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Assessing Risk Factors, Patterns, and Knowledge of Preventive Measures in Traumatic Dental Injuries among School Children

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ABSTRACT

Traumatic Dental Injuries (TDIs) were among the most prevalent conditions affecting children. Data on dental trauma primarily stem from studies conducted across various regions of the world. These injuries can have significant functional, aesthetic, and psychological implications for affected children. Effective prevention and timely treatment were essential, as untreated dental trauma can lead to long-term complications, including infection, malocclusion, and impaired oral development. **Objective:** To evaluate risk factors, patterns, and knowledge of preventive measures in traumatic dental injuries among school children. Methods: A study was conducted to evaluate dental trauma in children. The data were collected from 312 children aged 8 to 15 using a convenience sampling technique. The inclusion criteria encompassed children with erupted permanent anterior teeth. The relationships were analyzed using the Chi-Square test in SPSS version 26. **Results:** The data showed that 63.5% of the children were male, with 57.7% having experienced traumatic dental injuries. Falls (21.8%), sports injuries (15.7%), and biting (5.8%) were the most frequent causes present in the study. and maxillary central incisors had the highest tooth loss at 57.95%, while 57.7% of participants were aware of using mouth guards to prevent dental trauma. **Conclusions:** It identified several predisposing factors, particularly affecting the anterior teeth. Based on these results, strategic preventive measures should be implemented, specifically targeting the identified risk groups.

INTRODUCTION

The International Association of Dental Traumatology (IADT) defines dental trauma as an external force impacting dental tissue, which can manifest clinically as injuries to hard tissues (such as enamel fractures, enamel and dentin fractures with or without pulp exposure, root fractures, and alveolar fractures) or supportive tissues (including concussion, subluxation, intrusive, extrusive, or lateral dislocation, and avulsion) [1]. Traumatic Dental Injuries (TDIs) significantly affect children's chewing abilities and quality of life, also impacting parents emotionally and financially [2]. The prevalence of TDIs is from 6% to 34.8% in children and adolescents, with annual incidence rates of 1% to 3.3% in those aged 7 to 15, influenced by environmental and cultural factors [3]. Boys experienced more injuries which occurred primarily at home due to falls. Tooth loss most frequently occurs in the maxillary central and lateral incisors, as well as the lower anterior teeth [4]. Traumatic Dental Injuries (TDIs) arise from various causes, including sports injuries, road traffic accidents, falls, and violence, commonly occurring at home, school, playgrounds, streets, parks, and in school buses. Identified risk factors include dental profile, molar relationship,

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overjet, lip coverage, socio-economic status, and weight/BMI. These injuries can lead to complications like crown fractures, tooth discoloration, pulp necrosis, and root resorption. Additionally, research shows that children with front tooth trauma are often less likely to smile or participate in social activities than other children [5]. Numerous systematic reviews have indicated that various anatomical and biological factors contribute to a higher prevalence of TDIs, including obesity, pronounced overjet, anterior open bite, and poor lip seal [6]. The use of protective gear, like mouth guards, is deemed essential for preventing dentofacial injuries due to their capability to absorb and disperse impact energy [7]. The loss of permanent front teeth can be highly distressing for the children and parents, impacting facial appearance and potentially lowering a child's self-esteem. Furthermore, TDIs can adversely disturb the children's quality of life [8]. TDIs are affecting children and adolescents globally and they can lead to serious consequences, including tooth discoloration, pulp necrosis, reduced quality of life, and financial burdens [9]. It's essential to improve and upgrade school facilities, infrastructure, and playgrounds to create a safer environment for children. Educating teachers, parents, and students about preventive measures for dental injuries in both schools and at home is crucial. Additionally, using proper safety gear should be mandatory for children and adolescents during outdoor sports and recreational activities to minimize the risk of injuries [10]. Other epidemiological studies indicate that 50% of children have experienced Traumatic Dental Injuries (TDIs). Previous research has reported the prevalence of dental trauma in developed countries to be between 4% and 30%. This significant prevalence highlights the necessity for dental care programs that include public and parental education. Numerous studies have assessed parental knowledge regarding TDIs, with most findings showing a lack of awareness, particularly among fathers, underscoring the need for improved educational efforts for parents [11]. Identifying and addressing the risk factors associated with TDIs is essential for implementing effective preventive strategies and educational programs. This understanding allows public health initiatives to reduce the incidence of TDIs and enhance oral health among children.

Therefore, this study aimed to investigate the risk factors, patterns, and knowledge of preventive measures in TDI in school children.

METHODS

A cross-sectional study was performed to evaluate dental trauma in children. Ethical approval was obtained from the Gandhara University (No. GU/Ethical Committee/2023/205) and the data collection was started from 20th November 2023 to 10th June 2024, and data were collected using a convenience sampling technique. The sample size was calculated using OpenEpi version 3.01, with a 5% precision, a 95% confidence interval, and a prevalence of dental trauma estimated at 28.3% [12]. The total sample included 312 children. A pilot study was executed on 10 members to assess the feasibility and validity of the questionnaire. The inclusion criteria for the study focused on children, aged 8 to 15 years who attended school and had erupted permanent anterior teeth, with at least 75% of their crowns emerging into the oral cavity and those with signed consent forms from their parents were included. Conversely, the exclusion criteria eliminated children with filled or missing central and lateral incisors, peg laterals, large diastemas, excessive crowding, open bites, severely rotated teeth, or orthodontic appliances. Additionally, students who lost teeth due to dental caries, fractured roots, severe dental fluorosis, or those with physical, mental, or medical disabilities were excluded. The students were asked about the age, gender, presence or absence of dental trauma, risk factors and tooth loss and knowledge of the use of mouth guards and face guards as preventive measures. The children were examined with the help of a tongue depressor in day light. The examination proceeded systematically from the maxillary right quadrant to the mandible in a clockwise manner, relying on visual assessment without evaluating tooth vitality or using radiographs. The data were analyzed by using SPSS version 26.0. The frequency and percentages were calculated for the demographic profile of the children, risk factors, various preventive measures, and a chi-square test was used for the association between child's gender and risk factors. A P-value of ≤0.05 was established as significant.

RESULTS

The data showed that the majority of the children were male, with 63.5% being male, 36.5% being female and 68.3% being aged 12 to 15. Additionally, 57.7% of the children had experienced a traumatic dental injury, whereas 42.3% had not.

Table 1: Demographic Profile of the School Children (n=312)

Variables	Frequency (%)
Gender of Child	
Male	198 (63.5%)
Female	114 (36.5%)
Age of Child	
8-11	99 (31.7%)
12-15	213 (68.3%)
Presence or Absence of Dental Trauma	
Yes	180 (57.7%)
No	132 (42.3%)
Place of Trauma	
School	74 (23.7%)

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Home	78 (25.0%)
Street	27 (8.7%)

The data showed that falls (21.8%) were the most common risk, followed by sports injuries (15.7%). Road traffic accidents (5.1%), biting (5.8%), overjet (5.1%), and physical fights (4.2%) were less frequent contributors.

Table 2: Showing the Risk Factors for Dental Trauma (n=312)

Risk Factors for Dental Trauma	
Risk factors	**Frequency (%)**
Fall	68 (21.8%)
Sports	49 (15.7%)
RTA	16 (5.1%)
Biting Hard Objects	18 (5.8%)
Overjet	16 (5.1%)
Physical Fight	13 (4.2%)

The data revealed significant gender differences in dental trauma risk factors (p = 0.007). Males had higher rates of falls (23.2%) and sports injuries (20.7%), while females had more falls (19.3%) but fewer sports injuries (7.0%).

Table 3: Association of Children's Gender and Risk Factors (n=312)

Gender	Fall Frequency (%)	Sports Frequency (%)	RTA Frequency (%)	Biting Frequency (%)	Overjet Frequency (%)	Physical Fight Frequency (%)	p-Value
Male	46 (23.2%)	41 (20.7%)	9 (4.5%)	13 (6.6%)	11 (5.6%)	9 (4.5%)	0.007
Female	22 (19.3%)	8 (7.0%)	7 (6.1%)	5 (4.4%)	5 (4.4%)	4 (3.5%)	

The findings indicated that the upper front teeth experienced tooth loss at 57.95%, followed by upper lateral incisors at 39.74%, and 57.7% were aware of the use of mouth guard.

Table 4: Pattern of Permanent Teeth Loss and Knowledge about Preventive Measures (n=312)

Pattern of Teeth Loss	
Tooth Loss	**Frequency (%)**
Maxillary Central Incisor	175 (57.95%)
Maxillary Lateral Incisor	120 (39.74%)
Mandibular Central Incisor	5 (1.65%)
Knowledge about Preventive Measure	
Mouth Guard	180 (57.7%)
Face Guard	132 (42.3%)

DISCUSSION

The study involved 312 children, with 63.5% being male and 68.3% aged 12-15 years. Among the participants, 57.7% reported experiencing traumatic dental injuries, predominantly occurring at home. According to the previous study involving 1,100 participants, age and gender were found to influence dental injuries. The results indicated that boys had a dental injury rate of 11.5%, whereas girls had a lower rate of 10.2%. Furthermore, among 12-year-olds, the prevalence was recorded at 10.6%, while 15-year-olds showed a slightly higher prevalence of 11.3% [13]. This study identified various risk factors for dental trauma with which the most common risk factor was falling in both males (23.2%) and females (19.3%). Males had more sports-related injuries. A previously conducted study indicated that falls (61%) were the frequent reason of dental injuries, followed by biting hard objects (11%) and sports-related incidents (9%) [14]. Similar findings were also found by Nagarajappa R *et al.*, in which boys accounted for 67.4% of dental trauma more than girls 32.6%. The major cause was falls in the play area (46.0%), with pushing being the core reason for the injuries at 65.2% [15]. Another study was conducted on dental trauma in which the affected age bracket was 13 to 20 years (46%). The majority of trauma incidents resulted from falls while playing (36.6%), followed by bicycle accidents at 19.5% [16]. A study reported the findings that falls were identified as the leading cause of dental injuries (43.8%), road traffic accidents were 42.1%, and sports-related injuries accounted for 9.1% of the incidents [17]. However, Violence was the leading cause of dental trauma (42.5%), followed by roadway accidents (24.1%), impacts with people or objects (16.0%), and falls (9.1%) as reported in a study [18]. This study revealed that tooth loss occurred most frequently in the maxillary central incisors (57.95%), with the maxillary lateral incisors following at 39.74%. In comparison, the mandibular central and lateral incisors experienced much lower loss rates. Similar results were found by the previous literature suggesting that traumatic injuries were more commonly associated with maxillary teeth than mandibular teeth [18]. The increased susceptibility of maxillary teeth was attributed to their prominent position and protruded alignment, while the flexible lower jaw absorbed impacts, reducing trauma to the lower anterior teeth [19]. A study revealed the findings that boys (62.4%) had significantly more instances of multiple teeth being affected than girls (37.6%). The most commonly affected teeth were the maxillary central incisors (81.6%), followed by maxillary lateral incisors (12.7%) and mandibular central incisors (5.7%) [20]. Another study involving 443 teachers showed that children's safety improved with safe playgrounds (75.8%), 10.6% acknowledged that having a nurse on-site could effectively reduce and manage dental trauma and the remaining suggested the use of face guards and mouth guards were essential for child' safety [21]. Numerous studies indicated that mouth guard users reduced sports-related orofacial injury risk by 1.6 to 1.9 times, while education regarding the use of mouth guards by dental

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practitioners further reduced the TDIs[22].

CONCLUSIONS

The data highlights that males were more prone to dental trauma, particularly from falls and sports injuries. To reduce these risks, schools should implement safety programs, sports injury prevention measures, and oral health education. Policymakers must enforce stricter safety standards, and parents should supervise children during high-risk activities.

Authors Contribution

Conceptualization: SZSS,
Methodology: SLSS, AH, SGSS, FJS
Formal analysis: SLSS
Writing, review and editing: SZSS, SLSS, AH, SGSS, FJS

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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