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ROAD TRAFFIC ACCIDENTS ARE A MAJOR CAUSE OF TRAUMATIC BRAIN INJURY IN NORTH BIHAR – A PROSPECTIVE STUDY

Surgery

Prof. (Dr.) Sushant Kumar	Professor, Dept of Surgery, Darbhanga Medical College and Hospital, Darbhanga, Bihar.
Dr. Awadhesh Kumar Jha	Assistant Professor, Dept. of Surgery, Darbhanga Medical College and Hospital, Darbhanga, Bihar.
Dr. Jyoti Kumari	Junior Resident – 3rd yr, Dept. of Surgery, Darbhanga Medical College and Hospital, Darbhanga, Bihar.
Dr. Saurav Kumar Paul*	Junior Resident – 3rd yr, Dept. of Surgery, Darbhanga Medical College and Hospital, Darbhanga, Bihar. *Corresponding Author

ABSTRACT

Background – Traumatic Brain Injury (TBI) is a global epidemic causing significant morbidity and mortality. Road Traffic Accident (RTA) is a major cause of TBI in South East Asia (56%). This study was ensued to identify RTAs as the major cause of TBI, evaluate the characteristics of TBIs in North Bihar and the outcomes. **Materials And Methods –** This prospective study included details of TBI patients seen in the Surgery Department of Darbhanga Medical College and Hospital, Darbhanga, Bihar. All patients of any age with TBI were included in the study. Then inclusion and exclusion criteria were applied and the Study Population was obtained. The patients were classified according to their mode of injury and then they were clinically assessed and imaging was done and the outcomes were assessed. **Results –** During the study period, 2,354 patients of TBI were seen. Out of this, after applying inclusion and exclusion criteria, 2,041 patients were included in Study Population. There were 70.4% males and 29.6% females. Most common culprit was Road Traffic Accidents (RTA) (56%). Head injury was mostly mild (64%) and 16% had severe injury. Severe Head Injury patients had more incidence of intracranial bleed compared to Mild Head Injury. Mild head injury has best prognosis with complete recovery compared to severe head injury having 20% mortality. **Conclusions –** Traumatic Brain Injuries are mostly mild to moderate with low mortality rate. RTAs are the most common mode of injury.

KEYWORDS

Traumatic Brain Injury, Road Traffic Accidents, Glasgow Coma Scale – Pupil Score.

INTRODUCTION

Traumatic Brain Injury (TBI) is defined as mechanical damage to the brain resulting in disruption of brain function. It may be mild, where the patient is conscious and ambulatory, moderate head injury causing transient loss of consciousness, or it may be severe enough to render the patient unconscious and even lead to death. It may cause a focal neurological deficit or may diffusely involve the brain resulting in cerebral edema or intracranial bleeding (1). As per recent estimates, 69 million people sustain TBI annually. Road Traffic Accident (RTA) is a major cause of TBI in South East Asia (56%). Other causes of TBI include – falls, assaults, trauma during sports or recreational activities.

TBI is a major cause of global morbidity and mortality in both children and adults, thus putting a burden on the health care infrastructure (2,3). Outcome in TBI depends on clinical assessment and imaging studies. Basic predictors to prognosticate TBI clinically include – Patient's age and comorbidities, Glasgow Coma Scale (GCS) score, Pupil Reactivity and any other major life-threatening injuries. Non-contrast CT Scan of Brain is the investigation of choice in Emergency setting for evaluation of TBI. It helps to understand the severity and predict its outcome (4).

Outcome of TBI also depends on the quality of Emergency Care, which further depends on both human resources as well as health care infrastructure. Emergency care plays pivotal role in preventing long term disabilities in TBI. (8)

This study was ensued to classify TBI patients according to their mode of injury and then their characteristics and their outcomes were assessed.

MATERIALS AND METHODS

Study Design –

This prospective longitudinal study included patients for 16 months- 1st September 2022 to 31st December 2023 , from the Surgery Department of Darbhanga Medical College and Hospital, Darbhanga, Bihar. This study was conducted after approval from the Ethical Committee of the Institute. Patients' consents were taken before data collection and proper statistical analysis was done.

Inclusion Criteria –

All TBI patients of any age and sex that were admitted via Surgery Department of the Institute and who gave consent for the study.

Exclusion Criteria –

- Patients not agreed to consent for the study.
- Patients who received primary care and did not prefer admission.
- Patients with other serious life-threatening injuries like Chest, Abdomen, Spine or Limb trauma which could affect outcomes.

Methodology –

The cause of trauma was classified as RTAs, Falls, Assaults, Gunshot Injury, Trauma during sports and recreational activities . The clinical parameter to assess severity used in this study is GCS-P score (9). The imaging assessment was on the basis of NCCT Brain findings. (Fig. 1 showing Extradural Hematoma in a 23yr old male patient of RTA).

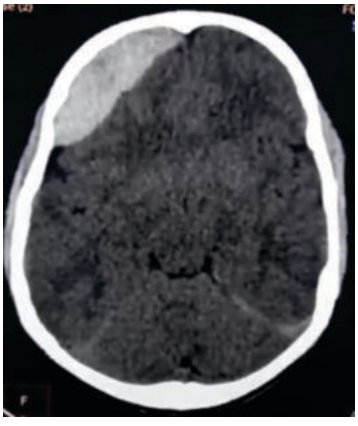

Fig. 1. Extradural Hematoma

The immediate outcome was classified as follows –

- Admission – those who required hospital admission
- Disposed – Discharged from Emergency department after initial management.
- Detained and Disposed – who were kept under observation for 24 hours and then discharged
- Transferred – those who were referred to another hospital due to

any reason

All the information obtained was assembled on a structured proforma.

Statistical Analysis –
Statistical Analysis was done through IBM Statistical Package for the Social Sciences for Windows version 24.0. For continuous variables, the mean was calculated. For categorical variables, percentages were calculated.

RESULT

Enrolled Patients –
A total of 2,354 TBI patients attended the Surgery department of the Institute, of which, after applying the Inclusion and Exclusion criteria , 313 patients were excluded. Thus our study population comprised of 2,041 patients of TBI, of which 1,538 patients belonged to low socio-economic status (75.4%), 351 patients belong to middle socio-economic status (17.2%) and 152 patients belong to high socio-economic status (7.4%) as per Revised Kuppuswamy Scale (Jan, 2021). There were 1436 male patients (70.4%) and 605 female patients (29.6%) in this study.

Age Distribution Of The Patients –
The mean age of the patients is 31.85 years. From this study, the incidence of TBI is highest among 20-40 years age group (48.8%) , followed by 0-20 years age group (24.9%).Only 7.2% TBI patients belong to above 60yrs age group, while 19.1% belong to 40-60 years age group.

Mode Of Trauma –
When the mode of trauma was assessed, RTAs were found to be the most prevalent cause of TBI, accounting for 1144 cases of RTA (56%). The second most common cause of TBI was Assaults with 672 cases (33%). Other minor causes include falls (8%) , Trauma during sports (2%) and Gunshot injury (1%).

Correlation of Socio-economic Status with Mode of Injury –
When the Socio-economic statuses of the patients were compared with their Mode of Injury, the following results were obtained. The study shows RTAs and Assaults are more common among Low Socio-Economic groups , while Trauma during Sports and Gunshot injury are more common among High Socio-Economic groups. (Fig 2)

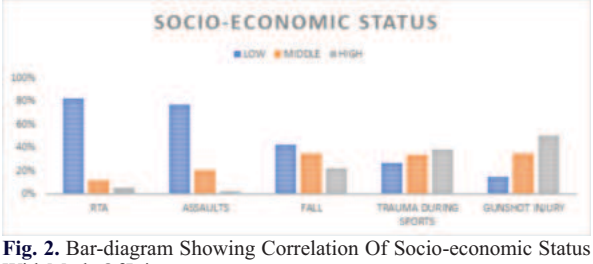

Fig. 2. Bar-diagram Showing Correlation Of Socio-economic Status With Mode Of Injury

Correlation of Age with Mode of Injury –
When the mode of injury was compared with age group, it was found RTAs, Assaults, Trauma during Sports and Gunshot injuries were common among young population, while Falls are more prevalent among extremes of age. (Fig. 3)

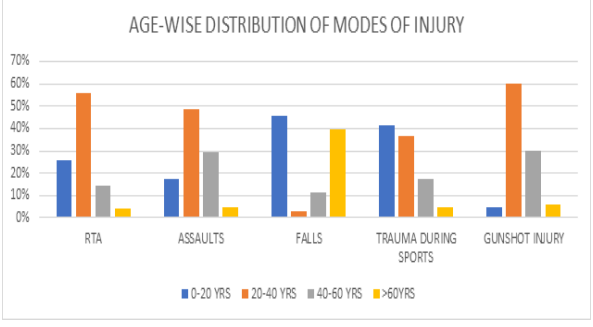

Fig. 3. Age-wise distribution of different modes of injury

Types of TBI –
Out of 2041 patients, 1246 patients had a normal NCCT Brain. Abnormal CT findings were present in 795 patients. 335 patients had EDH (16.4%), 190 patients had SDH (9.3%), 198 patients had SAH (9.7%), 442 patients had intracerebral haemorrhage/ contusions (21.7%) and 430 patients had skull bone or facial bone fractures (21.1%).

Clinical Severity of TBI –
Based on GCS-P Score (9), the patients were classified into mild, moderate and severe TBI. In our study, there were 1307 mild cases (64%), 406 moderate cases (20%) and 328 severe cases (16%).

Correlation of Clinical Severity with Radiological Findings –
Out of 328 cases of Severe TBI in our study, we had 221 cases of EDH (67.4%), 184 cases of Intracerebral hemorrhage (56%), 143 cases of Skull bone fractures (43.6%), 77 cases of SAH (23.4%) and 49 cases of SDH (14.9%).

In case of Moderate TBI, out of 406 cases, there were 172 cases of normal NCCT brain (42.4%), 114 cases of EDH (28%), 104 cases of Intracerebral hemorrhage (25.6%), 99 cases of Skull bone fracture (24.4%), 86 cases of SAH (21.2%) and 48 cases of SDH (11.8%).

In case of Mild TBI, out of 1307 cases, 1074 patients have a normal NCCT Brain (82.2%), 187 patients have facial bone fracture or a hairline skull bone fracture (14.3%), 154 patients have multiple tiny hemorrhagic contusions (11.8%) and 93 cases of SDH (7.1%). There were no cases of EDH and SAH among Minor TBI group. (Fig. 4) .

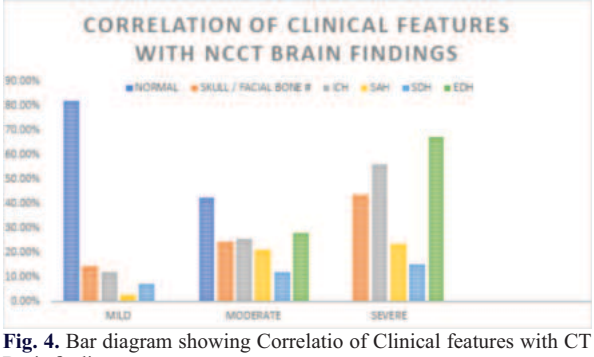

Fig. 4. Bar diagram showing Correlatio of Clinical features with CT Brain findings.

Thus from the above finding, we can conclude that the probability of getting intracranial bleeding (EDH/SDH/SAH/Intracerebral bleed) is more among the Severe TBI as compared to mild and moderate ones. Hence Clinical Severity matches with Radiological Findings.

Outcome –
After a full assessment and all first aid measures, the immediate outcome of TBI patients was categorised into four classes – admission, disposed, detained and transferred. Disposed patients were not included in the study, as they were lost to follow up. Admitted and Detained patients received treatment as per their clinical grading and radiological findings and followed up till 6 months of injury. Transferred patients were traced and followed up accordingly.

Patients with a normal NCCT Brain were managed as per their injuries and discharged after 48 hours of observation. Average length of Hospital stay for Minor Head Injury was 3 days, almost 85% patients being discharged by 48hrs. 6 month follow up showed no residual neuro-deficit.

Patients with moderate head injury also responded well to treatment. Most of the patients were managed conservatively, while a few required intervention. There were no mortality among this group. Average length of Hospital Stay for patients in this group was 10 days, though 70% patients were discharged by 7th day. Till 6 months follow up all patients were doing well having no disability or residual neuro-deficit.

Severe TBI patients did not have a good outcome. They were provided life support and definitive intervention as per need. Out of 328 patients, 32 patients died within 24 hours of admission (9.7%), 296 patients did survive. However, only 196 of them had a complete recovery by 6 months (59.7%), while rest 100 patients still had residual paralysis (30.5%).

DISCUSSION

In this Prospective Longitudinal Study of TBI, from a Tertiary Hospital in North Bihar, Road Traffic Accidents were identified to be the most common cause (56%). This finding is coherent with our National data (7). The second most common cause of TBI was found to be Assaults (33%) in this study, which differs from the National data, where Falls have been attributed as the second most common cause of TBI in India (7). The reason for this variation can be many like – poor literacy rates, poor enforcement of laws, etc.

In this study it was observed that mostly young (21-40 years) and productive population is getting affected by TBI and majority of patients were males(70.4%) which is close to the IMPACT study (2007), according to which TBI case are dependent on age (10) . Study of M.K.Goyal, et al. (2010) also concluded that most affecting age group to be 21-40 years and 66% were males (11). Road traffic accidents (60%) was found to be major common mode of injury which is close to the similar finding i.e. 65.73% in the study of A. Pathak, et al. (2008) (12).

From this study, we found that most of the TBIs are mild in nature (64%), which have a very good prognosis, with no mortality or residual disabilities till 6 months of follow up. However, severe cases (16%) had poor prognosis – around 80% survived and 20% expired. Among the patients that survived, 30% had residual neuro-deficit even after 6 months. Poor prognosis among severe cases can be attributed to lack of timely ambulance service, lack of facilities at Primary and Secondary levels of Health Care, and lack of sufficient ventilators and ICU beds at Tertiary levels.

A correlation does exist between the Clinical Severity and Radiological findings in TBI patients , as evident from higher incidence of intracranial hemorrhage in Severe cases compared to moderate and mild cases. This is helpful particularly in predicting outcome and initiation of treatment.

Overall TBI has a good prognosis with a overall mortality of only 1.6%, as per our study, which is close to study of Ram et al in 2014. Low GCS score at admission was associated with poor outcome .

CONCLUSION

The trends of TBI has been shown in this study. Major culprits include RTAs and Assaults in North Bihar. Most cases are mild with a favourable outcome. Mortality in TBI is generally low. However, due to lack of resources, and travel distance outcome is poor for severe cases. There exists a positive correlation between clinical assessment and imaging studies, which is helpful in predicting outcome and thereby necessary actions can be taken.

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