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Clinical Profile and Outcome in Patients with Head Injury at a Tertiary Health Care System

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Abstract

Introduction: Head injury or traumatic brain injury is defined as 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. It is a leading cause of morbidity, mortality, disability, and socio-economic losses in India and other developing countries. Young males are affected more than females and road traffic accident is the commonest cause of head injury. **Materials and Methods:** We studied patients who presented with head injury to a tertiary health care centre from ages 18 years to 60 years. Clinical profile was studied which included clinical examination and CT scan of brain. Severity of head injury was evaluated on admission by Glasgow Coma Scale (GCS) and functional outcome was assessed by Glasgow Outcome Scale (GOS) at 10th day, 1 month and 3 months after injury. **Results:** Study was conducted with 200 patients. Most of the patients with head injury were males (79.5%) and peak incidence was in the age group 31–40 years. The commonest cause of head injury was road traffic accidents (72.5%). Most common presentation was loss of consciousness (49%). On admission, GCS score was found to be mild, moderate, and severe in 77%, 9%, and 14.5% patients. Severe GCS score was mostly associated with subdural hematoma in 21.5% patients and also contributes to 82.5% mortality. Fractures (43%) were the commonest CT finding. 12.5% were treated with surgery. Overall mortality was 12.2%. GOS was calculated on 10th day, at the end of 1 month and at the end of 3 months. At the end of 3 months, 87% patients showed complete recovery, 0.5% patients showed moderate disability, 0.5% showed severe disability, 0% showed vegetative state and 12.2% was the mortality. There was considerable improvement in GOS scores with respect to disability and recovery from 10th day to follow-up at 3 months post trauma. **Conclusion:** GCS score on admission and the type of CT lesion are both important factors in determining the outcome, and both must be considered when describing severely head injured patients. GOS is a good modality to predict functional outcome of these patients and assess their recovery and disability.

Keywords: Glasgow Coma Scale, Head Injury, Subdural Hematoma, Traumatic Brain Injury

1. Introduction

Traumatic Brain Injury (TBI) is the major cause of mortality and morbidity in adult population and is responsible for more than 50% of all traumatic deaths.[1] Road traffic injuries are the leading cause of TBIs (60%) and alcohol involvement is known to be present among 15%-20% of TBIs at the time of injury.[2]

The Glasgow Coma Scale was first published in the year 1974 by Graham Teasdale and Bryan Jennett. It is a 15-pointer neurological scale, which aims to objectively

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assess the severity of head injury and record the conscious state of a person for initial as well as subsequent assessment. It is by far the most widely used scale in clinical research.[3] The Glasgow Coma Scale classifies brain injury as Mild (13–15), Moderate (9–12) and Severe (3–8).[4]

Along with clinical assessment, CT scan brain is usually the first test performed in an emergency room for a suspected traumatic brain injury. It can quickly visualize fractures and uncover evidence of hemorrhage, hematomas, contusions, and brain tissue swelling.

By correlating both GCS score with CT scan finding the surgeon can plan the management for the patient and predict the outcome more precisely than considering both parameters separately.

While managing these patients, there are two options of treatment: Either immediate surgical intervention or initial conservative, close clinical observation with possible delayed evacuation. The most common avoidable factor is delayed detection of features that can lead to secondary brain damage. These include intracranial hematoma, open skull injury, and extracranial injuries and complications. The objectives of management therefore should be prevention of secondary brain damage by prompt diagnosis and treatment of these conditions and then to promote the fullest possible recovery and social integration of the patient.

The overall outcome is assessed by using the Glasgow Outcome Scale (GOS) which was first described by Jennett and Bond in 1975. It is a global scale to measure the functional outcome that rates patient's status into one of the five categories viz., Dead, Vegetative State, Severe Disability, Moderate Disability or Good Recovery.[5]

The repercussion of acquiring brain injury at a young age is that individuals will spend considerably longer time living with the consequences of their disability.[6] Hence along with medical and surgical management, the survivors of head injury also require rehabilitation care in which one has to focus on issues such as retraining in activities of daily living, pain management, cognitive and behavioural therapies, and pharmacotherapy.

The current study is carried out at a tertiary heath care centre to assess the clinical profile of the patients presenting with head injury with special reference to correlation between Glasgow Coma Scale (GCS) and CT scan findings at the time of admission, and the functional outcome in terms of Glasgow Outcome Scale (GOS) on 10th day, 1 month and 3 months post injury.

2. Aims and Objectives

1. to study the clinical profile of patients with head injury.
2. To study and correlate the clinical outcome of these patients with respect to Glasgow Coma Scale and CT scan findings

3. Materials and Methods

Present study was a descriptive study done in a tertiary health care centre. The study protocol was approved by institutional ethics committee. The study period was from August 2017 to December 2019. 200 patients visiting the Emergency department with history of head injury was recruited after fulfilling stated inclusion and exclusion criteria viz.

3.1 Inclusion Criteria

All patients of head injury between ages of 18 years to 60 years, irrespective of gender; patients with relatives or legally authorized representatives who gave consent for inclusion in study.

3.2 Exclusion Criteria

Associated major life-threatening injury like severe chest trauma, severe abdominal trauma, and spinal cord trauma; associated major bone fracture like pelvic fracture, femur fracture, tibia fracture, humerus fracture, radius ulna fracture and fracture of spine; Associated crush injuries of upper limbs, lower limbs and compound fracture; Cases presenting with medical causes of IC bleed.

Informed consent was taken and data was collected as per pre-designed proforma prepared with relevant information from the patient and relatives mentioning clinical profile, history, investigations, GCS score and outcome as per GOS on 10th day, 1 month and 3 months.

3.3 Methodology

After recruitment of eligible patients, the following parameters were analyzed:

- Mode of injury – Road traffic accident, Pedestrian, Fall, Assault, Others

Table 1. Glasgow Coma Scale (GCS)

Domain	Response	Score
Eye Opening	Spontaneous	4
	To speech	3
	To pain	2
	None	1
Best verbal response	Oriented	5
	Confused	4
	Inappropriate	3
	Incomprehensible	2
	None	1
Best motor response	Obeying	6
	Localizing	5
	Withdrawal	4
	Flexing	3
	Extending	2
	None	1

Table 2. Classification Head Injury according to GCS

GCS Score	Classification
3–8	Severe
9–12	Moderate
13–15	Mild

Table 3. Glasgow Outcome Scale (GOS)

GOS level	Brief Description
1 = Dead	----------
2 = Persistent Vegetative State	Sleep/wake non-sentient
3 = Severely Disabled	Conscious but dependent
4 = Moderately Disabled	Independent but disabled
5 = Good Recovery	May have mild residual symptoms

- Clinical profile – History, General Examination, Neurological Examination
- Severity of head injury according Glasgow Coma Scale was calculated on admission according to Table 1 and classified according to Table 2.
- CT scan brain
- Type of management - Surgery/Conservative
- Outcome according to Glasgow Outcome Scale (GOS) was calculated on 10th day after 1 month and 3 months according to Table 3

4. Results

A total of 200 patients with head injury were included in the study. The demographic characteristics of patients is summarized in Table 4.

There were 159 males (79.5%) and 41 females (20.5%). The incidence of head injury was highest in age group 31-40 years (29%, n = 58). The most common mode of injury was road traffic accidents (72.5%; n = 145), followed by fall (11.5%, n = 23), pedestrian (10.5%, n = 21), assault (5%, n = 10), and other modes (0.5%, n = 1). The most common post traumatic symptom was loss of consciousness (49%; n = 98), followed by ENT bleed (36.5%, n = 73), vomiting (30.5%, n = 61), and seizures (7%, n = 14). (Table 4)

According to Glasgow Coma Scale (GCS), mild injury (GCS 13-15) was seen in 154 patients (77%), moderate injury (GCS 9-12) in 18 patients (9%), and severe injury (GCS 3-8) in 28 patients (14%). (Table 4)

Analysis of CT lesions indicated that fractures was the most common finding (43%; n = 85), followed by subdural hematoma (33%; n = 65), extradural hematoma (23%; n = 45), DAI + Petechial hemorrhage (12%; n = 24), and intra cerebral hematoma (4%; n = 8). A total of 25 patients (12.5%) underwent surgery, and 175 patients (87.5%) were managed conservatively. The overall mortality was (12.5%) (Table 4)

Table 4. Demographic, Clinical, GCS Score, CT imaging, Type of Management, GOS Score, Mortality Data in 200 Patients after Head Injury

Variables	Number of Patients, n (%)
Sex	
Male	159 (79.5)
Female	41 (20.5)
Age (years)	
18-20	17 (8.5)
21-30	50 (25)
31-40	58 (29)
41-50	40 (20)
51-60	35 (17.5)
Mode of Injury	
RTA	145 (72.5)
Pedestrian	21 (10.5)
Fall	23 (11.5)
Assault	10 (5)
Others	1 (0.5)
Signs/Symptoms	
Loss of Consciousness	98 (49)

Vomiting	61 (30.5)
Seizures	14 (7)
ENT Bleed	73 (36.5)
Severity of head injury according to Glasgow Coma Scale (GCS) on Admission	
Mild	154 (77)
Moderate	18 (9)
Severe	28 (14)
CT Lesion	
Extradural Hematoma	45 (23)
Subdural Hematoma	65 (33)
Intra Cerebral Hematoma	8 (4)
DAI + Petechial hemorrhage	24 (12)
Fractures	85 (43)
Management	
Surgery	25 (12.5)
Conservative	175 (87.5)
Mortality	25 (12.5)

Table 5. Association between GCS on Admission and CT lesion

GCS on Admission		**Mild (13–15)**	**Moderate** (9–12)	Severe (3–8)	Total
CT Lesion	Extradural Hematoma	32 (71.1%)	6 (13.3%)	7 (15.6%)	45 (100%)
	Subdural Hematoma	39 (60%)	12 (18.5%)	14 (21.5%)	65 (100%)
	Intra Cerebral Hematoma	6 (75%)	1 (12.5%)	1 (12.5%)	8 (100%)
	DAI + Petechial Haemorrhage	17 (70.8%)	3 (12.5%)	4 (16.7%)	24 (100%)
	Fractures	72 (84.7%)	5 (5.9%)	8 (9.4%)	85 (100%)

The correlation between CT Lesion and GCS on Admission is summarised in Table 5. It was seen that subdural hematoma led to highest incidence of severe GCS score on admission (21.5%, n = 14/65) and highest incidence of moderate GCS score (18.5%, n = 12/65). Fractures contributed highest to the incidence of mild GCS score (84.7%, n = 72/85).

Table 6. Association between GCS on Admission and CT lesion with Mortality

	Number of Patients	Mortality	Percent
Severity of Head Injury according to Glasgow Coma Scale (GCS) on Admission			
Mild Injury (GCS 13-15)	154	2	1.30%
Moderate Injury (GCS 9-12)	18	0	0%
Severe Injury (GCS 3-8)	28	23	82.1
CT Lesion			
Extradural Hematoma	45	6	13.30%
Subdural Hematoma	65	14	21.50%
Intra Cerebral Hematoma	8	1	12.50%
DAI + Petechial haemorrhage	24	4	16.70%

Table 7. Glasgow Outcome Scale (GOS) at 10th day, at 1 month, and at 3 months

GOS Score	Number of Patients		
	GOS on 10th day	GOS at 1 month	GOS at 3 months
	200 (100%)	**200 (100%)**	**200 (100%)**
Death	19 (9.5%)	23 (11.5%)	25 (12.2%)
Vegetative State	4 (2%)	1 (0.5%)	0 (0%)
Severe Disability	10 (5%)	6 (3%)	4 (2%)
Moderate Disability	20 (10%)	18 (9%)	14 (7%)
Complete Recovery	147 (73.5%)	152 (76%)	157 (78.5%)

The correlation between GCS on Admission and CT lesion with Mortality is summarised in Table 6. Severe GCS score led to maximum mortality (82.1%, n = 23/28), followed by mild GCS score (1.3%, n = 2/154), and moderate GCS score (0%, n = 0/18). Subdural hematoma on CT brain led to maximum mortality (21.5%, n = 14/65), followed by DAI + petechial haemorrhage (16.7%, n = 4/24), extradural hematoma (13.3%, n = 6/45), and intra cerebral hematoma (12.5%, n = 1/8).

Outcome according to Glasgow Outcome Scale (GOS) is summarized in Table 7. GOS score was calculated on 10th day, at 1 month, and at 3rd month. On 10th day, 147 patients (73.5%) showed complete recovery, 20 patients (10%) showed moderate disability, 10 patients (5%) showed severe disability, 4 patients (2%) showed vegetative state and 19 patients (9.5%) had died. At 1 month follow up, 152 patients (76%) showed complete recovery, 18 patients (9%) showed moderate disability, 6 patients (3%) showed severe disability, 1 patient (0.5%) showed vegetative state and 23 patients (11.5%) had died. At 3 months follow up, 157 patients (78.5%) showed complete recovery, 14 patients (7%) showed moderate disability, 4 patients (2%) showed severe disability, 0 patient (0%) showed vegetative state and 25 patients (12.5%) had died.

5. Discussion

Our study showed that the rate of head injury was nearly 3.87 times more in males as compared to females. Similarly, head injury rates are reported higher in male patients throughout the literature.[7–9] In our study, the peak incidence of head injury was in the age group 31–40 years. As per other studies as well, head injury is known to be more common in young people, and the highest incidence occurs in age group 20-30 years.[7,10–12] These age groups, especially the male gender, being the earning and working population is involved in a lot of travel, exposing them to higher risk of road traffic accidents. Also, this population is prone to consume more alcohol, assault and rash driving, subjecting them to head injuries.

In our study Road Traffic Accident (RTA) was the most common mode of injury accounting for 72.5%. It has been observed in literature that majority of the head injuries result from road traffic accidents ranging from 50–70% of the patient population.[7,11,12] As per the report published by NCRB (2015), 53 cases of road traffic accidents took place every hour and out of these 17 people got killed.

In our study the history of post traumatic loss of consciousness was the most common symptom in 49% patients, followed by ENT bleed in 36.5%, vomiting in 30.5% and seizures in 7%. As per studies, post traumatic loss of consciousness is a common symptom occurring in 77% of patients, followed by incidence of vomiting ranging to 55%, ENT bleed in 36.5% and seizures in 7%.[13–15] Each of these symptoms can predict the anatomical injury that has taken place in the brain, and thus guide the surgeon to take decisions regarding further management. Loss of consciousness indicates brain dysfunction in hemispheres or deep structures involving the RAS.[16] A late post-traumatic seizure is tended to develop epilepsy. Vomiting results from raised intracranial pressure or from blood swallowed during accident,[14] ENT bleed indicates underlying fractures which is detrimental to the underlying structures.[15]

In our study we evaluated the severity of head injury in patients according to Glasgow Coma Scale (GCS) on admission. In our study, most of the patients (77%) had mild GCS score. Literature suggests that, most of the patients with head injury have mild GCS score ranging from 65–97%[10,12,18] and many of these patients experiencing mild injury do not even seek medical help.[19] The GCS is a valuable tool for ongoing clinical assessment and detection of neurological deterioration. Young B, et al. claim that the GCS at the time of admission is a highly reliable indicator of outcome in patients of head injury, especially those undergoing emergency surgeries.[17]

On studying CT brain lesions, in our study, incidence of fractures was highest (43%), followed by SDH (33%). CT brain has been widely used for head injury, and most studies have reported incidence rates of fractures, EDH and SDH to be as high as 35-50%.[20,21]

In the current study it was found that 87.5% were treated with conservative management, and rest 12.5% with surgery. As per studies, the majority of patients (60-80%) are managed conservatively.[10,11,22] According to literature, the decision to operate depends on the patient's neurological status, imaging findings, and extent of extracranial injury.[5]

The overall mortality in our study is 12.2%. Over 5.56 million accidents occur worldwide per year with 1.2

million deaths/year and 3400 death/day making traumatic brain injury a major public health problem. [21]

On studying the association between GCS score and CT lesion, in the current study, it was observed that the incidence of severe GCS score on admission was highest (21.5%) in patients having subdural hematoma in their CT scan. Whereas, fractures in CT scan did not contribute much to the severity of GCS score, as most of these patients (84.7%) had mild GCS score on admission. The anatomical patterns seen in CT scan provide useful prognostic information.[23] Also, patients with the same GCS score can have markedly different outcomes, depending on the causative lesion.[24] Thus, by correlating GCS score with CT scan finding one can predict the condition of patient and outcome of patient precisely than considering both parameters separately.[25]

On assessing the GOS score, in our study, recovery rate after 3 months was found to be 78.5%, while moderate and severe disability were 7% and 2% respectively. According to Miller KJ, *et al.* and Vedantam A, *et al.*, recovery rate after 3 months ranged from 26% to 54%, and severe disability after 3 months ranged from 16% to 48%.[26,27] The Glasgow Outcome Scale (GOS) is widely used as a primary outcome measure, and is recommended by several national bodies, including the NIH in the USA, and the Department of Health in the UK. It is the most popular clinician-reported outcome assessment for randomized clinical trials in acute head injury, and has been used in >90% of the most methodologically robust trials.[6] The difference in GOS scores in various studies can be attributed to the condition on discharge, but most importantly to the amount and type of rehabilitation care given to the patient. Traumatic brain injury (TBI) commonly affects younger people and causes lifelong impairments in physical, cognitive, behavioral and social function. Rehabilitation is effective when an interdisciplinary approach is used. One has to focus on issues such as retraining in activities of daily living, pain management, cognitive and behavioral therapies, and pharmacotherapy. Rehabilitation is as important as the medical and surgical management of TBI to improve the quality of life of the patient and help them restore maximum purposeful life with residual disability.[28]

6. Conclusion

Head injury is more commonly seen in males belonging to young age group with road traffic accidents are the most common mode of injury. Most patients of head injury present with a history of posttraumatic loss of consciousness. Analysis of severity of head injury by Glasgow Coma Scale (GCS) on admission suggests that the majority of patients have a mild GCS score. Fractures are the most common CT finding encountered and Subdural Hematoma attributes to the severity of GCS score in most of the patients. Treatment is majorly by conservative modality. Mortality is higher in patients with severe GCS score and with evidence of Subdural Hematoma in their CT brain. GCS score on admission and the type of CT lesion are both important factors in determining the outcome, and both must be considered when describing severely head injured patients. Glasgow Outcome Scale (GOS) is a good modality to predict functional outcome of these patients and assess their recovery and disability.

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