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Evaluation of the Clinical Profile of Head Injury Patients Presenting to ED

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Abstract

Background: Millions of people sustain head injuries by different MOIs due to various causes most of them being preventable. Head injuries mostly end up in either mortality or de-capacitating disabilities, often persisting lifelong. They cause the society to pay the heavy penalty of "the global loss of economy and human resources." The study of the profiles of the head injury patients throws light on many important causes for concern to formulate strategies for patient management and injury prevention, as proved by studies. Early institution of appropriate management and care based on the head injury severity per GCS scores and timely transfers of patients to facilities that can cope with the patients' needs play a pivotal role in preventing the worsening of primary and occurrence of secondary neuronal damages.

Aim: To evaluate the clinical profile of Head Injury patients presenting to ED.

Objectives:

1) To evaluate the correlation between GCS scores and the Head Injury severity

2) To evaluate the correlation between the time bound changes in the GCS scores and head injury severity

Materials and Methods: The pre-approved prospective observational study was conducted on 100 head injury patients of both genders of all ages, presented to the ED of a quaternary care hospital in Kerala, India. Inclusion and exclusion criteria were strictly adhered to in the patient selection. MOIs in these patients were RTAs and non-accidental (slip and fall) and accidental falls (fall from height). The clinical profile data collected, analyzed, and studied included gender, age, vital signs (heart rate and blood pressure on arrival), mechanism of injury, the need for cervical spine immobilization, the patient disposal, and GCS scores, and head injury severity based on GCS scores the last two assessed on patients' arrival, and subsequently at 2 and 4 hours after that.

Results: The head injury prevalence was preponderant in the males and the age group between 20 and 50 years. Almost all the head injuries were due to high energy impacts, caused mainly through RTAs (> 2/3) and many (about 1/3) by non-accidental falls, and the last few (3%) because of accidental falls from heights. Except for a hand full of patients, all others needed cervical spine immobilization. However, all others were hospitalized in the ICU for the few duly discharged after observation in the ED, and the others were wheeled to or for emergent

neurosurgical procedures after resuscitation. Based on GCS scores on arrival, the head injury severity was moderate and severe in one-fourth and one-third of the patients, respectively. There had been time bound de-escalation of the GCS scores with a proportional escalation of the severity in an appreciable number of patients.

Conclusion: A part from the preponderance of head injury prevalence in the males and the second to fifth decade of life, most of the head injuries were due to high energy impacts, the majority of them being caused by RTAs and next by non-accidental falls, especially in the older adults and lastly in the least few due to accidental falls from height, often of occupational in nature. Except for very few, all others needed cervical spine immobilization and ICU care. In situations inaccessible for immediate access for Imaging, GCS scoring played a vital role in assessing and reassessing the head injury severity, which helped make patient management and transfer decisions early to prevent secondary neuronal injuries.

"Most of the head injuries are often preventable."A closer look globally at the prevailing traffic conditions, laxity in the traffic rules and regulations, including the lacuna in their implementation, would ensure safety on the road averting a high incidence of RTAs. Not only this, but also there needs to be a deep concern for the older adults succumbing to head injuries by 'slip and fall' and those sustaining head injuries by accidental falls from heights, mostly of occupational origin, are all of preventable nature by appropriate measures. Every health care personnel involved in the care of the head injury patients straight from the pre-hospital setup is being endorsed with the great responsibility of preventing the occurrence of secondary neuronal injuries in addition to averting further worsening of the already sustained neural damages.

Keywords: NOT PROVIDED.

Introduction

Traumatic brain injury (TBI), with its increased mortality and morbidity, is a devastating cause for the global economy and human resources loss. Internationally the annual incidence of head injury is variably estimated at 27 to 69 million.[1] Head injury is an alteration in brain function or with other evidence of brain pathology caused by an external force.[2] This can range from a mild bump or bruise over the head to a traumatic brain injury. The care, management, mortality, and morbidity of the head injuries are all decided by their severity, which depends on the impact energy and mechanism of injury, the associated comorbidities, and their complications. The majority of the head injuries are because of RTAs; the other causes being slip and fall in the older adults and fall from height accidental, homicidal or suicidal, to site a few. As most head injuries are also associated with cervical spine involvement, spinal immobilization is mandated even from the outset of the primary survey to prevent secondary neuronal damage. In areas inaccessible to advanced imaging, the arbitrary clinical assessment of head injury severity per GCS scoring could be a vital tool in the early decision making regarding patient transfers and initial management. In addition, the trend analysis of the GCS scores heralds well in advance the changes in the head injury severity. The clinical profile study of the head injury patients assists in forming injury prevention and management strategies.

Aim

To evaluate the clinical profile of Head Injury patients presenting to ED.

Objectives

1. To evaluate the correlation between GCS scores and the Head Injury severity.
2. To evaluate the correlation between the time-bound changes in the GCS scores and Head Injury severity.

Materials and Methods

This prospective observational study was conducted with the preapproval of our Institutional Review and the Ethics Committee.

This study was conducted on 100 head injury patients, not coming under exclusion criteria, presenting to the Emergency Department of Amrita Institute of Medical Sciences, Kochi – a Quaternary Care Medical Center.

The study period was from 1st November 2019 to 31st March 2020.

Inclusion criteria

- The study population included both genders of all ages sustaining head injuries due to different MOIs-RTAs, falls from height, and non-accidental falls.

Exclusion criteria

Head injuries:

- In Pregnant women

- Due to diving
- In patients under the influence of alcohol or 'Drugs.'
- In patients already sedated

The clinical profile data extracted from the patients' records included - sex, age, vital signs (heart rate and blood pressure – on arrival), GCS scores – assessed on arrival to ED, and at 2 and 4 hours after that, mechanism of injury (RTA, falls from height and non-accidental falls), the need for cervical spine immobilization and the patient disposal – Discharge from ED after observation and advice, admission to ward or ICU and transfer to OT for Emergent operation.

All the data were systematically entered into spreadsheets, and analysis was carried out using spreadsheet software - Microsoft Excel and Google Sheets. The graphs were made with the "graph" functions of Google Sheet and Draw.io.

Results

As our study population included 100 patients, the number of patients and the percentage were the same.

The results of the collected data of the different parameters are as follows:

Gender Distribution: Seventy-nine patients were men.

Age group distribution: Is represented in table 1.

Table 1: Incidence of head injuries (number of patients) stratified by age group.

Age groups (years)	Number of patients
1 to 20	16
21 to 60	58 (maximum)
61 to 80	22
81 to 100	4 (minimum)

Mechanism of Injury

Road Traffic Accidents in 67 patients, fall from height in 3 patients, and the rest because of non-accidental falls.

Cervical Spine Immobilization

Done in 96 patients

Clinical Parameters:

- Heart rate (on arrival)

Seventy-five patients had tachycardia, six patients bradycardia, and the rest, normal heart rate.

- Blood pressure (on arrival)

51 patients had hypertension, and 33 hypotension after that, had normal blood pressure

- Patient Disposal

Discharge with advice after observation and neurology consultation 7 patients

ICU admission - 85 patients

ED to OT for Emergent Operation – 8 patients

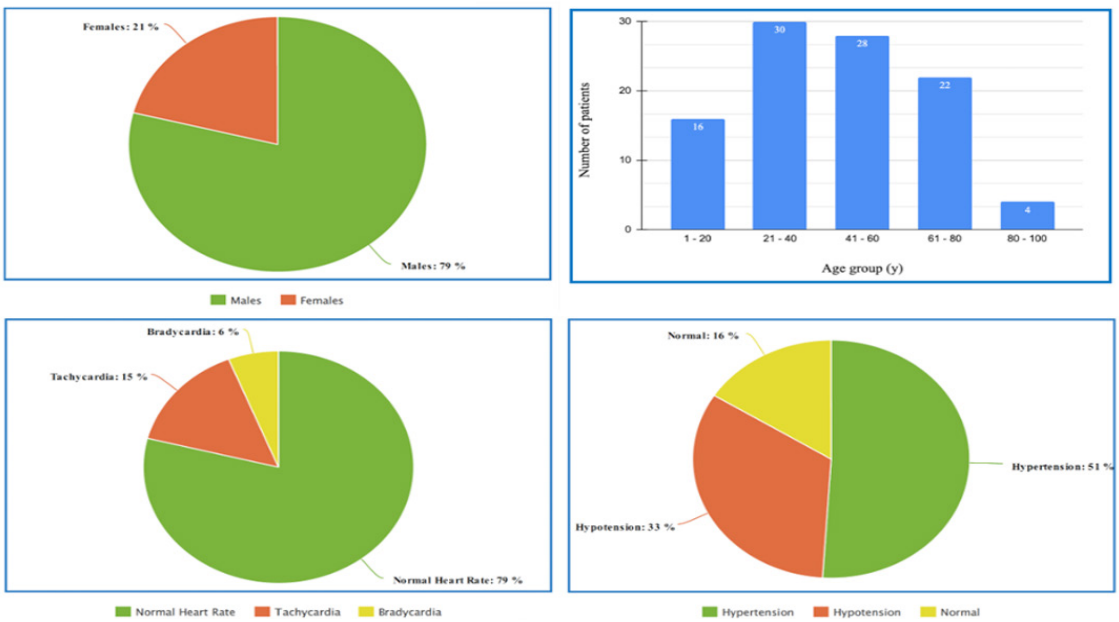

Fig. 1 a: Incidence of head injuries (number of patients) stratified by sex, **Fig. 1 b:** Incidence of head injuries (number of patients) stratified by age group, **Fig. 1 c:** Heart rate of patients on arrival to the Emergency Department, **Fig. 1 d:** Blood pressure of patients on arrival to the Emergency Department

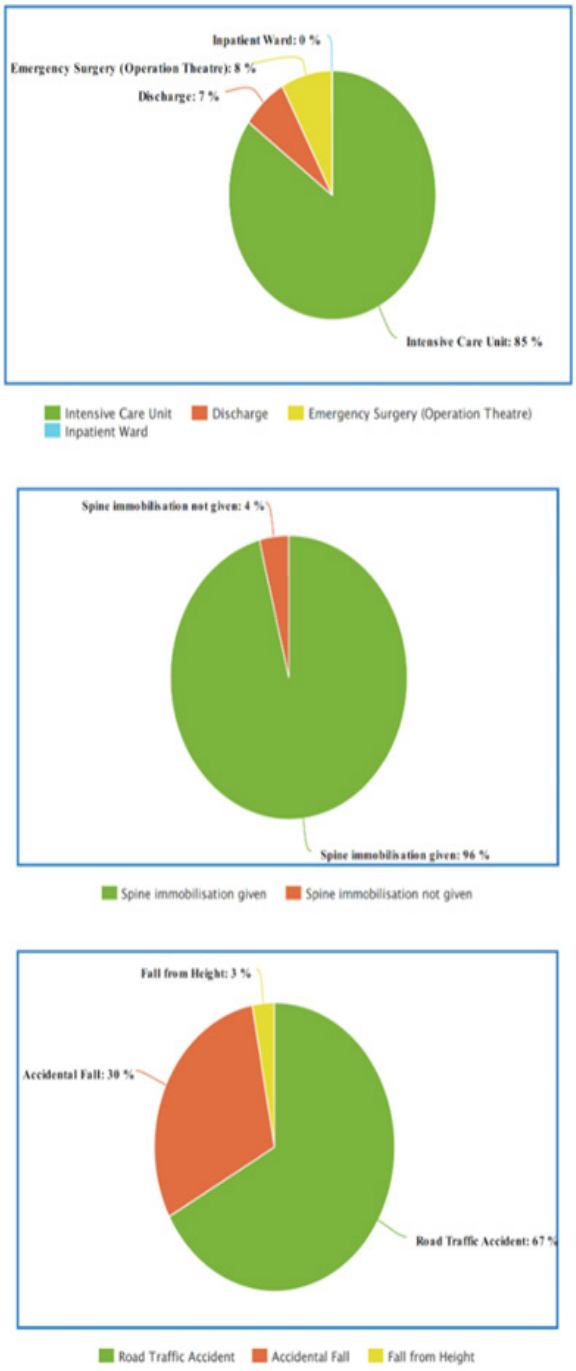

Fig. 2 a: Patient disposal after management and neurology specialty consultation, **Fig. 2 b:** Percentage of patients receiving spine immobilization, **Fig. 2 c:** Etiology of fall in the patients

GCS scoring and Head Injury Severity Assessment:

These were done on patients' arrival to ED and at two and 4 hours thereafter. Patients with a GCS score of 8 or lesser were grouped as severe, 9 to 12 as moderate, and 13 and above as mild head injuries.

The results are depicted in the Table 2 given below:

Table 2: Distribution of head injury severity based on GCS scoring (percentage of total patients)

GCS / Head Injury Severity	On Arrival (%)	2 Hours from Arrival (%)	4 Hours from Arrival (%)
Mild = 13 to 15	43	39	38
Moderate = 9 to 12	26	33	30
Severe = 8 and < 8	31	28	32

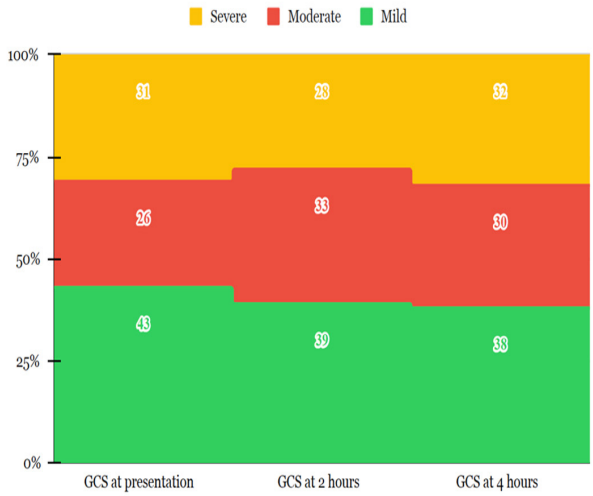

Fig 3: Progression of head injury severity based on GCS scoring (percentage of total patients) over a period of 4 hours since arrival to the Emergency Department

The GCS scoring and head injury severity were not constant in all three assessments at 0, 2, and 4 hours.

On arrival, the number of patients in the mild head injury severity category was 43, and this number changed to 39 and 38 at 2 and 4 hours respectively from arrival.

Initially, 26 patients were in the moderate head injury severity group and this number changed to 33 and 30 at 2 and 4 hours after arrival respectively.

Similarly, in the severe head injury group, the numbers were 31, 28, and 32 respectively at 0, 2, and 4 hours of arrival to ED.

Discussion

Head injury is a major socio-economic and health problem, affecting all strata of society. In this study, we looked into the *clinical profile* of the patients presenting with head injuries to our ED. Head injury incidence, severity, and outcome are primarily influenced by the gender and age of the patients.[3,4]

Gender distribution

The majority (79%) of our patients were males, concurring with many similar studies' findings.[3, 4] This could be because the males, being the breadwinners of the families, are mainly involved in outdoor activities, whether driving vehicles or occupations involving the hazard of accidental falls from heights: examples being construction and building maintenance work.

Age distribution

The most vulnerable age group to have head injuries was the one between 21 and 60 years occupying 58% of the study population; of course, this being the most active age group, to run from pillar to post to meet all needs and necessities of themselves and their families. Furthermore, in this age group, the sub-sect of those in their second and third decades of life span are fonder of fearlessly exposing themselves to the adventures and heroism on the road, happily extending an invitation to RTAs.

The least incidence of head injury 16% was in the age group of fewer than 20 years. Their activities are primarily indoor at this age group, confined to the home and Educational Institutions. Again in India, no one, if below 18 years of age, can get a driving license, further limiting RTAs related injuries in this age group.

MOIs

Globally, Road Traffic Accidents do occupy the most common cause of Head Injuries. In our study, too, this holds; in 67 percent of our study population, the cause was RTAs. The concern in this regard are:

1. The exponential explosion of vehicular traffic, for both public, individual, and family needs.
2. The rash driving, disobediently following "On the Rule of the Road;" "Drive and Drink," or "Drink and Drive."
3. Overburdened helpless regulatory authorities - Governments and their Officials - with their hands tied behind.
4. Deliberate Non-realization of responsibilities by the Individuals and society with utmost reluctance to adhere to Road Safety.

"All the above suggest the need to take a closer look at the nation's traffic conditions, laxity in our traffic rules and regulations. There is an absolute need for implementing measures beyond the hospital settings to ensure road safety. Not to be excluded is the possibility of those drivers who happen to be under the influence of any substance such as alcohol or drug, which also tends to be a liability on the road, whether to themselves or others. Further, the emphasis on the mandatory use of personal protective gears – helmets, seat belts, and stringent penalization for violation of traffic rules as well as driving under the drug/alcohol influence".[5]

Other than RTAs, nearly a third of the cases presented to our ED due to 'falls.' Of the 33% of the head injuries due to falls, 30% were due to non-accidental slip and fall and 3% were due to falling from a height, either unintentional or intentional. The etiologies of 'slip and fall' may be varied, and most of them are preventable. Most unintentional 'fall from height' are occupational in nature, mainly due to non-adherence to safe practices and safety advice. As a preventative measure, workers and their supervisors involved in such occupations should be trained and reinforced periodically in safe practices and the use of appropriate protective gear.[6,7]

Cervical spine Immobilization

Ninety six percent of our patients had Cervical Spine immobilization as they were all suspected of having C spine involvement based on the MOIs which were of significant nature.

On arrival, 75% of the patients had tachycardia and 6% bradycardia, and the rest had normal heart rates.

The incidence of hypertension and hypotension on arrival was 51% and 33%, respectively.

Patient Disposal

Most of our patients (85%) belonged to moderate to severe head injury categories needing ICU care.

As the definite indications warranted Emergent Neuro-Surgical interventions in 8% of the patients, they were wheeled to OT directly from ED, after resuscitation, essential investigations, and management.

After evaluation, investigation, management, and neuro-consultation, the rest of the patients were kept under observation at ED for an appropriate length of time and discharged home with advice to report back hospital when warranted.

Most of our study data are similar to and concurring with the data of other studies conducted at various centers around the world.[1,3-7]

GCS Scoring and Head Injury Severity Level Assessment

Head Injury Severity Level Assessment based on

GCS scores was done for all the patients at their arrival to ED two and four hours from there.

It is an undeniable fact that Neuroimaging is a definitive tool in the diagnosis, severity assessment, and management of head injury patients. However, the same may not be at immediate reach in every healthcare setup pre-hospital and primary and secondary care hospitals. In such situations, GCS Scores would be indispensable for the early stratification of the severity level of the head injuries. This will assist the clinicians to decide appropriate management strategies and prompt transport decisions to minimize secondary neuronal injuries.[8,9] However, GCS has certain limitations that are dependent on certain factors, such as a patient presenting to the ED with other associated comorbidities. Also, for example, evaluating the GCS of a patient presenting from another hospital has its restrictions as they may have already received first aid and may already be under sedation, analgesics, or intubation, wherein GCS assessment can give us a false interpretation of neurological status. In the case of severe polytrauma victims, GCS alone may not give the full picture of current neurological status, and all presenting issues will have to be addressed and triaged accordingly.[10] Hence, neuroimaging has been implemented for further confirmation of the severity of the injury and clinical correlation. A non-contrast CT scan is the most commonly used imaging modality, as intracranial bleeds and skull fractures are easily identifiable, and they are the most common presentations of traumatic brain injury. Cerebral edema as a result of trauma can be visualized on CT imaging. All current guidelines state that any person presenting to the ED with a history of head injury and a GCS of less than 14 should undergo a head CT.[10] Follow-up of patients is also essential. This is true especially within the ED, especially in a setting where higher specialties such as Neurosurgery are not available or where the patient transfer is delayed. Patients have to be documented for any signs of clinical deterioration, and if indicated, repeat scans may be required. It is common to find worsening of CT findings, and if so, alternative management plans may need to be implemented.[11-14]

Table 3: Distribution of head injury severity based on GCS

Gcs / Head Injury Severity	On Arrival	2 Hours from Arrival	4 Hours from Arrival
Mild = 13 To 15	43	39	38
Moderate: GCS= 9 To 12	26	33	30
Severe: GCS = 8 and < 8	31	28	32

The following observations and inferences from the above data concur with other similar studies:[2,4,8,13,14]

- The GCS score is a valuable tool in Head Injury Severity Level assessment in places inaccessible to immediate neuroimaging.
- The GCS scoring and hence the head injury severity are not constant.
- They may escalate or de-escalate in accordance with time.
- The time taken for this may be short or long and unpredictable.
- Even if the severity is mild, extended observation and vigilant care are mandated.
- Not to compromise neuron-imaging if warranted or in doubt.
- Extreme caution in decisions of premature discharges.
- Appropriate advice to report back to the facility without delay SOS and for follow up

Limitations of our study

- The study population was small.
- The study period was of short duration.
- Non-inclusion of people of multiple races and ethnicity.
- Non-inclusion of MOIs other than RTAs and 'falls.'
- No long-term follow-up.

Conclusion

Apart from the preponderance of head injury prevalence in the males and the second to fifth decade of life, most of the head injuries were due to high energy impacts, the majority of them being caused by RTAs and next by non-accidental falls, especially in the older adults and lastly in the least few due to accidental falls from height, often of occupational. Except for very few, all others needed cervical spine immobilization and ICU care. In situations inaccessible for immediate access for Imaging, GCS scoring played a vital role in assessing and reassessing the head injury severity, which helped make patient management and transfer decisions early to prevent secondary neuronal injuries.

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needs to be a deep concern for the older adults succumbing to head injuries by 'slip and fall' and those sustaining head injuries by accidental falls from heights, mostly of occupational origin, are all of preventable nature by appropriate measures.

Every health care personnel involved in the care of the head injury patients straight from the pre-hospital setup is being endorsed with the great responsibility of preventing the occurrence of secondary neuronal injuries in addition to averting further worsening of the already sustained primary insults.

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