

Original Article

# Quantitative Analysis and Outcomes of Road Traffic Accidents at Gujranwala Teaching Hospital's Trauma Center

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## ABSTRACT

**Background:** Trauma, particularly arising from road traffic accidents (RTAs), is a significant public health issue worldwide, with a notably high incidence in Pakistan. The vulnerability to traumatic injuries is exacerbated by socio-economic, environmental, and infrastructural factors. Young males are disproportionately affected, reflecting societal roles and risk behaviors. The efficiency of trauma care, influenced by the location and resources of trauma centers, plays a crucial role in patient outcomes.

**Objective:** This study aims to assess the patterns, causes, and outcomes of trauma cases treated at the Gujranwala Teaching Hospital (GTH) trauma center, with a focus on identifying demographic trends, predominant injury mechanisms, and the effectiveness of trauma care facilities.

**Methods:** An institution-based cross-sectional study was conducted from November 2021 to February 2022 at the GTH trauma center. Ethical approval was obtained from the Department of Emergency Medicine Ethics Committee at GMC Teaching Hospital. Data were collected using a WHO-guided pre-tested form, documenting sociodemographic profiles, clinical profiles, injury mechanisms, and outcomes. The study involved 813 trauma patients, with data analysis performed using SPSS version 25. Descriptive and inferential statistics were employed to analyze patient demographics, injury patterns, and outcomes.

**Results:** The study comprised 813 patients, predominantly male (75.3%). The median age was 33 years, ranging from 1.5 to 85 years. RTAs were the most common injury mechanism (78.6%), primarily affecting passengers (70.9%) and pedestrians (29.1%). Head injuries were the most frequent anatomical site of injury (45.75%). The triage categories showed 73.76% of patients in the 'Yellow' category. The overall mortality prevalence was 3.6%.

**Conclusion:** The study highlights the high prevalence of RTAs as a cause of trauma, particularly among young males. The findings underscore the need for improved trauma care facilities, stricter enforcement of traffic safety laws, and public awareness campaigns on road safety. Establishing well-equipped trauma centers near highways and enhancing prehospital care could significantly reduce trauma-related fatalities.

**Keywords:** Trauma, Road Traffic Accidents, Trauma Care, Public Health, Pakistan, Injury Patterns, Trauma Centers.

## INTRODUCTION

Traumatic injuries, necessitating immediate medical attention to save lives or preserve the functionality of the injured body part, are a global health concern (1, 2). These injuries can be the result of various types of insults, including blunt or penetrating trauma, and they affect individuals across all demographics—age, race, ethnicity, gender, economic status, and geographic location. Trauma stands as the foremost cause of death and disability worldwide (3-5). The global impact of injuries is staggering, with over 5 million fatalities annually, amounting to 16,000 deaths each day. This figure is projected to rise, positioning injuries as the seventh leading cause of global mortality by 2030, surpassing the combined annual death toll of HIV/AIDS, malaria, and tuberculosis. A particular focus in this context is road traffic accidents (RTAs), which constitute a significant portion of these injuries. A study revealed that 14.4% of all deaths in individuals aged 15 and older were due to external causes, with RTIs accounting for almost one-third of these

(6, 7). A 29% of unintentional injury deaths were attributed to RTIs in 2005, with 8085 road traffic accidents and 1622 fatalities recorded in 2015 alone (8, 9).

In the United States, trauma is a leading cause of death, particularly in the age group of 1 to 44 years, and is responsible for 20% of all deaths (10, 11). The economic impact is profound, with trauma leading to an estimated 37.7 million emergency hospital visits and incurring costs of approximately \$671 billion annually. However, the burden of trauma and its outcomes varies significantly with a country's economic status. Developed countries report a lower mortality rate from trauma (35%) compared to middle-income (55%) and low-income countries (63%). In Sub-Saharan Africa, one of the poorest regions globally, the mortality rate among young individuals is notably higher than in developed nations. Hospital-based injury surveillance data from this region indicate that road traffic accidents, falls, and assaults are the leading causes of hospital admissions due to injuries (12-14).

Gujranwala, a city with a high incidence of traffic accidents, reflects this global trend, with RTAs being the primary cause of accident-related death and disability (9, 11, 15-19). This situation underlines the urgent need for comprehensive research on the quality of emergency and trauma care, particularly in Low-Middle Income Countries (LMICs), where data is sparse and the health outcomes are often poorer. Assessing the trends and outcomes of trauma-related conditions is crucial for enhancing care in these regions. This study aims to provide a detailed account of patient demographics, injury patterns, and outcomes at the Gujranwala Teaching Hospital's trauma center. It seeks to identify the factors influencing injury outcomes, the most frequently occurring organ/system damages in emergencies, and their subsequent healing processes. The findings from this research are expected to contribute significantly to the advancement of future research and improved patient outcomes in the field of trauma care (20, 21).

## MATERIAL AND METHODS

The study was conducted as an institution-based cross-sectional investigation at the trauma center of Gujranwala Teaching Hospital (GTH) from November 2021 to January 2022, following ethical approval granted by the Department of Emergency Medicine Ethics Committee at GMC Teaching Hospital. Adhering to the World Health Organization's injury surveillance guidelines, a pre-tested data collection form was utilized to gather comprehensive information. This form was specifically tailored to include a range of pertinent details, such as sociodemographic profiles, clinical profiles, injury grading scores, and outcomes from the emergency department (22, 23). Variables like age, sex, place of residence, the type and mechanism of injury, the anatomical site of injury, and any surgical interventions conducted were meticulously documented. Additionally, the study also encompassed data regarding prehospital care, defined in this context as the care provided at health facilities or referral sites, not at the actual trauma scene (24, 25).

The data collection process involved a detailed assessment of the patients' medical records and direct consultations with healthcare providers. The team ensured that the data collection tool captured all essential variables to facilitate a comprehensive analysis of the trauma cases. The emphasis was on accurately reflecting the severity and nature of the injuries, alongside the demographic characteristics of the patients, to enable a robust evaluation of the patterns and outcomes of trauma cases presented at the center (26, 27).

For the purpose of data analysis, the collected information was processed using the Statistical Package for the Social Sciences (SPSS) software, version 25. This involved a series of statistical tests to interpret the data effectively. Descriptive statistics were employed to summarize the demographic and clinical characteristics of the patients. The relationship between these characteristics and the outcomes of the trauma cases was examined using inferential statistics, allowing for a deeper understanding of the factors influencing patient outcomes. The use of SPSS version 25 facilitated a rigorous and methodologically sound analysis, ensuring that the study's findings were both reliable and valid.

Throughout the study, all procedures were conducted in compliance with ethical standards, and patient confidentiality was rigorously maintained. The study's methodology was designed to provide a comprehensive understanding of the trauma cases encountered at GTH, with the aim of contributing valuable insights into the patterns, treatment, and outcomes of traumatic injuries in the setting of a teaching hospital.

## RESULTS

The pie charts illustrating the distribution of Gender, Residence, and Mode of Transport among trauma patients treated at the GTH trauma center provide insightful data. In terms of gender distribution, a significant majority of the patients were male, constituting 75.28% (612 patients), while female patients accounted for 24.72% (201 patients).

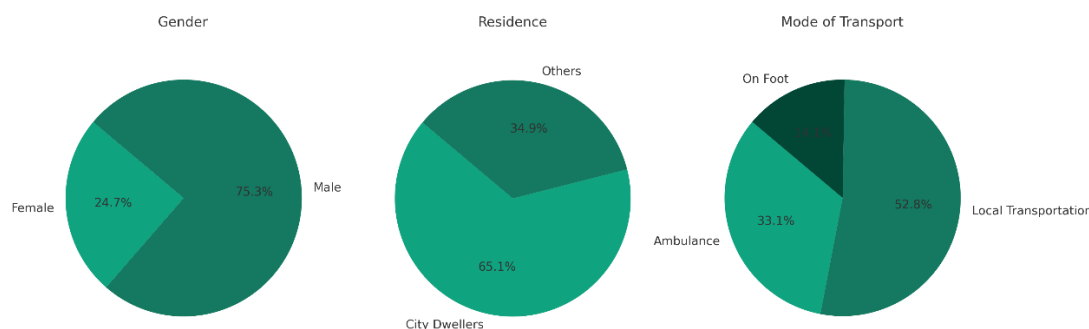


Figure 1 Gender, Residence, and Mode of Transport

This indicates a notably higher incidence of trauma in males. Regarding residence, the majority of the patients were city dwellers, representing 65.07% (529 patients) of the total cases, contrasting with the remaining 34.93% (284 patients) who came from other areas. This suggests a higher prevalence of trauma cases within city boundaries. The mode of transport used to arrive at the hospital further delineates the patients' access to medical care. A majority, 52.77% (429 patients), utilized local transportation, indicating its prominence as a means of reaching medical facilities. Ambulance services were used by 33.09% (269 patients), highlighting their role in emergency medical response. Interestingly, a smaller fraction of 14.15% (115 patients) arrived on foot, which might reflect proximity to the hospital or the non-critical nature of their injuries. These charts collectively provide a nuanced understanding of the demographic and logistical aspects of trauma care at the center.

Table 1 Study Characteristics

Category	Frequency	Percentage
Triage – Red	21	5.80%
Triage- Orange	37	10.22%
Triage- Yellow	267	73.76%
Triage- Green	37	10.22%
RTA Injuries	639	78.60%
Machine Injuries	79	9.72%
FAI Injuries	59	7.26%
Assault Injuries	36	4.43%
RTA- Passengers	453	70.89%
RTA- Pedestrians	186	29.11%
Head Injuries	598	45.75%
Lower Extremities Injuries	319	24.41%
Upper Extremities Injuries	279	21.35%
Chest Injuries	111	8.49%

The data presents a comprehensive overview of various aspects of trauma cases treated at the GTH trauma center. In the triage categorization, the majority of patients fell into the 'Yellow' category, comprising 73.76% (267 patients), indicative of moderate urgency. This was followed by the 'Orange' and 'Green' categories, each accounting for 10.22% (37 patients), and the 'Red' category, representing the most critical cases, at 5.80% (21 patients). Regarding the mechanisms of injury, Road Traffic Accidents (RTAs) were overwhelmingly the most common, involving 78.60% (639 patients) of the cases. Machine-related injuries constituted 9.72% (79 patients), followed by Fall from a Height (FAI) injuries at 7.26% (59 patients), and physical assaults at 4.43% (36 patients). Among the RTA victims, passengers formed the bulk of the cases, accounting for 70.89% (453 patients), while pedestrians represented 29.11% (186 patients). In terms of injury location, head injuries were predominant, involving 45.75% (598 patients). Lower extremity injuries were also significant, involving 24.41% (319 patients), followed by upper extremity injuries at 21.35% (279 patients), and chest injuries at 8.49% (111 patients). This data illustrates the varied nature of trauma cases encountered and highlights the predominance of certain types of injuries and their severity as categorized by the triage system.

## DISCUSSION

The findings of this study reveal a distinct age and gender predisposition in trauma cases, with a higher incidence among males. This trend could be attributed to the fact that men, particularly in Pakistan, are more frequently engaged in outdoor activities, increasing

their exposure to road traffic and other risks. Additionally, a certain degree of recklessness in behavior, especially in younger males, may contribute to this disparity. Pakistan's geographical location, along with its variable climate and socioeconomic factors, renders it susceptible to both natural and man-made disasters, which significantly impact public health. Traumatic injuries, often resulting in fatality or disability, are a notable consequence of such events (15, 19, 21).

In Gujranwala, regular occurrences of injuries, predominantly road traffic accidents (RTAs), highlight the critical role of trauma centers. However, the current state of these centers, often inadequately equipped and understaffed, especially in proximity to major roadways, exacerbates the risk of death and disability. The data suggests that over half of the injuries were a result of motorbike collisions, highlighting the need for enhanced trauma care facilities. Proximity to national highways is crucial for trauma centers to effectively manage and reduce the severity of injuries (27).

Furthermore, the study underscores the prevalence of traffic fatalities on highways, often involving heavy vehicles. Considering Pakistan's ongoing expansion of road infrastructure, including CPEC routes, the establishment of accessible trauma centers near highways becomes even more vital. The discrepancy in the availability of high-level trauma care between urban areas and roadways leads to delays in critical care, impacting patient outcomes during crucial periods.

The gender and age disparities observed align with previous research in Pakistan, indicating a higher vulnerability of young men to RTAs. Societal norms and a propensity for risk-taking behavior, such as high-speed motorcycling, contribute to this trend. The economic implications of losing individuals in this productive age group are significant, considering their contribution to family and national economies.

Head injuries emerged as the leading anatomical cause of trauma-related fatalities, aligning with earlier studies. The high incidence of skull fractures corroborates this finding. Despite national laws mandating helmet and seatbelt use, compliance remains low, as indicated by the Global Status Report on Road Safety 2018 (1, 3, 6). Enforcement of these regulations is imperative to reduce RTA fatalities. Preventive measures, such as increasing pedestrian infrastructure and stringent enforcement of traffic laws, are essential. The study, while insightful, is not without limitations. The reliance on data from a single trauma center may not fully represent the broader regional trends. Also, the retrospective nature of the study limits the ability to establish causality. Future research should focus on multi-center studies to provide a more comprehensive understanding of trauma patterns and outcomes. Additionally, public health campaigns and policy interventions focusing on traffic safety education and enforcement of safety regulations are recommended to mitigate the high incidence of RTAs and associated fatalities (10, 15, 20).

## CONCLUSION

The conclusion of this study underscores the urgent need for enhanced trauma care and stricter enforcement of traffic safety regulations in Pakistan, particularly in light of the high incidence of road traffic accidents (RTAs). The predominance of young male victims in RTAs points to a significant societal and economic loss, given their role as primary contributors to the workforce. Head injuries, identified as the leading cause of trauma-related deaths, further emphasize the importance of wearing helmets and seatbelts, a practice that remains alarmingly low despite existing laws. This study's findings highlight the critical implications for public health policy: there is a pressing need for the establishment of well-equipped and strategically located trauma centers, especially near highways and heavy traffic areas, coupled with rigorous public safety campaigns and law enforcement. By addressing these issues, it is possible to substantially reduce the mortality and morbidity associated with traumatic injuries in Pakistan, thereby improving the overall health outcomes and safety of the population.

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