

Outcomes of Traumatic Brain Injury in a Tertiary Care Hospital in Bangladesh

Abdul Hye Manik*¹, Rukun Uddin Chowdhury², Ahmed Ul Morsalin Chowdhury², Al Amin Salek², Amir Ali²

¹ Department of Neurosurgery, Momenshahi Combined Military Hospital, Mymensingh

² Department of Neurosurgery, Combined Military Hospital, Dhaka



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ABSTRACT: *Background:* Head injuries remain a significant cause of mortality and functional impairment, particularly among young adults. Presently, head injuries pose a considerable challenge at the community level, emerging as a major concern. The economic repercussions of head injuries are particularly severe in developing nations such as Bangladesh. *Objective:* To evaluate the outcomes of traumatic brain injury (TBI) in a tertiary care hospital in Bangladesh. *Methods:* This prospective cross-sectional study was conducted in the Combined Military Hospital, Dhaka, Bangladesh from May 2022 to July 2023. The study enrolled 117 patients with head injury using purposive sampling. Data were composed through a semi-structured, pre-designed inquiry form and analyzed using MS Office tools. *Results:* In this study, 28% of the patients were treated conservatively, while the remaining 72% underwent surgical intervention. After treatment, 69.2% of patients were discharged successfully, 27.4% were referred to rehabilitation programs, and 3.4% were referred for further treatment. The study reported a mortality rate of 11.1%. Neurological complications were observed in 20.5% of cases, with early post-traumatic stress (PTS) noted in 16.2% of cases. Non-neurological complications and aspiration pneumonia were observed in 11.1% and 8.5% of cases, respectively. *Conclusion:* Surgical intervention is common in managing traumatic brain injury (TBI) patients, although mortality rates remain a challenge. Neurological complications are frequent, posing challenges in both conservative and surgical management approaches.

Keywords: Outcomes, Traumatic Brain Injury, TBI, CT scan, Neurological Complications.

Article at a glance:

Study Purpose: The purpose of this study was to evaluate the clinical outcomes, mortality rates, and neurological recovery of patients with traumatic brain injury (TBI) admitted to a tertiary care hospital in Bangladesh.

Key Findings: Road traffic accidents (RTAs) are the most common cause, followed by falls and physical assaults.

Newer Findings: Faster surgical decompression and intensive neurocritical care improve survival and functional recovery.

Abbreviations: TBI: Traumatic Brain Injury.

INTRODUCTION

Traumatic brain injury (TBI) remains a major contributor to both mortality and long-term disability on a global scale. Each year, millions seek emergency care for TBI, with approximately 1.5 million fatalities reported annually.¹ It is the foremost cause of disability in individuals under 40, with severe cases leading to long-term impairment in 150 to 200 individuals per million each year.^{2, 3} In Bangladesh, neurotrauma is one of the principal causes of death, with estimates from the World Health Organization (WHO) indicating over 21,000 fatalities annually.⁴ The

burden of TBI is particularly pronounced in low- and middle-income countries (LMICs), home to 85% of the world's population WHO data suggest that nearly 90% of deaths from injuries occur in these regions.⁵ Despite the substantial impact, there is a limited understanding of patient outcomes following TBI in LMICs. A systematic review of predictive models for TBI outcomes found that only 7% of the 102 models analyzed were based on data from these regions.⁶ This disparity is linked to the "10/90 gap," where less than 10% of global health research funding is directed toward addressing health conditions that account for

90% of the worldwide disease burden.⁷ There are indications that outcomes following traumatic brain injury (TBI) could vary between high-income countries and LMICs. In LMICs, observed injury patterns differ from those in high-income nations, and variations in treatment, including standards of intensive care, could influence outcomes.⁸ Moreover, socio-cultural disparities, including variations in welfare provisions and cultural norms, could influence the extent of disability post-TBI. Studies conducted in Africa, including our country Ethiopia, have highlighted TBI as a primary reason for disability and death, with road traffic accidents (RTAs) being the main culprit.^{9, 10} Consistent with global trends, TBI remains a significant contributor to morbidity and mortality in Ethiopia.¹¹ Efforts to mitigate RTIs, the leading cause of TBI in the country, have been considerable.¹² The objective of this study was to measure the outcome variables of head injury in a tertiary care hospital in Bangladesh.

METHODS

This was a cross-sectional study that was conducted in the Combined Military Hospital, Dhaka, Bangladesh from May 2022 to July 2023. As part of this study, 117 patients with head injuries (HI) were selected using purposive sampling techniques. A comprehensive history was gathered, including details on age, sex, types of vehicles involved, types of victims affected, mode of injury, and Glasgow Coma Scale (GCS) scores. Additionally, physical examinations (PE) were conducted to assess associated injuries and relevant investigations such as computed tomography (CT) scans of the head were performed. Informed consents were received from all respondents. The study included all patients aged 10 years and above with traumatic brain injury (TBI), adhering to the inclusion criteria. Known epileptic patients and cases with non-traumatic causes of brain injury were excluded based on the exclusion criteria. Data analysis was conducted using MS Office tools.

RESULT

Out of all the participants, 35% belonged to the 21–30 years age group, followed by 23.93%, 16.24%, and 12.82% from the 31–40, 10–20, and 41–50 years age groups respectively. In this study, the majority of patients (74%) were male, while the remaining patients (26%) were female. Out of the total cases, 73 (62%) were from urban areas, while the remaining patients (38%) hailed from rural areas. In terms of occupational status distribution, 37.6% of our patients were from serving pool. Additionally, 20.5% were retired, and 14.5% were family members and others. In the current study, the majority of cases (62.4%) resulted from motor vehicle accidents. Falls accounted for 18.8% of cases, while assault or violence contributed to 8.5% of cases. It was observed that nearly half of the patients (47.9%) had severe Glasgow Coma Scores (≤ 8). Additionally, 40.2% and 12.0% of patients had moderate (9–12) and mild (13–15) scores, respectively. On CT scan, the types of traumatic brain injury (TBI) observed were as follows: acute extradural hematoma (AEDH) in 41.0% of cases, skull fracture in 29.1% of cases, acute subdural hematoma (ASDH) in 13.7% of cases, brain contusion in 9.4% of cases, and subarachnoid hemorrhage (SAH) or a combination thereof in 6.8% of cases. Upon analyzing the treatment modalities, it was found that 28% of the total patients were treated conservatively, while the remaining 72% underwent surgical intervention. After treatment completion, 69.2% of patients were discharged successfully, 27.4% were referred to rehabilitation programs, and 3.4% were referred for further treatment. The study reported a mortality rate of 11.1%. In the current study, neurological complications were observed in 20.5% of cases, while early post-traumatic stress (PTS) was noted in 16.2% of cases. Additionally, non-neurological complications and aspiration pneumonia were observed in 11.1% and 8.5% of cases, respectively.

Table 1: Age Distribution of Participants

Age (Years)	n	%
10–20	19	16.24%
21–30	41	35.04%
31–40	28	23.93%
41–50	15	12.82%
51–60	9	7.69%
>60	5	4.27%

Total	117	100%
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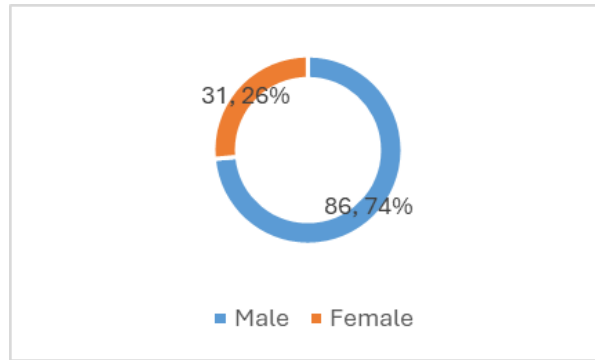


Figure 1: Gender Distribution

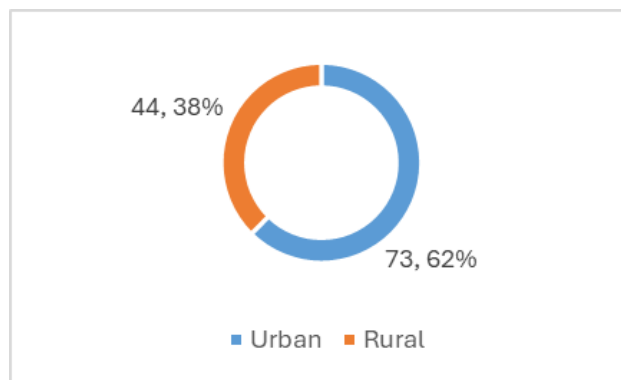


Figure 2: Distribution of Residence

Table 2: Occupational status of patients

Occupation	n	%
Serving pool	44	37.6%
Retired	24	20.5%
Family members and others	17	14.5%
Student	11	9.4%
Civil servant	16	13.6%
Paramilitary	5	4.3%

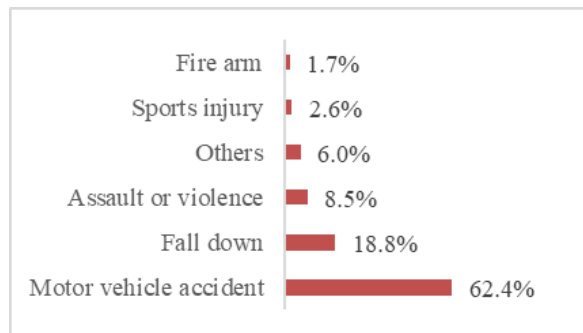


Figure 3: Mechanism of Injuries

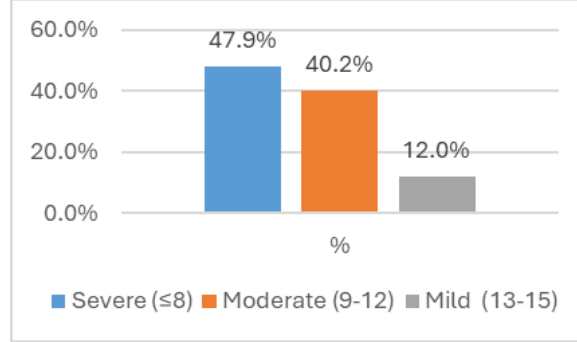


Figure 4: Glasgow Coma Score Distribution

Table 3: CT scan findings

Types of TBI on CT scan	n	%
AEDH	48	41.0%
Skull fracture	34	29.1%
ASDH	16	13.7%
Brain contusion	11	9.4%
SAH/combination	8	6.8%

AEDH: Acute extradural hematoma; ASDH: Acute subdural hematoma; SAH: Subarachnoid hemorrhage

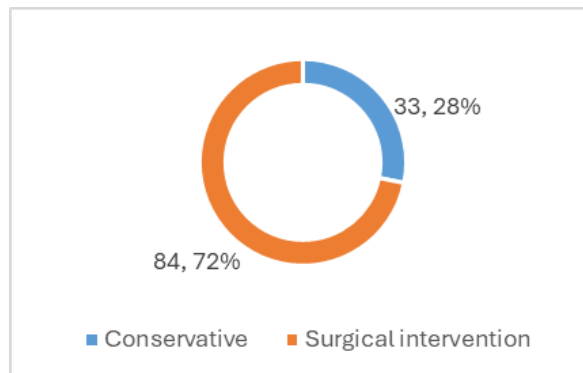


Figure 5: Treatment Modality

Table 4: Outcomes Distribution

Characteristics	n	%
Discharge	76	65.0%
Rehabilitation	25	21.4%
Mortality	13	11.1%
Referred for better treatment	3	2.6%

Table 5: Complications Distribution

Variables	n	%
Neurological complications	24	20.5%
Early PTS	19	16.2%
Non-neurological complications	13	11.1%
Aspiration pneumonia	10	8.5%
Late PTS	6	5.1%

HAIs	4	3.4%
Bone flap infection	1	0.9%

HAIs: Healthcare-associated infections; PTS: Post-traumatic stress.

DISCUSSION

In our study, 35% of all participants fell into the 21–30 years age group, followed by 23.93%, 16.24%, and 12.82% from the 31–40, 10–20, and 41–50 years age groups, respectively. These findings closely resembled those of another study.¹³ Additionally, the gender distribution in our study showed that 74% of the patients were male and 26% were female, a pattern similar to that observed in another study.¹⁴ In this study, 62% of cases came from urban places, while 38% were from rural places. This urban-rural distribution closely mirrored the findings of another study, which reported that 60.7% of patients were urban residents.¹⁵ Regarding occupation, 37.6% of our patients were serving pool, 20.5% were retired, and 14.5% were family members and others. These figures were comparable to those found in another study, which reported that 39.4% were farmers and 20% were daily laborers.¹⁶ In our study, the leading cause of head injuries was motor vehicle accidents, accounting for 62.4% of cases. Falls and assault or violence were responsible for 18.8% and 8.5% of cases, respectively. These findings are consistent with a study conducted in five European countries, where traffic accidents were identified as the primary cause of head injuries, comprising 47% of cases.¹⁷ In our study, close to half of the patients (47.9%) presented with severe Glasgow Coma Scores (≤ 8), while 40.2% had moderate scores (9–12), and 12.0% had mild scores (13–15). These results align with those of another study.¹⁸

In this research, 28% of the admitted patients took conservative treatment, while the remaining 72% underwent surgical intervention. This distribution is comparable to the findings of Srinivas *et al.*, where conventional treatment was administered in 20% of respondents and surgical management in 80% of patients.¹⁹ In this study, CT scans revealed various types of TBIs: AEDH (Acute extradural hematoma) in 41.0% of cases, skull fracture in 29.1% of cases, ASDH (Acute subdural hematoma) in 13.7% of cases, brain contusion in 9.4% of cases, and SAH (Subarachnoid hemorrhage) or a combination thereof in 6.8% of

participants. These results align with a prior study, which reported CT scan-based TBI diagnoses, including AEDH in 42.3% of cases, depressed skull fractures in 28.86%, ASDH in 12.3%, brain contusions in 10.20%, and SAH or a combination in 6.34% of the total study population.¹³ These findings closely resemble those observed in the present study. After completion of treatment, 69.2% of our patients were successfully discharged, while 27.4% were referred to rehabilitation programs, and 3.4% were directed for further treatment. A comparable trend was noted in a previous study.¹⁸ This study also reported a mortality rate of 11.1%, which aligns closely with findings from Hawassa, Ethiopia, where the mortality rate was reported at 12.7%.^{20–35} These findings provide valuable insights for future research in this area.

Limitation of the Study

The reliance of the study on a single center and its small sample size, combined with a short duration, may hinder its ability to accurately represent the entire country. Therefore, caution is warranted when interpreting the findings, as they may not fully capture the diverse scenarios present across the entire nation.

CONCLUSION

In the management of traumatic brain injury (TBI) patients, surgical intervention is frequently employed to address critical issues such as intracranial hemorrhage, elevated intracranial pressure, and skull fractures. While advancements in treatment modalities have led to improved outcomes, controlling mortality rates remains a significant challenge. Neurological complications are prevalent and pose considerable challenges in both conservative and surgical approaches to patient management. These complications can include cognitive deficits, motor impairments, seizures, and changes in behavior or personality. Addressing these challenges requires a multidisciplinary approach, with close collaboration between neurosurgeons, neurologists, intensivists, and rehabilitation specialists to optimize patient care and outcomes following traumatic brain injury.

Authors' Contributions

MAHM, RUC, AUMC: Concept and design, data acquisition, interpretation and drafting. MAAS and MAA: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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***Correspondence:** Dr. Md Abdul Hye Manik, E-mail: hye_doc@yahoo.com

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