Clinical and Neurocognitive recovery from Mild and Moderate Head Injury: A Study from a Tertiary care Hospital in Eastern India

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Abstract- INTRODUCTION- Traumatic Brain Injury (TBI) is a major cause of mortality & morbidity afflicting millions of people worldwide[1] and in India[2].The World Health Organization suggests traumatic brain injury (TBI) will be a leading cause of death and disability by 2020, with about 10 million people affected each year. A patient with TBI is a person who has had a traumatically induced physiological disruption of brain function, which is manifested by at least one of the following: 1. any period of loss of consciousness, 2. any loss of memory for events immediately before or after the accident, 3. any alteration in mental state at the time of the accident (e.g. feeling dazed, disoriented, or confused), or 4. focal neurological deficit(s) that may or may not be transient[3]. This study is designed to look for clinical outcome by GCS and neurocognitive outcome by PGI-BBD in mild to moderate head injury patients at 3 and 6 months after discharge of patient.
AIM OF THE STUDY- To assess the neurocognitive outcome in mild and moderate traumatic head injury patients.
MATERIALS AND METHODS - this study was carried out in Department of Neurosurgery, in association with Department of Neurogenetics, Neuromedicine and Psychiatry at Institute of Post-Graduate Medical Research & Education and Bangur Institute of Neurosciences, Kolkata. We have included all the cases of mild and moderate Head Injury (as per Glasgow Coma Scale mild= 13-15, moderate= 9-12) from January 2017 to June 2018, in a single unit. We had planned minimum 102 patients to be included in the study. It is a non-randomized, prospective, double blind study.
RESULTS - The mean dysfunction score (mean ± s.d.) of the patients was 19.01±2.35 with range 17 – 27 and the median was 18.Most of the patients (83.3%) had dysfunction score ≤20 which was significantly higher ($Z=9.44; p<0.0001$). However, 16.7% of the patients had dysfunction score>20.
CONCLUSION- The current study has shown clinical and neurocognitive outcomes in patients with mild and moderate TBI correlate wih the severity of Head injury.

Index Terms- Traumatic Brain Injury (TBI), Neurocognitive Outcome , Mild to moderate head injury

INTRODUCTION - Traumatic Brain Injury (TBI) is a major cause of mortality & morbidity afflicting millions of people worldwide[1] and in India[2].The World Health Organization suggests traumatic brain injury (TBI) will be a leading cause of death and disability by 2020, with about 10 million people affected each year.

A patient with TBI is a person who has had a traumatically induced physiological disruption of brain function, which is manifested by at least one of the following: 1. any period of loss of consciousness, 2. any loss of memory for events immediately before or after the accident, 3. any alteration in mental state at the time of the accident (e.g. feeling dazed, disoriented, or confused), or 4. focal neurological deficit(s) that may or may not be transient[3].

This definition of TBI includes the head being struck, the head striking an object, and the brain undergoing an acceleration/deceleration movement (i.e. whiplash) without direct external trauma to the head.

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To assess the neurocognitive outcome in mild and moderate traumatic head injury patients.

MATERIALS AND METHODS-

After obtaining clearance from the ethical committee of the institute, this study was carried out in Department of Neurosurgery, in association with Department of Neurogenetics, Neuromedicine and Psychiatry at Institute of Post-Graduate Medical Research & Education and Bangur Institute of Neurosciences, Kolkata. We have included all the cases of mild and moderate Head Injury (as per Glasgow Coma Scale mild= 13-15, moderate= 9-12) from January 2017 to June 2018, in a single unit. We had planned minimum 50 patients to be included in the study. It is a non-randomized, prospective, double blind study.

Inclusion Criteria

1. All patients of mild to moderate head injury GCS >=9(classified according to Glasgow Coma Scale).
2. Age more than 18 years

Exclusion Criteria-

A. GCS<9 (Severe head Injury)
B. Age < 18 years
C. Associated chest, abdomen & limb injury
D. Penetrating brain injury
E. Patient with pre existing psychomotor impairment

Study tools –

1. General- Age, sex, contact information, educational status, occupation, marital status, date and time of admission
2. History of event- Mode of injury, date and time of injury, route of referral
3. Initial examination including GCS
4. Neuroimaging data and operative notes if any surgical procedure is done
5. Date of discharge or death and GCS at the time of discharge
6. Glasgow Outcome Score at 3 month& 6 month interval
7. Neurocognitive outcome at 3 month& 6 month interval

GLASGOW OUTCOME SCALE

GOS 1	Good recovery
GOS 2	Moderate disability (disabled but independent), no assistance with activities of daily living
GOS 3	Severe disability (conscious but disabled), needing assistance with activities of daily living
GOS 4	Persistent vegetative state
GOS 5	Death

GOS = Glasgow outcome scale

PGI-Battery of Brain Dysfunction (PGI-BBD)

The components of the PGI-BBD are as follows:

- PGI Memory Scale (PGIMS)
- Revised Bhatia Short Battery of Performance Tests of Intelligence (BSR-R)
- Verbal Adult Intelligence Scale (VAIS)
- Nahar–Benson test
- Bender visual motor Gestalt test (Bender–Gestalt test).

Study Technique-

Patients of head injury were admitted in emergency ward and after evaluation started on standard treatment protocol as per clinical and neuroimaging findings. If necessary they underwent emergency surgery for head injury. All discharged patients were followed up at 3 & 6 months. They were allocated to one of the categories of Glasgow Outcome Scale by means of structured interview. Neurological assessment using PGI BBD Neuropsychological battery was done at 3 & 6 months.

Data thus generated was analyzed with the help of Microsoft excel 2007 and SPSS version 22nd software. Appropriate tables and graphs were generated. Chi-square test and other appropriate statistics as applicable was incorporated in the study for statistical inferences.

Results-

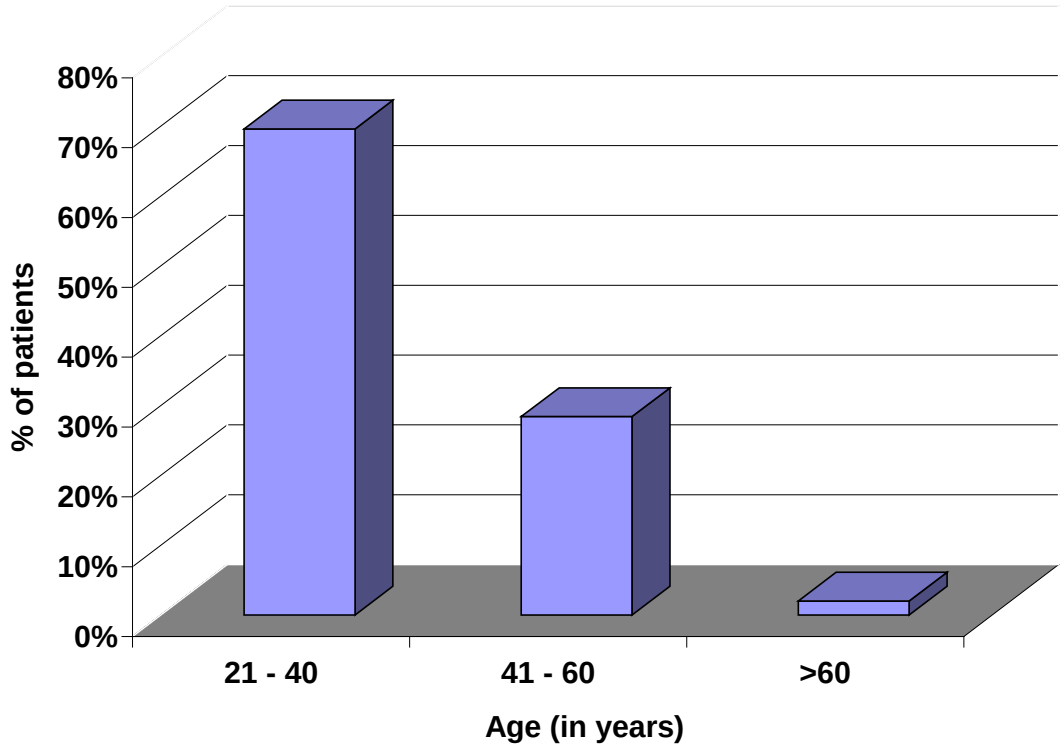
We have recruited total 102 patients in our study. Baseline data regarding age, sex and clinical presentation of the subjects was collected.

Table-1: Distribution of age of the patients

Age (in years)	Number	%
21 – 40	71	69.6%
41 – 60	29	28.4%
>60	2	2.0%
Total	102	100.0%
Mean ± s.d.	37.71±12.01	
Median	36	
Range	21 – 64	

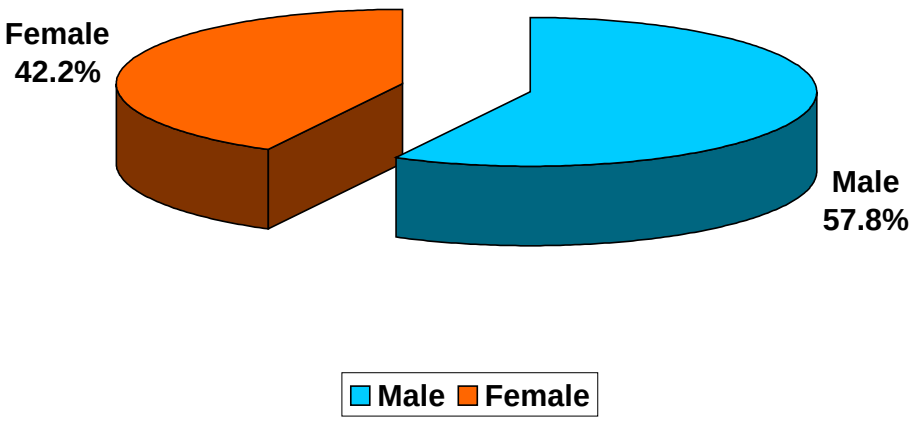
Most of the patients (59.6%) were with age between 21 – 40 years (69.6%) which was significantly higher than the patient with age >40 years (Z=4.56;p<0.0001).

Thus traumatic head injuries were mostly prevalent among the patients with age between 11 – 40 years.



Sex-wise Distribution of Head Injury patients

Table-2: Distribution of gender of the patients



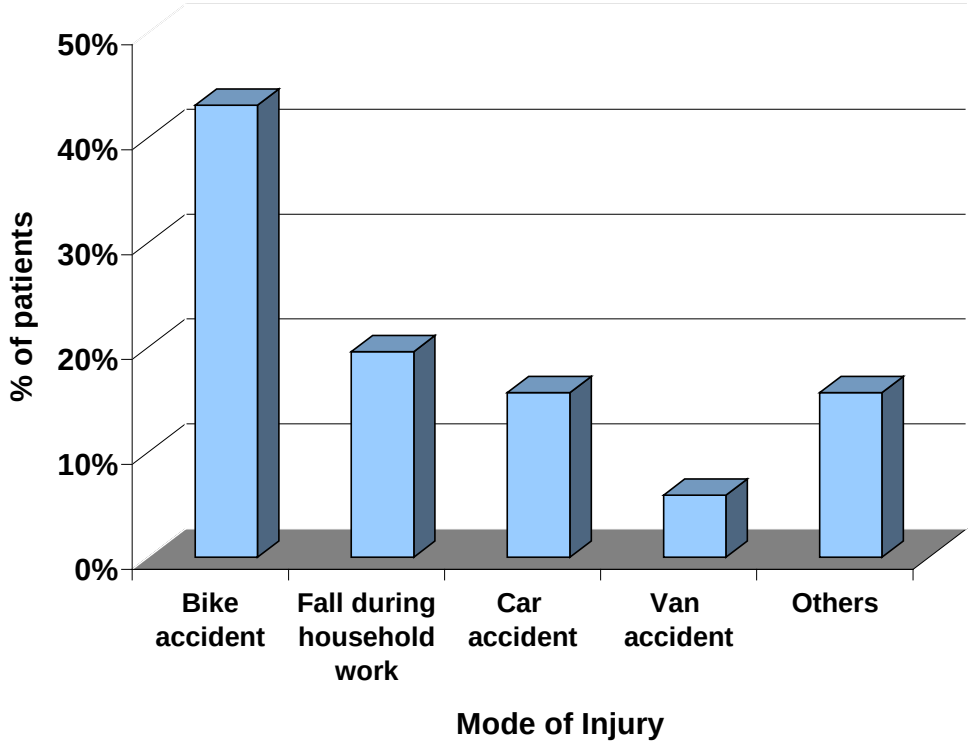
Gender	Number	%
Male	59	57.8%
Female	43	42.2%
Total	102	100.0%
Male:Female	1.4:1.0	

The ratio of male and female (Male**:**Female) was 1.4:1.0. Test of proportion showed that proportion of males (57.8%) was significantly higher than that of females (42.2%) (Z= 2.26; p=0.023).

Thus males were in significantly higher risk of having traumatic head injury than females.

Etiology of Head Injury

Table-3: Distribution of mode of Injury of the patients



Mode of Injury	Number	%
Bike accident	44	43.1%
Fall during household work	20	19.6%
Car accident	16	15.7%
Van accident	6	5.9%
Physical Assault	2	2.0%
Bicycle accident	2	2.0%
Bus accident	1	1.0%
Electrocution	1	1.0%
Fall from Tractor	1	1.0%
Fall from Bike	1	1.0%
Fall from train (Railways)	1	1.0%
Fall from Tree	1	1.0%
Hit by Cricket Ball	1	1.0%
Hit by Truck	1	1.0%
Fall from Rickshaw	1	1.0%
Road Traffic Accident	2	2.0%
Unknown	1	1.0%

Total	102	100.0%

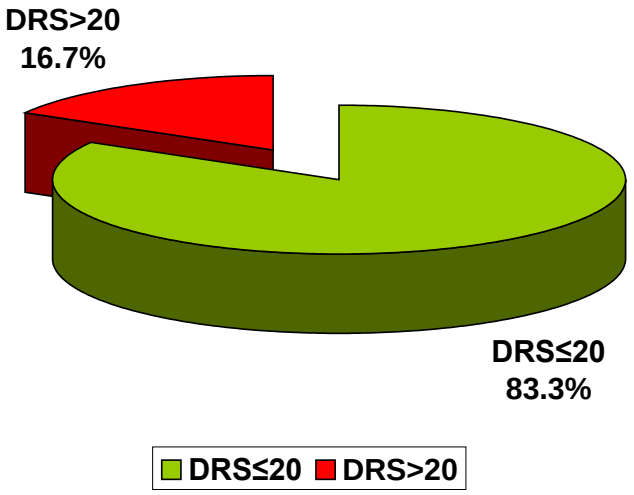
Bike accident was the most cause of the traumatic head injury (43.1%) which was significantly higher (Z=3.58;p<0.0001).

Table-4: Distribution of Dysfunction rating scores (Neuro-cognitive Outcome)of the patients

Dysfunction rating scores (Neuro-cognitive Outcome)	Number	%
≤20	85	83.3%
>20	17	16.7%
Total	102	100.0%
Mean ± s.d.	19.01±2.35	
Median	18	
Range	17 - 27	

The mean dysfunction score (mean ± s.d.) of the patients was 19.01±2.35 with range 17 – 27 and the median was 18.

Most of the patients (83.3%) had dysfunction score ≤20 which was significantly higher (Z=9.44;p<0.0001). However, 16.7% of the patients had dysfunction score>20.



DISCUSSION-

We have analysed distribution of TBI in various age groups, sex & mode of injury; its clinical outcome and neurocognitive outcome in relation to severity of brain injury.

ne of the striking findings from this review is that despite the relatively large volume of studies addressing functional outcomes and recovery following pediatric TBI, there are remarkably few studies with well defined and discrete severity groups, time points post injury, and age bands at the time of injury. This, in addition to the necessity for having descriptive statistical data to conduct a meta-analytic review, substantially reduced the number of studies that could be summarized. Nonetheless, data from available studies that met inclusion criteria were systematically summarized and reviewed in this paper, yielding empirically and clinically useful information regarding injury outcomes by neurocognitive domain at various defined time points post injury (cross-sectional studies), as well as the time course of recovery (longitudinal studies).

Studies of mild TBI included in the analyses showed few, if any, impairments in the neurocognitive domains reviewed at any time point, including postacute outcomes. This is consistent with previous literature (Bijur, Haslum, & Golding, 1990[4]; Satz et al., 1997[5]). Of note, however, there were some studies reporting substantial impairments in the mild TBI group, even at Time 3. For example, data from one study of a relatively younger TBI sample (2-7 years at injury and 5 years post injury) contributed effect sizes in the moderate to large range (with one exception) on four different paper and pencil measures of attention (Catroppa, Anderson, Morse, Haritou, & Rosenfeld, 2007[6]). Conversely, a study of comparatively older children (6–15 years at injury and 3 years post injury) resulted in no notable differences between cases and controls (Fay et al., 1994[7]). Further, a large British cohort of mild head injury in children found no differences between cases and healthy controls or other nonhead injury orthopedic controls in any aspect of neurocognitive ability or behavioral functioning (Bijur et al., 1990[4]). Although most studies found no statistically significant effects of mild TBI on neurocognitive functioning as a group, some suggested that there may be a subset of children with mild TBI who show adverse outcomes in some domains. The inconsistencies across studies in the outcomes of mild TBI may be due to several factors.

CONCLUSION

The current study has shown clinical and neurocognitive outcomes in patients with mild and moderate TBI correlate wih the severity of Head injury.

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