

## PATTERN OF FACIAL AND ASSOCIATED INJURIES IN ROAD TRAFFIC ACCIDENTS PRESENTED AT EMERGENCY OF PIMS

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### Abstract

**Objectives:** To evaluate the patterns and severity of maxillofacial and associated multi-region injuries among road traffic accident victims presenting to the emergency department of a tertiary care hospital in Islamabad.

**Background:** Maxillofacial trauma refers to any physical injury involving the facial region and is frequently encountered by maxillofacial surgeons due to its complexity and high morbidity. The etiology of maxillofacial injuries is multifactorial, but among developing countries, road traffic accidents (RTAs) remain the most prevalent cause of these fractures.

**Methodology:** This cross-sectional study was conducted at a tertiary care hospital in Islamabad, enrolling 212 patients with maxillofacial injuries from road traffic accidents over six months using consecutive sampling. Inclusion required patients aged over five years with documented facial trauma related to RTAs. Ethical approval and informed consent were obtained. Data on demographics, trauma etiology, and injury severity (via Facial Injury Severity Score) were collected through clinical exams and radiological evaluations, including CT scans and X-rays. Facial injuries were classified as mild, moderate, or severe based on FISS, enabling systematic analysis of fracture patterns and associated injuries.

**Results:** In our study of 212 patients, 92.9% were male, 95.8% had trauma from road traffic accidents, with 90.1% sustaining mandibular fractures. Injury severity (FISS score) was significantly linked to trauma cause ( $P=0.000$ ), while

gender, socioeconomic status, and fracture presence showed no significant association.

**Conclusion:** The study found maxillofacial trauma mainly affects young males from RTAs, with mandibular fractures common and 97.6% sustaining multi-region associated injuries; injury severity correlates with trauma cause, but gender and socioeconomic status do not.

## INTRODUCTION

Maxillofacial trauma refers to any physical injury involving the facial region and is frequently encountered by maxillofacial surgeons due to its complexity and high morbidity. The anatomical structure of the face can be broadly divided into three horizontal segments: the upper face, comprising the frontal bone and frontal sinus; the midface, including the nasal bones, ethmoid, zygomatic, and maxillary bones; and the lower face, primarily the mandible.<sup>1</sup> The etiology of maxillofacial injuries is multifactorial, but among developing countries, road traffic accidents (RTAs) remain the most prevalent cause of these fractures.<sup>2</sup> The facial skeleton's unique architecture, characterized by a close articulation of delicate and small bones reinforced by dense cortical struts, predisposes it to a variety of complex fracture patterns. These patterns are generally determined by the mechanism, direction, and magnitude of externally applied forces, with common causative factors including RTAs, physical assaults, falls, sports-related injuries, and gunshot wounds.<sup>3</sup>

Maxillofacial injuries frequently do not occur in isolation; they often coexist with additional traumatic injuries involving the cranial vault, thorax, abdomen, spine, and extremities, thereby compounding both the physical and psychological burden on the patient.<sup>4</sup> The complexity of such traumas frequently places patients in emergency situations, where management of life-threatening conditions such as traumatic brain injury, cervical spine injury, and thoracic trauma becomes paramount. Clinically, maxillofacial trauma presents with a spectrum of severity and manifestations that can differ significantly among individuals, complicating diagnosis and treatment approaches.<sup>5</sup>

Associated injuries are commonly observed in patients presenting with maxillofacial trauma, particularly those resulting from road traffic accidents. Studies have reported that the prevalence of associated

injuries among maxillofacial trauma patients ranges widely, from approximately 20% up to over 80%, depending on the study setting and population. Head injuries are the most frequent concomitant injuries, occurring in over 80% of cases in some reports, followed by thoracic injuries, which affect around 58% of patients. Other associated injuries may involve the abdomen, spine, and extremities.<sup>6</sup> These associated injuries significantly contribute to the overall morbidity and complexity of managing maxillofacial trauma cases. For instance, a large study involving trauma center patients found that maxillofacial fractures were accompanied by head injuries in 81.4% and thorax injuries in 58.3% of cases, emphasizing the critical need for multidisciplinary assessment and care in these patients.<sup>7</sup> The presence of such associated injuries also correlates with longer hospital stays, increased need for surgical intervention, and higher mortality rates, particularly among patients with severe injuries or polytrauma. This underscores the importance of thorough clinical and radiological evaluation of patients presenting with facial trauma to promptly identify and treat any life-threatening concomitant injuries.<sup>7</sup>

Despite the significant clinical challenge posed by maxillofacial trauma secondary to RTAs, there remains a scarcity of comprehensive data from Pakistan regarding the epidemiology, fracture patterns, and associated injuries in this population. Understanding the prevalent patterns and extent of facial and related injuries is crucial for improving diagnostic accuracy, trauma management protocols, and ultimately patient outcomes. This cross-sectional study was therefore designed to systematically evaluate the pattern of facial fractures and associated injuries among RTA victims presenting to the emergency department. The findings aim to contribute valuable information to the existing literature and assist

healthcare providers in anticipating common injury patterns, optimizing treatment strategies, and reducing morbidity related to road traffic accident-induced maxillofacial trauma.

## MATERIAL AND METHODS

This study was conducted using a cross-sectional design to assess the prevalence and patterns of facial injuries among patients presenting with maxillofacial trauma. The research took place in the tertiary care hospital Islamabad, which serves as a major referral center for trauma cases. Ethical approval was obtained from the Ethical Review Board of School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad. A Written informed consent was secured from all participants or their guardians after explaining the study's purpose, ensuring voluntary participation and confidentiality. Data collection was carried out over a period of six months following the approval of the study proposal. A non-probability consecutive sampling technique was utilized, whereby every patient meeting the inclusion criteria was enrolled consecutively until the required sample size was achieved. The sample size was calculated using the World Health Organization (WHO) sample size calculator, based on a 95% confidence interval, an estimated population proportion of 7.6% for lower third facial injuries related to road traffic accidents, and an absolute precision of 3.8%, resulting in a target sample size of 212 participants.<sup>8</sup>

Inclusion criteria comprised patients of either gender age range 5-70 years who had sustained injuries specifically to the oral and maxillofacial region with a documented history of involvement in road traffic accidents. Patients with injuries without craniofacial involvement were excluded from the study. Demographic data such as age, gender, socioeconomic status, along with clinical information including the etiology of trauma and Facial Injury Severity Score (FISS) at emergency admission were recorded using a structured proforma. Each patient underwent thorough clinical examination and radiological evaluation comprising computed tomography (CT)

scans with axial and coronal 3D reconstructions and routine trauma series X-rays (posteroanterior and paranasal sinus views) to accurately diagnose and classify facial injuries. Patients were also assessed for additional injuries by multidisciplinary teams as necessary. Facial injuries were categorized based on Duke modified severity index FISS scores into mild (0-3), moderate (4-7), and severe (>7) groups, facilitating standardized assessment of injury severity.<sup>9</sup> The primary outcomes measured were the prevalence and pattern of facial fractures and any associated injuries, analyzed according to parameters suggested by Störmann et al.<sup>10</sup> This comprehensive methodology ensured systematic and reliable data collection to describe maxillofacial trauma related to road traffic accidents within the study population.

Data were analyzed using SPSS version 23.0. Frequencies and percentages were calculated for categorical variables such as gender, socioeconomic status and associated injuries. The mean and standard deviation were computed for continuous variables including age and FISS score. Inferential statistical analysis was conducted using the independent t-test to evaluate any significant relationships between the severities of facial injuries and associated injuries. The level of significance was set at  $p < 0.05$ .

## RESULTS:

The study included a total of 212 participants, with a pronounced male predominance, as 197 individuals (92.9%) were male and only 15 (7.1%) were female. When looking at socioeconomic status, the majority (58.5%) of participants belonged to the middle class. Regarding clinical injury profiles, mandibular fractures were highly prevalent, affecting 191 participants (90.1%). Midface fractures were also common, present in 139 participants (65.6%), whereas 73 participants (34.4%) did not experience midface fractures. The severity of facial injuries, assessed by the Facial Injury Severity Scale (FISS), indicated that most participants 143 (67.5%) sustained mild injuries as shown in table No I.

Table No 1: Distribution of Participant Demographics and Clinical Characteristics (N=212).

Variable		Frequency	Percent (%)
Gender	Male	197	92.9%
	Female	15	7.1%
	Total	212	100.0%
Socioeconomic Status	Lower Class	64	30.2%
	Middle Class	124	58.5%
	Upper Class	24	11.3%
	Total	212	100.0%
Mandibular Fracture Status	No	21	9.9%
	Yes	191	90.1%
	Total	212	100/0%
Midface Fracture Status	No	73	34.4%
	Yes	139	65.6%
	Total	212	100.0%
FISS Score Category	Mild	143	67.5%
	Moderate	39	18.4%
	Severe	30	14.2%
	Total	212	100.0%

The table No II presents descriptive statistics for the age and Facial Injury Severity Scale (FISS) scores of the 212 study participants. The age of participants ranged from a minimum of 13 years to a maximum of 66 years, with an average age of approximately  $27.79 \pm 11.04$  years), indicating a relatively young study population with some variation in age. The FISS scores, which measure the severity of facial injuries,

varied widely from a minimum of 1 to a maximum of 16, with a mean score of  $3.50 \pm 3.22$ .

The distribution of the causes of trauma among the 212 participants in the study. RTA was most common cause of injury, 203(95.8%). Details of etiology related to cause of injury were described in figure 1. Types and frequencies of associated injuries observed in a cohort of 212 study participants. Details explained in Fig No II

Table No II. Descriptive Statistics of Age and FISS Score Among Study Participants (N=212)

Variable	No Of Patients	Minimum	Maximum	Mean $\pm$ Std. Deviation
Age	212	13	66	27.79 $\pm$ 11.037
FISS Score	212	1.00	16.00	3.4953 $\pm$ 3.22093

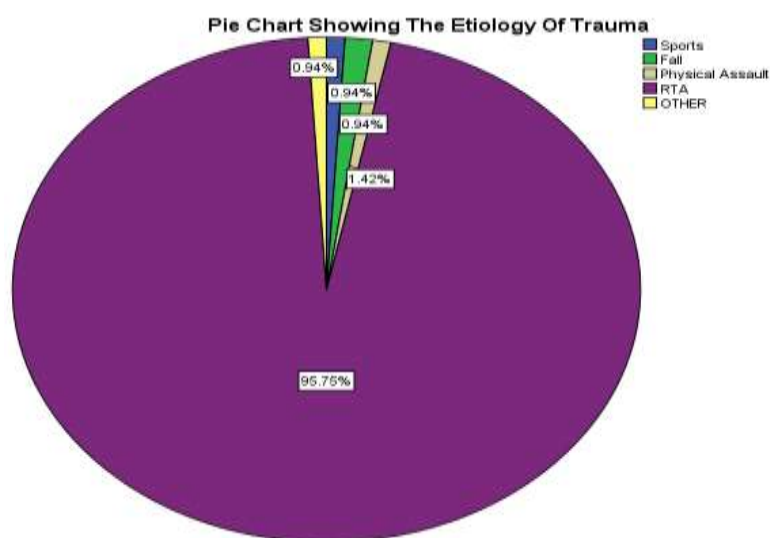


Fig No I: Etiology of Trauma Among Study Participants (N=212).

This Fig No II summarizes the types and frequencies of associated injuries observed in a cohort of 212 study participants. Out of the total group, only 5 individuals (2.4%) had isolated head injuries with

maxillofacial injuries. In contrast, a vast majority (207) participants (97.6%) sustained injuries involving more than one body regions such as Upper and lower extremities, chest and abdominal injuries.

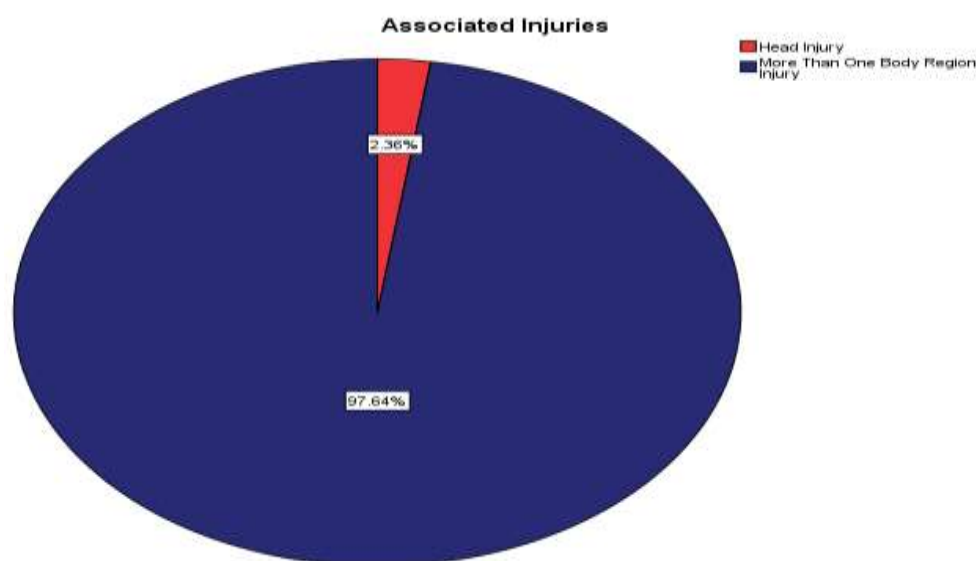


Fig No II: Distribution of Associated Injuries Among Study Participants.

The table No III shows the association between the etiology of trauma and various demographic and clinical characteristics in 212 participants. No statistically significant differences were found in trauma etiology by gender ( $P = 0.949$ ), socioeconomic status ( $P = 0.791$ ), Mandibular fracture status ( $P = 0.791$ ), midface fracture status ( $P = 0.294$ ) and associated injuries ( $P=0.994$ ). A statistically significant association

was observed between Facial Injury Severity Scale (FISS) score categories and trauma etiology ( $P = 0.000$ ). Mild injuries were recorded in 67.5% (143/212) of participants, with the majority due to RTA (140 cases) and sports injuries (2 cases). Moderate injuries (18.4%, 39/212) and severe injuries (14.2%, 30/212) showed differing distributions across trauma etiologies.

Table No III: Relationship Between Trauma Causes and Participant Clinical and Demographic Factors.

Variable		Etiology of trauma					Total	P-value
		Sports	Fall	Physical Assault	RTA	OTHER		
Gender	Male	2	3	2	188	2	197	0.949
	Female	0	0	0	15	0	15	
	Total	2	3	2	203	2	212	
Socioeconomic Status of Participants	Lower Class	0	1	1	61	1	64	0.791
	Middle Class	1	2	1	119	1	124	
	Upper Class	1	0	0	23	0	24	
	Total	2	3	2	203	2	212	
Mandibular Fracture Status	No	0	0	0	21	0	21	0.905
	Yes	2	3	2	182	2	191	
	Total	2	3	2	203	2	212	
Mid face Fracture Status	No	0	0	0	73	0	73	0.294
	Yes	2	3	2	130	2	139	
	Total	2	3	2	203	2	212	
FISS Score Category	Mild	2	0	0	140	1	143	0.000
	Moderate	0	0	2	36	1	39	



	severe	0	3	0	27	0	30	
	Total	2	3	2	203	2	212	
Associated Injuries	Head Injury	0	0	0	5	0	5	0.994
	≥ One Region	2	3	2	198	2	207	
	Total	2	3	2	203	2	212	

## DISCUSSION:

The present study examined the etiology of trauma, demographic characteristics, fracture patterns, and injury severity among 212 patients, revealing a predominance of young adult males, a high incidence of road traffic accidents (RTAs) as the primary trauma cause, and a strong association between trauma etiology and facial injury severity (FISS score).

Our finding of a predominantly male sample (92.9%) aligns with global and regional studies reporting male preponderance in maxillofacial trauma due to higher risk exposure in occupational, traffic, and social activities. For example, a recent international systematic review highlighted the male majority in facial trauma cases ranging between 70% and 90%, attributed to similar behavioural and environmental factors.<sup>11</sup> Regional studies from South Asia and the Middle East report comparable male dominance, reflecting cultural and occupational patterns.<sup>12</sup>

Road traffic accidents emerged as the overwhelming etiological factor (95.8%) in our cohort, markedly higher than percentages reported in some other studies but consistent with trends in developing countries where traffic regulations and safety enforcement may be less stringent. Maniaki A et al. reported RTAs as cause of 61.5% of maxillofacial fractures worldwide, with even higher rates in lower- and middle-income regions.<sup>13</sup> Similarly, studies from Pakistan, India, and neighbouring countries document RTAs as the leading cause, often exceeding 70%–80%, particularly in urban centres with heavy traffic and limited pedestrian infrastructure. The relatively minimal contribution of falls, physical assault, and sports injuries in our sample also reflects regional epidemiology<sup>12,15</sup>, whereas global literature often notes a higher proportion of interpersonal violence in Western contexts.<sup>12,16</sup>

Consistent with these etiological patterns, the high incidence of mandibular fractures (90.1%), often linked with RTAs, is supported by multiple studies indicating the mandible as the most commonly

fractured facial bone due to its prominent position and exposure during collisions.<sup>11,17</sup> Midface fractures occurred in 65.6% of participants, slightly lower but still substantial, reflecting variable injury mechanisms and energy transfer dynamics. These patterns echo findings that high-energy injuries such as RTAs produce complex fracture configurations involving both mandible and midface regions.<sup>13,18</sup>

Our analysis demonstrated a statistically significant association between FISS score categories and trauma etiology ( $P=0.000$ ). This emphasizes that RTAs and mechanical forces lead to more severe facial injuries, with a large proportion of mild to moderate cases but notable severe injuries as well. This concurs with published data where high-energy trauma mechanisms often result in elevated FISS scores, correlating with longer hospital stays and more complex surgical interventions.<sup>11-19</sup> The strong relationship between injury severity and trauma cause underscores the need for targeted preventive measures and resource allocation.

In contrast, socioeconomic status and gender did not show significant association with trauma etiology in our study, differing slightly from some reports that link socioeconomic disadvantages to higher assault rates or injury risks.<sup>20</sup> This may reflect unique local socio-cultural dynamics or sample characteristics, including the dominance of RTAs as the primary injury mechanism overshadowing other factors.<sup>21</sup>

Regarding associated injuries, the vast majority (97.6%) sustained injuries involving more than one body region, highlighting the multi-trauma nature of facial injuries in RTAs. This complexity is well-documented globally and regionally, with polytrauma management posing challenges requiring multidisciplinary care.<sup>13</sup> The relatively low isolated head injury rate parallels findings from similar hospital-based cohorts.<sup>22</sup>

Overall, our results corroborate regional and global literature in several key respects: male dominance, predominance of RTAs as trauma cause, and the

relationship of mechanism with injury severity. Differences in the relative proportions of other causes such as interpersonal violence and falls likely reflect local epidemiological and socio-cultural contexts. Compared to Western countries where assaults may contribute a higher share of maxillofacial injuries, our study aligns with regional data emphasizing traffic accidents as the main concern.<sup>23-24</sup>

These findings reinforce the critical need for improved traffic safety regulations, public health interventions addressing road safety, and optimized trauma care systems in regions facing high RTA-related facial injury burdens. Future studies could expand on associated factors such as alcohol use, protective equipment, and temporal trends, and include broader geographic samples for comprehensive surveillance.

## CONCLUSION:

Maxillofacial trauma predominantly affected young adult males in this study, with road traffic accidents as the main cause. Most patients had mandibular and midface fractures, and injury severity (FISS score) was significantly linked to trauma cause. Socioeconomic status and gender showed no significant association with trauma etiology. The high rate of multi-region injuries highlights the need for improved road safety and trauma care to reduce the burden of facial injuries in this region.

## LIMITATIONS AND RECOMMENDATIONS:

The study's retrospective design and single-center setting limit data completeness and generalizability. Key factors like protective equipment use and substance intake were not assessed. Causal relationships cannot be established due to the cross-sectional nature of the data.

Future multicenter, prospective studies with broader data collection on risk factors are needed. Emphasis should be placed on road safety interventions and improving trauma care facilities to reduce the burden of maxillofacial injuries.

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