Orginal Article

A study of Correlation Between motor Component of GCS score on Admission and Glasgow Outcome scale Score at Discharge in head injured Patients who underwent Surgical intervention

AK Saha[1], AH Khan[2], KMT Islam[3], M Hossain[4], AC Sarker[5], A Khair[6], KK Barua[7]

Abstract

The aim of this study was to establish a correlation between the motor component of Glasgow Coma Scale (GCS) score on admission and Glasgow outcome scale (GCS) score at discharge (on 10th post-operative day) who underwent surgical intervention in head injured patients. This cross sectional study was carried out at the department of neurosurgery, BSMMU from November, 2005 to May, 2007 on head injured patients who underwent surgical intervention. A total of 35 patients with their age ranged from 5 yrs to 50 yrs who came within 3 days after head injury were included in this study. The patients were examined and the motor component of GCS score on admission and GOS at discharge (on 10th post-operative day) were recorded. Data were collected with the help of a structured questionnaire and face-to-face interview with the attendants of the patients. All relevant data were compiled manually in a master data sheet and then organized by scientific calculator. Best motor response and GOS score exhibit a linear relationship ($r = 0.372$, $p = 0.028$) indicating that higher the best motor response on admission higher is the GOS score at discharge (on 10th post-operative day).

Introduction:

A large percentage of people have head injury each year in Bangladesh. Report of the Bangladesh Bureau of Statistics 1999 states that 11.5 % of 100 injured persons had head injury nationally in 1996 (10.5% in rural areas and 13.4% in urban areas).

Head injury is a major cause of morbidity and mortality in the community. It has been estimated that each year in the UK between 200 and 300 per 100,000 of the population are admitted to hospital with a head injury. This makes head injury one of the most common reasons for attending accident and emergency departments. Of these injuries 9 per 100,000 -are fatal, approximately 5000 per year. Traumatic injury, in which severe head trauma plays a major role in over 50% of cases, remains the leading cause of death in the population below 45 years of age and overall, the third leading cause of death, succeeded only by cardio-cerebral vascular disease and cancer. As a result cranio-cerebral trauma places a huge financial and psychological burden upon society. The majority of head injuries are a consequence of road traffic accidents, falls, assaults or injuries, occurring either in the workplace, during sport or at home. Most serious head injuries and 65% of subsequent deaths are a result of road traffic accidents. Excessive alcohol consumption is frequently implicated, and young males are most commonly involved.[1]

Head injury is arguably the most common cranial condition that neurosurgeons deal with and, unlike certain other clinical entities it is likely to remain primarily under our purview for the foreseeable future. Contrary to popular belief, major strides have been made over the past three decades in reducing the mortality and morbidity from head injury. While controlled and strictly comparable data are hard to come by, well-documented series have demonstrated declining mortality from severe head injury from 50% in 1970 to around 36% in the 1980s and possibly even lower currently. Although this is hard to prove conclusively, the most probable cause for this dramatic improvement in

1. Dr. Asit Kumar Saha
EMO, Shaheed Sohrawardi Medical College and Hospital

2. Dr. Akhlak Hossain Khan
Assistant Professor, Department of Neurosurgery, BSMMU.

3. Dr. K.M Tarikul Islam
Medical Officer, Department of Neurosurgery, BSMMU.

4. Dr. Mohammad Hossain
Assistant professor, Department of Neurosurgery, BSMMU.

5. Dr. Asit Chandra Sarker
Associate Professor, Department of Neurosurgery, DMCH.

6. Professor Abul Khair
Department of Neurosurgery, BSMMU.

7. Professor Kanak Kanti Burua
Department of Neurosurgery, BSMMU.

Corresponding author
Dr. Asit Kumar Saha
EMO, Shaheed Sohrawardi Medical College and Hospital

results is the wider availability and better application of emergency medical services and critical-care methodologies.[2]

The Glasgow Coma Scale (GCS) is composed of three sub-scores that contain redundant information, the simple addition of these sub-scores to create the GCS, although convenient, results in a nonlinear relationship between the GCS score and mortality. We found that the motor component of the GCS score is a powerful predictor of outcome and contains most of the predictive power of the score. The addition of the verbal sub-score adds slightly to the predictive power, but the further addition of the eye sub-score (resulting in the familiar GCS score) adds nothing to predictive power. We believe that a motor sub-score-only model of level of consciousness is the most practical because the verbal score may be impossible to obtain in seriously injured patients. Adding to the appeal of the motor-only model is its near linearity with respect to mortality. Quadriplegia is a potentially problematic injury because it naturally confounds the motor-only score.[3]

Different authors have pointed out the higher accuracy of the motor score compared with the whole GCS score as a predictor of outcome, supporting the importance of splitting the "motor component of the GCS from the "verbal component' and the "eye component": the last two are often difficult to evaluate in comatose patients.[4]

It is also seen that when one uses only the motor score component of the GCS, which has been shown to be the element of GCS most strongly predictive of outcome.[5]

Most outcome scales have been developed with a particular disease in mind e.g. Bartel/Rankin - Stroke; Karnofsky-tumor.[6] The Glasgow outcome scale (GOS) for the assessment of head injured patients was developed in 1975. In cases of brain damage, not only is the initial treatment dependent on the scarce resources, but the outcome may be permanent disablement which requires continuing social support.[7]

Materials and Methods:

This cross sectional study was carried out at the department of neurosurgery, BSMMU from November, 2005 to May, 2007 on head injured patients who underwent surgical intervention. A total of 35 patients with their age ranged from 5 to 50 years who came within 3 days after head injury were included in this study. The patients were examined and the motor component of GCS score on admission and GOS at discharge (on 10th post-operative day) were recorded. Data were collected with the help of a structured questionnaire and face-to-face interview with the attendants of the patients. All relevant data were compiled manually in a master data sheet and then organized by scientific calculator. Collected data was analyzed by using statistical package for social science (SPSS). r test was used to evaluate correlation between motor component of GCS score on admission and Glasgow outcome scale score at discharge in head injured patients who underwent surgical intervention. $p<0.05$ was considered as a minimum level of significance.

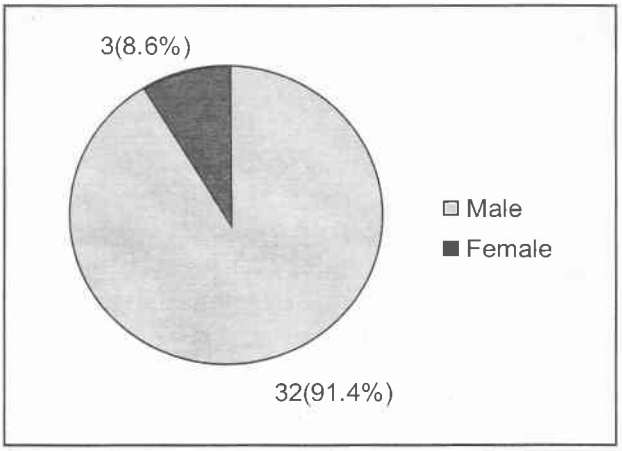
Results:

Table I : Age distribution of the participants (n = 35)

Age (yrs)	Frequency	Percentage%
<10	08	22.9%
10-20	14	40%
20-30	04	11.4
30-40	03	8.6%
40	06	17.1%

Age ranged from 5 to 50 years, mean age was 20.3±2.4 years.

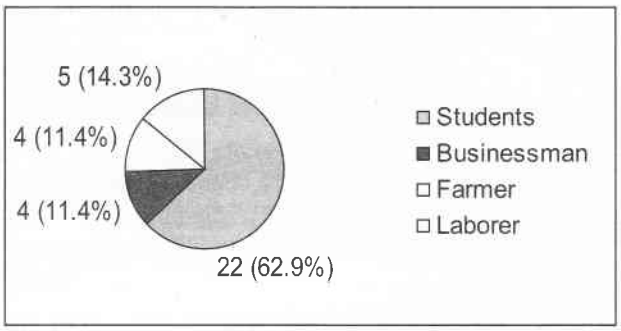
Figure-1: Pie diagram showing sex distribution (n = 35)



Majority 32(91.4%) of the victims were male and

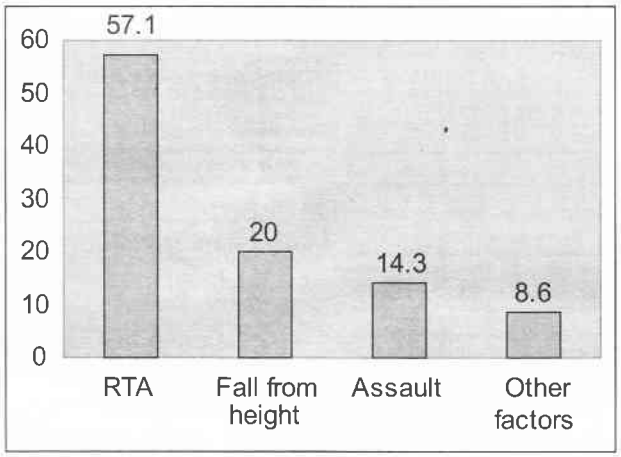
the rest 3(8.6%) were female with a male to female ratio of 10.6:1.

Figure-2: Distribution of Patients by occupation (n = 35).



Most 22(62.9%) of the victims of head injury were student. Businessman, farmer and laborer were 4(11.4%), 4(11.4%) and 5(14.3%) respectively.

Figure-3: Distribution of Patients by predisposing factors (n = 35)



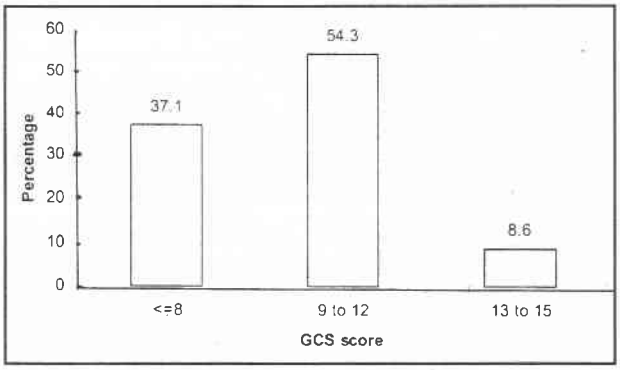
RTA was found to be the leading cause of head injury 20 (57.1%) followed by fall from height 7(20%), assault 5 (14.3%) and other factors 3(8.6%).

Table II : Distribution of subjects by components of GCS score (n = 35)

GCS score	Frequency	Percentage
Eye opening		
1	11	31.3
2	15	42.9
3	08	22.9
4	01	2.9
Best motor response		
3	08	22.9
4	12	34.3
5	12	34.3
6	03	8.6
Best verbal response		
1	08	22.9
2	09	25.7
3	12	34.3
4	04	11.4
5	02	5.7

Nearly 45% of the subjects had eye opening score 2 on admission, 31.3% score 1 and 22.9% core 3. In case of best motor response 34.3% exhibited score 4, another 34.3% score 5 and only 8.6% score 6. Evaluation of verbal response showed that 34.3% attained score 3, 25.7% score 2, 22.9% score 1, 11.4% score 4 and only 5.7% score 5.

Fig- 4: Distribution of subjects by GCS score on admission (n = 35).



Assessment of subjects on admission by Glasgow Coma Scale (GCS) score shows that 19 (55%) of the cases had moderate head injury (GCS score 9-12), 13 (37.1%) had severe head injury (GCS score ?8) and 3(8.6%) mild head injury.

Table III : Distribution of subjects by type of operation (n = 35)

Type of operation	Frequency	Percentage
Craniotomy and evacuation of intracranial hematoma	08	22.9
Surgical toiletting for compound / depressed skull fracture.	27	77.1

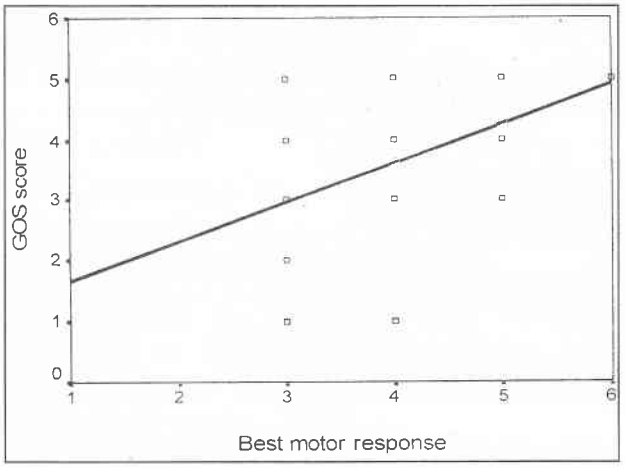
Distribution of subjects by type of operation shows that more than three-quarter (77.1%) of the cases (27) were operated for surgical toileting and elevation of compound, depressed skull fracture with or without evacuation of intracranial hematoma. Craniotomy and evacuation of intracranial hematoma was done in 8(22.9%) of the cases.

Table IV : Distribution of the subjects by GOS score (n = 35)

GOS score	Frequency	Percentage
5 (Good)	13	37.1
4 (Moderate disability)	11	31.4
3 (Severe disability)	06	17.1
2 (persistent vegetative)	01	2.9
1 (Death)	04	11.4

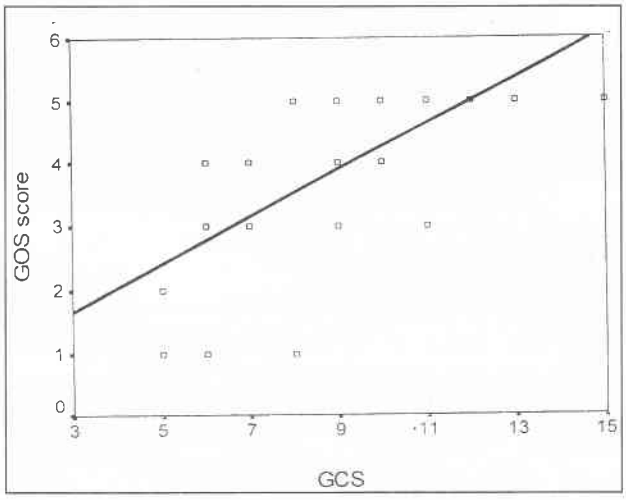
Evaluation of the subjects at discharge (on 10th post-operative day) showed that 13(37.10%) patients had good recovery (GOS score 5),_11(31.4%) patients had moderate disability, 6(17.1%) patients had severe disability, 1(2.9) patient was in persistent vegetative state and 4(11.4%) patients were dead. More than two-third (68.5%) of the cases had favourable outcome (moderate disability and good recovery) and the rest had unfavourable outcome (severe disability, persistent vegetative state and death altogether).

Fig-5 : Correlation between best motor response and GOS sore (n = 35)



Best motor response and GOS score exhibit a linear relationship (r = 0.372, p = 0.028) indicating that higher the best motor response on admission higher is the GOS score at discharge (on 10th postoperative day).

Fig-6 : Correlation between GCS score and GOS score (n = 35)



The correlation between GCS score on admission and GOS score at discharge (on 10th postoperative day). The two variables were found to bear a linear relationship (r = 0.677, p < 0.001).

Discussion:

This study was done in the Neurosurgery department of BSMMU hospital from November, 2005 to May, 2007. Patient's relatives, health care providers or other providers were often required to provide prognostic information that is used for

decision making. Care decision may be influenced by a "poor prognosis" and care withdrawn or withheld. In this study on admission motor component of GCS score and GOS at discharge (0n 10th post operative day) in head injured patients who underwent surgical intervention were assessed.

22.9% of patients were of age 5-10 years, whereas 40% were under the category of the age of 10-20 years. The number of school and college going students is increasing comparatively more than the senior age group which is comparable to other study[8] conducted on 9855 patients in BSMMU showed considerable percentage of the cranio-cerebral trauma patients were children and from young age group.

Among the 35 cases, majority (91.4%) were male which is similar to other study[8] where majority (90%) of the cranio-cerebral trauma patients were male. Most (62.9%) of the patients were students that is comparable to other study[9] where majority (35%) of the patient of depressed fracture were student. The students might be exposed to head injury for longer time and the businessmen and farmers less.

The incidence of road traffic accident was high (57.1%) in this study which is comparable to other study[8] where incidence of road traffic accident was 41.65%.

Among the presenting signs and symptoms the consciousness level was an important parameter and about 37.1% patient presented with Glasgow Coma Scale 8 or below (on admission). Observation of neurological function after pharmacologic neuromuscular blockade for intubations further complicates the direct relationship of GCS score to neurological dysfunction. In severely traumatized patients who are in a shock-like state have depressed GCS score10. This was paramount of the attributes contributing to compromising status of the patients as it can eventually affect the clinical condition and outcome of the patient.

In this study 54.3% patients had GCS score 9-12 which is comparable to other study[3] where 90% patients had GCS score of 15. In this study majority of the patients had favourable outcome (68.5%) and it was possibly due to earlier surgical where median GCS score on admission was 6 (range 3 to 15) and median GOS was 4 (range 1 to 5).

Distribution of subjects by type of operation shows that about 77% were operated for surgical toileting and elevation of compound depressed skull fracture with or without evacuation of intracranial haematoma, 23%, by craniotomy and evacuation of intracranial haematoma.

GOS score at discharge (on 10^{th} post operative day) after operation in head injured patients showed that majority had favorable outcome (good recovery and moderate disability) and 31.4% of patients had unfavorable outcome (severe disability, persistent vegetative state and death altogether). The percentage of death after operation in head in injured patient was 11.4.

The best motor response on admission and GOS score at discharge (on 10^{th} post-operative day) had significant correlation, (p-value <0.05) in head injured patients who underwent surgical intervention. The GCS score also had significant correlation with GOS at discharge in head injured patient who underwent surgical intervention. Udekwu et al. (2004)[11] had in their analysis of the motor component of GCS that demonstrates, by graphic inspection a better linear relationship, as well as a steeper slope, with survival than the verbal and eye components. This supports other investigators who have shown the GCS motor component to have the strongest relationship with outcome. Healey et al. (2003)[3] used a large trauma data set (National Trauma Data Bank, N=204, 181). They found neither the GCS nor its motor component are linear in the log odds of survival. However the best motor response score is far less irregular. Eye score was more nonlinear and the verbal score the most.

Conclusions:

This study has shown that there is significant correlation between motor component of GCS score on admission and Glasgow outcome scale score at discharge (on 10^{th} post-operative day) in head injured patients. So we can be able to assess the outcome of head injured patients on the basis of motor component of Glasgow Coma Scale score.

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