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Assessment of Differential Care among Traumatic Brain Injury Patients with Comorbidities and Without Comorbidities

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ABSTRACT

Traumatic Brain Injury refers to brain injury induced by head trauma. There are numerous potential causes including road traffic accidents, assaults, falls, and mishaps at home or at work place. Traumatic brain injury is a general phrase that encompasses a variety of brain ailments, such as diffuse axonal injury, intracranial hemorrhage, contusion, focal injury, and diffuse injury. The main objective of this extensive study is to assess the clinical profile and co morbidities of 152 individuals who have been diagnosed with TBI in a tertiary care hospital. This study shows complex gender and age dependent susceptibility patterns, with adults being more vulnerable. In terms of gender men are consistently slightly more prevalent than women. Co morbidity analysis uses tailored healthcare approaches to demonstrate variances in clinical outcomes for co morbidities such as Diabetes mellitus, Hypertension, Coronary artery disease, cardiovascular illness, and so on. Symptom analysis emphasizes the severity and variety of Traumatic Brain Injuries, emphasizing the importance of individualized therapy interventions. Prescription utilization patterns imply a more complex approach to traumatic Brain injury care. Diagnostic imaging, illness distribution, and Glasgow coma scale measurements provide thorough grasp of the clinical environment. Treatment choices are guided by the mechanism of injury. Medication use trends show a prudent choice of medications, with IV fluids, antibiotics, antiplatelet, anticoagulants, NSAIDS, corticosteroids, and analgesics all play important roles. The examination of the pharmacological regimen demonstrates a patient centric approach, taking into consideration severity of the injury, co morbidities, and specific patient characteristics. A balanced view point on prescription patterns is presented in the study's conclusion, underscoring a sophisticated comprehension of therapeutic approaches. In conclusion this study compares the severity of injury in patients with and without co morbidities and offers alternative treatment for each group. In summary this study differentiates care across patients with co morbidities and without co morbidities based on severity of their injuries. Providing critical insights for individualized interventions and well-informed choices and the measures of Glasgow coma scale helps to advance our understanding of TBI and prepares the way for more precise and tailored interventions in clinical practice.

***Keywords**: Traumatic brain injury, Comorbidity, morbidity*

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INTRODUCTION

Traumatic Brain Injury (TBI) is an injury to the brain brought on by the physical trauma that can arise from events such as car crashes, athletic competitions, falls, and physical assaults, among other things. Cognitive impairment, Information processing, language, memory, focus, reasoning, abstract cognition, assessment, resolving problems sensory, intellectual, and motor skills, psychosocial behavior, or bodily functioning are all areas where a traumatic brain injury must be severe enough to cause impairments (1–3).

Tragically, India has emerged as the global center for traumatic brain injury (TBI), with numerous people experiencing these injuries every year. In recent years, these injuries became a significant public health

issue in India (3). RTIs mostly happened in men between the ages of 15 and 40, and 66% of them happened at night or in the later of the day.
Reducing subsequent damage to the brain is the main goal of treatment for TBI. Therefore, maintaining appropriate cerebral perfusion and optimizing oxygenation, blood pressure, and intracranial pressure are the goals of this treatment (4). Additionally, controlling seizures, blood sugar, temperature, and other factors that could result in secondary brain injuries is crucial. Every member of staff who keeps an eye on a patient who has had a head injury needs to be taught to evaluate pupils and the GCS (5). When a patient arrives at the hospital, the ABC must be the primary focus right away, and any evaluation of the TBI must only start after the ABC interventions have been started (6).
Significance of Comorbidities in TBI: Among the individuals with TBI, co-morbidities may have a detrimental effect on the healing process and lead to permanent impairment. Although several co morbidities are highly prevalent in TBI, little is known about how they relate to the functional outcomes of patients (7).
Impact on recovery: After a TBI, the brain's capacity to repair can be adversely affected by pre-existing medical disorders such as diabetes, hypertension, or cardiovascular disease. This could result in a delayed recovery and more impairment (8).
Complication risk: Individuals with co morbidities and TBI may be more susceptible to developing other health problems, such as anxiety, sadness, chronic pain, seizures, or cognitive impairment. Tailored therapy regimens: To create a customized treatment strategy that tackles the TBI and the co morbidities, it is essential to comprehend the patient's current medical circumstance (9).
After a TBI, it's critical to closely monitor any pre-existing conditions because they can worsen or need modifying treatment plans (10,11). Common co morbidities linked to traumatic brain injury include: Mental health issues: PTSD, anxiety, and depression Conditions causing chronic pain: Back pain, musculoskeletal pain, and headache. Heart-related problems: Coronary artery disease and hypertension Metabolic disorders: excessive cholesterol, diabetes
Neurological disorders: stroke and epilepsy. Hyperglycemia has been found to be a separate risk factor for death in TBI. In addition to driving studies to ascertain the impact of traumatic hyperglycemia, this discovery spurred investigations into the relationship between diabetes mellitus, or DM, and poor outcomes after traumatic brain injury. These investigations showed that the patient death rates for DM patients who suffer a TBI are significantly higher (12). The majority of research on the impact of blood pressure on TBI outcomes has focused on showing that acute hypotension is a reliable indicator of poor patient outcomes.
TBI has been linked to the use of illegal substances and alcohol. According to a previously published research analysis, about 2/3rd of individuals with TBI have a previous history of past usage, and around half were inebriated when they were injured. It is noteworthy that intoxication with drugs or alcohol at the time of injury has been linked to poorer functional outcomes but has produced conflicting findings in the literature on fatality rates (7). Additionally, TBI results, such as mortality, for a long time functional outcomes, along with additional squeal, have been linked to a history of substance usage (12).
The aim of this study is to perform assessment the differential care among the patients of TBI with co morbidities and without co morbidities.

MATERIAL AND METHODS

Study Protocol

It is an institutional-based prospective observational study to be conducted for 6 months. Patients under the study criteria will be included in the study, which will collect data from the case sheets.

Study design

It is an institutional-based prospective observational study.

Study site

the study is to be conducted in the Intensive neuro care unit (INCU) at Yashoda Hospital, Secunderabad, and Telangana.

Study period

The study was conducted for six months.

Study population

The sample size is about 152 patients.

Study criteria

Inclusion criteria

- This study includes all the patients admitted to INCU, who have been diagnosed with TBI.
- Patients with co morbidities and without co morbidities.

- Patients under the adult age group of 20-80 years.
- The study consists of both male and female patients.

Exclusion criteria

- This study excludes pediatrics, children, and under the age group of 19 years and below.
- Outpatients are excluded from the study.
- Pregnant and lactating women are also excluded.
- Patient case sheets with incomplete data are excluded.

Statistical analysis

- The Statistical data was analyzed using SPSS software. The categorical variables were expressed by percentage.
- CHI – SQUARE test was used to calculate p value < 0.005 is considered as statistically significant (13,14).

RESULT AND DISCUSSIONS

Demographic data

In the present study population 152 patients were enrolled who have been diagnosed with TBI in the tertiary care hospital. The study population is enrolled to analyze the TBI patients with and without co morbidities in the tertiary care hospital (8,15).

According to **table 1** distribution based on gender, the percentage Males are predominant than Females, where males are of 79.605 % and females are of 20.395 %. it was concluded that males are more prone to TBI under the age group of young adults (when compared to females). The main reason behind this is due to several factors such as more driving, alcohol consumption. But according to the research that is currently available, some of the risk factors include things like road design and operation, vehicle safety features, failure to wear a helmet, seat belt, or child restraint, driving while intoxicated, speeding, poor visibility, a lack of sidewalks for pedestrians, and discipline (16,17). The study population of males among the age group of 21 – 40 is nearly 71% as shown in **table 2** which may be due to various reasons of more driving than females; significant relationships were found between age and surgical interventions.

Table 1: Distribution of Study Population Based on Gender

Gender	No. of Patients	Percentage (%)
Male	131	79.605%
Female	21	20.395%

Table 2: Age and Gender-Wise Distribution

AGE GROUP (in years)	MALE	FEMALE	PERCENTAGE (%)	
			M	F
21 – 30	38	7	84.10%	15.90%
31 – 40	33	5	86.84%	13.16%
41 – 50	25	3	89.28%	10.72%
51 – 60	11	2	84.61%	15.38%
61 – 70	10	12	45.45%	54.54%
71 – 80	4	2	66.66%	33.34%
Total	121	31	80.60%	19.40%

Distribution based on severity of injury

The data distribution based on severity of injury to the number of patients associated with injury (Figure 1). It shows that the moderate TBI is predominant among mild, and severe with 61%, where they account for mild 17.10%, severe 21.71% as shown in **table 3**.

Distribution of study population based on comorbidities associated with various types of TBI, the chi-square test statistic is 2.8674. The *p*-value is < 0.00001. The result is not significant at $p < 0.005$. This depicts that there is no significant relationship among co morbidities and the population among various types of TBI as shown in **table 4** Comorbidities are observed in the above adult age group of >30 years, various comorbidities such as HTN, DM, CVA, CVD are evaluated (18,19). The systematic review on co morbidities in adults and all causing mortality, a large population-based studies data supports co morbidities as a predictor for short-term and long-term effects. A study on medical co morbidities associated with outcomes in patients concluded that co morbidities associated demonstrated significant relationships with outcomes (20).

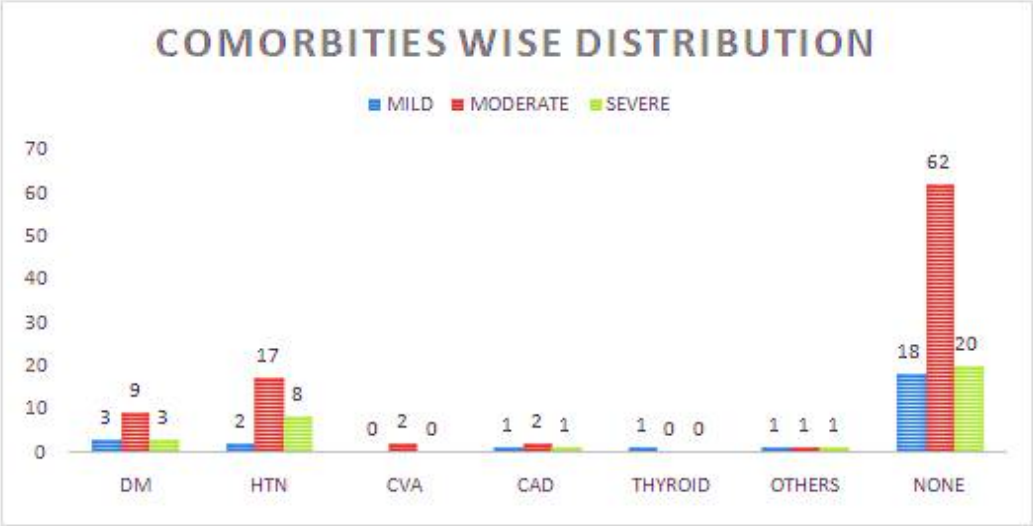

Figure 1: Distribution based on comorbidities

Table 3: Distributions Based on Study Population

TYPE OF TBI	NO. OF PATIENTS	PERCENTAGE (%)
MILD	26	17.10%
MODERATE	93	61.18%
SEVERE	33	21.71%

Table 4: Distribution of Study Population Based on Comorbidities Associated with Various Types of TBI

COMORBIDITIES	MILD	MODERATE	SEVERE
DM	3	9	3
HTN	2	17	8
CVA	-	2	-
CAD	1	2	1
THYROID	1	-	-
OTHERS	1	1	1
NONE	18	62	20

Distribution based on mechanism of injury

The chi-square test statistic is 43.0662. The *p*-value is < 0.00001. The result is significant at $p < 0.005$. This result shows that the significant relationship among various mechanisms of TBI and number of cases received. The number of cases accounted for hemorrhages-4, DAI-6, concussion- 2, contusion- 27, hematoma- 17 as shown in **table 5,** distribution of study population based on clinical features as shown in **table 6,** this data distribution deals with the number of patients experienced the clinical feature such as 104 members with edema,80 with hemorrhage,97 with seizures,92 with vomiting,129 with LOC,9 with mass effect,60 with MLS, and 92 with polytrauma. table illustrate distribution based on clinical features associated with TBI. It can be concluded that most of the patients have clinical feature of LOC, Edema, Seizures or Vomiting, and poly trauma predominantly, least noticed features are either MLS or Mass effect.

Distribution based on mechanism of injury is shown in Figure 2.

Table 5: Distribution Based on Mechanism of Injury

MECHANISM	YES	NO
HEMORRHAGE	4	148
HEMATOMA	17	135
CONTUSION	27	125
CONCUSSION	2	150
DAI	6	146

Table 6: Distribution of Study Population Based on Clinical Features

Clinical features	No. of patients
Edema	104
Hemorrhage	80
Seizures	97
Vomiting	92
LOC	129
Mass effect	9
Mid line shift	60
Poly trauma	92

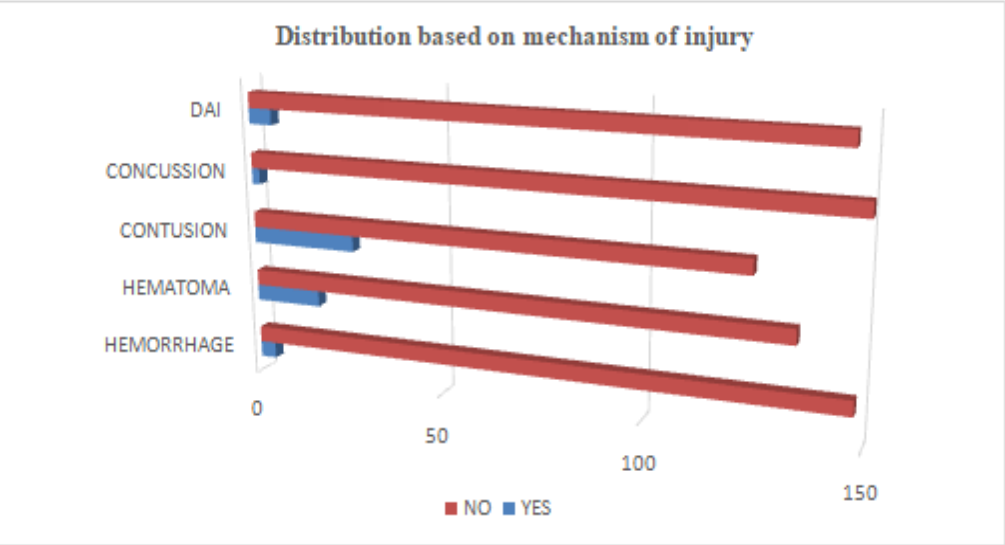

Figure 2: Distributions based on Mechanism of injury

Distribution of study population based on Glasgow Coma Scale (GCS)

Table 7 illustrates GCS score wise distribution of the study population. It can be concluded that most of the patients were diagnosed with moderate TBI (9-12) with medium GCS score (n=93).

Table 7: Distribution of Study Population Based on Glasgow Coma Scale (Gcs)

	LOW	MEDIUM	HIGH
GCS SCORE	26	93	33

Distribution of various drugs in TBI

The **table 8** represents classification of drugs used in the management of TBI. It indicates that antiepileptic is used mostly as prophylaxis therapy to prevention of epilepsy or seizure episodes.

Table 8: Distribution of Various Drug Classes in TBI

Drug category	Number
Anticoagulant	10
Anti-platelets	2
Anti-epileptic	90
Anti-hypertensive	27
Anesthesia	26
Antibiotics	72
Supplements	21
Pain medication	28

Distribution of study population based on stat medication- age wise

The type of drugs used in the treatment of TBI include drugs such as diuretics, Mannitol, anticonvulsants such as levepil, NSAID paracetamol etc (21). Usually, the management includes diuretics are one type of medication that can be used to treat TBI. Usually, its purpose is to the decrease volume of fluid in the

tissue. Mannitol, Furosemide and anticonvulsants are used. Usually, they are employed to stop seizures from causing more damage. Carbamazepine induces levetiracetam coma. Furthermore, analgesics are also utilized as drugs (22). They are often helpful in treating traumatic brain injury by lowering pain. TBI is also treated with a variety of medications, including as aspirin, propofol, and pentobarbital as shown in table 8 and table 9.

Table 9: Distribution of Study Population Based on Stat Medication Age Wise

Age group	Tranexamic acid	Levetiracetam	3%Nacl	Mannitol	Ceftriaxone
21-30	10	25	14	9	23
31-40	5	22	4	7	11
41-50	4	19	4	2	9
51-60	1	7	2	1	5
61-70	4	11	1	2	6
71-80	0	3	3	2	3

CONCLUSION AND LIMITATIONS

The study on assessment of differential care among the patients with co morbidities and without co morbidities in TBI, it includes the sample size of 152 patients diagnosed with TBI, illuminated critical aspects of their clinical profile. The age and gender distribution revealed the susceptibility with higher vulnerability among adults, particularly in those between the age group 21 to 40. Gender specific factors were evident as males, predominantly with road traffic accidents may be due to several factors such as drunk and drive, violation of traffic rules, and skid and falls from two wheelers. The majority of study population is young adults where no co morbidities were found in most of the cases. The presence of preexisting co morbidities is however restricted to the age group of above 30 years.

The management of TBI in INCU is followed as per guidelines and standard therapy remains constant irrespective of co morbid or non co morbid conditions. We found that the treatment pattern was found to be differential among severity of TBI. It is single centered hospital based observational study and thus may not represent actual population. The cohort of patients was highly selective and there was no follow-up. We could not compare study subjects with healthy controls.

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Competing Interest

None

Ethical Approval

The study was approved by the Institutional Review Board of Anurag University bearing the research proposal number: IRB-AU/2024-2025/07.

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