



## A study of prognostic significance of the Glasgow coma scale in cases of Non-traumatic coma in a medical intensive care unit

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### Abstract

**Introduction:** Coma is common emergency encountered by the doctors in casualty department. It is important to triage and manage coma victims promptly and correctly if irreversible brain damage is to be prevented. Numerous scoring systems have been in use for rapid triage of coma victims and assessment of the patients for disease severity and prognosis. Glasgow Coma Scale (GCS) is one of the most widely used scoring systems. Though, GCS has traditionally been used in coma induced by traumatic brain injury (TBI), scale also correlates significantly with outcome in non-traumatic coma (NTC).

**Aim:** This study was conducted to assess the prognostic significance of the GCS in cases of NTC.

**Material and Methods:** The study included 100 patients of NTC admitted in medical intensive care unit of a tertiary care teaching hospital. All cases were studied in detail with respect to history and clinical examination with daily follow up, till discharge or death, to determine the outcome. The profile included assessment of severity of coma by GCS score and evaluation of brainstem reflexes. The outcomes were graded between death and survival.

**Results:** Out of 100 cases of non-traumatic coma, total mortality was 48%. The two most common etiologies leading to mortality in this study are cerebrovascular accidents (CVA) and hepatic encephalopathy. Drug induced coma carried the best prognosis.

**Conclusion:** Poor outcome was associated with low GCS score and absence of brain stem reflexes. Low GCS score formed an independent predictor of outcome.

**Keywords:** Glasgow coma scale (GCS), traumatic brain injury (TBI), non-traumatic coma (NTC)

### Introduction

The term "COMA" in Greek means "Deep Sleep" or a trance [1]. Approximately 5% of the patients present to the emergency department with an altered mental state and 1% of the admissions at the emergency department is due to coma [2]. The assessment and management of a patient with coma is always a medical emergency. It is important to identify and correct the cause of coma as well as identify the pathological mechanisms causing it to prevent the development of irreversible brain damage. It is also necessary to identify the patients with severe irreversible brain damage who have poor to grave prognosis to reduce the cost to benefit ratio. This is of special relevance in a resource-limited developing country like India where the health care including emergency medical services must be judiciously used to optimize the available resources. Triage of the coma victim is first step towards optimization of the available resources; be it man or material.

Numerous scoring systems have been in use for rapid triage of coma victims and assessment of the patients for disease severity and prognosis [3]. These scoring systems are based on ease of use, inter-rater consistency, reproducibility and prognostic value. Different scoring systems have been used to evaluate coma; Simplified Acute Physiology Score (SAPs), Glasgow Coma Scale (GCS), the Reaction Level Scale (RLS85), newer Full Outline of Unresponsiveness (FOUR) and the Mayo classification [4].

The best known and widely accepted scale in use is the GCS [5] (Figure 1). This scale was derived in 1974 with an objective to translate clinical descriptions to numerical form [6]. The GCS score is a useful tool in triage for initial disposal of coma victims, not only in neurological and medical intensive care units, but also in other departments dealing with acute brain insult [7, 8, 9].

The essence of the GCS is the independent assessment of graded responses in three behavioral domains: eye opening (E) motor response (M) and verbal response (V). The components are more important than the total score. The score was originally not intended to be converted to a single score. The GCS Score is the arithmetic sum of all the three responses (GCS Score= E+M+V). Patients scoring 3 or 4 have an 85 per cent chance of dying or remaining vegetative, while scores above 11 indicate 85 per cent chance of moderate disability or good recovery. Intermediate scores correlate with proportional chances of patients recovering [10]. The advantage of GCS is that if any one type of response is untestable, for example due to periorbital swelling or endotracheal intubation, the others are still available [10]. However, the predictive value of GCS goes down if all 3 parts of the test cannot be scored. Some of the other disadvantages of GCS are that it does not incorporate brain stem reflexes, the motor component score does not factor in unilateral pathology and it is unreliable in

the middle range of 9-12. There is variation in scoring V component in intubated patients and the score cannot be applied to small children. Still, GCS remains the most widely recognized of all consciousness level scoring systems. GCS has traditionally been used in coma induced by traumatic TBI [11, 12]. This study was conducted to determine the morbidity and mortality with respect to GCS in NTC.

**Aim**

To study the prognostic significance of Glasgow Coma Scale in cases of Non-traumatic coma.

**Methodology**

The study was conducted at a tertiary care referral teaching hospital in western Maharashtra. The data was collected over period of 18 months. 100 consecutive comatose patients admitted in medical ICU were included in the study. Patients of either sex of more than 12 years of age, presenting in comatose condition with no history of trauma were included in the study. Patients with history of trauma to head and pregnant women were excluded from the study.

**Data Collection**

All patients were evaluated by detailed history taking and clinical examination on admission. GCS score was calculated for each patient and the progress was monitored with neurological examination and GCS score daily. All the patients included in the study were investigated with in accordance with history and clinical examination with pulse oximetry, complete blood count, urinalysis, blood sugar levels, liver function test, blood urea, serum creatinine, serum electrolytes, Chest X-ray (PA), X-ray skull (AP/lateral), CT scan /MRI of brain, Cerebrospinal fluid (CSF) analysis and EEG (if required).

All patients were followed till discharge or the time of death in the hospital. The results were appropriately entered and analyzed by appropriate statistical analysis. The etiological factors were compared with the final outcome. GCS score at admission and presence or absence of brainstem reflexes at admission were compared with the final outcome.

**Results**

One hundred cases of NTC formed the study group. The highest number of cases (28 patients) were in the age group of 61-70 years. There was no significant relation between the age group and the outcome. However, patients with age more than 40 were more likely to have a bad outcome compared to the other groups. There were 59 male and 41 female patients, giving male to female ratio of 1.43:1. The difference in mortality rates among males and females was found statistically significant. The onset of coma was divided into sudden and gradual onset, depending on available history. Cerebrovascular causes, drug / toxin induced and hypoglycemia comprised most of the sudden onset of coma. Onset of coma had no correlation with outcome. Intracranial causes (72%) were commonest cause of medical coma followed by metabolic coma (26%). Drug and poisoning included coma comprised 2% cases (Table 1). Headache and vomiting, suggestive of raised intra-cranial pressure, were the most common symptoms (Table 2). Amongst intracranial causes, 39 patients presented with a low GCS score between 3-5. The etiology of coma was not statistically significantly associated with the GCS Score (p>0.05).

Table 3 shows various diseases and their association with outcome in patients with coma in this study. The most common diseases associated with patients of coma were hypertension and diabetes and thus being important risk factors for the etiology of coma. Hypertension was present more commonly in patients with cerebrovascular disease and also more commonly associated with mortality. They are 4.636 times more likely to develop bad outcome followed by alcoholics who are 3.571 times more likely to develop adverse outcome.

Table 4 shows the relation of Glasgow Coma Scale scores at the time of admission to the outcome of coma. The GCS score was calculated at the time of admission and every 24 h till the recovery of coma or till the end of 30 days whichever was earlier. The outcome was categorized as dead or survived. The score was divided in two groups: 3-5 & 6-8. As expected, the group of patients who had GCS score between 3-5 at the time of admission had the maximum mortality, as compared to the group of patients with GCS score between 6-8.

**Table 1:** Different etiologies of coma

	<b>Etiology</b>	<b>No. of Cases</b>
CVA	Intracerebral bleed	29
	Ischemic strokes	29
	Subarachnoid hemorrhage	4
Meningitis and Encephalitis	Tubercular	3
	Pyogenic	4
	Viral encephalitis	3
Endocrinal	Hypoglycemia	2
	DKA	5
	Myxedema coma	1
	Hepatic	12
Metabolic	Uremic	5
	Hyponatremia	1
	Drugs/substance Intoxication	
	OP Poisoning	1
	Alcohol intoxication	1
	<b>Total</b>	<b>100</b>

**Table 2:** Preceding Complaints

Preceding complaints	Number
Headache	31
Altered sensorium	30
Vomiting	28
Seizures	25
Fever	18
Weakness	09
Jaundice	08
Malena	04
Hematemesis	02
Breathlessness	01
Intolerance to cold	01
Goiter	01

**Table 3:** Diseases Associated With Outcome

Comorbidity	Total (100)	Death	Survival
Hypertension	43	24	19
Diabetes	25	09	16
Alcoholism	08	06	02
IHD	05	02	03
CRF	05	04	01
RHD	02	01	01
OP poisoning	01	00	01
HBV infection	01	0	00
Hypothyroidism	01	00	01
Tuberculosis	01	00	01

**Table 4:** Gcs Score and Outcome

GCS Score	Total (n=100)	Death (n=48)	Survival (n= 52)
3-5	58	41	17
6-8	42	7	35

**Table 5:** Comparison with other Studies

Studies	Gcs score	Deaths%	Survival%
1. Sacco RL	3-5	85.2	14.8
2. Thacker	<4	75.0	25.0
3. Dhamija	3-6	84.0	16
4. Present study	3-5	85.4	14.6

<b>Eye opening (E):</b>	
Spontaneous	4
To loud voice	3
To pain	2
Nil	1
<b>Best motor response (M):</b>	
Obeys	6
Localizes	5
Withdraws (flexion)	4
Abnormal flexion posturing	3
Extension posturing	2
Nil	1
<b>• Verbal response (V):</b>	
Oriented	5
Confused, disoriented	4
Inappropriate words	3
Incomprehensible sounds	2
Nil	1

**Fig 1:** Glasgow Coma Scale

**Discussion**

The current study was a prospective study of 100 cases of coma of non-traumatic etiology. From the history, onset of coma was divided into sudden and gradual. The temporal profile of the onset of coma provided a clue to reach the probable diagnosis. CVA, metabolic causes like hypoglycemia, hepatic encephalopathy and drug/poisons formed the majority of the abrupt onset of coma.

GCS score and outcome: Although there is no consensus to the precise cut-off point to define coma, in general a GCS of 8 or less is used [13, 14]. NTC was defined as a GCS of 8 or less based on several studies included in this study [15, 16]. In current study observed mortality in cases of NTC was 48%. CVA was the leading cause of non-traumatic coma in our study as also in various other studies. The high incidence of hepatic coma in this study was due to high prevalence of alcohol consumption in this region, leading to alcoholic liver disease. Several studies have shown that coma implies a grave prognosis [17]. Among 310 patients of coma, in one series, 70% of the victims had died. [18] In another study, 61% of patients with NTC either died or remained in a persistent vegetative state.

The GCS score at the time of presentation was between 3 and 8 in this study. And to categorize it according to the severity of coma, it was done in two groups, 3-5 and 6-8 as done in other studies. There were total 58 cases with GCS score between 3-5 and 42 cases with score between 6-8. The group of patients who had GCS score between 3-5 at the time of admission had the maximum mortality. Nine out of 11 cases with GCS score of three were of CVA. In cases with GCS score of four, there were only two survivors. As expected, there was good recovery of coma in patients presenting with GCS score 6-8. In one study, 85.2% out of 88 patients with GCS score between 3-5 either died or remained in persistent coma at the two-weeks while only 46.9% of those with GCS between 6-8 either died or remained in persistent coma. In another study, patients with acute meningitis (bacterial or unknown origin) with a GCS above 12 had a 96% chance of recovery [18]. Other studies have also had similar outcome of coma in relation to GCS score (Table 5). The predictive accuracy of GCS further improves if used along with brainstem reflexes. In one study, imminent brain death was established when the FOUR score was 0 or the GCS score was 3 and at least 3 among pupillary light, corneal, pharyngeal, carinal, oculo-vestibular, and trigeminal reflexes were absent. FOUR score routinely incorporates brainstem reflexes in scoring and therefore may become preferable and more popular score in years to come [18, 19].

## Conclusion

GCS is an excellent tool to objectively assess the prognosis of patients of NTC. The two most common etiologies leading to mortality in this study were cerebrovascular accidents and hepatic encephalopathy. Poor outcome was also associated with low GCS score and absence of brainstem reflexes. Drug induced coma carried the best prognosis, and low GCS score formed an independent predictor of outcome.

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