

## ORIGINAL ARTICLE

# Traumatic Dental injuries and its Forensic Aspects: A Prospective study at a Tertiary care Teaching Hospital

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## Abstract:

A traumatic dental injury is an impact injury to the teeth resulting from traffic accidents, falls, assaults, and sports. Traumatic dental injuries, by affecting a patient's speech and aesthetics, can lead to psychological and social problems, lowering the patient's quality of life. The role of the Forensic expert is to document and describe injuries and assess the quantum of disease and disability suffered. The study aims to analyse the pattern of traumatic dental injuries in a tertiary care teaching hospital and emphasise the medico-legal issues that arise from a Forensic perspective. 62 cases of traumatic dental injuries presenting to the emergency room or the department of Oral Medicine were studied prospectively over a one year period. There was a preponderance of male cases (61%) over female cases. A maximum number of cases were seen in the adult population (55%). Road traffic accidents (40.4%) were the most common mode of dental trauma. The commonest type of traumatic dental injury observed was uncomplicated crown fractures and maxillary central incisors were the most commonly traumatised teeth. In 12 cases injuries were reported as simple and in 50 cases, they were grievous in nature. To conclude, traumatic dental injuries are preventable, and their prevalence could be reduced when potential risk factors are identified. Meticulous examination and documentation of traumatic dental injuries should result in an accurate, complete and unbiased medico-legal report that will aid in the legal framing of criminal charges against the accused or suspect in question.

**Keywords:** Forensic aspects; Grievous hurt; Medico-legal report; Traumatic dental injury.

## Introduction:

An injury inflicted on the dentoalveolar system is referred to as a traumatic dental injury. Since the oro-facial region is the most exposed part of the body, it is highly susceptible to traumatic injuries. A traumatic force applied to the teeth or periodontium can cause destruction in a variety of ways and to varying degrees of severity. These injuries occur as a result of traffic accidents, falls, assaults, and sports, and they may be present either solely or in conjunction with other regional injuries.

Traumatic dental injuries, by affecting patient's speech and aesthetics can lead to psychological and social problems, lowering the patient's quality of life. The role of the forensic expert is to document and describe injuries, assess the quantum of disease and disability suffered and draw conclusions to help with the legal framing of the criminal offences against the accused or suspect in question.

Several epidemiological studies<sup>1-13</sup> conducted throughout the globe have focused on the pattern of traumatic dental injuries in children and adults, and a few studies<sup>14-19</sup> have highlighted the forensic significance of such cases. However, there is still a

paucity of literature with regard to the Forensic interpretation of such injuries, especially in an Indian scenario. With an intention to fill the dearth, the authors in the present study have attempted to analyse the pattern of traumatic dental injuries in a tertiary care teaching hospital and emphasise the medico legal issues that arise from a forensic perspective.

## Materials and methodology:

An approval from the Institutional Ethics Committee was obtained for the study. The present prospective study was conducted at a tertiary care teaching hospital on 62 cases of traumatic dental injuries presenting either to the emergency room directly or to the department of Oral Medicine during the period of 1 year, i.e., from January 2021 to December 2021.

The study included all such cases in the age range from 1 year to 80 years. Cases initially treated at an outside hospital and then referred to the teaching hospital were excluded from the study. All deceased cases were excluded from the study. Informed consent was taken from the patient or relatives after explaining to them in the vernacular language.

The patient details, history provided and dental findings were documented in a pre-structured proforma. The traumatic dental injuries sustained were categorised as per the classification and analysed.

Other authors have classified traumatic dental injuries according to the Ellis classification<sup>2</sup> or Andreasen's classification.<sup>10</sup> However, the authors in the present study classified traumatic dental injuries as per an unnamed classification used in studies

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**Table 1: Age wise distribution of cases.**

Modes of traumatic injury	Children (<10 years)	Adolescents (10-18years)	Adults (>18 years)
Road traffic accidents	02	05	18
Falls	12	01	04
Sports	02	06	05
Assault	00	00	07
Total	16	12	34

**Table 2: Types of traumatic dental injury.**

Types of traumatic dental injury		Number of cases
Injury to hard dental tissue and pulp	Injury involving only enamel	16
	Injury involving dentin and enamel (uncomplicated crown fracture)	23
	Injury involving dentin, enamel and pulp (complicated crown fracture)	13
	Root fracture	07
Injuries to periodontal tissues	Concussion	02
	Luxation (Intrusion, Extrusion, Lateral)	05
	Avulsion	07
Injuries to supporting bone	Fracture of socket wall	07
	Fracture of alveolar process	06
	Fracture of maxilla/mandible	09
Injuries to gingival and oral mucosa	Abrasion, contusion and laceration	13

**Table 3: Associated injuries.**

Associated injuries	Number of cases and percentage
Head injuries	14(22.5%)
Facial injuries	21(33.8%)
Systemic injuries	05(8.06%)

conducted by Jung et al.<sup>8</sup> and Birgen et al.<sup>16</sup> which appeared more simple and appropriate for the present study. Traumatic dental injuries were classified into four categories: injuries to hard dental tissue and pulp; injuries to periodontal tissues; injuries to supporting bone; injuries to gingival and oral mucosa.

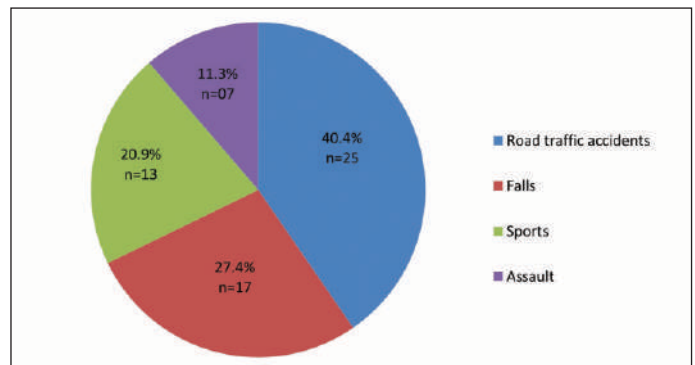
**Results:**

Overall, there was a preponderance of male cases (61%, n=38) over female cases (39%, n=24) A maximum number of cases were seen in the adult population (55%, n=34).The youngest patient presented at the age of one year while the oldest patient was seventy-five years old. The age-wise distribution of cases is depicted in Table 1. The most common mode of dental trauma is road traffic accidents [Graph 1]. Uncomplicated crown fractures were the commonest type of traumatic dental injury [Table 2] and maxillary central incisors were the most commonly traumatised teeth.

**Discussion:**

A traumatic dental injury is an impact injury to the teeth and the supporting hard and soft tissues within the vicinity of the oral cavity. It is usually sudden, circumstantial, unexpected, and accidental and often requires emergency attention.<sup>13</sup> The predisposing factors for traumatic dental injury include inadequate lip coverage, increased overjet, maxillary incisor protrusion, dental malposition, dental hypocalcification or hypercalcification, dental caries, and triggering seizures. The nature of the occurrence of accidental dental trauma usually varies according to age. In the first decade of life, primary dentition and hyperactive behaviour make children susceptible to

**Graph 1: Modes of traumatic dental injury.**



dental injury; rash and negligent behaviour and sports activities make them vulnerable in the adolescent age group. Traffic accidents, violent behaviour and assaults, and trivial falls make adults and the elderly susceptible to traumatic injury.

Consistent with the findings of the present study, various studies<sup>1-10,12</sup> have also reported an overall dominance of male cases compared to females. A higher prevalence in males could be attributed to their violent behaviour and active involvement in outdoor activities. Depending on the age, the cases in the present study were classified into children under ten years old, adolescents, and adults. A majority of traumatic dental injuries were seen among adults, followed by children and adolescents [Table 1]. Studies conducted by Shrestha et al.<sup>3</sup> and Mahmoodi et al.<sup>4</sup> also revealed a similar order of occurrence of injuries.

In the present study, considering all causations, the most common mode of traumatic dental injury was road traffic accidents (40.3%). The common mode of injury however varied according to age, and it was observed that falls were common in children under ten years old (75%), sports activity in adolescents (50%) and road traffic accidents in adults (53%). The above observations were similar to the findings observed in studies conducted by several authors.<sup>1-3,7,9,12</sup> Lack of parental supervision, lack of motor coordination and curious behaviour were the factors contributing to falls in children in the present study. Application of mouth guards is considered an effective preventive measure to prevent or reduce the severity of dental trauma in sports<sup>4</sup> but none of the cases of sports injuries in the present study were found wearing mouth guards. The study reported no cases of assaults among adolescents, which could be due to their reluctance to reveal the cause of injury, suggesting that the proportion due to assault may be underestimated. A study conducted by Nagrajappa et al.<sup>2</sup> also reported a similar finding. The reasons observed for higher incidences of road traffic accidents in adults in the present study were rash and negligent driving, lack of protective gear and alcohol intake.

Contrasting findings were observed in certain studies<sup>4-6,10</sup> which cited falls to be the most common mode of trauma probably because their studies reported higher incidences of trivial falls in the elderly due to poor balance and coordination, impaired vision and adverse effects of medications. However, the second most common injury in the above studies was attributed to road traffic accidents.



Figure 1: Complicated crown fracture without displacement in relation to 11.



Figure 4: Orthopantomogram revealing parasymphiseal fracture in mandibular anterior quadrant (case of assault).



Figure 2: Accidental fall in children resulting in intrusion of 51 and 61.



Figure 5: Gingival laceration surrounded by oedema and haematoma (case of Road traffic accident).



Figure 3: Avulsion of teeth in relation to 31, 32 and 41 with gingival laceration and encrustation of lips (case of Road traffic accident).

The most commonly traumatised tooth was the maxillary central incisors, and the findings are in accordance with existing literature.<sup>2,7</sup> This is most likely due to the vulnerable position of these teeth, which frequently protrude and may have insufficient coverage by the lips. Another reason could be the non rigid connection of the mandible to the cranial base, which allows any impact force to dissipate.

Injuries to the hard dental tissues and pulp could include injuries involving only the enamel, or both dentin and enamel

(uncomplicated crown fracture), or those involving dentin, enamel and pulp (complicated crown fracture). Crown fractures are usually seen in road traffic accidents and falls and they occur due to an impact from a small object moving at a relatively high velocity and making contact from a lateral direction. In the present study, uncomplicated crown fractures (n=23) outnumber complicated crown fractures(n=13) and the findings are consistent to the findings of various studies<sup>2,7,10,12</sup> and contrary to the findings of Shubham et al.<sup>1</sup> root fractures usually occur as a result of an assault.

Injuries to periodontal tissues include concussion, luxation and avulsion. Concussion can be appreciated by eliciting tenderness on percussion in the absence of tooth displacement or loosening. Tooth luxation is the dislocation and loosening of tooth. Radiographically, there are three types of luxation. Tooth intrusion is the luxation of tooth inward into the alveolar socket. In extrusive luxation, the tooth is displaced from the socket in an occlusal direction and there is a large definite increase in width of the space in apical area. In lateral luxation, there is a marked widening of periodontal space apically on either side of the tooth depending on direction of impact.<sup>16</sup> Eighty percent of luxation injuries in the present study were appreciated in children, consistent with the findings of Shrestha et al.<sup>3</sup> and Toprak et al.<sup>9</sup> This could be due to the higher bone elasticity in children that has the ability to absorb more energy of impact favouring luxation injuries. Another reason could be the smaller crown and roots that favour luxation rather than a fracture. Permanent teeth are embedded more firmly in the alveolar bone and are more likely to

fracture. Tooth avulsion refers to the tooth being out of the alveolar socket completely. Injuries to the supporting bone are seen as fracture of socket wall, fractures of alveolar process and fractures of maxilla and mandible. Injuries to gingival or oral mucosa usually take the form of abrasion, contusion or laceration.

**Forensic aspects:** The role of the Forensic expert lies in documenting and evaluating dental injuries. It is always important to document injuries and photographs as they serve as key Forensic evidence in the Courts of law. Assessing the gravity of trauma and the traumatic mechanisms involved allows establishment of causation between the nature and extent of permanent impairment and injury which aids in the legal framing of criminal offences. The question of dental trauma affecting mastication, speech, and aesthetics arises in civil and criminal cases. Among civil cases, those most commonly seen are those related to compensation and insurance claims. Among criminal cases are assaults, accidental trauma, or cases of negligence against a doctor as a result of iatrogenic trauma. The quantum of punishment is fixed by the courts based on the opinion of the doctor regarding the loss of function.

**Dental trauma and Section 320 Indian Penal Code (IPC) :** The clauses of grievous injury that are applicable to dental trauma are defined in Section 320IPC.

**Seventh clause-Fracture or dislocation of bone or tooth: fracture of orbital walls.**

Dislocation of a tooth, whether deciduous or permanent, is a grievous injury. It is no defence that since the teeth are deciduous and will eventually be replaced by the successional permanent teeth, they do not attract the clause. Similarly, tooth luxation, whether intrusion, extrusion, or lateral, is a grievous injury. Fractures of the supporting bone, such as fractures of the socket wall, alveolar process, maxilla, and mandible, are grievous injuries.

**Eight clause-Any hurt which endangers life or which causes the sufferer to be during the space of twenty days in severe body pain or unable to follow his daily routine.**

Traumatic dental injuries indirectly attract this clause on numerous occasions. It is observed that traumatic dental injuries may be associated with life threatening head injuries, facial injuries, and systemic injuries. The present study also reported such a finding [Table 3]. In comparison to such injuries, the dental injuries sustained may be miniscule. As a result, in such scenarios, the final opinion may not be relevant to dental injury at all. However, dental pain, on the other hand, is a subjective phenomenon in which the forensic expert should be able to assess the severity of the traumatic dental injury suffered and whether such injuries are capable of causing pain for a period of twenty days and affect his routine activities like brushing teeth and chewing food. Out of the 62 cases of traumatic dental injuries examined in the present study, the authors reported 12 cases as simple and 50 cases as grievous in nature.

**Dental trauma and professional negligence:** An act of omission or commission refers to professional negligence. In traumatic dental injuries, it is essential to provide prompt care in order to savage the pulp, thereby preventing further complications like pulp

necrosis, ankylotic and inflammatory root resorption, and pulp canal obliteration. Failure to do so will result in medical negligence. An act of commission, i.e., iatrogenic traumatic injury, includes slippage of instruments (clippers, elevators), dislocation of neighbouring teeth through inadequate support, or tracheal intubation.

The Doctrine of Res Ipsa Loquitur constitutes gross negligence like extraction of the wrong tooth, or severing the lingual nerve or inferior alveolar nerve, resulting in numbness and taste disorders.

A new intervening negligent act by the doctor following a traumatic injury is referred to as a Novus actus interveniens. The elements of negligence may include causing damage to nerves while attempting to repair them or introducing infections as a result of using unsterile equipment.

Informed consent is considered a cornerstone of ethical medical practice. Informed consent should be obtained after explaining the procedure to the patient and giving him autonomy to decide. However, informed consent is not a defence in suits of criminal negligence.

Depending on the quantum of damage resulting from negligence, doctors may be punished under Section 336, Section 337, Section 338, or Section 304A of Indian Penal Code.

The number of days of medical care required, time taken for adequate healing should all be taken into consideration while evaluating dental injuries. However, no cases of negligence or iatrogenic trauma were reported in the present study.

**Dental trauma and Road traffic accidents:** Road traffic accidents being the commonest mode of dental trauma in adults in the present study was due to high incidences of drunken driving (48%, n=12) or lack of protective gear like helmets (28%, n=7), or a fatal combination of both (40%, n=10). Road traffic accidents usually involve monetary compensation and insurance claims and hence require a meticulous examination and an accurate opinion. Primary preventive approach through safe riding and driving practices and strict implementation of traffic rules like speed monitoring, compulsory helmets and testing for alcohol levels should be enforced.<sup>20</sup>

### **Conclusion:**

The present prospective study gives an insight into the pattern and magnitude of traumatic dental injuries. Their prevalence could be reduced if potential risk factors are identified, since in most cases reported, they were observed to be preventable. Preventive strategies include parental awareness and supervision so as to prevent injuries among children and adolescents, and awareness and outreach programmes highlighting the importance of protective gear and the dangers of drunken driving among adults.

From the Forensic purview, meticulous examination and documentation of traumatic dental injuries should result in an accurate, complete, and unbiased medicolegal report. The quantum of punishment is fixed by the courts based on the opinion of the doctor. On certain occasions, the presence of associated life threatening injuries may mask the nonfatal traumatic dental injuries, leaving less scope to address the latter. To conclude, it is imperative for future prospective studies to stress upon many more preventive strategies to reduce traumatic

dental injuries and emphasise a few more forensic aspects that may have been overlooked.

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