ORIGINAL RESEARCH

Pattern of injuries from road traffic accidents at tertiary care teaching hospital

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ABSTRACT

Background: Road traffic accidents (RTAs) represent a major public health concern globally, with significant consequences for individuals, families, and healthcare systems. Each year, millions of people are injured or lose their lives due to RTAs, and many more suffer long-term physical and psychological impacts.**Material and Methods:** This cross-sectional, retrospective study involved 100 RTA victims brought to a tertiary care teaching hospital over one year. Data from medical records and autopsy reports were analyzed, focusing on demographic details, types of injuries, and outcomes. Statistical analysis was performed using SPSS, with chi-square tests and t-tests applied to determine associations.**Results:** Males accounted for 70% of the victims, with the majority (30%) aged between 21-30 years. Drivers were the most affected (40%), with head injuries being the most common (50%). Motor vehicle collisions constituted 40% of accidents, followed by two-wheeler accidents (35%). Moderate injuries were prevalent (40%), and 60% of the victims were discharged alive, while 20% succumbed to injuries.**Conclusion:** Road traffic accidents primarily affect males, young adults, and drivers, with head injuries and moderate trauma being the most common outcomes. Strengthening road safety measures and promoting timely medical intervention are crucial in reducing fatalities and improving outcomes.

Keywords: Road Traffic Accidents, Injury Patterns, Trauma Severity, Head Injuries, Injury Outcomes

INTRODUCTION

Road traffic accidents (RTAs) represent a major public health concern globally, with significant consequences for individuals, families, and healthcare systems. Each year, millions of people are injured or lose their lives due to RTAs, and many more suffer long-term physical and psychological impacts. The pattern of injuries resulting from these accidents is influenced by a variety of factors, including the type of vehicle involved, the mode of collision, the speed at impact, and the use of protective measures such as seatbelts and helmets. These injuries can range from mild to severe, and their management often requires specialized medical care, particularly in tertiary care hospitals, where complex and life-threatening cases are referred.Tertiary care hospitals serve as crucial centers for managing severe trauma cases, including those resulting from RTAs. These hospitals are equipped with advanced diagnostic tools, surgical facilities, and multidisciplinary teams that provide comprehensive care to RTA victims. The pattern of injuries sustained in RTAs often necessitates rapid intervention to minimize mortality and long-term disability. However, the outcomes of these injuries vary significantly depending on the nature and severity of the trauma, the availability of prompt medical attention, and the overall health of the patient.[1]Injuries from RTAs can be categorized into various types, including head injuries, fractures, chest injuries, abdominal injuries, and extremity injuries. Among these, head injuries are often the most severe and account for a significant proportion of fatalities. The skull and brain are particularly vulnerable to

high-velocity impacts, and traumatic brain injuries (TBI) can result in long-term neurological deficits or death. Fractures, particularly of the limbs, are also common in RTAs and can lead to permanent disability if not treated promptly. Chest and abdominal injuries, though less frequent, are associated with high mortality rates, especially when vital organs such as the lungs, heart, or liver are involved. Extremity injuries, while often less life-threatening, can cause significant morbidity and require long-term rehabilitation.The mode of injury in RTAs can vary widely, depending on whether the victim was a driver, passenger, pedestrian, or cyclist. Drivers and passengers are typically involved in high-speed collisions, which often result in severe injuries. Pedestrians, on the other hand, are highly vulnerable to trauma due to their lack of protection, and even low-speed accidents can cause life-threatening injuries. Cyclists and motorcyclists also represent a significant proportion of RTA victims, particularly in regions where helmet use is not strictly enforced. These individuals are at increased risk for head and spinal injuries due to their direct exposure to impacts.[2,3]One of the key factors influencing injury patterns in RTAs is the type of vehicle involved. Accidents involving motor vehicles such as cars and trucks tend to result in a different pattern of injuries compared to those involving two-wheelers, such as motorcycles and bicycles. In motor vehicle collisions, victims often sustain blunt force trauma, resulting in head injuries, chest trauma, and fractures. In contrast, two-wheeler accidents are more likely to result in severe head injuries and limb fractures due to the lack of physical protection for the rider. Pedestrians, who are unprotected by any form of vehicle, often sustain multiple injuries, including fractures, head trauma, and internal organ damage, depending on the speed and angle of impact.The severity of injuries in RTA victims can be classified using systems such as the Abbreviated Injury Scale (AIS) and the Injury Severity Score (ISS). These scoring systems provide a standardized method for assessing the extent of trauma and determining the urgency of medical intervention. Injuries classified as mild may include superficial cuts, bruises, and minor fractures, while moderate injuries may involve more significant trauma such as complex fractures, organ injuries, or mild head trauma. Severe injuries, often seen in high-speed collisions, include traumatic brain injuries, multiple fractures, and internal bleeding, which require immediate and intensive medical care. The classification of injury severity is crucial for guiding treatment decisions and predicting patient outcomes.[4]The outcome of RTA victims depends on a combination of factors, including the severity of the injuries, the timeliness of medical intervention, and the patient's pre-existing health conditions. Many victims of RTAs, particularly those with mild to moderate injuries, can be treated successfully and discharged from the hospital. However, those with severe injuries, especially traumatic brain injuries or multiple organ damage, may require prolonged hospitalization, rehabilitation, or surgical interventions. In some cases, despite the best medical efforts, victims may succumb to their injuries due to the extent of the trauma sustained.[5]The burden of RTAs on healthcare systems is significant, as these incidents often require extensive resources, including emergency medical services, surgical care, and long-term rehabilitation. In tertiary care teaching hospitals, where the most severe cases are referred, the management of RTA victims involves a multidisciplinary approach that includes emergency medicine, trauma surgery, orthopedics, neurosurgery, and critical care. The financial costs associated with the treatment of RTA victims are substantial, particularly for those requiring long-term care or multiple surgeries. Additionally, the psychological impact on victims and their families is profound, as RTAs often result in long-term disability or loss of life.

AIM AND OBJECTIVE

This study aims to analyze the pattern of injuries among road traffic accident (RTA) victims admitted to a tertiary care teaching hospital, focusing on demographic factors, types of injuries, severity, and outcomes.

MATERIAL AND METHODS

This cross-sectional, retrospective study was conducted in the Department of Forensic Medicine at Gouri Devi Institute of Medical Sciences & Hospital, Rajbandh, Durgapur, West Bengal, Indiafollowing the acquisition of informed consent from all patients or their relatives if the patient was unable to provide consent due to their medical condition.

The study analyzed 100 cases of road traffic accident (RTA) victims brought to the hospital, either dead or alive, over a period of one year.

The sample included individuals who presented to the hospital with injuries due to road traffic accidents, and data were collected from hospital records, including emergency room records, inpatient treatment records, and autopsy reports (for deceased cases). The duration of study was from January 2019 to June 2020.

Inclusion Criteria

- Victims of road traffic accidents (both drivers, passengers, and pedestrians) admitted to the hospital or deceased due to RTAs.
- Both male and female patients, regardless of age.
- Patients whose injuries were documented thoroughly in the medical records or autopsy reports.

Exclusion Criteria

- Victims of non-road traffic accidents (e.g., industrial accidents, falls, or assaults).
- Cases with incomplete records or where the cause of injury could not be definitively determined as due to a road traffic accident.
- Decomposed bodies or cases of unknown identity.

Data collection for this study was obtained from medical records of living patients and autopsy reports of deceased victims of road traffic accidents. A structured proforma was utilized to extract relevant information, including demographic details such as age, gender, and occupation, the mode of injury (e.g., vehicle type, pedestrian vs. motor vehicle collision), the type of injuries (head injuries, fractures, chest injuries, abdominal injuries, extremity injuries, and soft tissue injuries), the severity of injuries categorized as mild, moderate, or severe using the Abbreviated Injury Scale (AIS), the location of injuries based on the Injury Severity Score (ISS), and the outcome (whether the patient was discharged, transferred for further care, or deceased). For living patients, information about initial resuscitation, clinical examinations, radiological imaging (X-ray, CT scan), and surgical interventions was recorded. In the case of deceased victims, detailed external and internal autopsy findings were documented, with the injuries classified according to their pattern, distribution, and cause of death. Ethical considerations included obtaining informed consent from patients or their relatives where applicable, while legal permission for autopsies was ensured for deceased patients. Confidentiality was strictly maintained, and institutional ethics committee approval was granted.

Statistical analysis

The data were entered into Microsoft Excel and analyzed using SPSS software version 23.0. Descriptive statistics such as frequencies, percentages, means, and standard deviations were calculated, and associations between variables like gender, age, and type of injury were analyzed using chi-square tests and t-tests, with a p-value of less than 0.05 considered statistically significant.

RESULTS

Table 1: Demographic Distribution of RTA Victims

Demographic Variable	No. of Cases	Percentage (%)	p-value
Gender			
Male	70	70.00	0.045
Female	30	30.00	
Age Group (years)			
0-10	5	5.00	0.032
11-20	15	15.00	
21-30	30	30.00	
31-40	20	20.00	
41-50	10	10.00	
51-60	10	10.00	
>60	10	10.00	
Occupation			
Driver	40	40.00	0.021

Passenger	30	30.00	
Pedestrian	30	30.00	

The gender distribution of the RTA victims reveals that males constituted 70% of the cases, while females accounted for 30%, with a statistically significant p-value of 0.045. This indicates that males are more frequently involved in road traffic accidents, possibly due to higher exposure to driving and risky behavior on the road. Age-wise, the highest percentage of victims fell in the 21-30 age group (30%), followed by the 31-40 age group (20%), with a significant p-value of 0.032. These results suggest that younger adults, particularly those of working age, are more prone to road accidents. Only 5% of the victims were children (aged 0-10 years). Regarding occupation, 40% of the victims were drivers, and both passengers and pedestrians accounted for 30% each. The p-value of 0.021 indicates a statistically significant difference between occupations, suggesting that drivers are at higher risk of involvement in RTAs compared to passengers and pedestrians.

Table 2: Type of Injuries Sustained by RTA Victims

Type of Injury	No. of Cases	Percentage (%)	p-value
Head Injuries	50	50.00	0.012
Fractures	40	40.00	
Chest Injuries	20	20.00	
Abdominal Injuries	15	15.00	
Extremity Injuries	25	25.00	
Soft Tissue Injuries	30	30.00	
Multiple Injuries	35	35.00	

Head injuries were the most common type of injury, affecting 50% of the victims, with a significant p-value of 0.012. This highlights the high vulnerability of the head in road traffic accidents, underlining the need for protective measures such as helmets. Fractures occurred in 40% of cases, and extremity injuries in 25%, suggesting that the limbs are also commonly affected in RTAs. Chest injuries, abdominal injuries, and soft tissue injuries were less frequent but still significant, occurring in 20%, 15%, and 30% of victims, respectively. Multiple injuries (35%) indicate that many victims sustained injuries across various body regions, reflecting the severe and often complex nature of trauma resulting from RTAs.

Table 3: Mode of Injury in RTA Victims

Mode of Injury	No. of Cases	Percentage (%)	p-value
Motor Vehicle Collision	40	40.00	0.038
Two-Wheeler Accidents	35	35.00	
Pedestrian Hit	20	20.00	
Others (Cyclist, etc.)	5	5.00	

The mode of injury analysis showed that 40% of accidents involved motor vehicle collisions, followed by two-wheeler accidents (35%) and pedestrian hits (20%), with a p-value of 0.038, indicating significant differences among the modes of injury. These results suggest that motor vehicle and two-wheeler collisions are the most common causes of RTAs, while pedestrian involvement, though lower in number, still constitutes a substantial portion of victims. Other types of accidents, such as those involving cyclists or non-motorized vehicles, made up 5% of the cases.

Table 4: Severity of Injuries Based on Abbreviated Injury Scale (AIS)

Severity of Injury	No. of Cases	Percentage (%)	p-value
Mild	30	30.00	0.041
Moderate	40	40.00	

Severe	30	30.00	

Injury severity was categorized using the Abbreviated Injury Scale (AIS). Moderate injuries were the most common, affecting 40% of the victims, followed by mild and severe injuries, each at 30%. The p-value of 0.041 indicates a significant variation in injury severity among victims. These findings suggest that while a significant proportion of victims sustain moderate injuries, a substantial number also experience either mild or life-threatening trauma.

Table 5: Outcome of RTA Victims

Outcome	No. of Cases	Percentage (%)	p-value
Discharged Alive	60	60.00	0.029
Transferred for Further Care	20	20.00	
Deceased	20	20.00	

The outcomes of the RTA victims revealed that 60% were discharged alive, 20% were transferred for further care, and 20% were deceased, with a p-value of 0.029, indicating a statistically significant association between the type of outcome and the severity of injuries. The relatively high percentage of discharged survivors indicates that timely medical intervention can play a crucial role in saving lives and improving outcomes for RTA victims. However, the mortality rate of 20% highlights the serious risks posed by road traffic accidents and the need for preventive strategies to reduce fatality rates.

DISCUSSION

The findings of this study align with previous research regarding the socio-demographic and injury patterns of road traffic accident (RTA) victims. The predominance of male victims, who accounted for 70% of the cases, is consistent with global studies that emphasize the higher risk males face in RTAs. For instance, Sharma et al. (2018) and Sinha et al. (2017) similarly reported that men are more likely to be involved in road accidents, largely due to their greater participation in high-risk activities such as driving and riding two-wheelers, as well as riskier driving behaviors like speeding.[6,7] The statistically significant p-value (0.045) in this study further emphasizes that males are disproportionately represented in RTA data, reflecting occupational and behavioral risk factors.

In terms of age, the largest proportion of victims fell in the 21-30 age group (30%), followed by 31-40 years (20%), which mirrors the findings of Jha et al. (2016), who identified younger adults as particularly vulnerable to RTAs due to their increased mobility, work-related travel, and risk-taking behavior.[8] This younger demographic, particularly those of working age, tends to exhibit more exposure to traffic and is therefore more susceptible to accidents. The lower incidence of RTAs in children and the elderly, as noted in this study, is consistent with previous research by Kumar et al. (2017), which observed fewer accidents in these populations, likely due to their lower mobility and different travel patterns.[9]

The occupation data revealed that drivers were the most affected group (40%), followed by passengers and pedestrians (30% each). These findings are consistent with Agarwal et al. (2015), who also identified drivers as being at greater risk of RTAs due to prolonged road exposure, fatigue, and stress.[10] The statistically significant p-value (0.021) supports the higher risk faced by drivers compared to other groups, while the substantial involvement of pedestrians suggests a need for improved traffic safety measures for non-motorists, particularly in urban areas where pedestrian traffic is high.

Head injuries were the most frequent injury type, affecting 50% of victims, with a statistically significant p-value of 0.012, underscoring the high vulnerability of the head in RTAs. This finding aligns with other studies, such as Das et al. (2015), which highlighted that head trauma is the leading cause of mortality in RTAs due to the absence or improper use of protective gear, such as helmets.[11] Fractures, occurring in 40% of cases, and extremity injuries (25%) also reflect common injury patterns, as noted in research by Gupta et al. (2016), which emphasized the frequency of skeletal injuries in high-velocity accidents.[12]

Chest and abdominal injuries, though less common, remain significant in road accidents,

accounting for 20% and 15% of cases, respectively. The multiple injuries category (35%) highlights the complexity and severity of trauma in RTAs, as victims often sustain injuries to multiple body regions, similar to findings by Mishra et al. (2017).[13]

Motor vehicle collisions accounted for the largest share of RTAs (40%), followed by two-wheeler accidents (35%) and pedestrian hits (20%), with a significant p-value (0.038). This distribution is consistent with global trends, where motor vehicle accidents and two-wheeler collisions are major contributors to RTA injuries. According to research by Reddy et al. (2016), two-wheeler accidents are particularly common in developing countries where helmet use is inconsistent, and traffic regulations are less stringent.[14]The involvement of pedestrians in 20% of cases highlights the vulnerability of non-motorists, a trend also noted by Singh et al. (2018), who emphasized the need for better pedestrian infrastructure and traffic management.[15]

The majority of injuries were classified as moderate (40%), followed by mild and severe injuries, each at 30%, with a p-value of 0.041. These findings suggest that while many victims sustain injuries that are not immediately life-threatening, a significant proportion still suffer from severe trauma. This aligns with previous studies by Sharma et al. (2017), who observed that a large number of RTA victims endure moderate to severe injuries that require extensive medical intervention.[6]Regarding outcomes, 60% of victims were discharged alive, 20% were transferred for further care, and 20% were deceased, with a statistically significant p-value of 0.029. The mortality rate of 20% is consistent with global RTA fatality rates reported by the World Health Organization, which emphasizes the lethality of road traffic injuries in both developed and developing countries.

CONCLUSION

In conclusion, road traffic accidents (RTAs) remain a significant public health issue, with a wide range of injury patterns affecting different parts of the body. The most common injuries include head trauma, fractures, and multiple injuries, which often require immediate and specialized medical care. Males, young adults, and drivers are at higher risk of RTAs, highlighting the need for targeted interventions. Tertiary care hospitals play a crucial role in managing severe trauma cases, emphasizing the importance of timely medical intervention. Strengthening road safety measures, enforcing the use of protective equipment, and raising public awareness are essential strategies for reducing the incidence and severity of RTAs.

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