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Evaluation of Injury Characteristics in Road Traffic Accidents and Their Medicolegal Implications.

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ABSTRACT

Road traffic accidents (RTAs) constitute a major public health and medicolegal challenge worldwide, contributing substantially to trauma-related morbidity, mortality, and socioeconomic loss. Comprehensive evaluation of injury characteristics is essential for understanding accident biomechanics, determining causation, and informing medicolegal adjudication. To evaluate the socio-demographic profile, injury characteristics, and medicolegal implications of patients involved in RTAs. A descriptive cross-sectional study was conducted on 56 RTA cases managed at a tertiary care center. Data were obtained from clinical records, medicolegal case files, radiological reports, and autopsy papers. Variables assessed included age, sex, road user type, vehicle involved, injury type, anatomical distribution, severity, safety measures, alcohol influence, outcome, and medicolegal relevance. Descriptive statistics were used for analysis, and findings were interpreted in a medicolegal context. Most victims were males (75 percent) and belonged to the 21–40 years age group (50 percent). Two-wheelers were the most commonly involved vehicles (53.6 percent). Abrasions (75 percent), contusions (60.7 percent), and fractures (35.7 percent) predominated. Safety measures were poorly observed (21.4 percent), and alcohol influence was noted in 17.9 percent. Fatality rate was 14.3 percent, with 57.1 percent of cases deemed compensation-relevant. RTAs predominantly affect young males, with two-wheelers constituting a major vulnerability. Injury patterns and medicolegal variables highlight deficiencies in safety compliance and underscore the need for strengthened forensic documentation and preventive policies.

Keywords: Road traffic accidents; Injury characteristics; Medicolegal implications.

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INTRODUCTION

Road traffic accidents (RTAs) represent a major global public health and medicolegal concern due to their substantial burden of morbidity, mortality, disability, and socioeconomic loss. According to recent estimates, RTAs contribute significantly to trauma-related deaths in developing as well as industrialized nations, with a disproportionate impact on young and economically productive age groups [1].

The pattern, nature, and severity of injuries sustained in RTAs vary widely depending on crash mechanisms, vehicular factors, environmental conditions, and individual vulnerabilities [2, 3]. These injury characteristics offer critical insights into the biomechanics of trauma, the severity indices, and potential fatality predictors. From a medicolegal perspective, evaluation of RTA-related injuries plays a vital role in the reconstruction of events, identification of negligence, establishment of causation, and adjudication of compensatory claims [5-7]. Proper documentation, objective assessment, and classification of injuries are essential components for legal proceedings, insurance settlements, and criminal investigations [8]. Moreover, medicolegal analysis aids in determining the manner of injury, influence of alcohol or substances, use of safety measures such as helmets and seatbelts, and compliance with traffic regulations. Given the rising incidence of RTAs and the complexity of medico-legal evaluations, systematic study of injury characteristics is essential for improving trauma care, informing policy, strengthening forensic assessment, and enhancing road safety measures.

STUDY METHODOLOGY

Our present study was conducted as a descriptive, observational, cross-sectional study aimed at evaluating injury characteristics in road traffic accident (RTA) victims and assessing their medicolegal implications. The study was carried out in the Department of Forensic Medicine at a tertiary care hospital. Ethical approval was obtained prior to initiation of the study, and all procedures adhered to institutional and medicolegal standards. A total sample of 56 RTA cases was included over the defined study period. Cases were enrolled consecutively based on availability of complete clinical and medicolegal records.

Data collection was performed retrospectively and prospectively from medicolegal case files, emergency department records, radiology reports, autopsy findings, and police inquest papers. Detailed information was extracted regarding sociodemographic variables (age, gender), mechanism of accident, road user category (driver, rider, pedestrian, pillion), type of vehicle involved, and contributory factors such as alcohol intake and use of safety devices. Injury characteristics were documented in terms of type (abrasions, contusions, lacerations, fractures, internal injuries), anatomical distribution, severity grading, and associated fatality or disability.

Clinical and forensic assessments were carried out using standard medico-legal protocols and injury classification systems. Cases involving fatalities were further evaluated for cause of death, survival period, and consistency of injury pattern with reported mechanism of accident. The medicolegal aspects analyzed included causation, negligence, culpability, documentation quality, and relevance for compensation or legal proceedings. All findings were verified and cross-checked against original records to ensure accuracy.

Data were entered into structured proformas and coded for statistical analysis. Descriptive statistics were applied to summarize injury profiles and demographic attributes. Comparative analyses were conducted to explore associations between mechanism of accident and injury severity, type of road user and injury pattern, and presence of protective measures and morbidity outcomes. Results were interpreted in context of medicolegal relevance, forensic significance, and implications for trauma prevention and legal adjudication.

RESULTS

Table 1: Socio-Demographic And Accident-Related Profile Of Cases (n = 56).

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	≤20	6	10.7
	21–40	28	50.0
	41–60	16	28.6
	>60	6	10.7
Gender	Male	42	75.0
	Female	14	25.0
Road User	Driver/Rider	24	42.9
	Pillion Passenger	8	14.3
	Pedestrian	16	28.6
	Others	8	14.3
Vehicle Type	Two-wheeler	30	53.6
	Four-wheeler	18	32.1
	Heavy vehicle	8	14.3

Table 2: Distribution Of Injury Characteristics (n = 56).

Variable	Category	Frequency (n)	Percentage (%)
Injury Type	Abrasions	42	75.0
	Contusions	34	60.7
	Lacerations	26	46.4
	Fractures	20	35.7
	Internal Injuries	14	25.0
Injured Region	Head & Neck	22	39.3
	Upper Limb	18	32.1
	Lower Limb	26	46.4
	Chest	12	21.4
Injury Severity	Abdomen	10	17.9
	Mild	18	32.1
	Moderate	26	46.4
	Severe	12	21.4

Table 3: Medicolegal Implications And Outcomes (n = 56)

Variable	Category	Frequency (n)	Percentage (%)
Safety Measures	Used Helmet/Seatbelt	12	21.4
	Not Used	44	78.6
Alcohol Influence	Present	10	17.9
	Absent	46	82.1
Outcome	Survived	48	85.7
	Fatal	8	14.3
Manner of Death (Fatal cases)	Accidental	8	100
Medicolegal Relevance	Compensation Likely	32	57.1
	Culpability/Negligence Possible	18	32.1
	Pending Investigation	6	10.7

DISCUSSION

In our present study involving 56 road traffic accident (RTA) cases, the socio-demographic and injury profiles demonstrated patterns consistent with existing global and national trauma epidemiology. The predominance of males (75 percent) and the highest frequency of cases in the 21–40 years age group reflect the vulnerability of young, economically active males who engage more frequently in high-risk

driving behaviors, longer driving hours, and occupational mobility. Similar demographic trends have been reported in forensic and trauma studies globally, underscoring RTAs as a major contributor to morbidity and mortality within the productive workforce. Two-wheeler involvement (53.6 percent) emerged as the most common vehicle type, emphasizing the increased exposure of riders and pillion passengers to impact forces and lack of physical protection compared to enclosed vehicles [9].

Pedestrians constituted 28.6 percent of cases, highlighting urban traffic hazards, inadequate pedestrian infrastructure, and non-compliance with traffic norms. The distribution of road users indicates the multifactorial nature of RTAs, influenced by vehicle mix, traffic density, and safety culture. The injury spectrum demonstrated abrasions (75 percent), contusions (60.7 percent), and lacerations (46.4 percent) as common external injury types, which are characteristic of impact and dragging mechanisms. Orthopedic injuries, particularly fractures (35.7 percent), were indicative of high-energy trauma and contributed significantly to disability outcomes. Internal injuries (25 percent) involving thoraco-abdominal structures carried greater clinical severity and medicolegal implications due to their association with life-threatening complications and potential fatality [10, 11].

Anatomical distribution favored lower limbs (46.4 percent) and head and neck injuries (39.3 percent). Head injuries are well-recognized predictors of mortality and long-term disability in RTAs, and their presence in this cohort underscores the forensic relevance of helmet compliance. Despite their importance, safety measures such as helmets or seatbelts were used in only 21.4 percent of cases, suggesting poor adherence to protective strategies. This finding has legal ramifications regarding contributory negligence, compensation claims, and policy enforcement. The presence of alcohol in 17.9 percent of cases also aligns with previous research identifying alcohol as a major risk factor impairing judgment, reaction time, and motor coordination. Alcohol presence is a critical medicolegal variable affecting penal liability, culpability, and insurance adjudication [12].

The fatality rate of 14.3 percent observed in the study aligns with published mortality statistics in comparable settings. Fatal cases were classified entirely as accidental in manner, which reinforces the predominance of unintentional trauma in RTAs rather than homicidal or suicidal intent. Survivors constituted 85.7 percent of cases, but many presumably sustained temporary or permanent disability, which carries significant medicolegal consequences with respect to compensation, disability certification, and litigation.

Medicolegally, 57.1 percent of cases were judged likely to qualify for compensation, and negligence or culpability was potentially attributable in 32.1 percent. These findings reinforce the dual function of medicolegal evaluations: reconstruction of accident events and determination of legal responsibility. Proper documentation of injury characteristics, alcohol detection, use of safety measures, and mechanism of trauma forms the backbone of forensic analysis and legal adjudication. Overall, this study emphasizes the importance of integrating forensic medicine, trauma care, traffic safety policy, and legal frameworks to mitigate RTA burden and enhance justice outcomes.

CONCLUSION

RTAs predominantly affect young males, with two-wheelers constituting a major vulnerability. Injury patterns and medicolegal variables highlight deficiencies in safety compliance and underscore the need for strengthened forensic documentation and preventive policies.

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