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Original Article

Relationship between Etiology and Radiological Findings in Case of Moderate and Severe Head Injury Patients.

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Abstract:

Introduction: Traumatic brain injury (TBI) or head injury is one of the leading causes of mortality and disability in the world. The common causes of TBI are usually motor vehicle accident, fall and physical assault.

Methodology: This was a prospective cohort study to find out the relationship between etiology and the radiological findings in moderate and severe head injury patients. The places of the study were the Neurosurgery department of Sylhet M A G Osmani Medical College Hospital, Sylhet Women's Medical College Hospital (SWMCH) and King Faisal Hospital (KFH), Taif, KSA. The Sample size was 104. The study period was 3 years (July 2021 to December 2022). On the basis of radiological findings, the participants were divided into three groups or arms. The different arms were diffused traumatic brain injury (arm-1), focal traumatic brain injury (arm-2) and both (diffused and traumatic) types traumatic brain injury (arm-3).

Results: Mean age was significantly higher in female (51.83%). Overall mean age was 40.28 year. Highest frequency (23%) was in the below 20-year age group followed by the 41-50-year age group (20.2%). Road traffic accident (RTA) was the commonest (63.5%) etiology followed by fall (21.2%). At the end of 1 month 68.3% of participants showed improvement.

Conclusion: Post head injury disability is a huge psychological and financial burden for any nation or family. RTA contributes the major risk for the moderate and severe head injury.

Key words: Traumatic brain injury (TBA), Radiological findings, Etiology of head injury.

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Introduction:

In the emergency department of a tertiary care hospital about 7-8% of the patients require Neurosurgery consultation.[1]

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Just less than half (45%) of the Neurosurgical patients who reach the emergency department need admission. The most frequent conditions in the emergency department are cerebrovascular disease (31%),neuro-trauma (28%), and altered mental status (12%)[2]. The commonest cause of head injury or traumatic brain injury (TBI) is road traffic accident (RTA) followed by fall and physical assault. Brain contusion is a common finding, revealed in up to 43% of patients with blunt trauma and frequently as coup or countercoup injuries in deceleration or acceleration trauma.[2]Contusion patients coexisting with low Glasgow Coma Scale (GCS) scores, pupillary asymmetry or older age are expected to be benefitted from prompt neurosurgical intervention. Acute Subdural hematomas (ASDH) are also relatively common (10–20% of patients with TBI) and are unfortunately have high mortality (50–85%) rate. Traumatic Subarachnoid hemorrhages (SAH) are more common in children and the elderly because of their relatively large

subarachnoid spaces, and usually presents in up to 11% of TBI patients. It frequently coexists with a contusion. Epidural hematomas or extradural hematomas (EDH) are relatively uncommon (1–4% of head trauma patients) and are frequently presents with skull fractures. Intraventricular hemorrhages (IVH) are also uncommon (2.8%) and eventually shows outcome of significant morbidity and mortality. One of the studies revealed that nearly half of patients with IVH developed raised increase intracranial pressure, and 10% of them required ventricular drainage.[3] Almost all of the complications of head trauma can later on lead to cerebral ischemia, which if untreated can result in higher morbidity and mortality.[4]

The Neurosurgery professors of University of Glasgow Professor Graham Teasdale and Professor Bryan Jennett published the Glasgow Coma Scale (GCS) for the first time in 1974.[5] This scale ranges from 3 to 15. The three components of GCS are Best eye response (4), Best verbal response (5) and Best motor response (6). Head injury (traumatic brain injury) is classified into severe (GCS 3-8), moderate (GCS 9-12) and mild (GCS 13-15) according to GCS.[6]

The aim and primary objective of this cohort study was to find out the relationship between the etiology and radiological findings in moderate and severe head injury patients. The secondary objective was to find out the relationship between the etiology and outcome in moderate and severe head injury patients.

Selection criterion:

Inclusion criterion:

1. Age from 18 to 65 year
2. Diagnosed as moderate or severe head injury.

Exclusion criterion:

1. Previously diagnosed as dementia / Parkinson's disease
2. Impaired renal / hepatic function.

Methodology:

This was a multicenter prospective cohort study. The places of the study were the Neurosurgery department of Sylhet M A G Osmani Medical College Hospital, Sylhet Women's Medical College Hospital (SWMCH) and King Faisal Hospital (KFH), Taif, KSA. The Sample size was 104 and the study period was 3 years (July 2021 to December 2022). Ethical approval certificates were achieved from the institutional ethical review board (IERB) of SWMC and KFH. All the adult patients of moderated and severe traumatic brain injury (TBI) according to GCS were considered as target population. After confirming inclusion and exclusion criterion patients were enrolled in any of the three groups. Informed consent were taken. The groups were diffused traumatic brain injury (arm-1), focal traumatic brain injury (arm-2) and both (diffused and traumatic) types traumatic brain injury (arm-3). Grouping diagnosis was confirmed by the CT scan of brain report. Cerebral contusion, epidural hemorrhage (EDH), subdural hemorrhage (SDH), intracerebral hemorrhage (ICH) and intraventricular hemorrhage (IVH) were included under focal injury. Diffuse axonal injury (DAI), generalized ischemic brain injury and sub arachnoid hemorrhage (SAH) were included in the diffused group. Patient's particulars and clinical data were collected from patient's file and electronic hospital information system (HIS). The significance test for categorical data was done by chi-square test and the significance test for numerical data was done by student's t- test.

Results:

Total 104 participants were enrolled in the study. The data were tabulated according to different variables.

Table-1: According sex

Sex	Number	Percentage	Mean age (year)	p-value
Male Female	85 19	81.7% 18.3%	38.26 51.83	.0019

Table-1 shows male were nearly 4 times higher than female but the mean ae of female was significantly (p=0.0019) higher than male.

Table-2: According to age frequency

Age frequency	Number	Percentage	p-value
Below 20	24	23%	
21-30	15	14.4%	
31-40	14	13.5%	0.3470
41-50	21	20.2%	
51-60	17	16.3%	
Above 60	13	12.6%	

Table-2 illustrates distribution according to age group. Higher percentages were in below 20 and 41 to 50-year age groups though the differences with other age frequency groups were not significant.

Table-3: According to etiology

Mode of injury	Number	Percentage	p-value
Assault	13	12.5%	
Fall	22	21.2%	
RTA	66	63.5%	<
Sports	03	2.8%	0.00001

According to table-3, the etiology RTA was significantly frequent than other etiologies.

Table-4: According to initial GCS

Initial GCS	Number	Percentage	p-value
3-8	56	53.8%	0.2672
9-12	48	46.2%	

Table-4 shows that the difference between the percentage of moderate and severe head injury groups was not significant.

Table-5: According to outcome

Outcome (N=104)	Number	Percentage	p-value
Improved	71	68.3%	
Not improved	26	25%	< 0.00001
Died	07	6.7%	

Table-5 describes that number of improves participants were significantly higher than other outcome groups.

Table-6: Relationship between radiological finding and etiology

	Assault	RTA	Fall	Sports	p-value
Arm 1 (n=44) (42%)	09	27	07	01	< 0.00001
Arm 2 (n=28) (27%)	02	16	09	01	< 0.00001
Arm 3 (n=32) (31%)	02	23	06	01	< 0.00001

According to table-6, The etiology RTA was significantly higher in all three (diffuse, focal and both) radiological groups.

Table-7: Relationship between initial GCS and etiology

Initial GCS	Number	Assault	RTA	Fall	Sports	p-value
3-8	56	04	40	11	02	< 0.00001
9-12	48	06	29	11	01	< 0.00001

According to table-7, The etiology RTA was significantly higher in both moderate and severe head injury groups.

Discussion:

The sample size of this study was 104. The result of this study were compared with those of the international studies.

According to the study of Rutland-Brown et al the most frequent age groups for TBI are 0-4 year along with adolescence and the older (more than 65 year) age group.[7] The top two leading etiologies were fall and RTA. Due to more incidence of TBI and less incidence the number of living disable people have increased significantly. In this study below-20-year group had the highest frequency and RTA was the commonest etiology.

Kraus JF et al found the common cause of TBI in children and older adult (more than 75 year) were fall.[8] The data of Centers for Disease Control and Prevention (CDC) revealed that fall was the cause of 40.5% of TBI. The other causes were RTA (14.3%), stuck against hard surface (15.5%) and assault (10.7%). Etiology of nearly one-fifth (19%) TBI was not known. Number of male affected was 29% higher than that of female. Alcohol was found one of the key driven factor of head injury in 56% of cases. In this study fall was the cause of 21.2% participants.

More than half cases were involved with RTA. Alcohol consumption variable was not included in this study.

Jennett B et published their study on use of Glasgow Outcome Scale for severe head injury patients.[9] The mean age of the participants of their series was 28 years. About 44% participant's age was below 20 years and 5% had age of more than 60 years. Male gender was 5 times more the female. The follow up was done after 6 months on 150 participants. One-fifth (20%) were found severely disabled. The percentage of moderate disability and good recovery were 40% each. Common disabilities were dementia, hemiparesis, dysphasia, cranial nerve palsy and ataxia. In this study nearly half (53.8%) participants suffered from severe head injury. One-fourth cases of this study did not show any improvement at the time of 1 month follow up.

Wardlaw JM et had published their systematic review on outcome prediction of head injury patients. CT scan of 425 participants were reviewed.[10] Normal CT was present in 12.3% cases. According to CT scan focal injury was present in 14.8% cases. Less than one-third (28.9%) cases had diffuse injury in CT scan whereas 44% had both (diffuse and focal). In this study 42% had diffuse injury, 27% had focal injury and 31% had both types.

Kelly C et al 2000 participants in their series where they evaluated CT scan findings of minor head injury patients.[11] Nearly two-third (67.3%) were male and 32.7% were female. Mean age of the participants was 30.5 ± 19 years. Highest frequency was in 21-30-year age group. RTA was the cause was in 29.2% cases. Fall was responsible for 30.5% participants. Assault was the etiology of head injury in 17.9% cases. Brain swelling and concussion were the CT findings in respectively 39% and 23% cases. Subdural hematoma was evident in 33% cases and hemorrhagic contusion was accompanied in 21% CT scan reports. In this study 81.7% participants were male. Mean age for male was 38.26 and female was 51.83 year.

Conclusion: Male gender were vulnerable for traumatic brain injury in comparison to female. Younger age group had higher incidence and for the all participants RTA was the commonest cause of TBI. Moderate and severe head injuries were nearly equal in frequency. Most of the TBI patients had diffuse type of head injury according to CT scan of brain report.

Conflict of interest: It was self-funded study. No conflict of interest (COI) was declared by any of the co-authors.

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