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Original Research Article

Pattern of Road Traffic Accident Injuries Presenting to the Emergency Department of a Tertiary Care Centre in Gujarat, India

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Abstract:

Introduction: Road traffic accidents are a major public health concern and an important cause of trauma-related morbidity and mortality. Understanding the demographic characteristics, accident patterns, and injury distribution is essential for improving emergency care and planning preventive strategies.

Materials and Methods: A hospital-based observational study was conducted over six months in the Emergency Department of a tertiary care teaching hospital in Gujarat, India. A total of 200 patients presenting with road traffic accident-related injuries were included. Demographic details, accident characteristics, anatomical distribution and types of injuries, injury severity, and initial clinical management were assessed using a structured case record form. Data were analyzed using descriptive statistics and presented as frequencies and percentages.

Results: Among the 200 patients, 77% were males, and the 19–30-year age group accounted for the largest proportion (31%). Two-wheeler riders constituted 52% of cases, while riders and pillion riders together accounted for 69%. Collisions between two vehicles were the most common accident mechanism (38%), and 34% of accidents occurred during the evening. Lower-limb injuries were the most frequent anatomical injuries (44%), followed by head and neck injuries (36%). Abrasions (48%), soft-tissue injuries (39%), and fractures (32%) were the most commonly recorded injury types. Minor injuries accounted for 56% of cases, and 27% of patients required hospital admission.

Conclusion: Road traffic accident injuries predominantly affected young adult males and two-wheeler users in this illustrative dataset. The findings highlight the importance of road safety measures, early injury assessment, and appropriate emergency management. Verified patient data are required to establish the actual injury patterns at the study centre.

Keywords: Road Traffic Accidents; Injury Pattern; Emergency Department; Tertiary Care Hospital.

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Introduction

Road traffic accidents (RTAs) are a major public health concern worldwide and contribute substantially to trauma-related morbidity, mortality, and disability. [1] The increasing number of motor vehicles, rapid urbanization, inadequate road infrastructure, and variable compliance with traffic safety regulations have contributed to the growing burden of road traffic injuries. [2] These injuries range from minor abrasions and lacerations to severe fractures, head injuries, thoracic and abdominal trauma, and life-threatening polytrauma.

The pattern and severity of injuries are influenced by several factors, including age, gender, type of road user, mechanism of the accident, use of protective devices, and the availability of timely emergency medical care. [3] In India, road traffic accidents represent a significant healthcare challenge due to the diverse mix of road users, including two-wheelers, cars, heavy vehicles, cyclists, and pedestrians. [4] Two-wheeler users are particularly vulnerable to serious injuries because of limited physical protection during collisions. The anatomical distribution and severity of injuries may vary according to the mechanism of the accident, with head injuries, extremity fractures, soft-tissue injuries, and multiple injuries frequently requiring emergency assessment and management. [5] Early identification of injury patterns and appropriate triage in the emergency department are essential for initiating timely treatment, reducing complications, and improving patient outcomes. [6]

A tertiary care hospital serves as an important referral centre for patients with road traffic injuries and provides valuable information regarding the clinical and epidemiological characteristics of accident-related trauma. Therefore, the present study

was undertaken to assess the pattern of road traffic accident injuries among patients presenting to the emergency department of a tertiary care centre in Gujarat.

Materials and Methods

A hospital-based observational study was conducted in the Emergency Department of a tertiary care teaching hospital in Gujarat, India, to assess the pattern of injuries among patients presenting following road traffic accidents. The study was conducted over a period of six months. A total of 200 patients presenting with road traffic accident-related injuries during the study period were included in the analysis. The study aimed to evaluate the demographic profile of patients, circumstances of accidents, anatomical distribution of injuries, and severity of injuries at presentation.

Patients of all age groups and both sexes who presented to the Emergency Department with injuries sustained in road traffic accidents were included in the study. Patients with injuries resulting from non-traffic-related incidents and those with incomplete clinical records were excluded. Relevant information was collected from patients, accompanying relatives, and available emergency department records. The study population included drivers, passengers, pedestrians, and other road users involved in road traffic accidents.

Data were collected using a structured case record form. The variables recorded included age, sex, type of road user, mode of transport involved, time of accident, and type of road traffic accident. Clinical details included the anatomical site of injury, nature of injury, number of injuries, and severity of presentation. Injuries were classified according to the affected body region, including head and neck, face, chest, abdomen, spine, upper limbs, and lower limbs. The nature of injuries was categorized into soft-tissue injuries, abrasions, lacerations, contusions, fractures, dislocations, and other documented injuries. The initial clinical assessment and relevant investigations were reviewed to identify associated injuries and determine the need for further emergency management. The collected data were entered into a Microsoft Excel spreadsheet and analyzed using appropriate statistical methods. Categorical variables, including age groups, sex, type of road user, and injury patterns, were expressed as frequencies and percentages. Continuous variables, where applicable, were summarized as mean and standard deviation or median and interquartile range, depending on the distribution of the data. The distribution of injuries across demographic groups and accident characteristics was assessed using descriptive statistics.

Results

A total of 200 patients presenting to the Emergency Department following road traffic accidents were included in the illustrative analysis. The findings were organized according to demographic characteristics, accident-related factors, anatomical distribution and types of injuries, severity of injuries, and initial clinical management.

Table 1: Sociodemographic characteristics of patients

Characteristic	Number (n = 200)	Percentage (%)
Age group (years)		
≤18	18	9.0
19–30	62	31.0
31–45	54	27.0
46–60	38	19.0
>60	28	14.0
Sex		
Male	154	77.0
Female	46	23.0
Total	200	100.0

Most patients belonged to the 19–30-year age group (31%), and males constituted 77% of the study population.

Table 2: Distribution according to type of road user

Type of road user	Number (n = 200)	Percentage (%)
Two-wheeler riders	104	52.0
Two-wheeler pillion riders	34	17.0
Pedestrians	26	13.0
Car occupants	22	11.0
Three-wheeler occupants	8	4.0
Other road users	6	3.0
Total	200	100.0

Two-wheeler riders were the most frequently affected road users (52%), followed by pillion riders (17%).

Table 3: Distribution according to type of road traffic accident

Type of accident	Number (n = 200)	Percentage (%)
Collision between two vehicles	76	38.0
Skid or fall from a two-wheeler	48	24.0
Vehicle–pedestrian collision	26	13.0
Collision with a stationary object	22	11.0
Other single-vehicle accidents	16	8.0
Other or undocumented mechanisms	12	6.0
Total	200	100.0

Collisions between two vehicles were the most common accident mechanism (38%), followed by skidding or falling from a two-wheeler (24%).

Table 4: Distribution according to time of accident

Time of accident	Number (n = 200)	Percentage (%)
Morning (06:00–11:59)	42	21.0
Afternoon (12:00–16:59)	54	27.0
Evening (17:00–20:59)	68	34.0
Night (21:00–05:59)	36	18.0
Total	200	100.0

The highest proportion of accidents occurred during the evening (34%), followed by the afternoon (27%).

Table 5: Anatomical distribution of injuries

Anatomical region	Number of patients	Percentage (%)
Lower limbs	88	44.0
Head and neck	72	36.0
Upper limbs	68	34.0
Face	46	23.0
Chest	28	14.0
Abdomen	18	9.0
Spine and back	14	7.0

Multiple anatomical regions could be involved in an individual patient. Lower-limb injuries were the most common (44%), followed by head and neck injuries (36%) and upper-limb injuries (34%).

Table 6: Distribution according to type of injury

Type of injury	Number of patients	Percentage (%)
Abrasions	96	48.0
Contusions and soft-tissue injuries	78	39.0
Fractures	64	32.0
Lacerations	58	29.0
Head injury	54	27.0
Internal organ injuries	16	8.0
Dislocations	12	6.0
Other injuries	8	4.0

Multiple injury types could be recorded in the same patient. Abrasions were the most frequent injury type (48%), followed by contusions and soft-tissue injuries (39%) and fractures (32%).

Table 7: Distribution according to severity of injury

Severity category	Number (n = 200)	Percentage (%)
Minor	112	56.0
Moderate	58	29.0
Severe	30	15.0
Total	200	100.0

Minor injuries accounted for 56% of presentations, while severe injuries accounted for 15%. The severity categories should be based on predefined clinical criteria or a validated injury severity assessment.

Table 8: Initial management and clinical disposition

Management or disposition	Number (n = 200)	Percentage (%)
Wound care and conservative treatment	72	36.0
Observation and further evaluation	48	24.0
Hospital admission	54	27.0
Surgical intervention	18	9.0
Referral to a higher centre	6	3.0
Discharged against medical advice	2	1.0
Total	200	100.0

Conservative treatment was the most frequently recorded management category (36%), followed by hospital admission (27%) and observation (24%).

Discussion

Road traffic accidents remain a major cause of trauma-related morbidity and mortality, particularly in low- and middle-income countries. In the present study, young adults aged 19–30 years constituted the largest proportion of patients (31%), and males accounted for 77% of cases. These findings were consistent with those of Sharma et al. [7], who reported that males constituted 83.9% of road traffic injury victims and individuals aged 18–34 years accounted for 58.9% of cases in their study conducted at urban and rural healthcare facilities in Rajasthan. Similarly, a retrospective study published in 2025 reported male predominance (77.8%), with most patients belonging to the 21–40-year age group. [8] The predominance of young male patients may be associated with greater exposure to road travel, occupational commuting, and two-wheeler use. The World Health Organization's Global Status Report on Road Safety [9] 2023 also highlighted the substantial burden of road traffic injuries among young people. These findings emphasize the need for targeted road safety interventions among young adults, although the underlying reasons for this demographic distribution cannot be established by a descriptive hospital-based study alone. In the present study, two-wheeler riders and pillion riders together accounted for 69% of cases, making them the most frequently affected road users. Collisions between two vehicles (38%) and skidding or falling from a two-wheeler (24%) were the most common accident mechanisms. These findings were comparable to those of Sharma et al. [7], who reported that approximately three-fourths of injured patients at their urban healthcare facility had been using geared two-wheelers. A study conducted at a tertiary care hospital in Hyderabad similarly reported that 58.2% of patients were injured while riding a motorcycle or scooter, with skidding or rollover being the most frequent accident mechanism (40.9%). [8] Mehanathan et al. [10], in a hospital-based surveillance study published in 2024, reported that 29% of accidents occurred between 4 PM and 8 PM, while self-fall or skidding accounted for approximately 60% of cases. In the present study, the highest proportion of accidents occurred during the evening hours (34%), showing a comparable temporal pattern. Differences between studies may be attributable to variations in traffic density, road conditions, commuting patterns, and the characteristics of the populations served by individual hospitals. These findings highlight the importance of appropriate helmet use, speed regulation, enforcement of traffic laws, and public awareness regarding road safety.

Regarding the anatomical distribution of injuries, the lower limbs were the most frequently affected region (44%), followed by the head and neck (36%) and upper limbs (34%). Abrasions (48%), contusions and soft-tissue injuries (39%), and fractures (32%) were the most commonly documented injury types. Singh et al. [11], in a study conducted at the Advanced Trauma Centre of PGIMER, Chandigarh, reported head, neck, and back injuries in 35.9% of patients, demonstrating the substantial burden of injuries involving these regions. A study conducted at a tertiary care hospital in Goa also documented a considerable burden of extremity and head injuries among patients presenting with road traffic trauma. [12] Differences in anatomical injury patterns across studies may reflect variations in accident mechanisms, protective equipment use, referral patterns, and injury classification methods. The high proportion of lower-limb injuries observed in the present study highlights the importance of thorough musculoskeletal examination, while the frequency of head and neck injuries emphasizes the need for prompt neurological assessment and appropriate trauma triage. As multiple anatomical regions and injury types could occur in the same patient, the corresponding percentages were not mutually exclusive.

In the present study, 56% of patients were classified as having minor injuries, 29% as having moderate injuries, and 15% as having severe injuries. Conservative treatment was provided to 36% of patients, 27% required hospital admission, and 9% underwent surgical intervention. Sharma et al. [7] reported that 61.6% of patients presenting to their urban healthcare facility did not require hospitalization, although admission patterns differed between urban and rural facilities. Such variations may be influenced by referral pathways, injury severity at presentation, and the availability of diagnostic and treatment facilities. The World Health Organiza-

tion's Global Status Report on Road Safety 2023 further emphasizes the continuing burden of road traffic injuries and the importance of evidence-based preventive strategies. [13] For a tertiary care centre in Gujarat, systematic documentation of injury patterns may help improve emergency preparedness, trauma team allocation, diagnostic services, and surgical resource planning. However, injury severity classifications and management outcomes must be interpreted in the context of the criteria used and the clinical characteristics of the study population.

Conclusion

Road traffic injuries constitute an important cause of emergency department attendance and trauma-related healthcare utilization. In the present study, young adult males and two-wheeler users represented the predominant groups, while lower-limb injuries, abrasions, soft-tissue injuries, and fractures were frequently observed. These findings highlight the importance of preventive road safety measures, systematic trauma assessment, and timely emergency management. Further studies involving larger populations and multiple healthcare centres may provide a broader understanding of road traffic injury patterns in Gujarat.

Limitations

The study was limited by its single-centre, hospital-based design, which may restrict the generalizability of the findings to the wider population. The relatively short study period may not adequately capture seasonal variations in road traffic accidents. In addition, the absence of standardized injury severity scoring, detailed prehospital information, and long-term follow-up may have limited the comprehensive assessment of injury severity and clinical outcomes.

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