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Efficacy Of Glasgow Coma Scale in Assessing the Outcome of Patients with Head Injury

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OBJECTIVE

1. To evaluate the efficacy of Glasgow Coma Scale scoring in predicting the prognosis of head injury patients.
2. To assess each individual component of the Glasgow Coma Scale and identifying which of the three is significantly predicting the outcome of a patient's prognosis.
3. To categorise severity of head injury as per Glasgow coma scoring.
4. To assess Glasgow outcome scale at two months interval.

METHODS

Head injury patients admitted under neurosurgery department at Igmc shimla were taken, who meet the inclusion criteria.
Does patient match inclusion criteria? No-> Excluded from study.
Yes-> Included in study.
GCS Score at the time of arrival in Emergency department taken. Severity of head injury assessed and patients are categorised accordingly.
Followed by → Assessment of Glasgow outcome scale at discharge and 2 months interval.
Duration of Study: 1 year
Study Period: September 2021 to September 2022
Study Design:Observational Prospective Study
Study Population:Head Injury Patients aged 16-60 years.
Study Sample:All cases within the mentioned time frame who meet the inclusion criteria.

CONCLUSION

The percentage of patients with Good Recovery as GOS was 27% (27/100) and with Moderate/Severe disablement was 67%(67/100) and 6%(6/100) patients died on 2 month follow up. Out of the 100 patients who participated in this study, 60 Were of severe head injury status according to scoring system i.e. GCS score of 8 or less. The remaining 35 patients were of moderate brain injury (GCS of 9-12) as And 5 patients of mild head injury. On comparing the individual component of GCS, it was found that verbal component was most significant in assessing outcome of the patient.

KEY WORDS Traumatic brain injury, Glasgow coma scale, Glasgow outcome score, road traffic accidents

ABBREVIATIONS

ABCDE- Airway, Breathing, Circulation, Disability, Exposure
ABG-Arterial Blood Gas
ATLS-Advanced trauma life support
BTF-Brain Trauma Foundation
Cm-Centimetre
DAI-Diffuse Axonal Injury
DALYs-Disability Adjusted Life Years
ECG-Electrocardiogram
ED-Emergency Department
EDH-Extra Dural Haematoma
HDI-Human Development Index
HDR-Human Development Report
ICU-Intensive Care Unit
IVH-Intra ventricular haemorrhage
IPH-Intra parenchyma haemorrhage
IGMC-Indira Gandhi Medical College
MM of Hg-Millimetre of mercury
NPO-Nil Per Orally
NST-Neurosurgical trauma
RTA-Road Traffic Accidents
SDH-Sub Dural Haematoma
TBI-Traumatic Brain Injury
USA-United States of America

INTRODUCTION

Traumatic brain injury is a significant public health problem in the world. TBI occurs when a traumatic event causes the brain to move rapidly within the skull, leading to damage.[25] The event can be classified as either impact or non-impact, depending on whether the head makes direct contact with an object (impact) encounters a non-impact force such as blast waves or rapid acceleration and deceleration(non-impact).

TBI is a major public health problem in India. It is also a leading cause of mortality, morbidity, disability and socioeconomic losses in the Indian subcontinent.[29] The increase in economic growth in India coupled with a rise in population, motorisation, and industrialisation has contributed to a significant increase in TBI with each advancing year.

TBI results in deaths, injuries, and disabilities in all age groups but more in young and productive persons and higher in males than females.[30] National level data in India is not available for TBI as in many other developed countries.

The most common cause of TBI normally reported in India is traffic accidents (RTA) accounting for 60%, followed by falls and assaults contributing to 25% and 10% of traumatic brain injuries respectively.[27]

The economic losses to India due to TBIs are phenomenal, though unmeasured. According to the World Health Organisation, the disability- adjusted Life Years (DALYs) losses are higher for low-income countries due to injuries for nearly all causes and TBI is an important and often critical sequel of these

injuries.[31] Also low income countries like India face a higher preponderance of risk factors for TBI yet often do not have the healthcare capacity to deal with the associated health outcomes.The significant disability associated with TBI also places a considerable burden on health systems in these countries. Road traffic injuries account for 2.1% of global mortality.The developing countries bear a large share of burden and account for about 85% of the deaths as a result of road traffic crashes.[32] India accounts for about 10% of road accident fatalities worldwide.[33]

Road accident contributed 30.2 percent to all kind of natural and unnatural accidental deaths during 2005. According to the Institute of Road Traffic Education (2006),New Delhi, out of the estimated 1.4 million serious road accidents/collisions occurring annually in India, hardly 0.4 million are recorded.[33] This indicates that the surveillance system for vehicular accidents is not well established in India. Epidemiological data on road traffic accidents in India have been reported but there is no proper correlation with head injury. There have been significant social and demographic changes including changes in lifestyle, population and number of vehicles. Continuous growth in the number of motor vehicles, increase in population and poor access to health care are some of the important factors in fatalities due to vehicular accidents. There has been significant growth in a number of motor vehicles from 241 (1996-1997) to 317 (2006-2007) per 1000 population. The majority of vehicles were two-wheelers. The road length has been reduced from 2.06 (2000-2001 to 1.88 (2006-2007) km per 1000 population and 8.45 (2000-2001) to 5.90 (2006-2007) km per 1000 vehicles.[33] However, despite the increase in TBI burden, research, as evidenced by publications in scientific journals pertaining to TBI, is grossly inadequate in India. For evaluation of traumatic brain injury(TBI), in 1974 the Glasgow Coma Scale (GCS), based on clinical observations, was developed & used as a functional scale for the assessment of coma and impaired consciousness.

It is used to classify the severity of TBI as Mild (GCS 13-15), moderate(GCS 9-12), and severe (GCS <=8).[1] Even though the Glasgow Coma Scale has been accepted as the gold standard in the neurological assessment of patients, it has come down under scrutiny and many authors have claimed weaknesses in the scoring system.

This includes its inability to predict a patient outcome and having variation in its reading amongst assessing individuals.[1] In 1975, Jennet finalised the Glasgow Outcome Scale with Michael Bond who became the professor of psychological medicine in Glasgow. The Glasgow Coma Scale was able to categorise neurological cases in the follow-up period of 3-6 months from the date of trauma/cerebral accident.[5,6]

In this study, we pursue a different aspect, i.e. the relation between the two scales and how the Glasgow Coma scale can help in predicting the Glasgow outcome score in a patient with head injury. Himachal Pradesh, being a hilly state, receives a significant number of patients with TBI but there are limited neurosurgery care centres. IGMC Shimla is one of the largest tertiary care centre in the state and no such studies has been previously done in the past in our institute. Hence, an attempt is being made to study the efficacy of Glasgow coma scale in predicting the prognosis in patients with TBI in Himachal Pradesh, India.

MATERIALS AND METHODS

Head injury cases admitted under neurosurgery were taken, who meet the inclusion criteria.

Does patient match inclusion criteria? No-> Excluded from study.

Yes-> Included in study.

GCS Score at the time of arrival in Emergency department taken.

Followed by → Assessment of Glasgow outcome scale at discharge and 2 months interval.
Duration of Study: 1 year
Study Period: September 2021 to September 2022
Cases of isolated head injury that follow the inclusion/exclusion criteria were selected from the trauma cases that come through the emergency department.
Study Design: Observational Prospective Study
Study Population: Head Injury Patients aged 16-60 years.
Study Sample: All cases within the mentioned time frame who meet the inclusion criteria.

Inclusion Criteria:
1. Age 16 to 60 years.
2. Closed head injuries.
3. Apparently healthy individuals.
4. Mechanism of injury- Free fall from height and Road side accident.
5. Admitted under neurosurgery for a period more than 24 hours.

Exclusion Criteria:
1. Age <16years and >60years.
3. Cases with associated major abdomen/chest/orthopaedic trauma
4. Known Case of a. Liver pathology/Failure b. Renal Failure c. Cardiac failure.
5. Patient on Heparin/Warfarin/Ecosprin and related drugs

RESULTS

In this study, we analysed each component of the Glasgow Coma Scale and compared it with the Glasgow Coma Scale for sample size of 100 patients with head injury who came to IGMC Hospital, Emergency department between the months of September 2021 to end of September 2022. All the head injury patients underwent resuscitation and CT brain and admitted in the Neurosurgery intensive care unit. Consents from patient's close relatives were obtained and, aside from the initial GCS score, the patients were assessed with regard to severity and mode of injury. To interpret the results, the scores of each component of GCS were divided into those with no response ('1') and those with response ('2' and above) and full GCS score was divided into 3 categories, mild, moderate and severe. For Glasgow Outcome scale; a scale with five categories, was pooled into three categories; good recovery(GOS-5), moderate/severely disabled (GOS-2,3,4) and death(5). Of the 100 patients, 6 were deemed vegetative or dead in the 2 month follow-up. Upon admission, Glasgow coma score was taken and the patient was stabilised by ensuring adequate Resuscitation. Once stabilised, the patient was shifted to the neurosurgery ICU/Ward. Out of the 100 patients who participated in this study, 60 Were of severe head injury status according to scoring system i.e. GCS score of 8 or less. The remaining 35 patients were of moderate brain injury (GCS of 9-12) and 5 patients of mild head injury.

The mean age of the patients was 44.39 years old. The percentage of patients with 'Good Recovery' as GOS was 27% (27/100) and with Moderate/Severe disablement was 67%(67/100) and 6%(6/100) patients died on 2 month follow up. Patients with mild GCS(13-15) were 5%, moderate GCS(9-12) were 35% and severe GCS(=<8) were 60%. On collection of cases, it was noted that the majority of patients who had

come to the emergency department with head trauma were of male gender. A total of only 10 patients out of 100 patients were female. Therefore, sex of an individual could not be used as a variable in this study. Patients who sustained trauma by fall were 59% out of which 22%(13/59) had good recovery and 78%(46 out of 59) had moderate/severe disablement and death. Patients who sustained trauma by RSA were 61%, out of which 9.83%(6/61) had good recovery and 57.37% (35/61) had moderate/severe disablement and death.

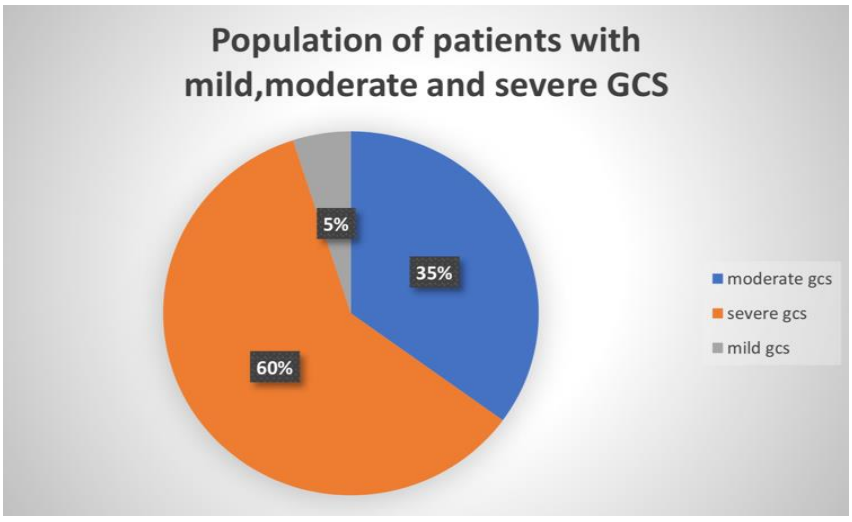
Out of 100 patients, 26 were under the influence of alcohol during trauma. Out of 26 patients, 2 were female and rest 24 patients were male.

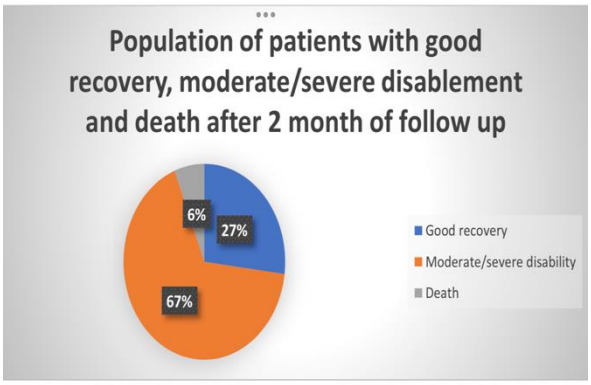
70% patients underwent emergency surgical procedure along with medical treatment and rest 30% patients were managed medically.

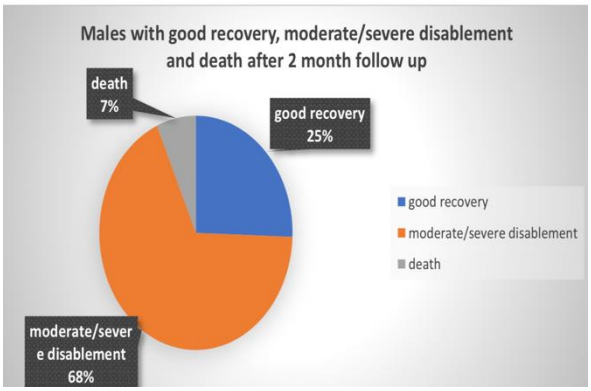
Most patients presented with mixed components of TBI on NCCT head. 57 patients were having EDH, 34 were having SDH, 29 had SAH. 10 had DAI, 2 had IPH and 1 had IVH. 63% of patients were having solitary component of TBI and rest 37% were having mixed components. 6 out of 37 patients with mixed components of TBI showed good recovery and 22 out of 63 patients of solitary component of TBI showed good recovery. Out of 100 patients, 27 had good recovery and 73 patients have moderate/severe disability and death. Out of these 73 people, 6 patients were E1 and 67 patients were E2-4. Chi square was 0.0176 and p value is 0.894. The result is not significant as p value <0.05.

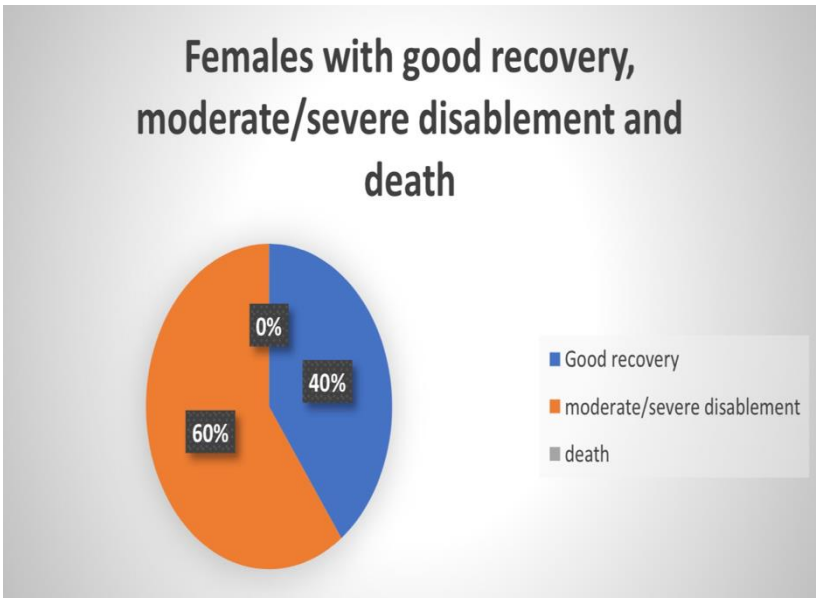
According to the analysis, verbal component of Glasgow coma score showed more promise in predicting a poor Glasgow Outcome scale. Numbers show that 61 patients had no verbal response. Of 61 patients, 12 had good recovery, 44 has moderate or severe disability and 5 patients died. Of the 39 patients with verbal response, 15 had Good recovery while 23 were moderately and severely disabled and 1 died after 2 months. Chi square was 4.2612 with p-value of 0.038. Hence the results were significant as p value of <0.05.

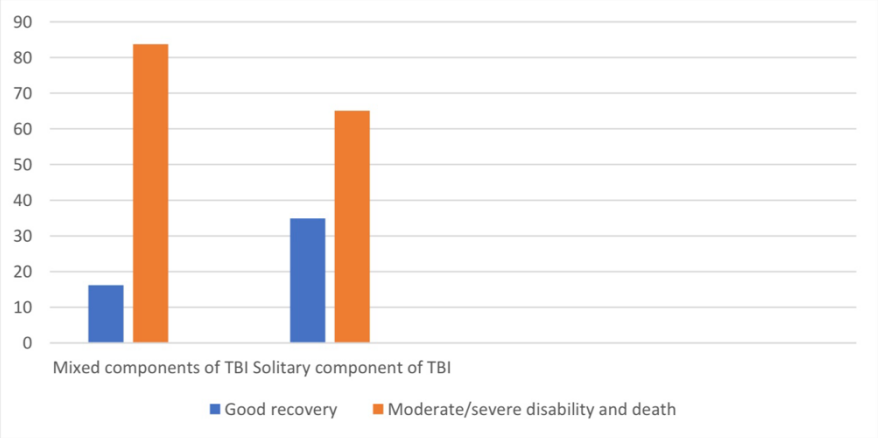
The total number of patients having no motor response was 16/100, out of which 3 showed good recovery, 12 showed moderate to severe disability and 1 died. Chi-square was 0.657 and p-value was 0.417. Results are not significant with p value of <0.05 Even though the p value was not significant, it was found to be more significant in comparison with the Eye component of GCS.

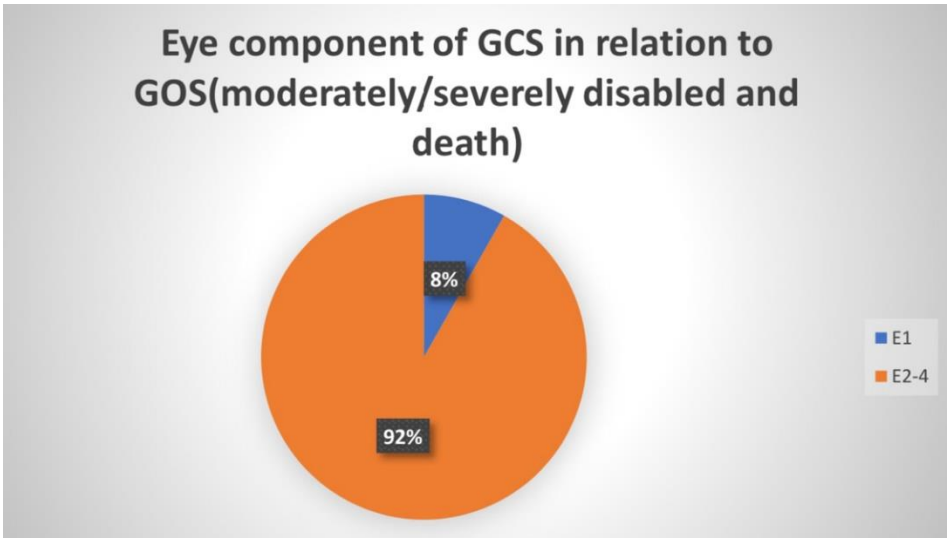


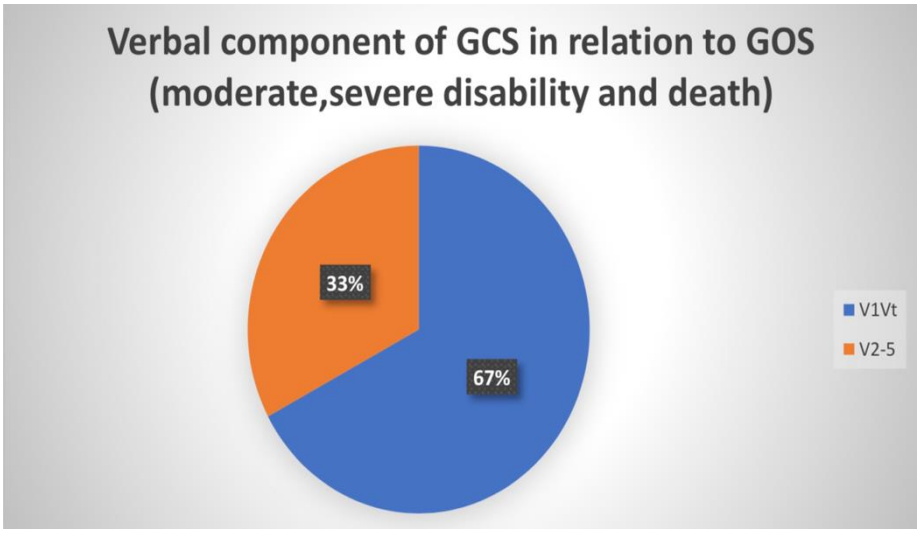

Population of patients with good recovery, moderate/severe disablement and death after 2 month of follow up
6%
27%
67%
Good recovery
Moderate/severe disability
Death

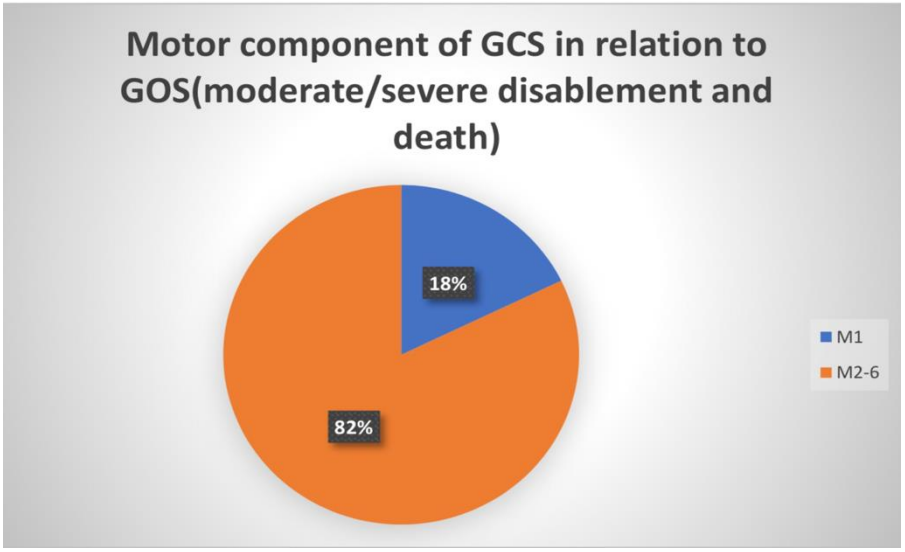

Males with good recovery, moderate/severe disablement and death after 2 month follow up
death 7%
good recovery 25%
moderate/sever e disablement 68%
good recovery
moderate/severe disablement
death


Females with good recovery, moderate/severe disablement and death
0%
40%
60%
Good recovery
moderate/severe disablement
death


90
80
70
60
50
40
30
20
10
0
Mixed components of TBI
Solitary component of TBI
Good recovery
Moderate/severe disability and death


Eye component of GCS in relation to GOS(moderately/severely disabled and death)
8%
92%
E1
E2-4


Verbal component of GCS in relation to GOS (moderate,severe disability and death)
33%
67%
V1Vt
V2-5



DISCUSSION

Traumatic brain injury (TBI), a significant public health problem, is a leading cause of disability and mortality in all regions of the globe despite advancements in prevention and treatment.[78] Its global incidence is rising and it is predicted to surpass many diseases as a major cause of death and disability. TBI is the main cause of one-third to one-half of all trauma deaths and the leading cause of disability in people under forty, severely disabling 15–20/100,000 populations per year.[79] There is some data to indicate that the majority of TBI cases (60%) are as a result of RTA, followed by falls (20-30%), and violence (10%).[82] This observational prospective study was done in IGMC Hospital, Shimla. The study was initiated from the month of September 2021 to end of September 2022 with a total of 100 patients with head injury that were brought and admitted under the neurosurgery department. Specific criteria for selecting the patients was in place. All the 100 patients were admitted in IGMC Hospital, underwent complete treatment until time of discharge.

Sex in this study

In the present study, males were higher than females. Males outnumbered females in the study with a ratio of 9:1. These results are in concordance with the previous studies where male dominance over females in neurosurgical trauma cases have been observed.[82,84] Yattoo et al in their study also noted an overall male: female ratio 3:1 in patients with TBI.[85] The major reason of male dominance could be due to the fact that the most of drivers, labourers, farmers and other workers are males who could be injured during the course of work and males have an increased risk-taking behaviour as compared to females.

Alcohol and TBI

It was also observed that a total of 26 (26%) patients had a prior intake of alcohol before the injury. Alcohol contributes substantially to the morbidity and mortality of trauma patients, regardless of the type of injury suffered. Serum alcohol levels correlate closely with the extent of the injury. Approximately half of the alcohol-related deaths in trauma occur in pre-hospital settings. In a study on TBI, 35- 81% of the injured patients are alcohol-intoxicated and 42% of the TBI patients were heavy drinkers before the injury.[93] Sekhar et al in a study of TBI cases found that 8% cases had a history of alcohol intake prior to meeting an injury.[92]

Outcome in TBI

It was observed that mortality rate was 6%. 27% patients showed good recovery, and 67% had moderate/severe disability at the end of 2 months. These results are in concordance with the study of Yattoo et al in which the total number of traumatic brain injury deaths was 1298 out of a total of 18093 (7.1%) head injury patients.[102]

Type of Treatment in TBI

Out of 100 patients, 30 patients received medical Management. and 70 patients were operated. In a study by Shekhar et al on TBI only 11% cases required surgical management, rest were managed conservatively.[92]

Intubation Before Reaching IGMC vs Outcome in TBI

We also observed that as per their condition 55 patients required intubation before reaching IGMC, Shimla. There was clear-cut association between outcome and intubation of patients before reaching IGMC but controversy remains regarding when and where the patient should be intubated as noted in the following studies. Chmayssani et al in their study mentioned that although the evidence linking hypoxemia to the poor outcome is very well established, the timing as to when to institute mechanical ventilation is controversial.[106] In an Australian based randomized trial, prehospital rapid sequence intubation was associated with improved outcome at 6 months. On the contrary, in another randomized trial prehospital intubation was associated with adverse outcome compared with intubation in hospital. Lack of adequate experience of paramedics was attributed to an adverse outcome for pre- hospital intubations. The current guidelines recommend aggressive airway management in hypo ventilated or hypoxemia TBI patients, either by endotracheal intubation or by mask ventilation.[106] In a report of the

National Confidential Enquiry into Patient Outcome and Death in London (2007), it was noted that the current structure of prehospital management is insufficient to meet the needs of the severely injured patient. There is a high incidence of failed intubation and a high incidence of patients arriving at the hospital with a partially or completely obstructed airway. It was recommended that change is urgently required to provide a system that reliably provides a clear airway with good oxygenation and control of ventilation. This may be through the provision of personnel with the ability to provide anaesthesia and intubation in the prehospital phase or the use of alternative airway devices.[88]

GCS vs Outcome In TBI

In the present study, we classified the patients with TBI on the basis of Glasgow Coma Scale (GCS). GCS was classified as mild, moderate, and severe on the score of 13-15, 9-12, and ≤8 respectively. It was found that 5% had a mild injury. 35% patients had a moderate injury and 60% had severe injury. Study by Shekhar et al in showed that as per Glasgow coma scale mild, moderate, and severe grade of TBI was seen in 62%, 22%, and 16% cases respectively.[93] We also observed if GCS grade was associated with the outcome of treatment. It was found that among 6 patients who expired, 5 patients had severe GCS grade and 1 patients had moderate GCS grade. It was observed that GCS grade was significantly associated with the outcome of the treatment (P=0.000). We observed the highest mortality among patients with severe TBI. In other studies, it was observed that mortality was highest (38%) among severe TBIs compared to mild TBIs (1.5%).56 Tandon also reported a high mortality of 43.5% among severe brain injured persons compared with 7% of moderate and mild brain injuries.[60]

Type of TBI

It was observed that scalp hematoma/laceration was most common, followed by fracture skull, EDH in 57, SDH in 34, ICH/IVH in 3, SAH in 29 and DAI in 10 patients. Yattoo et al in their study also noted that the highest number of patients were having scalp lacerations.[102] Since the 1970s, when Teasdale and

Jennett established the Glasgow Coma Scale, the scale has been the subject for numerous papers. The assessment of outcome in head injury patients have been compared to many variables of which GCS has outstood them all. Some of these studies have even been dated before the use of CT scans and other advancements of medicine, revealing how accurate it is as a scale of quantifying impaired consciousness in an individual with head injury. This study revealed that of the 100 patients, being of moderate to severe head injury cases, 6 of them were of vegetative state or dead by the two month of follow up according to Glasgow Outcome Score. Statistical analysis of the results of this study was done and presented as tables which were portrayed earlier. A comparison between the results of this study and that of other similar studies have been cleared below. This study has revealed much of the same knowledge we know about the Glasgow Coma Scale and its components; this being the fact that out of the three components, eye response was of lowest stature in predicting Glasgow Outcome Scale. The number one predictor of GOS, in this study, was found to be verbal response, followed by motor component. This is explained by the fact that a majority of patients with no verbal response, were intubated causing a stir in the final result. The International Mission for Prognosis and Analysis of Clinical Trials in TBI is known as IMPACT. It was a study developed with almost 10 years' worth of papers and researches in developing easily usable formula for predicting prognosis in individuals with traumatic brain injury. The aim of this group is to significantly increase the positive predictability in identifying prognosis of patients with head injury. Compared to Murray, G. et al, in his study Multivariable Prognostic Analysis in Traumatic Brain Injury: Results from the IMPACT Study, "GCS motor score and pupil response were powerful independent predictors of outcome. GCS eye and verbal were powerful with modest but relevant independent effects."[12] This study also took into account, other variables which were of significance, i.e. demographic variables (age, sex, race, educational level), hypotension, hypoxia, CT scan (according to Marshall CT classification) and prothrombin time, which was almost as equal as a predictor of prognosis compared to other laboratory parameters (ex. Glucose, haemoglobin and platelet levels). Majority of the cases (61%) where due to road traffic accidents being the mode of injury. Shekhar et al observed that fall from height was the main cause of TBI (56%) followed by road traffic injury (RTI) (36%).[92] Falls were more prominent in second and third decades. Predicting the precise outcome of a patient's prognosis in the form of Glasgow Outcome Scale, could be done only to a certain extent. According to the results of this study, patient with poor verbal and motor response have a high stature in the Glasgow Coma Scale scoring, compared to eye response. In a study by Lindsey Wilson, J.T, et al, she elaborated on the drawback of the Glasgow Coma Scale, describing it as an open-ended format where the results are variable among individual assessors. GOS are multidimensional, and the criteria for the upper categories are therefore ambiguous.[8] Weir, J, et al, then did a study that was titled "Does the Extended Glasgow Outcome Scale Add Value to the Conventional Glasgow Outcome Scale?" In this study, results showed that "using ordinal technique to analyse the GOS gives a substantial gain in efficiency relative to the conventional analysis, which collapses the GOS onto a binary scale (favourable versus unfavourable outcome).[21] They finalised that Glasgow Outcome Scale- Extended, should be used in place of the original Glasgow Outcome Scale. Extended (GOSE) that is now being used regularly.[8] Gradually there will be new advancements and new factors that will come into place when it comes to assessing trauma patients. Simple factors like age and mode of injury have impacted the routine survey of an individual with traumatic head injury. There is more to discover regarding head injury and managing cases; it is getting simpler with the number of studies being done. In comparison to other studies, this study was different in that it focused mainly on the three components of the Glasgow Coma Scale. If more prognostic factors were included in the study, better

calculated outcome could have been reported. There were many limitations in this study. Multiple patients were not affordable for Intensive care unit stay and requested discharge, therefore being removed from the study mid-way. Many patients also lost follow up after 2 months. Secondly, there was unusually high significance in verbal response of GCS compared to that of motor response. This could be suspected as a number of patients were brought intubated from outside hospital with no assessment available prior to intubation, hence these cases were taken down as 'no verbal response' causing significance in the results of the study. Lastly, other significant variables should have been included in the study, such as pupil reactivity to light, hypotension, hypoxia, and even PT/INR values, which have been proven to be a striking prognostic factor as mentioned in the study by Murray, G. et al.

SUMMARY

The percentage of patients with'Good Recovery as GOS was 27% (27/100) and with Moderate/Severe disablement was 67%(67/100) and 6%(6/100) patients died on 2 month follow up. Out of the 100 patients who participated in this study, 60 Were of severe head injury status according to scoring system i.e. GCS score of 8 or less. The remaining 35 patients were of moderate brain injury (GCS of 9-12) as And 5 patients of mild head injury. The mean age of the patients was 44.39 years old. Patients with mild GCS(13-15) were 5%, moderate GCS(9-12) were 35% and severe GCS(=<8) were 60%. On collection of cases, it was noted that the majority of patients who had come to the emergency department with head trauma where of male gender. A total of only 10 patients out of 100 patients were female. Patients who sustained trauma by fall were 59% out of which 22%(13/59) had good recovery and 78%(46 out of 59) had 53 moderate/severe disablement and death. Patients who sustained trauma by RSA were 61%, out of which 9.83%(6/61) had good recovery and 57.37% (35/61) had moderate/severe disablement and death.

Mean length of hospital stay was 9.12 days Out of 100 patients, 26 were under the influence of alcohol during trauma. Out of 26 patients, 2 were female and rest 24 patients were male. 70% patients underwent emergency surgical procedure along with medical treatment and rest 30% patients were managed conservatively.

63% of patients were having solitary component of TBI and rest 37% were having mixed components. 6 out of 37 patients with mixed components of TBI showed good recovery and 22 out of 63 patients of solitary component of TBI showed good recovery. Out of 100 patients, 27 had good recovery and 73 patients have moderate/severe disability and death. Out of these 73 people, 6 patients were E1 and 67 patients were E2-4. 61 patients had no verbal response. Of 61 patients, 12 had good recovery, 44 has moderate or severe disability and 5 patients died. Of the 39 patients with verbal response, 15 had Good recovery while 23 were moderately and severely disabled and 1 died after 2 months. Total number of patients having no motor response was 16/100, out of which 3 showed good recovery, 12 showed moderate to severe disability and 1 died.

CONCLUSION

Many papers on the Glasgow Coma Scale are being made to further excel its purpose in the Neurosurgery and Emergency Medicine field. Having better knowledge regarding the clinical progression of a patient with traumatic brain injury and being able to assess with CT staging of the injury is the aim. This study and many other studies like it, has brought a conclusion that every response to a similar injury, is different for different patients. It cannot be said that all patients will react or improve the same way as the other. Even though a majority of studies declare certain predictors for prognosis of head injury patients as the

best one, equal number of studies prove otherwise. Many factors in head injury patient have been assessed and analysed, however, now is the time to expand our use of clinical knowledge beyond the Glasgow Coma scale, and create new scoring systems that take other variables into account for establishing prognosis of head injury patients. Scales such as the Glasgow Coma Scale – Extended is an example of such a scale. Numerous meta-analysis studies have been brought to light, and taking all of this knowledge and results can help create a more precise scoring system with accurate results. Considering the enormity of the problem of Neurosurgical Trauma in our state there is an urgent need for the provision of proper transportation facilities of these patients quickly to the nearest hospitals and tertiary care centres in well-equipped ambulances with well-trained medical personnel. Evacuation by helicopters can be a good measure to save time in patients who have sustained an injury in far-flung areas of the state. ATLS course should ideally be provided for the doctors serving in the periphery. A prehospital Trauma course should be designed for emergency medical technicians/nurses/pharmacists for management of patients with Neurosurgical trauma. Better prehospital care, better documentation and strict adherence to ATLS protocols can reduce the morbidity and mortality of Neurosurgical trauma. Spinal boards, cervical collars, endotracheal tubes, nasopharyngeal airway devices, oxygen cylinders should be freely available in all ambulances and peripheral hospitals. Prevention is possible by better upkeep and management of roads and other legislative measures. Strict enforcement of motor vehicle laws like the compulsory wearing of seat belts, helmets and strict police action against drunken driving can reduce the disease burden associated with Neurosurgical Trauma. All buildings, balconies, workplaces should have mandatory safety railings to prevent fall which is a major cause of Neurosurgical Trauma. Neurosurgical Trauma patients require complex, multidisciplinary care which frequently involves ICU care. The number of ICU beds in tertiary centres should be increased and separate ICU beds should be made available for these patients. Mobile, portable ventilators can be provided in peripheral hospitals and ambulances to facilitate the transfer of ventilated patients to tertiary centres. Those patients in need of surgery should be operated as soon as possible. Separate dedicated well-staffed trauma centres should be made in tertiary centres. Regardless of how many people perceive the Glasgow coma scale and it's assessment of prognosis through the Glasgow outcome scale, it has proven to be widely used, easy form of examination that can help in predicting patient's future with or without disability. As long as its purpose and its benefits are appreciated, it can have an essential role in predicting outcome of patients with head injury in the future for many more years to come.

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