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Studying the clinical profile of the patients with head injury, factors affecting its prognosis along with role of Glasgow Coma Scale (G.C.S.) in its outcome

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Abstract

Background: The Glasgow Coma Scale (GCS) score, remains a key measure in neurological assessment after head injury. A score less than or equal to 8 is the traditional criterion for differentiating between severe and moderate to mild head injury. Present study was aimed to study clinical profile of the patients with head injury, factors affecting its prognosis along with role of Glasgow Coma Scale (G.C.S.) in its outcome. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in patients > 18 years, with a history of road traffic accident, Head Injury due to falls or assault, admitted in the neurosurgical ICU or Neurosurgical wards. At the end of one month, we evaluated the Glasgow outcome scores of all patients and documented. **Results:** In our study we enrolled a 100 consecutive adult patients, 68% of the patients were males, while 32% were female, 34% patients sustained mild head Injuries (GCS 13-15) while 40% Patients sustained moderate head injuries (GCS 9-12), and 26% patients sustained severe head Injuries (GCS 3-8). The most recurring symptom/sign in all patients was history of Loss of Consciousness (49 %), followed by, Headache (40%), ENT bleed along with history of Head Injury (37%). A significant correlation noted between Admission GCS grades and GOS grades seen at 1 month. A mortality rate of 6% was observed in the Conservatively managed patients, whereas a mortality rate of 22% was observed amongst the operative arm of the cohort. 11% patients were left with severe disability whereas 10% patients continued to be in a persistent vegetative state, while a mortality of 12% was observed. Unfavorable outcomes (GOS 3,4,5) were observed in 33% of the cohort. **Conclusion:** We conclude that GCS scoring at the time of admission is an essential and useful tool in prognostication of head injuries

Keywords: Glasgow Coma Scale (GCS) score, head injuries. pupillary response, Glasgow Outcome Scale (GOS) score

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Introduction

Traumatic brain injury (TBI), often referred to as the "silent epidemic" remains a growing public health concern and represents the greatest contributor to death and disability globally among all trauma-related injuries.[1] In a rapidly developing country like India, road transportation is massively increasing due to urbanization and industrialization. As a result, head injuries due to road traffic accidents (RTA) have become a daily occurrence taking an increased toll on human lives and limbs.

The primary goal in treating patients with head injury due to any cause is to preserve life of the patient and remaining neurological function. Optimal management of these patients depends on early and correct diagnosis and therefore CT scan head has a vital role. The advent of CT has been a breakthrough as it meets these vital requirements. CT also forms the important screening modality for victims of both blunt and traumatic injuries. Contribution of CT is crucial to complete injury assessment and forms the basis of patient management.[3,4,5]

The Glasgow Coma Scale (GCS) score, remains a key measure in neurological assessment after head injury, and in most studies, classification of the severity of the trauma is still based on the admission GCS. A score less than or equal to 8 is the traditional criterion for differentiating between severe and moderate to mild head injury, and patients' management frequently dependent upon this initial classification.[6] Present study was aimed to study clinical profile of the patients with head injury, factors affecting its prognosis along with role of Glasgow Coma Scale (G.C.S.) in its outcome.

Material And Methods

Present study was single-center, prospective, observational study, conducted in department of Neurosurgery at Mamata Medical College & Hospital, Khammam, Telangana, India. Study duration was of 2 years (October 2106 to September 2018). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- Patients > 18 years, with a history of road traffic accident, Head Injury due to falls or assault, admitted in the neurosurgical ICU or Neurosurgical wards, willing to participate in present study

Exclusion criteria

- Pediatric cases.
- Patients undergoing LAMA (Leave Against Medical Advice)
- Patients not willing for admission / stable and not admitted patients.
- Patients Lost to follow up were excluded and subsequent patients were enrolled.

Study was explained to patients in local language & written consent was taken for participation & study.

We recorded various demographic factors like age, sex, education, occupation, mode of injury. Clinical factors such as history of unconsciousness, vomiting ,convulsions, ENT bleed , light reflex, pupillary status were recorded in the study proforma. Glasgow coma scale at the time of presentation was documented and head injuries were classified as Mild , Moderate and Severe as per the GCS. CT scan findings were included as study factors and were classified as those with intracranial collections, those without intracranial collections.

We statistically analyzed the relevance of GCS at admission in prognosticating the GOS calculated at the end of one month. A statistical analysis of various parameters was performed in regards to Glasgow outcome scales at the end of 1 month. A verbal score of 1 was noted for patients reporting to the emergency department with previous intubation status. Surgical decision making was based frequent clinical examinations, and serial CT scans, and

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based on clinical judgement. At the end of one month, we evaluated the Glasgow outcome scores of all patients and documented..

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

Results

In our study we enrolled a 100 consecutive adult patients, 68% of the patients were males, while 32% were females, a 2.5-fold incidence of head injuries in the male sex. Majority patients were from 19-30 years age group (50 %), followed by 31-50 years age group (31 %) cases. The most prevalent cause of head injuries was Road traffic accidents (68 %) followed by assault related injuries (14 %) and fall related injuries (18 %),

Table 1: General characteristics

	No. of patients	**Percentage**
Age groups (in years)		
19-30	50	50%
31-50	31	31%
>50	19	19%
60-69		
70-79		
Mean age (mean±SD)	36.4 ± 16.3 years	
Gender		
Males	68	68 %
Females	32	32 %
Mode of Injury		
RTA	68	68 %
Falls	18	18 %
Assault	14	14 %

34% patients sustained mild head Injuries (GCS 13-15) while 40% Patients sustained moderate head injuries (GCS 9-12), and 26% patients sustained severe head Injuries (GCS 3-8).

Table 2: Admission -GCS distribution of patients

GCS	**No Of Patients**	**Grading Of Head Injury**	**No Of Patients**
3	2	Mild (GCS 13- 15)	34 (34%)
4	4		
5	5		
6	2		
7	10		
8	11		
9	7	Moderate (GCS 9-12)	40 (40%)
10	3		
11	15		
12	15		
13	11	Severe (GCS 3-8)	26 (26%)

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14	10		
15	4		

The most recurring symptom/sign in all patients was history of Loss of Consciousness (49 %), followed by, Headache (40%), ENT bleed along with history of Head Injury (37%).
After analysis of history findings vs Change in Glasgow Outcome Scores,

Significant correlation was observed between presence of history of vomiting and Head injury outcome scores. p= 0.009, (<0.05) ++Significant

Highly Significant correlation between presence of history of history of unconsciousness and Head injury outcome scores. p= 0.009, (<0.05) ++Significant
No Significant correlation was observed between history of Headache, ENT Bleeding, H/o Convulsions and Outcome scores. (p =0.304, 0.088, 0.233 respectively) p>0.05 non-Significant

Table 3: Presenting Symptom

Presenting Symptom	Percentage of Patients
Loss Of Consciousness	49%
Headache	40%
ENT Bleeding	37%
Vomiting	34%
Seizures	4%

A normal pupillary response was observed in 77% of cases while, anisocoria was observed in 14% patients, dilated non-reacting pupils / Mid dilated, non-reacting pupils were observed in 5% patients, bilateral constricted pupils were observed in 4% patients. After analysis of pupillary findings vs Change in Head Injury severity grades, which reveal significant correlation between pupillary findings and Head injury severity grading.

Table 4: Pupillary response - Vs Head Injury Severity

	Mild (13-15)	Moderate (9-12)	Severe (3-8)
Normal (n=77)	44.10%	44.10%	11.60%
Anisocoria (n=14)	0.00%	35.70%	64.20%
Dilated (n=5)	0	20%	80%
Constricted (n=4)	0	0	100%

A non-parametric, CHI Square test was used to analyze the two-way progression of pupillary findings vs Change in Glasgow outcome score grades, which reveal significant correlation between pupillary findings and GOS grading.

Table 5: Pupillary Examination Vs GOS (Outcomes)

Pupillary Response	GOS 1 Death	GOS Vegetative State	GOS 3 Severe Disability	GOS Moderate Disability	GOS 5 Good Recovery
Normal N=77	4	2	9	16	46
Anisocoria N=14	4	5	1	1	3
Dilated / Mid Dil. N=5	4	1	0	0	0
Constricted N=4	0	2	1	0	1
Total	12	10	11	17	50

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In present study, common associated injuries were Limb Fractures (26 %), Maxillofacial Injuries (15 %) & Chest Trauma / Fractures (11 %).

Table 6: Associated Injuries – Distribution

Type of Injury	Number of patients
Head Injury Alone	29
Limb Fractures	26
Maxillofacial Injuries	15
Chest Trauma / Fractures	11
Polytrauma	7
C Spine Injury	6
Blunt abdominal Trauma	6

A non-parametric, CHI Square test was used to analyze the two-way progression of each GCS grading vs Change in Glasgow outcome score grades, which reveal significant correlation between Admission GCS grades and GOS grades seen at 1 month. (P = 0.000 , +++Significant)

Table 7: Head Injury Severity (GCS) Vs. Mortality

Head Injury grading	Mortality (GOS 1)	Survival GOS 2,3,4,5
Mild Head Injury (13-15)	5.8%	94.1%
Moderate head injury (9-12)	2.5%	97.5%
Severe Head Injury (3-8)	34.6%	65.3%
Total	12%	88%

Common abnormal CT findings were SDH (17 %), CONTUSIONS (16 %), Mixed Lesion (13 %) & EDH (10 %).

Table 8: CT Findings Distribution

CT Findings	No of Patients
Normal	19
SDH	17
CONTUSIONS	16
Mixed Lesion	13
EDH	10
SAH	8
Depressed Fractures	8
Diffuse cerebral Edema	5
ICH	2
DAI	2

A mortality rate of 6% was observed in the Conservatively managed patients, whereas a mortality rate of 22% was observed amongst the operative arm of the cohort. As statistical analysis of findings between Severe Head and Mortality at the end of 1 Month, yields a statistically significant correlation (p = 0.000)

Table 9: Outcome after conservative / neurosurgical management

Management	No. of Cases	Outcome	
		Death	Recovery

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Conservative	65	4 (6%)	61 (94%)
Operative	35	8 (22.8%)	27 (77.2%)
Total		12 (12%)	88 (88%

A Good Recovery was observed in 50% cases, whereas Moderate disability was seen in 17% patients. Favorable outcomes (GOS 4,5) translated to 67% Head Injury Patients. 11% patients were left with severe disability whereas 10% patients continued to be in a persistent vegetative state, while a mortality of 12% was observed. Unfavorable outcomes (GOS 3,4,5) were observed in 33% of the cohort.

Table 10: GOS (Glasgow Outcome Scale at the end of one month) - Distribution

Glasgow Outcome Score	**Number Of Patients**	
1 : Death	12 (12 %)	UNFAVORABLE OUTCOME GOS 1, 2, 3 N=33 (33%)
2 : Vegetative State	10 (10%)	
3 : Severe Disability	11 (11%)	
4 : Moderate Disability	17 (17%)	FAVORABLE OUTCOME GOS 4,5 , n=67 (n=67%)
5 : Good Recovery	50 (50 %)	

Discussion

Traumatic brain injury (TBI) is a common cause of case- fatality, cognitive impairment, and post-injury functional disability. Furthermore, even mild TBI can have long-term consequences. Work-related TBI is caused mainly by falls, motor vehicle crashes, and assaults in manufacturing and construction industries, and it is avoidable by developing preventive measures.[8]

We observed an overall 12% mortality in a cohort of 100 adult patients of Head Injury. Which is alarming, since our cohort consisted of all instances of TBI whether, mild, moderate or severe. This emphasizes the urgent need for interventions to prevent and eliminate the occurrences of head injuries to begin with.

Patients in young age group (18-30 years) accounted for 46% cases. The average age in present study was 36.4 ±16.3 years. Similar findings were noted by Kamal VK et al.,[8] & Agrawal D et al.,[9] 68% of the patients were males, while 32% were females. This represents a 2.1 :1 ratio. Men are twice as much affected with TBI as compared to females. Similar findings were noted by GH Yattoo[10] & Adeleye AO et al.,[11]

According to the admission GCS, we observed a 34% incidence of mild head injuries, 40 % Moderate head injuries, whereas a 26% incidence of severe head Injuries. Our findings were comparable with observations by Agrawal D et al.,[9] GH Yattoo[10], Adeleye AO et al.,[11] & Murray GD et al.,[12]

In the present study 12 % patients expired, 10 % achieved a Vegetative state, 11% had severe disability, 17% had moderate disability and 50% had a good recovery. We observed an overall mortality of 12%, with differential mortality of 5.9%, 2.5% & 34 % within mild, moderate and severe head injuries respectively. The mortality rates in our study are comparable with results from the study by DeSilva et. al.[13] in the mild head injury group. In our overall mortality rates are low (12%) as compared to study by Agrawal D et al.,[9] (22%), which can be attributed to the cohort size, local factors and pattern of traumatic brain injury in the local region as well as referral pattern of the institute.

In the present study, GCS has shown a good correlation with Glasgow outcome score. There was a consistent improvement in outcome with increasing score of GCS. In a comparative study, McNett MM et. al.[14] concluded that GCS & FOUR scores were comparable in bivariate associations with long-term outcome. Discharge coma scores performed best for both tools, with GCS discharge scores predictive in multivariate models.

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In a study by Baum J et. el.[15] concluded that Age, GCS, Injury Severity Score, and critical head injuries (AIS ≥5) were significant tools in predicting outcome in this patient cohort. Singh B et. al.[16] concluded that in patients with TBI, SMS predicts different outcomes with similar accuracy as GCS except mortality, such that GCS was highly prognostic in terms of mortality prediction.

A simple arithmetic combination of the GCS score and pupillary response, the GCS-P, extends the information provided about patient outcome to an extent comparable to that obtained using more complex methods. The greater range of injury severities that are identified and the smoothness of the stepwise pattern of outcomes across the range of scores may be useful in evaluating individual patients and identifying patient subgroups. The GCS-P may be a useful platform onto which information about other key prognostic features can be added in a simple format likely to be useful in clinical practice.

We observed an overall 19%(19) incidence of normal CT Scan findings at the time of admission. While abnormal scans were observed in 81% of the patients. Similar findings were noted by Monsef Kasmaei V et al.,[18] & Fearnside et al.,[18]

We end our discussion with a strong conviction that, GCS and Pupillary status, does correlate with patient outcomes. In our study over a small cohort in a tier II city of Telangana we observed trends in injury demographics which were comparable to studies from Tier I cities in India as well as from the Developed world. This observation is alarming such that in tier II cities, rapid development is bringing in a multitude of vehicles on the road which may not be suitable for handling an exponential rise in traffic.

TBI claims millions of deaths each year and by 2020, it is projected to reach the third spot in terms of disease burden[2]. The prevention of injury is he only intervention that can be exercised to reduce the burden of this growing epidemic. Data collection and analysis helps tremendously in understanding and treatment of disease. Although our study considered a small cohort of patients, larger studies are empirical to understand the nature of this epidemic. The Global Neurotrauma Outcomes Study (GNOS)[19] is one such endeavor in this direction. The Global Neurotrauma Outcomes Study is a prospective, multi-center, international cohort study of outcomes following emergency surgery for traumatic brain injury, the largest of its kind. We believe that such endeavors would strongly help neurosurgeons and treating physicians and bring deeper insight into better management of TBI.

Conclusion

We conclude that GCS scoring at the time of admission is an essential and useful tool in prognostication of head injuries. Additionally, pupillary response evaluations add substantially in the prognostication of Head injury patients. While the role of healthcare professionals at the hospital level remains confined to the prevention of secondary brain injury, the goal lies in the prevention of occurrence of head injuries, via interventions in the form of safe driving habits, use of helmet while driving and the avoidance of driving under the influence of alcohol amongst others.

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References

1. Rusnak, M. Traumatic brain injury: giving voice to a silent epidemic. Nat Rev Neurol. 2013;9:186-187.
2. Khan A, Prince M, Brayne C, Prina AM: Lifetime prevalence and factors associated with head injury among older people in low and middle income countries: a 10/66 study. PLoS

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

One 10:e0132229, 2015.
3. Ko DY. In Clinical evaluation of patients with head trauma. Clin N Am 2002; 12 (2)165-174.
4. Riegor J, Linesenmaier U.Pfeifer M. Radiological diagnosis in acute craniocerebral trauma. Radiologe, 2002 ; 42 (7) : 547-55.
5. Udsteun GJ, Claar JM. Imaging of acute head injury in the adult. Seminar in Ultrasound CT MR, 2001 ; 22 (2): 135-147.
6. Balestreri, M., Czosnyka, M., Chatfield, D., Steiner, L., Schmidt, E., Smielewski, P., et al. (2004). Predictive value of Glasgow Coma Scale after brain trauma: Change in trend over the past ten years. Journal of Neurology, Neurosurgery, & Psychiatry, 75(1), 161- 162.
7. Kim SC, Ro YS, Shin SD, Kim JY. Preventive Effects of Safety Helmets on Traumatic Brain Injury after Work-Related Falls. Int J Environ Res Public Health. 2016;13(11):1063. Published 2016 Oct 29.
8. Kamal VK, Agrawal D, Pandey RM. Epidemiology, clinical characteristics and outcomes of traumatic brain injury: Evidences from integrated level 1 trauma center in India. J Neurosci Rural Pract 2016;7:515-25
9. Agrawal D, Ahmed S, Khan S, Gupta D, Sinha S, Satyarthee GD. Outcome in 2068 patients of head injury: Experience at a level 1 trauma centre in India. Asian J Neurosurg. 2016;11(2):143-5.
10. GH Yattoo and Amin Tabish. The profile of head injuries and traumatic brain injury deaths in Kashmir, Journal of Trauma Management & Outcomes 2008; 2:5: 1-9.
11. Adeleye AO, Ogun MI. Clinical Epidemiology of Head Injury from Road-Traffic Trauma in a Developing Country in the Current Era. Front Neurol. 2017;8:695. Published 2017 Dec 15.
12. Murray GD, Teasdale GM, Braakman R, et al (1999) The European Brain Injury Consortium survey of head injuries (1999). Acta Neurochir (Wien) 141 (3): 223–236.
13. De Silva MJ, Roberts I, Perel P, Edwards P, Kenward MG, Fernandes J, et al. Patient outcome after traumatic brain injury in high-, middle- and low- income countries: Analysis of data on 8927 patients in 46 countries. Int J Epidemiol 2009;38:452-8
14. McNett MM, Amato S, Philippbar SA. A Comparative Study of Glasgow Coma Scale and Full Outline of Unresponsiveness Scores for Predicting Long-Term Outcome After Brain Injury. J Neurosci Nurs. 2016 Jul- Aug;48(4):207-14.
15. Baum J, Entezami P, Shah K, Medhkour A. Predictors of Outcomes in Traumatic Brain Injury. World Neurosurg. 2016 Jun;90:525-529. doi: 10.1016/j.wneu.2015.12.012. Epub 2015 Dec 22. PubMed PMID: 26721615.
16. Singh B, Murad MH, Prokop LJ, Erwin PJ, Wang Z, Mommer SK, Mascarenhas SS, Parsaik AK. Meta-analysis of Glasgow Coma Scale and Simplified Motor Score in predicting traumatic brain injury outcomes. Brain Injury 2013; 27(3): 293-300.
17. Monsef Kasmaei V, Asadi P, Zohrevandi B, Raouf MT. An Epidemiologic Study of Traumatic Brain Injuries in Emergency Department. Emerg (Tehran). 2015;3(4):141-5.
18. Fearnside MR, Cook RJ, McDougall P, et al.: The Westmead Head Injury Project outcome in severe head injury. A comparative analysis of pre-hospital, clinical, and CT variables. Br J Neurosurg 7:267-279, 1993
19. Clark D, Joannides A, Ibrahim Abdallah O, Olufemi Adeleye A, Hafid Global Neurotrauma Outcomes Study (GNOS) collaborative. Management and outcomes following emergency surgery for traumatic brain injury - A multi-centre, international, prospective cohort study (the Global Neurotrauma Outcomes Study). Int J Surg Protoc. 2020 Feb 28;20:1-7.