

Disability, cognitive impairment and depression in patients with Traumatic Brain Injury (TBI) – A Prospective Study

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Abstract

Introduction

Traumatic brain injuries are most commonly caused due to RTA in India, which has become the biggest killer. Physical deficits are given importance in the early phase of recovery post-head injury but it is the cognitive impairments and behavioural issues that lead to disability and prevent patients from returning back to work, causing an emotional and financial burden to families.

Aims and objective

Purpose of the study was to assess for disability and cognitive impairment associated with post TBI. Also to assess for the presence and severity of depression in patients suffering from TBI.

Methodology

110 patients of TBI from the neurosurgery in-patient department, recruited from January 2016 to June 2016 consenting to study from a tertiary care hospital are considered for assessment for a period of 6 months by follow up. Disability is assessed by using the WHO-DAS scale, cognitive

impairment is assessed by the HMSE scale and severity of depression is assessed by the HAM-D scale.

Results

In this study out of 110 TBI patients, 21.8% had moderate disability and 8.2% had severe disability. In this study 52.6% suffered from depression and among these 25% had mild depression, 55% had moderate and 20% had severe depression.

Conclusions

This is one of few studies done in south India specifically in Karnataka to assess for the disability associated with post TBI and also to assess for cognitive impairment that patients with TBI suffer post injury. TBI patients suffer from depression, cognitive impairment and significant disability, hence early assessment is required.

Keywords: traumatic, head injury, depression, disability, cognitive impairments

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Introduction

Motor vehicle accidents are the most common cause of head injury, accounting for more than 50%, followed by falls (21%), violence (12%), and injuries from sports or recreational activities (10%) (1).

In India 30,000 people die and 1,25,000 become disabled due to traumatic brain injury (TBI). The psychiatric sequelae of TBI can be acute and chronic. It may also lead to inappropriate aggression, sexual behaviour, personality change, mood changes, post-concussion syndrome, neurotic disorders and psychosis (2).

Traumatic head injuries occur most commonly in young below 45 years old, which causes most of the time

permanent disability costing both to individual and to society (3).

Rockhill CM (4) et al did a study that compares the cost burden of psychiatric disorders in TBI patients with that of non TBI patients and it was found that the average cost of living was 5.75 times higher in patients with psychiatric disorders in TBI than that of patients without psychiatric disorders

85% of head injury cases are mild and hence they do not receive adequate care and follow, but the remaining significant proportion of persons with head injury face with cognitive and psychiatric sequelae years after injury. Hence it is essential to create and increase awareness

regarding post head injury sequelae to limit disability and improve functioning (5).

Treatment of neuropsychiatric sequelae of TBI is complicated and includes pharmacological therapy and rehabilitative interventions, which are equally important. Rehabilitation should begin on the day of the injury and continue until the patient is stable or has reached his or her premorbid functioning condition. Rehabilitation includes behavioural treatment, social skills training, vocational training, individual therapy, group therapy, and family therapy (6).

Cognitive deficits are common complications post TBI, which is one of the main sources to cause potential disability (7).

Memory impairments are most commonly seen post TBI especially affecting recent and remote memory but sparing immediate memory (8).

Delirium, dementia, amnesic disorder, or mild cognitive deficit are some of the common cognitive deficits that occur after head injury which also include impairment of attention, arousal, memory, language, and executive function (9).

Post traumatic brain injury patients suffer from a lot of psychiatric illnesses as sequelae but depression is the commonest and important due to its effect on productivity and quality of life (10,11). It also causes temporary or permanent dysfunction in the brain which

prevents patients from participating in routine activities of society (12,13,14).

Depression following TBI is associated with worst global outcomes (Federoff et al., 1992), worse social functioning during the first year post-injury (Jorge et al., 1993b; Schoenhuber and Gentilini, 1988), and lower health-related quality of life (Christensen et al., 1994; Rutherford, 1977).

Methods

150 patients admitted to the neurosurgery department of a tertiary hospital, in South India who consented and fulfilled the criteria were taken for study from July to December 2016. Patients who consented to the study and who had no previous psychiatric illness were taken for the study. Initially, socio-demographic details were taken, along with an assessment with the HMSE scale. Scale used in these studies are the Hindi Mental Status Examination (HMSE) for assessing cognitive impairment and Hamilton depression rating scale (HAM-D) for assessing depression and its severity. And WHO-DAS (World Health Organisation-Disability Assessment Scale) to assess for disability due to head injury. HMSE scale was again administered at 3rd and 6th months. Depression was assessed by HAM D at 6th month along with WHO DAS to assess for disability at 6 months post traumatic brain injury. During the study 15 patients were lost to follow up in the 3rd month, another 7 died and 18 were lost at the 6th month follow up. So finally 110 patients completed all assessments till 6th month.

Results

Table 1. Association between Severity of injury and WHODAS scale

		Severity of Injury							
		Mild		Moderate		Severe		Total	
		Count	%	Count	%	Count	%	Count	%
WHODAS	Normal	53	81.5%	5	16.1%	5	35.7%	63	57.3%
	Mild	12	18.5%	2	6.5%	0	0.0%	14	12.7%
	Moderate	0	0.0%	24	77.4%	0	0.0%	24	21.8%
	Severe	0	0.0%	0	0.0%	9	64.3%	9	8.2%

ii.

$$\chi^2 = 144.27, df = 6, p < 0.001^*$$

In the study, 110 subjects were rated by 6-WHODAS Scale. Of them 57.3% had normal, 12.7% had mild, 21.8% had moderate and 8.2% had severe psychiatric illness.

Among subjects with mild injury, 18.5% had mild psychiatric illness, among subjects with moderate injury,

the majority i.e. 77.4% had moderate psychiatric illness and among subjects with a severe injury, 64.3% had severe psychiatric illness. There was a significant association between psychiatric illness and severity of injury according to the 6-WHODAS Scale i.e. with an increase in severity of injury there was an increase in the severity of psychiatric illness.

Table 2. Comparison of Mean HMSE score between Severity of injury at Baseline, 3 months and 6 months

HMSE	Severity of Injury								P value
	Mild		Moderate		Severe		Total		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Baseline	25.34	3.47	20.39	2.97	15.71	3.15	22.72	4.76	<0.001*
3 rd Month	27.50	2.79	22.04	3.16	21.00	3.00	25.31	4.04	<0.001*
6 th Month	29.46	1.56	26.46	1.73	24.00	2.45	28.02	2.59	<0.001*

iii.

*ANOVA test

Table 3. Bonferroni test post hoc test

Dependent Variable	(J) Severity of Injury	P value
0-HMSE	Mild Vs Moderate	<0.001*
	Mild Vs Severe	<0.001*
	Moderate Vs Severe	<0.001*
3-HMSE	Mild Vs Moderate	<0.001*
	Mild Vs Severe	<0.001*
	Moderate Vs Severe	0.966
6-HMSE	Mild Vs Moderate	<0.001*
	Mild Vs Severe	<0.001*
	Moderate Vs Severe	<0.001*

iv.

In the study mean HMSE score at baseline in subjects with mild injury was 25.34 ± 3.47 , among subjects with moderate injury was 20.39 ± 2.97 and among subjects with severe injury was 15.71 ± 3.15 . This difference in

mean HMSE with respect to severity of injury was statistically significant. I.e. with increase in Severity of injury there was significant decrease in HMSE score, hence worsening of cognitive functions.

Table 4. Comparison of Mean HMSE score with in the groups of injury in comparison with baseline value

HMSE	Severity of Injury							
	Mean	P value	Mean	P value	Mean	P value	Mean	P value
Baseline	25.34		20.39		15.71		22.72	
3 rd Month	27.50	<0.001*	22.04	0.099	21.00	<0.001*	25.31	<0.001*
6 th Months	29.46	<0.001*	26.46	<0.001*	24.00	<0.001*	28.02	<0.001*

v.

*Paired t-test

Overall there was a significant increase in mean HMSE score at the 3rd month and 6th month compared to baseline i.e. with an increase in the duration of follow-up HMSE score improved irrespective of the severity of the injury ($p < 0.001^*$).

Out of 110 subjects, 38 subjects (34.54%) had a psy-

chiatric illness and 72 (65.46%) subjects had no psychiatric illness.

Out of 38 subjects who were diagnosed with psychiatric illness most common was depression 52.6% (20), 23.7% (9) had GAD, 13.2% (5) had ADS, 5.3% (2) had PTSD, 2.6% (1) had OCD, and 2.6% (1) had Psychosis.

Table 5. Depression among subjects according to HAM-D Severity Rating Scale

		Count	%
HAM-D Severity Rating Scale	Mild Depression	5	25%
	Moderate Depression	11	55%
	Severe Depression	4	20%

In this study out of the 38 subjects who had psychiatric disorders following TBI, 52.6% (20) fulfilled the criteria for depression on the MINI PLUS scale.

Among these 20 subjects who were diagnosed with depression were again assessed for severity using the HAM-D scale and found that 25% had mild depression, 55% had moderate depression and 20% had severe depression.

Discussion

Jiang JY et al (15) in their study of traumatic brain injury concluded that 30% had good recovery (able to return to work or school), 14% had moderate disability (live independently but cannot participate in work or school), 24% had severe disability (unable to live independently but able to follow commands), and 29% died.

Nada Andelic et al in the study reported that one quarter of the patients reported disability requiring personal assistance after TBI. And also reported that One Quarter had major problems with social integration, and 42% were not working. And also demonstrated that nearly half of the patients had poor physical health, and 37% reported poor mental health. Activity limitations and participation restrictions accounted for 50% of the physical health and 35% of the variance in mental health.

Return to work (RTW) following traumatic brain injury (TBI) that is disability following TBI ranges from 12-70% as reported by a study in the Journal of Disability and Rehabilitation (16).

Cognitive impairments like disturbances of attention, memory, and executive functioning are the most common

neurocognitive consequences of TBI. Disturbances of basic cognitive functions like attention and memory problems may cause or exacerbate additional disturbances in more complex cognitive functions like communication and executive functions (17).

In our study among the subjects who were diagnosed with a psychiatric disorder depression was most common at 52.6%, among which 20% had mild depression, 60% had moderate depression and 20% had severe depression.

According to S Chaudhury et al (18), major depression occurs in approximately 25% of patients with a head injury in their study. Diaz AP et al (19) study showed a significant increase in MDD ($p=0.02$) and a significant decrease in alcohol and cannabinoid use ($p=0.01$) along with major depressive disorder and personality changes being the most common psychiatric illness. According to a study by Deb S et al (20) depressive illness was present in 13.9% of the traumatic brain injury patients.

According to Deb S et al incidence of depressive illness present in post TBI patients is 13.9% compared to 0.8% in the general population (21).

According to Koponer S et al commonest psychiatric disorder post TBI is major depression (26.7%) and Koponer S et al also suggests that TBI may cause vulnerability to psychiatric disorders, particularly depressive episodes, delusional disorder, and personality disturbances (22).

Chaudhury et al (18) in their literature review reported and concluded that major depression was the most common cause of psychiatric disorders after a head injury, approximately 44%.

The results of Reballi R et al study were in agreement with the study by Goodison et al (23), who reported that anxiety disorders were the second most common psychiatric disorder after major depressive disorder post head injury.

Whelan-Goodinson et al in their study on 100 patients who were 0.5 to 5.5 years post mild to severe TBI and 87 informants, evaluated at a single time point by using the Structured Clinical Interview for – IV DSM Disorders (SCID-I) found that post injury, 65% had major depression the commonest (45%) among all, followed by anxiety (38%) and substance use disorder (21%). And according to the author more than two-thirds of postinjury depression and anxiety cases were new and showed poor resolution rates.

A national study was conducted in South Korea, which was a national retrospective cohort study, where they

collected data from National Health Insurance Service-National Health Information Database (NHIS-NHID) (24). Data was collected between 2008 and 2017, and data was analysed between 1,141,593 patients with TBI and 1,141,593 controls. Among these sample data base 240,969 (21.11) and 155,288 (13.60) depression cases occurred in patients with TBI and controls, respectively. This study showed that males are at higher risk of suffering from depression post TBI than females.

Albrecht and colleagues (25) in their study report that older patients of traumatic brain injury are at higher risk of depression than younger patients of TBI.

Conclusion

In our study, 8.2% of patients had severe disability due to traumatic brain injury, and 52.6% of patients suffered from depression. Among these 52.6%, 25% of patients suffered mild depression, 55% had moderate depression and 20% suffered from severe depression post head injury. Since post traumatic brain injury causes significant psychiatric illnesses like depression being commonest among them, it also causes cognitive impairment. Patients of traumatic brain injury are left with significant disability which prevents them from reintegrating back into society and also further causing a burden to family and society. Early education and counselling regarding TBI are the most effective interventions to reduce complications post traumatic brain injury. Hence to limit the disability, early intervention is required, like Cognitive rehabilitation, interpersonal communication skills and Psychotherapy (eg, supportive, individual, cognitive-behavioral, group, and family therapy).

Conflicts of interest

There are no conflicts of interest.

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