

Psychiatric sequelae of traumatic brain injury (TBI)



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ABSTRACT

Background: Traumatic brain injury (TBI), a leading cause of morbidity and mortality worldwide, is an alteration in brain function, caused by an external force. With rapid surge in urbanization, motorization and economic liberalization in India, risk of TBI is increased, raising a cause for concern about its neurological as well as psychiatric sequelae. **Aims and Objectives:** This study was planned to understand the magnitude of the problem which could give us insights to manage/ rehabilitate it in a more comprehensive manner. **Materials and Methods:** The current study included 50 patients aged 18-60 years at DY Patil Medical College, Pune. GCS scores were noted for severity of TBI. Patients were assessed through MMSE, BCRS, HAM-A & BDI. **Results:** On GCS, 20% cases had severe head injury; 22% moderate and 58% had mild. On MMSE initially, at six months and one year; 26.19%, 21.88% & 11.1% cases had cognitive impairment respectively. On BCRS, 38.10%, 34.4% & 37.10% cases had cognitive deterioration initially, at six month & at one year respectively. On HAM-A, mild & moderate to severe anxiety was found in 64.3% & 35.7% cases respectively. On BDI, initially 7.14% cases had depression, 25% at six months and 37.05% after one year. No statistically significant change was seen in BCRS score during follow up. Comparison of the mean scores at first interview and at six months demonstrated statistically significant (P-value $p < 0.005$) differences in MMSE as well as BDI. **Conclusion:** TBI is associated with an increased risk of psychiatric disorders and may need psychiatric interventions later.

Key words: Cognitive deficits; Depression; Anxiety; Psychiatric sequelae; Traumatic brain injury

INTRODUCTION

Traumatic brain injury (TBI) is a major global health problem with an annual incidence of 10 million¹ and is a leading cause of morbidity and mortality worldwide.² Traumatic brain injury (TBI), also called intracranial injury, is a non-degenerative, non-congenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical, and psychosocial functions, with an associated diminished or altered state of consciousness.³ TBI has been defined as “an alteration in brain function, or other evidence of brain

pathology, caused by an external force”.⁴ The alteration in brain function may manifest as a loss or decreased level of consciousness, alteration in mental state, incomplete memory for the event, or neurological deficits.⁵ Examples of external forces include the head striking or being struck by an object, rapid acceleration or deceleration of the brain, penetration of the brain by a foreign object, and exposure to forces associated with blasts.

In the USA 1.6 million people sustain a TBI each year, out of which approximately 50,000 people die from TBI and 125,000 are disabled one year after injury.⁶ In Europe

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annually 1.6 million patients with TBI are admitted to hospital and 66,000 die.

In comparison to other parts of the world, Asia has the highest percentage of TBI-related outcomes as a result of falls (77%), unintentional injuries (57%) and road traffic accidents (48%).⁷ The outlook in the developing countries like India is less encouraging. Every year 30,000 persons die and 125,000 persons are disabled due to TBI.⁸ Road traffic accidents 60%, Falls 20-25% and Violence 10% are the leading cause of TBI. Out of these 15-20% are related to alcohol alone.⁹

TBI is associated with an increased risk of developing numerous psychiatric disorders and will need psychiatric interventions years after the injury.¹⁰ It may cause lifelong problems for those who are victims of it, their care givers and for the society as a whole. Risk factors for sustaining a TBI include male sex, younger age (peak at 15-24 years with a similar peak in the elderly), alcohol, lower socioeconomic status and a psychiatric history.¹¹ Mood and behavioural problems after traumatic brain injury interfere with rehabilitation efforts and cause adverse outcomes such as unemployment, repeated hospitalizations, legal problems, and alienation from family and friends.¹² In addition, these effects are amplified by high rates of psychiatric co morbidity in patients with traumatic brain injury.¹³

TBI is one of the major health issues in India which will increase in time with increase in the population on one hand, increase in two and four wheelers on the other. So, there is a cause for concern about TBI and its neurological as well as psychiatric sequelae. Keeping in view of this, this study was planned to understand the magnitude of the problem which could give us insights to manage/ rehabilitate it in a more comprehensive manner. The objectives of this study were to evaluate the psychiatric sequelae of TBI, its severity and to evaluate and correlate anxiety, depression and cognitive functions with TBI.

MATERIALS AND METHODS

This study was carried out over a period of 27 months (July 2011 to September 2013) with 50 consecutive patients in the age group of 18-60 years (as the percentage of occurrence of moderate or severe TBI is the highest in this age group in India [21-30 years (29.68%), followed by 31-40 years (18.07%)])¹⁴. Consecutive patients with head injury attending a tertiary care hospital were included and patients with previous psychiatric problems, repeat traumatic injury and history of epilepsy, hypertension & diabetes mellitus were excluded from this prospective and observational study. Socio-demographic details of pre-injury alcohol consumption, number of years of formal

education, occupational status and social class, history of a previous head injury, history of a psychiatric illness and family history of a psychiatric illness were noted.

Glasgow Coma Scale scores [The GCS being the most common scoring system used to describe the level of consciousness in a person following a traumatic brain injury, measured by functions of Eye opening (score 0-4), Verbal response (score 0-5) and Motor response (score 0-6) and classified as severe (≤ 8), moderate (9-12) and mild (13-15)] were taken into consideration for severity of the brain injury. Patients were assessed through Mini Mental Status Examination [The MMSE is a 30-point questionnaire used extensively to measure cognitive impairment and scored as uncertain cognitive impairment (24-30), mild (19-23 points), moderate (10-18 points) or severe cognitive impairment (≤ 9 points)], Brief Cognitive Rating Scale [used to assess global cognitive deterioration either due to brain injury or degenerative disorders of the brain and having five domains rated from 1-7. The total score is divided by 5. Less than 3 being normal to very mild, 4-5 is moderate and 6-7 is severe], Hamilton Anxiety Scale [one of the first rating scales developed to measure the severity of anxiety symptoms. The scale consists of 14 items; each item is scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0-56 where 14-17 = Mild Anxiety, 18-24 = Moderate Anxiety and 25-30 = Severe Anxiety] and Beck's Depressive Inventory [based upon clinical observations and descriptions of symptoms frequently experienced by depressed psychiatric patients. There are 21 items. Each one is scored on a Likert scale of 0-3. Total score = 0- 63. As a general rule, 0-10 is considered to be within normal range; 11-16 indicates mild mood disturbance; 17-20 indicates borderline depression; 21-30 indicates moderate depression; 31-40 indicates severe depression and over 40 indicates extremely severe depression].^{15,16,17,18}

RESULTS AND DISCUSSION

Out of 50 recruits for the study, eight (16%) expired during hospital stay and 10 (20%) could not be followed up for six months. Hence psychiatric evaluation could be done on the remaining 32 registered patients and their results were statistically analysed. The first interview was done on the day of discharge of the patient from the hospital; second interview was done after six months and the third interview after one year.

Mean age of the sample was 34.82 with a SD of 13.30. Majority (62%) of cases who sustained brain injury were below the age of 35 years (Figure 1) and 46% of them were males. Sixty percent of the population was employed; however it was not statistically significant (Figure 2).

Although an old study, Hillbom's (1960) follow-up of 3552 wartime head injuries, of which 1505 were penetrating, showed cognitive impairment in 2%, changes of character in 18% and severe neuroses in 11%.¹⁹ Similarly, Ota's (1969) large series of 1168 closed head injuries among Japanese civilians showed cognitive impairment in 3%, changes of character in 6%, psychoses in 5% and neuroses in 22%.²⁰

Chaudhury et al¹⁰ highlighted the close link between head injury and psychiatry and provided an overview of the epidemiology, risk-factors, and mechanisms of psychiatric sequelae including, cognitive deficits, substance abuse, psychoses, mood disorders, suicide, anxiety disorders, dissociative disorders, post-concussion syndrome, and personality changes following head injury.

A large scale study of 254 people showed a higher rate of cognitive, behavioral and emotional changes at five years than at two years post-TBI. 32% of those working at two years were unemployed at five years.²¹ In cases of chronic TBI, the rate of psychosis is 20%, depression is 18-61%, mania is 1-22%, PTSD is 3-59% and post TBI agitation is 20-40%.²²

In our study, on Glasgow Coma Scale, 10 cases (20%) had severe head injury; 11 cases (22%) had moderate injury and the rest 29 cases (58%) were mild type. (Figure 3)

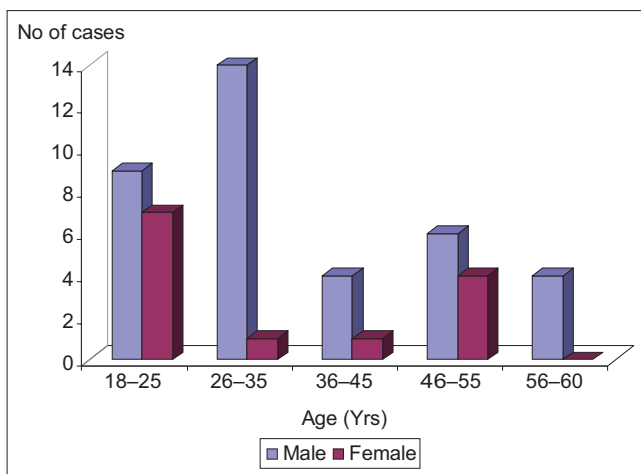


Figure 1: Bar diagram showing age and sex in study

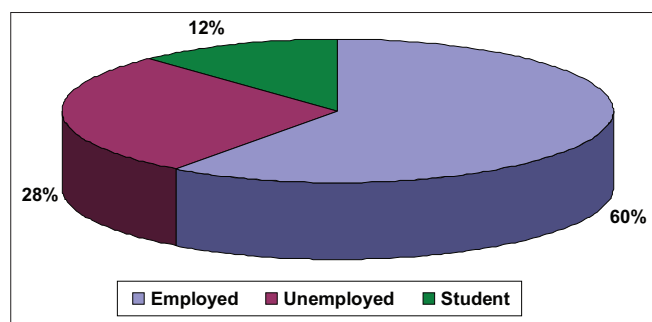


Figure 2: Pie diagram showing employment status in study group

Cognitive impairment was assessed by the use of Mini Mental Status Examination. 11 cases (26.19%) had definite cognitive impairment as they were below cut off score of 23. After six months, the number had reduced to seven cases (21.88%) with cognitive impairment. After one year it had further reduced to three cases (11.1%). (Figures 4-6)

On BCRS, cognitive deterioration was seen in 16 patients out of 42 (38.10%) at the first interview; in 11 out of 32 (34.4%) at six months and 10 out of 27 (37.10%) at one year. (Figures 7-9)

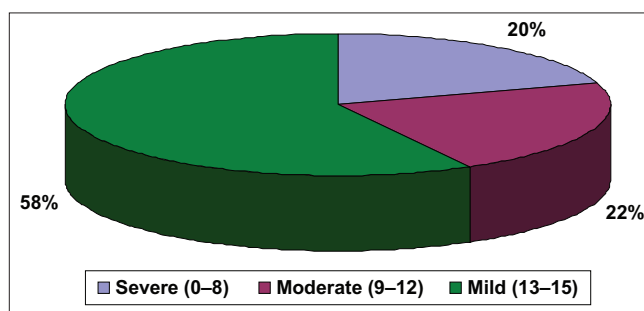


Figure 3: Pie diagram showing GCS score in study group

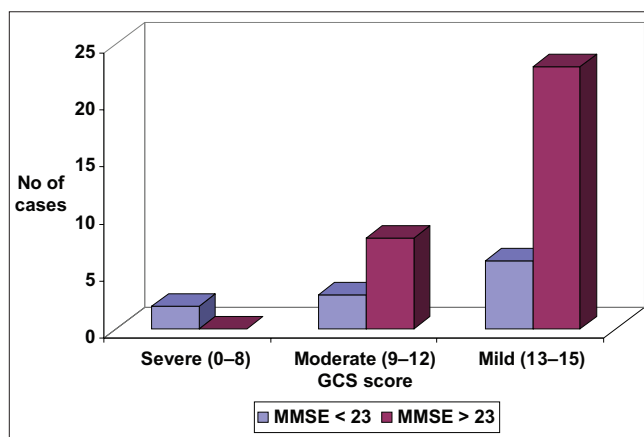


Figure 4: Bar diagram showing association between GCS score and MMSE at 1st interview in study group (N=42)

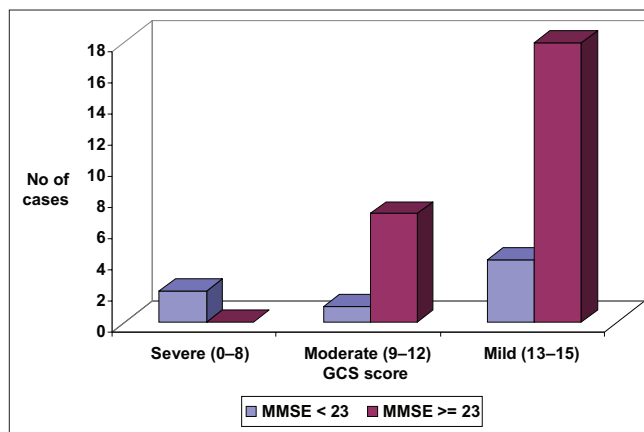


Figure 5: Bar diagram showing association between GCS score and MMSE after 6 months

Studies show that anxiety disorders, including generalized anxiety disorder, panic disorder, phobic disorders, PTSD and OCD are common after TBI and range in frequency from 11% to 70%.^{23,24,25}

On Hamilton Anxiety Scale (HAM-A), mild anxiety was found in 27 cases (64.3%) and moderate to severe anxiety

in 15 cases (35.7%). After six months, only 18.75% cases had moderate to severe anxiety and hence the percentage of mild anxiety cases had risen to 81.25% from the earlier 64.3%. At the end of one year anxiety levels remained unchanged from the earlier 6 months figures.

Depression is one of the major side effects post TBI. As per a previous study, approximately 30% of patients post TBI met the criteria for depression after an year or beyond that; 27% met criteria for depression 3-6 months from injury; 32% at 6-12 months; and 33% beyond 12 months.^{26,27,28}

On Beck's Depressive Inventory, in our study, number of cases with depression rose from initial three cases (7.14%) to 8 (25%) at 6 months and 10 cases (37.05%) after one year follow up. six out of 10 patients (37.50%) had scores of moderate to severe depression (Figure 10).

No statistically significant change was seen in the BCRS score during follow up. Comparison of the mean scores

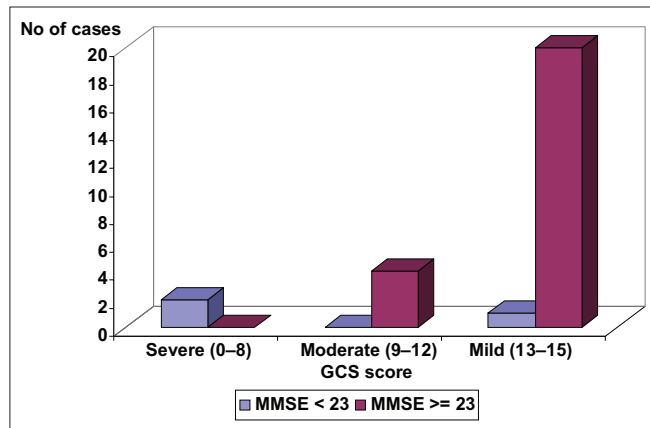


Figure 6: After 1 year in study group

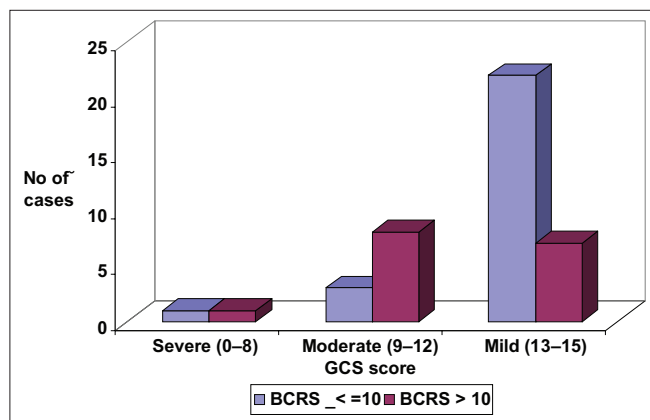


Figure 7: Bar diagram showing association between GCS score and BCRS at 1st interview in study group

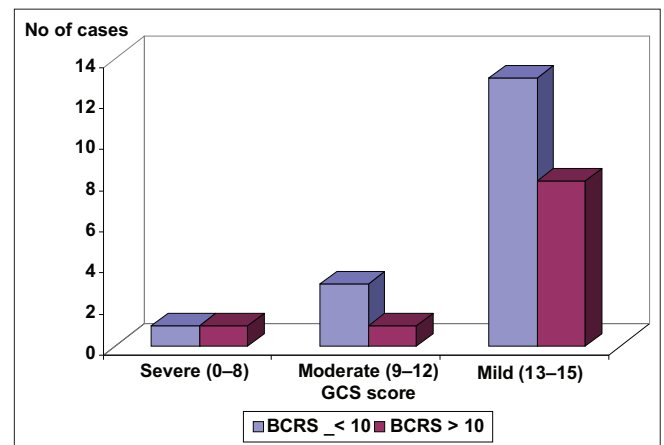


Figure 9: Bar diagram showing association between GCS score and BCRS at 1 year in study group

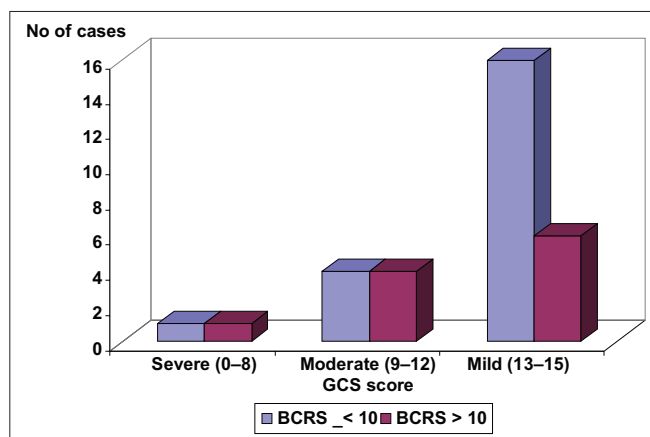


Figure 8: Bar diagram showing association between GCS score and BCRS at 6 months in study group

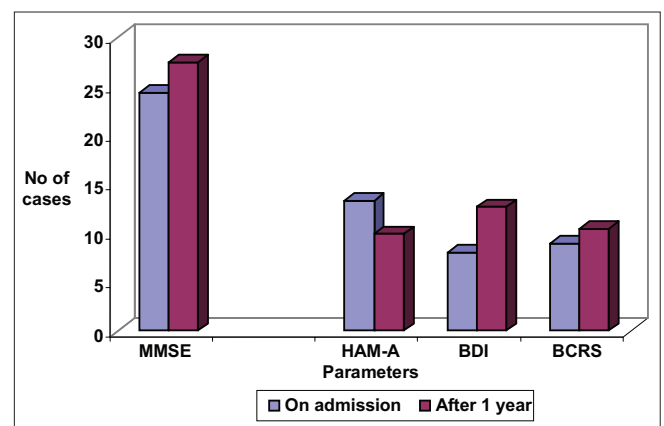


Figure 10: Bar diagram showing correlation of MMSE, HAM-A, BDI, BCRS on 1st interview and after 1 year in study group

at first interview and at six months demonstrated that the differences in MMSE as well as BDI were statistically significant with P-value of $p < 0.005$.

CONCLUSION

Patients with TBI many a times have emotional and cognitive consequences. Our research states that depression is the commonest comorbidity here. However, there is no single factor-psychological, physiological, somatic, or demographic-that uniformly predicts psychiatric comorbidity.

We conclude that TBI is associated with an increased risk of developing numerous psychiatric disorders and will need psychiatric interventions years after the injury. An increased insight into these sequelae with subsequent early psychiatric interventions may result in improved function and limited disability.

Although any injury to the brain is serious, and severe damage can be fatal, medical and surgical advances have improved the odds for surviving a TBI. Nevertheless, coping with the life-changing consequences of traumatic brain injury presents a great challenge for patients, families, physicians, therapists, and society.

Implications of the study

Many countries in Asia are experiencing a rapid surge in urbanization, motorization and economic liberalization leading to an increased risk for TBI.

Future recommendations

TBI is a public health problem that requires appropriate attention from researchers and policy-makers regionally through the development of ongoing surveillance programs and the implementation of effective, evidence-based interventions.

Limitation of the study

One limitation of the study is the relatively small sample size. Secondly comparing our findings with other published studies is rather difficult for several reasons. Firstly, there are major differences in constructing outcome between the studies. Secondly, the duration of follow up is found to be too inadequate due to time constraints. Thirdly, MMSE could not be done in some cases at the first interview and subsequent interviews due to death and drop outs; which might have led to some discrepancies in the results.

Abbreviations

TBI=Traumatic Brain Injury, GCS=Glasgow Coma Scale, MMSE=Mini Mental Status Examination, BCRS=Brief

Cognitive Rating Scale, HAM-A=Hamilton Anxiety Scale, BDI=Beck's Depression Inventory

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Authors Contribution:

AmG - Concept and design of the study, interpreted results, prepared and critically reviewed first draft of medicine; **BD** - Analysed and interpreted the study design, prepared and edited the manuscript; **AH** - Statistically analysed, reviewed the study and co-ordinated the study; **AnG** - Analysed and reviewed the manuscript; **PD** - Analysed and reviewed the manuscript; **DS** - Mentored, guided, thoroughly reviewed and supported the entire project and manuscript.

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