Original Research Paper

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Prevalence of Traumatic Permanent Anterior Tooth Fractures: A Hospital-Based Cross-Sectional Study in Northern West Bengal

Abstract:

Aim: The study aimed toestimate the prevalence and patterns of fracture in anterior teethin the permanent dentition due to trauma in Northern West Bengal population.

Materials and Methods: After obtaining an informed consent, a hospital-based cross-sectional survey was conducted out among 955 patientsfrom June to November 2025. Results were evaluated using Binomial test and the Pearson Chi-square test.

Results: Of 955 patients, traumatic dental injuries were present in 112(11.73%) of subjects, the 20–29-year group recorded the highest number; 48(42.9 %), followed by 23(20.5 %) in the 10–19-year group. Among those with traumatic injuries, females comprised 59(52.7 %) and males 53 (47.3 %). Trauma was most frequent among students 48(42.9 %), Most trauma cases were from urban areas 63(56.3 %), followed by semi-urban 41(36.6 %) and rural 8(7.1 %). The most common injury pattern was enamel and dentine fracture 48(42.9 %), followed by enamel-only fracture 37(33.0 %), pulp involvement 13(11.6 %).

Conclusions: In the present study it was observed that anterior tooth trauma was most frequent amongst females, with falls as the attributable reason, occurring predominantly amongst the 20–29-year-old group. Furthermore, fracture of maxillary central incisor was most common and among all, fractures involving enamel and dentin were most common.

Key-words: Falls, tooth fracture, trauma.

Introduction:

Traumatic dental injuries include injuries to the tooth and the structures supporting it. Traumatic dental injuries can span from enamel fractures to avulsion of teeth. Dental trauma encompasses about 5% of all bodily injuries with oral injuries being the sixth most commonly injured body part and fifth highest incidence in diseases and conditions are commonly unreported.[1] Dental trauma can affect the pulp directly, sometimes accompanied by injury to the crown or root, or it may cause the tooth to be displaced from its socket.[2] Traumatic dental injuries can jeopardize dental health, but along with having aesthetic, psychological, social and therapeutic implications. Given that permanent teeth are still under development during these years, such injuries may pose a significant dental concern and warrant prompt intervention.

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[3,7] Although dental professionals are generally well informed about the risks associated with traumatic dental injuries, this knowledge is not effectively communicated to the wider public, limiting opportunities for prevention. Moreover, multiple epidemiological studies have highlighted traumatic dental injury as a significant public health concern.[8] It has been reported that the majority of the dental injuries involve the anteriorteeth.[9]

Most Indian studies on traumatic dental injuries have focused on school children or community-based samples, leaving hospital-based evidence relatively scarce. In Northern West Bengal, where diverse demographic and occupational factors may shape trauma risk differently, such data are virtually absent. To address this gap, the present study was designed as an exploratory hospital-based investigation in a less studied population, aiming to provide preliminary estimates of anterior tooth fracture prevalence, identify common etiologies, and describe clinical patterns in permanent dentition.

Materials and Methodology:

After ethical approval from the Institutional Ethics Committee (No:IEC/NBMC/M-18/018/2025), the current cross-sectional study was conducted by screening over two thousand patients over the period of six months from June 2025 to November 2025, to assemble information on the prevalence of anterior tooth fracture involving the permanent dentition; due to trauma in the patients reporting for first time to the Out-patient Department of the Institution. Individuals aged 15–65 years who met the inclusion criteria were enrolled using purposive sampling.A hospital-based approach was chosen for feasibility and to generate preliminary regional estimates and clinical patterns where community data are scarce.

All patients were informed about the nature and purpose of the survey, and written informed consent was taken before examination. The study was carried out in accordance with the ethical principles of the Declaration of Helsinki, and only those patients who agreed voluntarily was included.

Individuals presenting with recent maxillofacial injuries, restricted mouth opening, or anterior dental caries were excluded. The study included participants aged over 15 years who were free from physical or mental disabilities. Each patient was examined for anterior tooth fracture on the dental chair under good illumination using sterilized mouth mirror, explorer, and tweezers, and those who presented with fractured anterior teeth due to trauma was further questioned using the World Health Organization (WHO)-based questionnaire to assess associations with age, gender, location, occupation, and etiology. Dental trauma was classified according to the WHO scoring criteria (2013) [7], where affected teeth was coded as 0 meaning no sign of injury, 1 treated injury, 2 enamel fracture only, 3 enamel and dentine fracture, 4 pulp involvement, 5 missing tooth due to trauma, 6 other damage, and 9 excluded teeth. Of the 2000 individuals initially screened, 955 met the inclusion criteria and constituted the final accessible population.As prior regional data required for formal sample size calculation were limited, the study was designed as an exploratory hospital-based cross-sectional investigation. Therefore, all eligible patients attending during the study period were included, and the final accessible population of 955 participants constituted the study sample.

Statistical analysis:

The collected data was tabulated in a spreadsheet using Microsoft Excel 2024, and then statistical analysis was carried out using International Business Machines (IBM) Statistical Package for the Social Sciences Statistics (SPSS) for Windows, Version 27.0. (Armonk, NY: IBM Corp). Descriptive statistics summarized the categorical variables, presenting them as frequencies and percentages. The Binomial/Chi-square(χ^2) test was carried out to analyze the categorical variables. The level of significance was set at five percent.

Results:

Out of total 955 patients examined, traumatic dental injury was found in 112 (11.73%) cases while rest 843 (88.27%) showed no sign of trauma (Table 1 and Figure 1). So nearly one in ten patients had anterior tooth fracture.

When age groups were compared, the 20–29 yrs group had 48 (42.9%) cases, followed by 10–19 yrs with 23 (20.5%) and 30–39 yrs with 18 (16.1%). Older age groups had much less cases: 40–49 yrs 13 (11.6%), 50–59 yrs 8 (7.1%), and 60–69 yrs only 2 (1.8%). The difference across age was statistically significant ($P < 0.0001$).

Gender wise, females 59 (52.7%) and males 53 (47.3%) were almost similar, no significant difference ($P = 0.637$).

Occupation wise, students 48 (42.9%) was most affected, then clerical/skilled workers 33 (29.5%), homemakers 22 (19.6%), shop owners/self-employed 8 (7.1%), professionals 3 (2.7%), and retired 2 (1.8%).

Urban residents had more trauma 63 (56.3%) compared to semi-urban 41 (36.6%) and rural 8 (7.1%) (Table 1).

Observing at the clinical profile, enamel and dentine fracture 48 (42.9%) was most frequently observed, followed by enamel only fracture 37 (33.0%) and pulp involvement 13 (11.6%). Less frequent were missing due to trauma 3 (2.7%), other damage 2 (1.8%), and combined pulp + enamel fracture 2 (1.8%) [Figure 2].

WHO trauma score showed majority in score 3 with 48 (42.9%) and 2 with 37 (33.0%), while score 4 had 14 (12.5%), score 5 had 3 (2.7%), score 6 had 2 (1.8%), and score 9 only 1 (0.9%) [Figure 3].

Nvolvement of two teeth was most frequent 54 (48.2%), followed by single tooth 47 (42.0%), while three teeth 6 (5.4%) and four teeth 5 (4.5%) was uncommon (Table 2).

Regarding cause, falls 43 (38.4%) was leading etiology, followed by unspecified 32 (28.6%), road traffic accidents 15 (13.4%), sports injury 12 (10.7%), domestic/other accident 6 (5.4%), violence 3 (2.7%), and firecracker blast only 1 (0.9%) (Table 3 and Figure 4).

Table 1. Demographic Distribution of Traumatic Dental Injuries χ^2 :chi-square test statistic a:analyzed by Binomial test NS:not significant(P>0.05),*: Significant at P≤0.05

Variable	Category	Frequency (%)	Statistical Test statistic, *P* value
Prevalence	Present	112 (11.73)	
	Absent	843 (88.27)	
Age group	10–19 yrs	23 (20.5)	χ^2 = 69.821, *P*< 0.0001*
	20–29 yrs	48 (42.9)	
	30–39 yrs	18 (16.1)	
	40–49 yrs	13 (11.6)	
	50–59 yrs	8 (7.1)	
	60–69 yrs	2 (1.8)	
Gender[a]	Female	59 (52.7)	0.637 (NS)
	Male	53 (47.3)	
Occupation	Students	48 (42.9)	χ^2 = 282.875, *P*< 0.0001*
	Clerical/skilled workers	33 (29.5)	
	Homemakers	22 (19.6)	
	Shop owners/self-employed	8 (7.1)	
	Professionals	3 (2.7)	
	Retired	2 (1.8)	
Location	Urban	63 (56.3)	χ^2 = 41.054, *P*< 0.0001*
	Semi-urban	41 (36.6)	
	Rural	8 (7.1)	

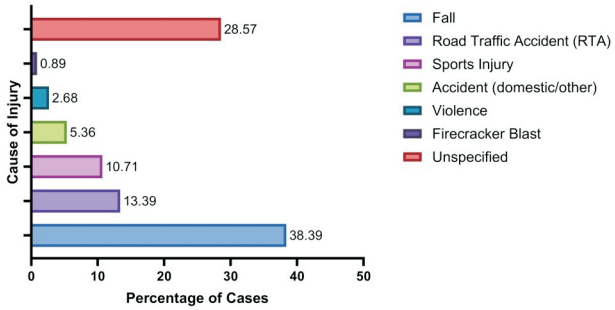

Figure 1: Pie Chart showing the prevalence of traumatic injuries

Table 2. Clinical Characteristics of Traumatic Dental Injuries NS:not significant(P>0.05),*: Significant at P≤0.05

Variable	Category	Frequency (%)	Statistical Test statistic ,*P* value
Type of injury	Enamel + dentine fracture	48 (42.9)	χ^2 = 167, *P*< 0.0001*
	Enamel fracture only	37 (33.0)	
	Pulp involvement	13 (11.6)	
	Missing due to trauma	3 (2.7)	
	Other damage	2 (1.8)	
	Combined pulp + enamel fracture	2 (1.8)	
Trauma severity (WHO score)	2	37 (33.0)	χ^2 = 133.75, *P*< 0.0001*
	3	48 (42.9)	
	4	14 (12.5)	
	5	3 (2.7)	
	6	2 (1.8)	
	9	1 (0.9)	
Number of teeth involved	1 tooth	47 (42.0)	χ^2 = 73.214, *P*< 0.0001*
	2 teeth	54 (48.2)	
	3 teeth	6 (5.4)	
	4 teeth	5 (4.5)	

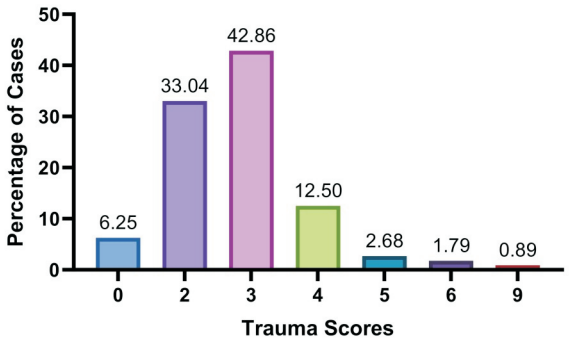

Figure 2:Bar graph showing the distribution of the study subjects with traumatic injuries according to Trauma Type

Table 3. Etiology of Traumatic Dental Injuries NS:not significant(P>0.05),*: Significant at P≤0.05

Cause of Injury	Frequency (%)	Statistical Test statistic,
		P value
Fall	43 (38.4)	$\chi^2 = 93.5$, $P< 0.0001$*
Unspecified	32 (28.6)	
Road traffic accident	15 (13.4)	
Sports injury	12 (10.7)	
Domestic/other accident	6 (5.4)	
Violence	3 (2.7)	
Firecracker blast	1 (0.9)	

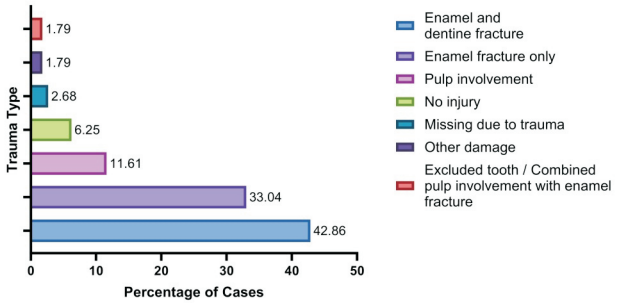

Figure 3:Bar graph showing the distribution of the study subjects with traumatic injuries according to Trauma Score

Figure 4:Bar graph showing the distribution of the study subjects with traumatic injuries according to Cause of Injury

Discussion:

Traumatic dental injuries are a worldwide public dental health concern, although a matter of neglect.[10,11] In the present study, it was observed that the overall prevalence of anterior tooth fracture was 11.73 %(n=112)in 955 patients of West Bengal population. Among individuals with trauma, the 20–29 year group recorded the highest number; 48 (42.9 %), followed by 23 (20.5 %) in the 10–19 year group and 18 (16.1 %) in 30–39 years.

Only 13 (11.6 %), 8 (7.1 %), and 2 (1.8 %) cases were noted in 40–49, 50–59, and 60–69 years respectively, where significant difference was observed across age groups; trauma was more prevalent in the 20–29 year group compared with all other ages.

Among those with traumatic injuries, females comprised 59 (52.7 %) and males 53 (47.3 %), indicating comparable prevalence between males and females with no gender-related predisposition.

Most trauma cases were from urban areas 63 (56.3 %), followed by semi-urban 41 (36.6 %) and rural 8 (7.1 %), indicating that urban residents had significantly higher prevalence of traumatic dental injury compared with semi-urban and rural counterparts,it can be explained by the fact that urban population have more chance of accidents from work centers, road traffic accidents than the rural population. [12]

Trauma was most frequent among students 48 (42.9 %), followed by clerical/skilled workers 33 (29.5 %), homemakers 22 (19.6 %), shop-owners/self-employed 8 (7.1 %), professionals 3 (2.7 %), and retired individuals 2 (1.8 %), thus, students showed a significantly higher proportion of trauma than all other occupational categories. The higher prevalence in these age groups may be attributed to their greater involvement in extracurricular activities and a general tendency toward risk-taking behavior.[13]

In the present study, enamel–dentine fractures were the most common injury pattern (n=48; 42.9%). This was followed by enamel-only fractures (n=37; 33.0%). Thus, the frequency of enamel–dentine fractures was significantly higher than that of all other fracture types, which is consistent with the findings of Brunner et al.; [14] Bücheret al.; [15] Zuhal et al.; [16] Bauss et al.;[17]

Adekoya-Sofoworaet al.[18] reported enamel-only fractures as the most common type of injury. Differences in diagnostic criteria across studies may partly explain such variation. In addition, individuals with isolated enamel fractures often do not seek treatment, either because the injury causes no symptoms or because they remain unaware of it. This lack of clinical presentation could account for the higher frequency of enamel fractures recorded in those studies.

Traumatic anterior tooth fractures can result from several etiological factors, with falls being the most frequently reported.A finding corroborated by Hegde et al. [19], Caldas et al. [9], Levin et al.[20],Hecova et al. [21], and Comfort et al. [22]

WHO score 3 (48 cases; 42.9 %) being the most frequent one observed in this study. Similar findings were reported by Katharina et al.[23] Hecova et al. [21].

In this study involvement of two teeth 54 (48.2 %) was most frequent, followed by single-tooth injury 47 (42.0 %), while three-tooth involvement 6 (5.4 %) and four-tooth involvement 5 (4.5 %) were uncommon, showing that injuries

involving one or two teeth were significantly more common than multi-tooth injuries.

To the best of the authors' knowledge, this is the first hospital-based cross-sectional study from Northern West Bengal that specifically examines traumatic anterior tooth fractures. The study population comes from a largely indigenous and socio-culturally distinct community, offering fresh insights into dental trauma patterns in a region where data have been limited. The work was also carried out and reported in line with the STROBE statementfor cross-sectional studies, [24] which adds transparency and consistency to the reporting.

To the best of our knowledge, this is the first hospital-based exploratory study from Northern West Bengal focusing on traumatic anterior tooth fractures. By examining a less explored population, the study offers fresh insights into clinical patterns and etiological factors. However, as an exploratory hospital-based design, the findings should be interpreted as proportions among attendees rather than population prevalence.The cross-sectional design also confines the capacity to deduce causal relationships between traumatic anterior tooth fractures and associated factors. In addition, the study included only individuals aged 15–65 years and focused solely on permanent anterior teeth, which may underestimate the overall burden of dental trauma.

Conclusion:

In the present study, we noticed that the urban populations were more prone to anterior tooth fracture due to trauma than the rural population. Fall was the most frequent cause of tooth fracture among other causes like automobile injuries, sport injuries and violence. Females had a slightly higher proportion than the males. Among the different types of fractures, the one involving enamel and dentine was most common.

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