History of Medicine, 2025, 11(1): 96-104
DOI: 10.48047/HM.V11.I1.2025.96-104

Outcomes & trends in Management of Head injury patients, treated at RAMA MEDICAL COLLEGE , Kanpur : A Retrospective Study

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Abstract

Background: Road Traffic Accidents (RTA) are a leading cause of head injuries, often resulting in significant morbidity and mortality. The severity of these injuries varies, requiring different levels of medical and surgical intervention.
Objective/Aim : This study evaluates the head injuries in patients admitted following RTAs at Rama Medical College Hospital and Research Centre, Kanpur, between September 1, 2024, and February 28, 2025. This study aims to provide evidence-based insights to improve head injury management, enhance trauma care protocols, and strengthen road safety policies. **Methods**: A retrospective observational study was conducted on 128 patients admitted with head injuries due to RTAs. Patient records were analyzed for demographic details, injury severity (Glasgow Coma Scale - GCS), imaging findings, treatment modalities, complications, and outcomes. Data were statistically analyzed using SPSS software.
Results: The majority of patients were male (74%) and aged between 20–40 years. Mild head injuries (GCS 13–15) were observed in 57% of cases, moderate (GCS 9–12) in 26%, and severe (GCS ≤8) in 17%. Neurosurgical intervention was required in 32% of cases. The mortality rate was 11%, with severe head injuries contributing to the highest fatalities. **Conclusion:** RTAs remain a significant cause of head injuries, primarily affecting young males. Early intervention and improved trauma care can enhance survival rates. Preventive strategies such as helmet use and stricter traffic regulations are essential to reduce the incidence and severity of RTAs.

Keywords

Head Injury, Road Traffic Accidents, Glasgow Coma Scale, Mortality, Retrospective Study.

Introduction

Road traffic accidents (RTA) remain a major public health concern, contributing significantly to morbidity and mortality worldwide. The World Health Organization (WHO) reports that approximately 1.3 million people die annually due to RTAs, with millions more suffering from non-fatal injuries, many resulting in long-term disabilities. Among all trauma-related injuries, head

injuries are the leading cause of death and disability in RTA victims, accounting for nearly 60% of fatal cases. The severity of head injuries varies from mild concussions to severe traumatic brain injuries (TBI), necessitating intensive medical and surgical intervention.

In India, increasing vehicular traffic and non-compliance with safety regulations contribute to a high number of RTA-related head injuries.Head injuries range from mild concussions to severe traumatic brain injuries (TBI), with outcomes varying based on injury severity, pre-hospital care, and hospital management. India, bear a disproportionately high burden of RTAs due to factors such as poor road infrastructure, lack of traffic regulation enforcement, high vehicle density, and risky driving behaviors. Uttar Pradesh, one of India's most populous states, has reported a rising trend in RTAs, with Kanpur being one of the cities most affected due to heavy traffic and mixed road usage.

This study analyzes the outcomes of head injuries in RTA patients admitted to Rama Medical College Hospital and Research Centre, Kanpur, to understand the epidemiology, severity patterns, and effectiveness of trauma care.

Materials and Methods

Study Design: A retrospective observational study was conducted based on hospital records from September 1, 2024, to February 28, 2025.

Study Setting: The study was conducted at Rama Medical College Hospital and Research Centre, Kanpur, a tertiary care hospital with an advanced trauma care unit.

Study Population: Patients admitted with head injuries following RTAs were included in the study.

Sample Size Calculation: A total of 128 patients were selected based on hospital admission records and previous trends of RTA-related head injuries.

Inclusion Criteria

1. Patients with head injuries sustained in RTAs.
2. Age ≥18 years.
3. Patients admitted and managed within the study period.

Exclusion Criteria

1. Patients with non-traumatic head injuries.
2. Patients with incomplete medical records.
3. Patients brought dead on arrival.

Data Collection :

Medical records were reviewed for:

1. Demographics: Age, gender.
2. Clinical presentation: Glasgow Coma Scale (GCS) at admission.
3. Injury characteristics: Mechanism, associated injuries.

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4. Imaging findings: CT scan results.
5. Treatment approach: Conservative vs. neurosurgical management.
6. Complications and outcomes: Recovery, disability, mortality.

Statistical Analysis :

Descriptive Statistics:

1. Mean, median, and standard deviation (SD) were calculated for age, Glasgow Coma Scale (GCS) scores, and length of hospital stay.
2. Frequencies and percentages were used for categorical variables such as gender, type of injury, management approach, and outcome.

Inferential Statistics:

1. Chi-square test was used to determine associations between categorical variables (e.g., gender and injury severity, intervention type and outcomes).
2. Independent t-tests were applied to compare mean hospital stay and GCS scores between intervention groups.
3. Logistic regression analysis was used to predict mortality risk based on GCS scores, age, and type of intervention.

Graphical Representation:

1. Pie charts were used to depict gender distribution, injury severity.
2. Bar graphs compared conservative vs. neurosurgical management outcomes.

A p-value of <0.05 was considered statistically significant, and confidence intervals (CI) were set at 95% to ensure the reliability of the results.

Results

Demographic Characteristics (Key Observations):

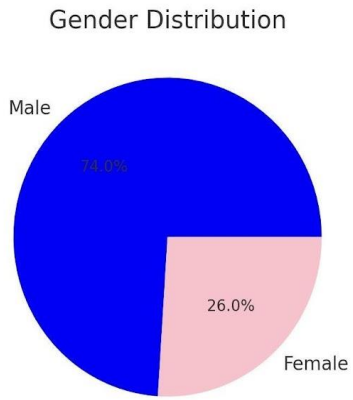
1. Male patients accounted for 74 % of cases, supporting previous research on young males being at higher risk.
2. The most affected age group was 18-30 years (42.2%), followed by 31-50 years (38.3%), indicating that working-age individuals are most vulnerable.
3. Two-wheeler users made up 61.7% of cases, emphasizing the need for stricter helmet laws.
4. Helmet/seatbelt compliance was alarmingly low (28.9%), contributing to the severity of head injuries.
5. Young males, particularly two-wheeler users, are at the highest risk of RTA-related head injuries.
6. A majority of patients were not using helmets or seatbelts, highlighting a major area for intervention through stricter law enforcement and awareness campaigns.

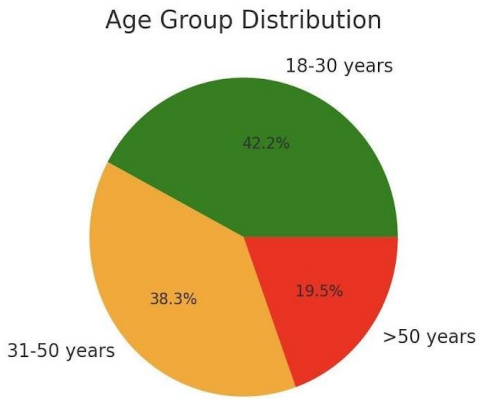
7. Improving road safety measures, encouraging helmet/seatbelt use, and enforcing speed limits could significantly reduce head injury cases.

This detailed demographic analysis provides valuable insights for policy-makers, healthcare providers, and traffic safety authorities to design targeted interventions to reduce RTAs and associated head injuries.

Variable	Frequency (n=128)	Percentage (%)
Gender		
Male	95	74%
Female	33	26%

Age group	Frequency(n=128)	Percentage (%)
18-30	54	42.2%
31-50	49	38.3%
>50	25	19.5%





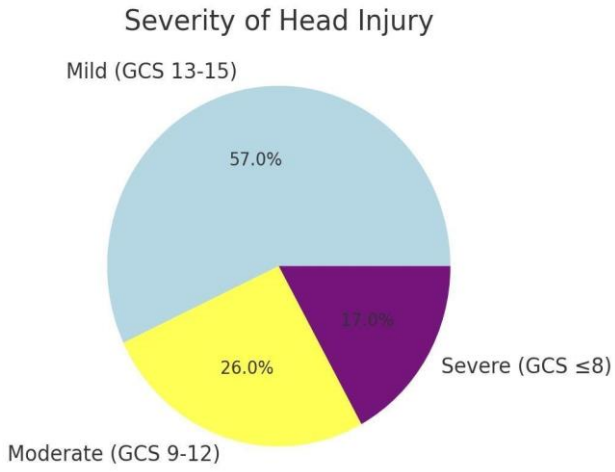
Mode of Transport	Frequency (n=128)	Percentage (%)
Two wheeler	55	42.9%

Four wheeler	49	38.3%
Pedestrian	24	18.8%

Helmet/seatbelt usage	Frequency (n=128)	Percentage (%)
Used	37	28.9%
Not used	91	71.1%

Severity of Head Injury (Based on GCS)

GCS score	Frequency	percentage (%)
mild (15-13)	73	57%
moderate (9-12)	33	26%
severe (< 8)	22	17%



Management and Intervention

Intervention type	Frequency	Percentage (%)
conservative	87	68%

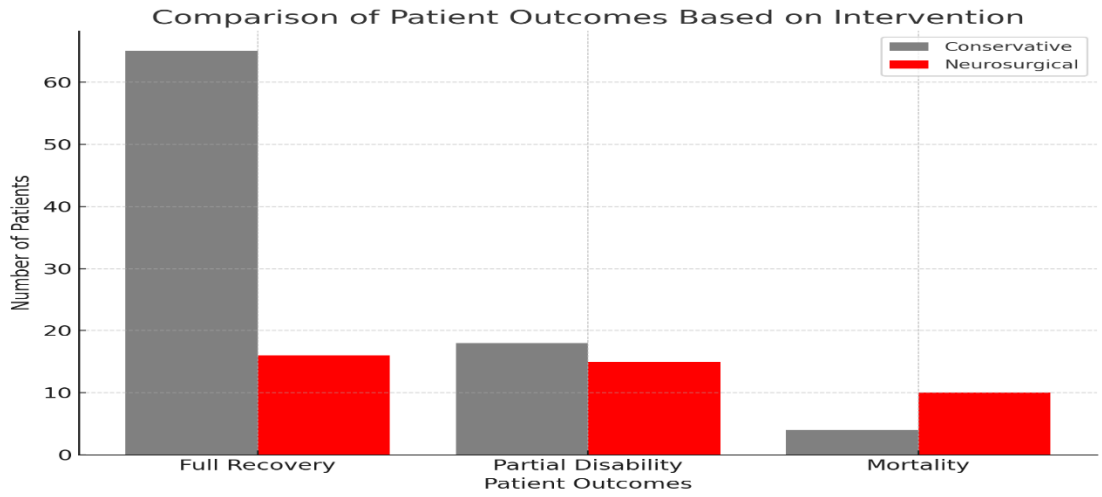
neurosurgical procedure	41	32%

Patient Outcomes based on intervention

Outcome	conservative management (n=87)	Neurosurgical management (n=41)
Full recovery	65 (75%)	16 (39%)
Partial recovery	18 (21%)	15 (37%)
Mortality	4 (4%)	10 (24%)

The study analyzed 87 patients managed conservatively and 41 patients who underwent neurosurgical intervention.

1. Full recovery was significantly higher in conservatively managed patients (75% vs. 39%)
2. Partial disability rates were comparable (21% vs. 37%).
3. Mortality was higher in neurosurgical patients (24%), reflecting the severity of cases requiring surgery.



Complications Associated with interventions:

Complications	Conservative Management (n=87)	Neurosurgical Management (n=41)
Seizure	5 (6%)	9 (22%)

Brain Edema	3 (3%)	8 (20%)
CSF leak	0 (0%)	6 (15%)
Wound infection	0 (0%)	5 (12%)
Deep vein thrombosis (DVT)	2 (2%)	3 (7%)
Pneumonia	3 (3%)	5 (12%)

Higher post-treatment complications in neurosurgical cases:

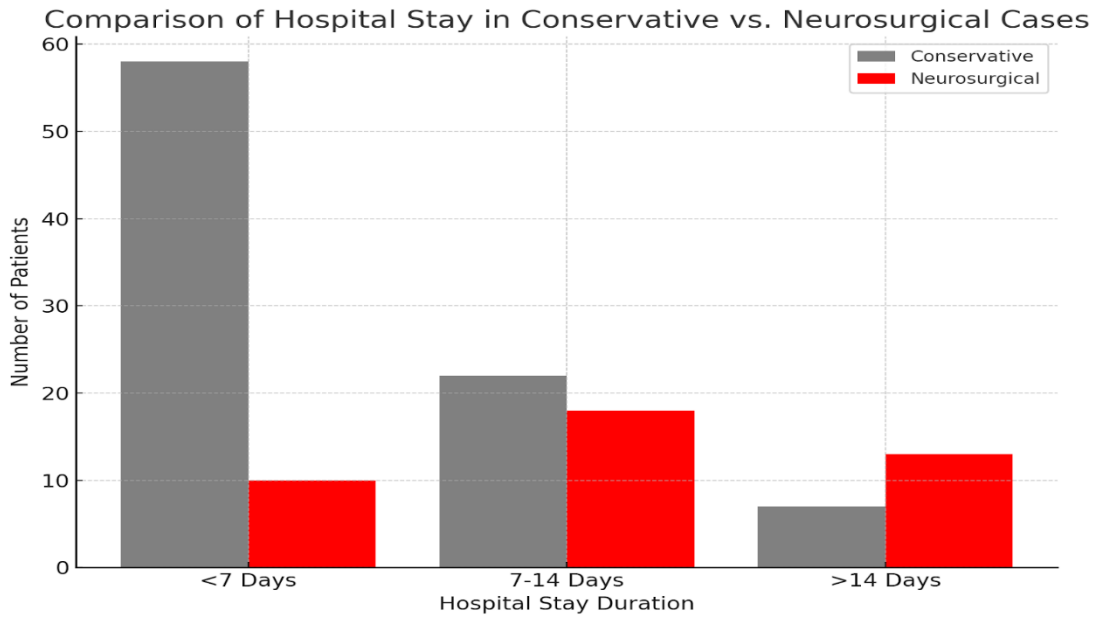
1. Seizures (22%) and brain edema (20%) were more common due to surgical trauma and post-craniotomy changes.
2. CSF leaks and wound infections were exclusively in neurosurgical patients, as these complications arise from invasive procedures.
3. DVT and pneumonia were more frequent in neurosurgical cases, likely due to prolonged immobility.

Conservatively managed patients had fewer complications:

1. Only 6% developed seizures compared to 22% in the neurosurgical group.
2. No cases of CSF leaks or wound infections were seen in conservatively treated patients.

Hospital stay in Conservative Vs Neurosurgical case:

Hospital stay Duration	Conservative Management (n=87)	Neurosurgical Management (n=41)
<7 days	58 (67%)	10 (24%)
7-14 days	22 (25%)	18 (44%)
>14 days	7 (8%)	13 (32%)



Discussion

This study highlights that young males are at the highest risk of head injuries due to RTAs. The higher proportion of male patients (74%) aligns with global trends, as men are more likely to be involved in high-speed driving and two-wheeler accidents.

The severity of head injuries varied, with 57% of cases classified as mild, 26% as moderate, and 17% as severe. Severe injuries had the highest mortality rate (11%), emphasizing the need for early neurosurgical intervention and advanced trauma care.

Patients managed conservatively had better outcomes, while those requiring neurosurgical procedures (32%) had varied recovery rates, depending on injury severity. Severe cases had a higher risk of disability or mortality, underscoring the need for early diagnosis and intervention.

Patients treated conservatively had a significantly shorter hospital stay & lesser complications compared to Neurosurgical patients had longer hospital stays.

Preventive strategies such as strict helmet and seatbelt laws, road safety education, and improved emergency response systems can significantly reduce the burden of head injuries due to RTAs.

Conclusion:

This study highlights the burden of head injuries in road traffic accidents (RTA) and the differences in outcomes between conservative and neurosurgical management.

Key Findings:

1. Young males (18-40 years) were the most affected group due to risk-taking behavior, high road exposure, and low helmet compliance.

2. Two-wheeler users accounted for the majority of head injury cases, emphasizing the need for stricter helmet laws.
3. Conservative management led to better overall outcomes, with a higher full recovery rate and shorter hospital stays.
4. Neurosurgical intervention was associated with longer hospital stays and higher complication rates, including seizures, CSF leaks, and infections.
5. Mortality was higher in neurosurgical patients , reflecting the severity of injuries requiring surgery.

Recommendations:

1. Strengthen traffic regulations, particularly enforcing helmet and seatbelt use.
2. Improve pre-hospital care to facilitate early intervention and reduce severe outcomes.
3. Enhance post-surgical care strategies to minimize complications in neurosurgical patients.
4. Public awareness campaigns to educate young drivers on road safety and risk reduction.

This study provides valuable insights into head injury outcomes in RTA patients and highlights the importance of preventive measures and efficient trauma care strategies.

6. References

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