–sectional survey included 858 school children aged 10-12 years, of both sexes, randomly selected from 12 schools in urban Bangalore, India. The dental examination for traumatic injuries included only maxillary and mandibular permanent incisors. Anthropometric data were collected and Body Mass Index (BMI) was calculated (weight in kg/(height in meters)^2.

Results: The prevalence of Traumatic Dental Injuries (TDI) was 15.04% and boys experienced more traumatic injuries than girls, but the difference was not statistically significant ($p>0.05$). OW boys sustained more TDI than OW girls and the association between dental trauma and OW was statistically significant ($p<0.05$; OR=3.85; 95% CI=2.62-5.24).

Conclusion: Overweight could be considered a significant risk factor for the occurrence of TDI to permanent incisors in Indian school children residing in urban areas.

Keywords: Dental trauma, Overweight, Body mass index, Permanent incisors, Prevalence, Childhood

INTRODUCTION

Changes in lifestyle associated with urbanization, has resulted in a nutrition transition towards a greater prevalence of non-communicable diseases. Traumatic dental injuries (TDI) constitute one of the leading reasons for childhood odontological emergencies [1]. Recent estimates of the prevalence of these injuries to anterior teeth in children shows wide variation [2–4]. Various risk factors to TDI suggested in the literature include excessive overjet, [4–6] inadequate lip coverage, [5,6] high socioeconomic status, [7] and childhood obesity [8,9].

There is an emerging consensus that overweight (OW) and/or obesity in childhood is gradually becoming a major health concern in developing countries including India, especially in urban areas [10,11]. Increased trends in the prevalence of OW in childhood have led to extensive research on its association to dental trauma as these children are more prone to TDI. Because these injuries can be prevented, a better understanding of the risk factors associated with dental trauma might aid in the application of adequate preventive actions.

Furthermore, there is very limited literature reporting on the relation between OW and dental trauma in India. The aim of the present study was to determine the prevalence of traumatic dental injuries to permanent incisors and explore the association between dental trauma and overweight in a sample of 10 to 12–year-old school children residing in an urban area.

MATERIAL AND METHODS

This cross sectional study was carried out among a group of 10-12 year-old school children selected from 12 schools (6 Government and 6 private schools) in Bangalore urban region, Southern India. Permission to examine the children from randomly selected schools was obtained from the respective principals and head teachers. The objectives, importance and methods of the study were explained and written informed consent to children participation in the proposed study was obtained from the parents. These children were randomly selected to represent the population of 10-12–year-old school children living in Bangalore urban region.

The size of the sample was calculated to give a standard error of 5% or less. The 95% confidence interval level and a prevalence of traumatic dental injury of 15% were used for the calculation. The following equation was used to estimate the required sample size,

$n = p_x q/ (E/1.96)$ [2].

n = minimum sample size.

p = maximum expected prevalence (%).

q = 100 – p.

E = margin of sampling error tolerated (%).

Anthropometric measurements were recorded prior to dental examination by a trained investigator who was blinded to the study. Weight was assessed to the nearest 0.1 kg on a single calibrated digital scale and height was measured to the nearest 0.1 cm using a stadiometer by having the subject standing straight without shoes. Three readings were made and the mean height was considered. Body mass index was calculated using the following formula: weight in Kg/(height in meters)^2. According to Centers for Disease Control and Prevention (CDC) guidelines, children are considered at risk of being overweight if they are between the 85th and 95th percentile of age and gender-related BMI, whereas overweight children includes those who are at or beyond the 95th percentile of age and gender-related BMI [12]. The reference data used to identify the cut off points were taken from the CDC 2000 dataset for BMI [13]. For the purpose of this study, subjects who were at-risk-of-being-overweight and overweight were considered under overweight (OW) category i.e., subjects were dichotomized into OW (BMI $\geq$ 85th percentile value) and normal weight (NW; BMI $\leq$ 85th percentile value) categories.

Dental examinations were carried out by another investigator who had participated in the standardisation and calibration training sessions before the study in order to guarantee the reliability of

data. Children were examined under a standard head light for dental trauma in a predetermined order at schools during class hours using sterile sets of plane mouth mirrors and cotton buds. The dental examination for traumatic injuries included only maxillary and mandibular permanent incisors. Details concerning the age, sex, and presence or absence of trauma were recorded. A tooth was scored as fractured when some of its surface was missing as a result of trauma and there was no evidence of caries [14]. Neither vitality tests nor radiographs were used to assess the extent of the fractured teeth. In the analysis, the children were categorized as having no anterior tooth trauma (code-0) or one/more teeth with traumatic injury (code-1).

All data were collected on standardized forms, and an electronic database was created with all collected information, including age and gender. To protect confidentiality, the database was password secured and only accessible to one data analyst. 10% of subjects were re-examined at the end of the day for intra–examiner variability (k=0.96). All results were analyzed using the Statistical Package for Social Sciences software [SPSS, 16.0, SPSS Inc., Chicago, IL, USA]. The frequency distributions and means were calculated. Chi square analysis was used to compare outcomes in the overweight and normal weight groups. The significance level was set at 5%.

RESULTS

Of the 858 children examined in the survey, 452 (52.7%) were boys and 406 (47.3%) were girls. The prevalence of traumatic injuries to permanent incisors was 15.04% (n=129). Boys experienced more traumatic injuries than girls, 16.4% and 13.6% respectively, but the difference was not statistically significant (p>0.05; OR=1.25; 95% CI=0.87-1.89) [Table/Fig–1]. Intra examiner agreement was calculated and a score of 0.90 indicated an optimal agreement. Mean age of the study population was 10.81 ± 0.43 years and the overall mean BMI was 19.2 ± 3.1 kg/m^2. The proportion of OW was higher among boys (n=87, 19.24%) than among girls (n=66; 16.26%) and the prevalence of traumatic injuries was higher among OW boys than OW girls (35.6% vs 28.8%, respectively) [Table/Fig–2].

Of the 129 children who presented permanent incisor trauma, more traumatic dental injuries were seen among OW than among NW subjects (32.7% vs 11.2% respectively). There was a significant relation between the occurrence of dental trauma and the presence of OW (BMI ≥ 85th percentile) in both boys (p<0.05; OR=4.15; 95% CI=3.53-5.86) and girls (p<0.05; OR=3.41; 95% CI=2.19-5.11) [Table/Fig–3]. The overall relationship between dental trauma and OW among children with TDI in both the genders was statistically significant (p<0.05; OR=3.85; 95% CI=2.62-5.24). This study indicates that dental traumatic injuries were observed 3.85 times higher in the OW school children when compared to those with the NW.

DISCUSSION

The present study identified a prevalence of 15.04% of traumatic dental injuries to the permanent incisors in 10-12–year-old school children living in urban Bangalore, India. This finding corroborates with that of a recent study by Ravishankar et al., [5] who reported a prevalence of 15.1%. However, other studies in Indian children have showed prevalence rates varying between 4% and 15% [2,5,15,16]. These differences may only be partly due to the different ages of the study sample and diagnostic classifications employed in the study criteria. Authors suggest that results from the present study indicate that traumatic injuries to the permanent incisors in Indian children have been consistent.

The study confirmed previous reports that indicated a gender difference in the prevalence estimates with boys having a higher probability of TDI than girls [6,9,17]. This may be related to increased

Gender	Traumatic Dental Injuries		Total no (%)	p-value*	OR and CI with 95%
	With trauma no (%)	Without trauma no (%)			
Boys	74 (16.4)	378 (83.6)	452 (100)	p > 0.05	1.25 (0.87-1.89)
Girls	55 (13.6)	351 (86.4)	406 (100)		
Total	129 (15.04)	729 (84.96)	858 (100)		

[Table/Fig-1]: Distribution of traumatized children according to gender
*Chi-square test; CI is confidence interval to odds ratio (OR)

BMI	Boys			Girls			p-value
	n	Mean ± SD	SEM	n	Mean ± SD	SEM	
Over weight (OW)	31	23.18+2.71	0.48	19	20.56+2.39	0.54	*P* = 0.001*
Normal weight (NW)	43	17.38+0.85	0.13	36	17.06+0.33	0.10	*P* = 0.036*

[Table/Fig-2]: Mean BMI values of children with dental trauma
n=number of subjects; *p<0.05.

Gender	BMI	Traumatic Dental Injuries		Total No (%)	p-value*	OR and 95% CI
		With trauma No (%)	Without trauma No (%)			
Boys	OW	31 (35.6)	56 (64.4)	87 (100)	p < 0.05	4.15 (2.53-6.33)
	NW	43 (11.8)	322 (88.2)	365 (100)		
Total		74 (16.4)	378 (83.6)	452 (100)		
Girls	OW	19 (28.8)	47 (71.2)	66 (100)	p < 0.05	3.41 (2.19-5.11)
	NW	36 (10.6)	304 (89.4)	340 (100)		
Total		55 (13.6)	351 (86.4)	406 (100)		
Total Sample	OW	50 (32.7)	103 (67.3)	153 (100)	p < 0.05	3.85 (2.62-5.24)
	NW	79 (11.2)	626 (88.8)	705 (100)		
Total		129 (15.04)	729 (84.96)	858 (100)		

[Table/Fig-3]: Distribution of dental traumatic injuries by gender according to BMI category (OW and NW)
OW=Overweight; NW=Normal weight; *Chi-square test
CI is confidence interval to odds ratio (OR)

participation of boys in leisure activities or sports of aggressive nature compared to girls of similar age groups [18]. Vanderas et al., [19] had pointed out higher levels of epinephrine, dopamine and emotional stress in boys. Similar to other reports, [9,20] no significant difference was observed between gender and the presence of TDI in the present study. Contrary to this, increased trend in the dental trauma seen among girls has been related to their extensive participation in sports or activities, equivalent to boys [21].

Evidence in the literature suggest that an increased body fat mass decreases postural stability and increases the odds of falling, particularly when combined with low muscle mass. This study revealed that OW children were 3.85 times more prone to TDI than NW children. Further, the relationship between the presence of dental trauma and OW (≥85th percentile BMI) was statistically significant in our study which is in agreement with the findings in the literature [8,9,22]. On the contrary, few other studies did not detect any statistically significant relation between TDI and OW [20,23,24]. Petti et al., [22] had suggested that lower adeptness among the obese individuals make them more prone to these injuries. Bernard et al., [25] suggested that the less stable posture was not only the result of OW by itself but could be related to sensory integration problems.

Weight status in children is measured by assessment of BMI corresponding to gender and age-ranked percentages [12]. The present study evaluated overweight using BMI which is similar to that used in other studies [8,22]. However, an earlier study by Soriano et al., [9] reporting obesity as risk factor to trauma used different diagnostic criteria (the NCHS reference tables) for evaluating obesity. The

results are often conflicting due to variations in the methods used to measure BMI including those involved with sample selection and study design. Furthermore, the application of International reference standards of BMI in an Indian setting may have limitations. No comprehensive data on risk factors for injury were collected in the present study. Apart from gender, the only variable examined for its association to injury was overweight (BMI). Further, as the trauma index used in the study recorded only visible damage to the hard tissues, it is likely that these data underestimate injury rates.

Data from this study indicates that 15.04% of 10-12 year-old school children living in urban Bangalore had experienced TDI to anterior teeth and that OW children are significantly more prone to these injuries compared to NW children. This study concludes that OW could be considered a risk factor for the occurrence of TDI to permanent anterior teeth in Indian school children residing in urban areas. This study will help inform future research and implementation of potential preventive interventions against such diseases. The need for health promotion programs aimed at increasing awareness regarding the consequences associated with these problems should be emphasized.

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