# Study of Clinical Profile and Outcome of Traumatic Brain Injury in UCMS-TH

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## Abstract

**Introduction:** Traumatic Brain Injury (TBI) is a major cause of death and disability globally affecting millions of people each year. The clinical presentation and prognosis of TBI vary widely, depending on factors such as the severity of the injury, the location of brain damage and patient's overall health. This study is aimed for learning the clinical profile and outcome of traumatic brain injuries in our setting.

**Materials and Methods:** This is a hospital based observational descriptive cross-sectional study conducted for a period of 18 month at Neurosurgical unit of Universal College of medical science teaching hospital, Bhairahawa. All the patients presenting in the Emergency department with TBI were enrolled in the study.

**Results:** There was total 278 cases mostly male (76.6%) and of age group 21 to 40 yrs. Most cases were mild head injury (60 %) and 48 cases (18.2%) had some pupillary abnormalities. The most common mode of injuries was RTA followed by fall injuries and physical assault. Most of the cases underwent conservative management and 44 cases (15.8%) had undergone surgeries. Outcome of TBI at discharge in terms of GOS was 1.88 for severe TBI, 4.67 for moderate TBI and 5 for mild TBI. Mean GOS after 3 months follow up was 5 for mild, 5 for moderate TBI and 3.69 for severe TBI.

**Conclusions:** The study provides insightful data on patients with head injuries, revealing several key trends. Functional outcome of severe head injuries according to GOS was poor at time of discharge but improved after 3 months

**Keywords:** Traumatic Brain Injury, Glasgow outcome scale

## Introduction

Traumatic Brain Injury (TBI) is a major cause of death and disability globally, affecting millions of people each year. TBI can result from a variety of events, including motor vehicle accidents, falls, and assaults. The clinical presentation and prognosis of TBI vary widely, depending on factors such as the severity of the injury, the location of brain damage, and the patient's overall health.[1] Outcomes for TBI patients are similarly variable. While some individuals may experience full recovery, others may suffer from long-term neurological deficits, including cognitive impairment, motor dysfunction, and emotional disturbances. The degree of recovery often depends on multiple factors, such as the initial GCS score, the presence of secondary brain injuries (e.g. Hemorrhage, edema), and the timing and quality of medical intervention. Prognostic models like the Glasgow Outcome Scale (GOS) are frequently used to assess recovery and long-term functional outcomes.[2] Despite advances in trauma care and rehabilitation, the burden of TBI remains significant. Early diagnosis, prompt medical intervention, and tailored rehabilitation programs are crucial for improving outcomes, but more research is needed to fully understand the mechanisms of recovery and optimize treatmentvstrategies for TBI patients. [3] The purpose of this study was to evaluate and describe the clinical profile focusing on the mode, severity, morphology and outcome of patients admitted with TBI at UCMS teaching hospital Bhairahawa.

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## Methods and Materials

This is a hospital based observational descriptive cross-sectional study conducted for a period of 18 month from Nov 2022 to May 2024 at Neurosurgical unit of Universal College of medical science teaching hospital, Bhairahawa. This study has been approved by Institutional Review Committee of UCMS-TH(UCMS/IRC/155/22). All patients with the diagnosis of TBI and admitted through emergency department undergoing both conservative and surgical treatment were included in the study. Patient who will be declared brain death, less than 18 years older and those who had already undergone interventions at other center were excluded from the study. All the patients presenting in the emergency department with traumatic brain injury were managed according to the ATLS protocol. After resuscitation on the basis of GCS, they will be classified as severe (GCS 3–8), moderate (GCS 9–12) and mild (GCS 13- 15). A detailed history and examination regarding age, sex, mode of injury, time since injury, morphology of injury, associated injuries in poly trauma and relevant investigations like computed tomography (CT) scan of head will be performed. Then patient is managed as per standard head injury protocol and then discharged once they met the discharge criteria. The Outcome of patients was assessed at the time of discharge and at 3 months follow-up using Glasgow outcome scale (GOS). Data was entered and analyzed into SPSS version 20. Descriptive statistics was Used to analyze the data. In descriptive statistics frequency, percentage, mean and standard deviation was used to analyze the data.

## Results

There was total 278 patients included in the study. The results showed that majority of the patients were male (76.6%).

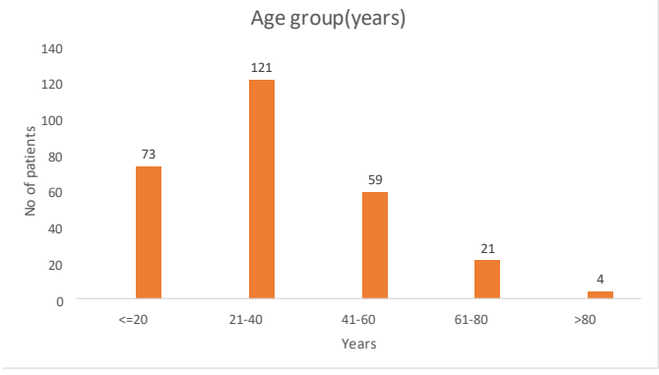


*Fig 1 frequency distribution of number of head injury patients according to age group*

The results showed that the average age of the patients was 33.5 ±9.3 years and most of them were in age groups 21-40 years (43.5%) followed by <=20(26.3%), 41-60 years (21.2%) and least were from age groups >80 years (1.4%).

*Table1 Frequency of patients according to mode of injuries*

| Mode of Injury | Frequency | Percent |
|---|---|---|
| RTA | 184 | 66.2 |
| Fall | 63 | 22.7 |
| Physical Assault | 31 | 11.2 |
| Total | 278 | 100 |

Among 278 patients, in majority of the cases mode of injury was road traffic accident (66.2%) followed by fall (22.7%) and physical assault (11.2%). Time interval between the occurrence of the traumatic brain injury (TBI) and the patient's arrival at the hospital was on average 5.8 hours with Standard Deviation of 14.38 hours to 0.75 hours.

*Table 2 Number of patients according to different morphology of injuries*

| Morphology of Injury | Frequency | Percent |
|---|---|---|
| Concussion | 80 | 28.7 |
| concussion with scalp laceration | 29 | 10.4 |
| Fracture with concussion | 20 | 7.19 |
| Fracture | 15 | 5.3 |
| fracture with scalp laceration | 25 | 8.9 |
| EDH | 23 | 8.2 |
| EDH with fracture | 13 | 4.6 |
| SDH with fracture | 5 | 1.7 |
| EDH with SDH | 5 | 1.7 |
| SDH with SAH | 2 | 0.7 |
| Traumatic SAH | 6 | 2.1 |
| SDH | 14 | 5.0 |
| contusion with EDH | 5 | 1.7 |
| contusion with SDH | 3 | 1.0 |
| contusion | 20 | 7.1 |
| Fracture with pneumocephalus | 3 | 1.0 |
| DAI | 10 | 3.5 |
| Total | 278 | 100 |

Regarding morphology of injury, 80 patients (28.7%) had concussions, making it the most common injury. 29 patients (10.4%) had concussions combined with a scalp laceration. 20 patients (7.19%) had both a fracture and concussion. 15 patients (5.3%) had fractures without other complications. 25 patients (8.9%) had fractures combined with scalp lacerations. 23 patients (8.2%) had EDH, 13 patients (4.6%) had EDH combined with

had SDH with SAH, 6 patients (2.1%) had SAH due to trauma and14 patients (5.0%) had only SDH. 5 patients (1.7%) had a contusion with EDH. 3 patients (1.0%) had a contusion with SDH. 20 patients (7.1%) had contusions without other injuries. 3 patients (1.0%) had a fracture with pneumocephalus. 10 patients (3.5%) had diffuse axonal injuries (DAI).

*Table 3 Frequency of patients according to Severity of Head Injuries*

| Severity of Head Injury | Frequency | Percent |
|---|---|---|
| Mild Head Injury | 167 | 60.1 |
| Moderate Head Injury | 81 | 29.1 |
| Severe Head Injury | 30 | 10.8 |
| Total | 278 | 100 |

The results showed that among 278 cases, 167(60.1%) patients had mild head injury followed by Moderate head injury (29.1%) and Severe Head injury (10.8%). The majority of patients (82.2%) had bilaterally equal and reactive pupils. 28 patients (10.1%) had both pupils dilated and non-reactive, 20 patients (7.1%) had only one pupil dilated and non-reactive.

(15.8%) patient was managed operatively and (84.2%) was managed conservatively.

*Table 4 GOS scores of head injury patients at the time of discharge*

| GOS Score at Discharge | N | Mean | Std. Deviation | P Valu |
|---|---|---|---|---|
| Severe Head Injury | 30 | 1.88 | 1.44 | <0.001 |
| Moderate Head Injury | 81 | 4.67 | 1.03 | |
| Mild Head Injury | 167 | 5.00 | 0.00 | |
| Total | 278 | 4.05 | 1.64 | |

The results showed that the average GOS score at discharge in Severe head injury was 1.88 ± 1.44. The average GOS score in Moderate head Injury was 4.67 ± 1.03. Similarly, the average GOS score in Mild head injury was 5.00 ±0.00. The mean difference in GOS score at discharge between different severity of injury was found to be statistically significant (p<0.001).

*Table 5 GOS scores of patients at 3 months of follow up*

| GOS Score at 3 months | N | Mean | Std. Deviation | P Valu |
|---|---|---|---|---|
| Severe Head Injury | 30 | 3.69 | 1.59 | <0.001 |
| Moderate Head Injury | 81 | 5.00 | 0.00 | |
| Mild Head Injury | 167 | 5.00 | 0.00 | |
| Total | 221 | 4.85 | .68 | |

Follow up data of the patients after 3 months of discharge showed that average GOS score in Severe head injury was 3.69 ± 1.59. The average GOS score in moderate Head injury was 5.0 ± 0.00 in Mild head injury was 5.00 ±0.00. The mean difference in GOS score at 3 months between different severity of injury was found to be statistically significant (p<0.001).

## Discussion

In our study, 76.6%% of patients were male and 23.4% of patients were female. These findings were similar to previous studies with male and female ratio of 81:19 and 77:23 in two large head-injury databases CRASH and IMPACT respectively. In our study, the average age of the patient was 33.5 ±9.3 years. These findings were similar to previous studies with mean age of 37.1 (17.0) and 33.9 (16.3) in CRASH and IMPACT database respectively [4]

This study demonstrate that the majority of traumatic brain injury (TBI) cases were caused by road traffic accidents (RTA), which accounted for 66.2% of the injuries. This finding aligns with existing literature that consistently highlights RTAs as the leading cause of TBI, particularly in developing countries where road safety measures are often inadequate. Falls were the second most common cause of TBI, accounting for 22.7% of the injuries. This is consistent with global data, which often identifies falls as a major cause of TBI, particularly in specific age groups such as children and the elderly. Fall from height were responsible for 32.2% of head injury cases. [5,6]

The majority of TBIs in this study were mild (60.1%), a finding that mirrors the work of another study, which reported that 60% of TBIs in their cohort were mild, with most patients experiencing favorable outcomes following conservative treatment. Moderate TBIs accounted for 29.1% of cases which is indicative of more substantial cognitive and neurological impairment. These patients often require more extensive monitoring and, in some cases, surgical intervention to prevent worsening outcomes. Studies such as those by Andriessen et al. have shown that moderate TBIs are frequently associated with diffuse injuries and are complicated by fluctuating GCS scores, making their management challenging.[7]

Severe TBIs, which made up 10.8% of the cases in this study these patients often require immediate neurosurgical intervention to manage intracranial pressure as highlighted by the findings of studies. Severe TBIs are associated with a high mortality rate, and survivors often experience significant neurological deficits. This aligns with global trends that show severe TBIs as a major contributor to long-term disability and healthcare cost [8].

In terms of injury morphology, the data shows that concussions, both isolated (28.7%) and in combination with scalp lacerations (10.4%), are the most frequently observed injuries. This is consistent with findings from numerous studies, which established concussions as the predominant injury in mild TBIs due to their association with transient, diffuse brain injury following blunt trauma. SDH is one of the most common injuries in severe TBI, and immediate surgical evacuation is often required to prevent further brain damage. Similarly, studies underscore the high incidence of contusions and skull fractures in RTAs, which necessitate complex management strategies,

including craniotomy or other neurosurgical procedures. [6-9]

Significant proportion of patients (82.8%) had bilaterally equal and reactive pupils, indicating a better prognosis. However, 10.1% of patients had bilaterally dilated and non-reactive pupils, often a sign of severe brain injury, associated with poor outcomes. Non-reactive pupils often indicate a more severe injury and poor prognosis, consistent with the association between severe TBI and worse clinical outcomes. The findings align with previous studies that have demonstrated a strong association between non-reactive pupils and severe TBI. Previous Studies have reported that patients with non-reactive pupils often require urgent surgical intervention and have significantly poorer outcomes compared to those with reactive pupils [9,10]

Patients with moderate injuries displayed an initial GOS score of 4.67 at discharge, which improved to 5.0 after three months. This reflects the potential for recovery among this cohort, as appropriate management and rehabilitation can significantly enhance functional outcomes over time. Other research supports this, highlighting that individuals with moderate TBI can achieve substantial improvements through structured rehabilitation programs.[11]

With an initial GOS score of 1.88 at discharge indicative of severe disability these patients with severe head injuries showed an increase in GOS to 3.69 after three months. While this improvement is notable, it underscores the persistent challenges faced by individuals with severe injuries. According to Maas et al. (2017), severe TBI often results in long-term impairments that require extensive rehabilitation and support to optimize recovery and quality of life. The findings suggest that, although some improvement is possible, many severe TBI patients may continue to experience significant functional limitations, necessitating ongoing care and rehabilitation efforts.[12]

### RECOMMENDATION

The findings underline the importance of preventive measures, especially regarding road safety, given the high incidence of RTAs as the primary cause of TBI. Early intervention, particularly in severe cases, and continued post-discharge care are critical for improving long-term outcomes. The study also demonstrates that while mild injuries may resolve with minimal intervention, severe TBIs require prolonged rehabilitation and intensive management, highlighting the strain on healthcare resources

## Conclusion

The study provides insightful data on patients with head injuries, revealing several key trends. The majority of patients were male (76.6%), with most injuries occurring in the 21-40 year age group. The leading cause of injury was road traffic accidents (66.2%), and the most common type of injury was concussion (41.4%). In terms of injury severity, 60.1% of patients suffered mild head injuries, while 29.1% had moderate and 10.8% had severe injuries. Most patients (84.2%) were treated conservatively for their injuries. Upon discharge, those with severe head injuries had the lowest GOS score of 1.88, reflecting poorer initial outcomes, while patients with mild injuries had an ideal score of 5.0. However, after three months, significant improvement was observed, with the GOS score for severe injuries increasing to 3.69. This suggests that although severe injuries led to worse short-term results, patients showed progress over time. The study highlights the critical role of early intervention and continued follow-up in managing injuries led to worse short-term results, patients showed progress over time. The study highlights the critical role of early intervention and continued follow-up in managing head injuries.

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