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# Etiological Profile of Non-Traumatic Coma and Role of GCS in Predicting the Outcome of Non-Traumatic Coma in Pediatric Age Group

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## Abstract

***Background:*** *Acute non-traumatic coma is a common problem in pediatric practice accounting for 10-15% of all hospital admissions and is associated with significant mortality. Assessment of the severity of coma is essential to comment on the likelihood of survival in comatose children.* ***Objectives:*** *To assess outcome in a pediatric non-traumatic coma with the role of the Glasgow Coma Scale and Modified Glasgow Coma Scale.* ***Methodology:*** *N=80 cases of non-traumatic coma aged from 1 month to 12 years, coma severity was assessed by using the Modified Glasgow Coma Scale. A score of less than 8 and more than 8 was used for the analysis of the outcome.* ***Results:*** *Out of 80 cases, n=8 cases expired (10%), n=4 cases were discharged against medical advice (4%), n=68 cases were improved and discharged (85%), among these, n=8 cases were discharged with complication (11.7%). Overall mortality was (10%) (8/80) males outnumbered females in frequency with a ratio of 1.28:1. CNS infection accounted for almost about 66%.* ***Conclusion:*** *Children with GCS and MGCS scores of less than 8 have a poor prognosis and a very high probability of death. Those with a GCS score of more than 8 have a good prognosis. Identification of these cases at the outset can help prepare the treating physician to plan critical care referrals and to give a preliminary assessment of the outcome to the family.*

***Keywords****: Glasgow Coma Scale; Modified Glasgow Coma Scale; Coma*

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## Introduction

Acute non-traumatic coma presentation is very common in pediatric practice and accounts for approximately 10-15% of all hospital admission cases and it is associated with significant mortality risk [1]. Non-traumatic coma is considered as an important pediatric emergency. The primary etiology of non-traumatic coma is wide ranged which includes CNS infections and metabolic disorders apart for others such as epilepsy. The etiology of coma and clinical status at the presentation are likely to influence the possible outcome. An essential understanding of the etiology and outcome is important to plan and manage these cases. To assess the severity of coma which is directly related to chances of survival in the past few decades various scores have been in use. These include Glasgow Coma Scale (GCS) [2], James Adaptation of Glasgow Coma Scale [3], the Simpson and Reilly Scale [4], Children's Coma Scale [5], the Children's Orthopedic Hospital and Medical Center Scale [6], the Jacobi's Scale [7]. Among these, the modified Glasgow Coma Scale (MGCS) [8] has been used widely despite a few drawbacks. Some studies have been conducted in this field however; the data is inconsistent and lacks homogeneity. This study was conducted to assess the relationship between MGCS, its components, and survival in

children with acute non-traumatic coma presenting to our tertiary care hospital.

## Materials and Methods

This Prospective study was conducted in the Department of Pediatrics, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Institutional Ethical committee permission was obtained for the study. Written consent was obtained from the parents/guardians of the patients in the present study. The patients were selected from the children admitted with non-traumatic come to this institute. The inclusion criteria were non-traumatic coma in children aged from 1 month to 12 years of 80 pediatric cases between the age group of 1 month to 12 yrs. Exclusion criteria were patients with traumatic coma and Those with neurodevelopmental delay and any other pre-existing neurological illness and those in whom coma was secondary coma. Coma was defined as the unintentional failure of the patients to open eyes spontaneously or in response to sensory stimulation and inability to obey commands or localize painful stimulus with or without the ability to express comprehensible words appropriate for that age group [9]. The subjects were then scored with a modified Glasgow Coma Scale (MGCS) for pediatric patients [10]. All the patients underwent focused neurological examination which includes brain stem reflexes, oculocephalic, oculovestibular papillary reactivity from the time to admission followed up every 6 hourly. The essential laboratory investigations were done by taking appropriate blood samples. Standardized protocols based on current guidelines for management were used for treatment. All the recorded data were analyzed using SPSS version statistical software on windows format.

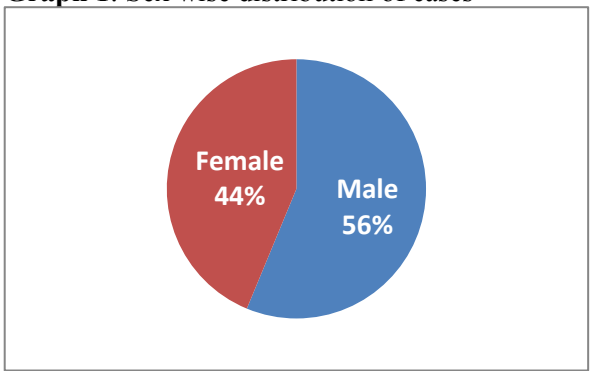
## Results

A total of n=80 children were studied with a non-traumatic coma during the study period. The commonest age group involved in the study was 6 –10 years with n=25(31.25%) patients followed by 3 - 5 years with n=20(25%) patients. The total number of males in the study was n=45(56.25%) and females were n=35(43.75%).

**Table 1**: Age-wise distribution of the patients in the study

| Age Group | Male | Female | Total (%) |
|---|---|---|---|
| 1 Month – 1 Year | 05 | 03 | 08(10) |
| 1 – 2 Years | 08 | 04 | 12(15) |
| 3 – 5 Years | 12 | 08 | 20(25) |
| 6 – 10 Years | 13 | 12 | 25(31.25) |
| 11 – 12 Years | 07 | 08 | 15(18.75) |
| Total | 45 | 35 | 80(100) |

**Graph 1**: Sex wise distribution of cases




Most of the cases reported in the study were with presentation of fever in n=62(77.5%) of cases followed by convulsions in n=56(70%) of cases and n=40(50%) of cases were showing symptoms of vomiting. Other symptoms and the percentages are given in table 3.

**Table 3**: Clinical presentation of cases of coma

| Clinical presentation | Frequency | Percentage |
|---|---|---|
| Fever | 62 | 77.5 |
| Convulsions | 56 | 70.0 |
| Vomiting | 40 | 50.0 |
| Headache | 20 | 25.0 |
| Ear discharge | 05 | 6.25 |
| Icterus | 04 | 5.0 |
| Diarrhea | 04 | 5.0 |
| Hypoglycemic attacks | 02 | 2.5 |

Intracranial infection was the most common cause of coma in this study forming the largest group. It is interesting to note that n=17 (21.25%) children with cerebral malaria presented with acute coma. 12 children presented with viral encephalitis(15%), n=12(15%) with pyogenic meningitis, n=10 (12.5%) with seizure disorder, n=8 (10%) with atypical febrile seizures, 9 with enteric encephalopathy (11.25%), n=5 with hepatic coma (6.25%), hypoglycemic seizures n=2 (2.5%) cases, tubercular meningitis n=2(2.5%) cases, unknown diagnosis n=3 (3.75%). Mortality was highest in the intracranial infection n=8 persons died (10%).

**Table 4**: Diagnosis of the causes of coma

| Diagnosis | Frequency | Percentage |
|---|---|---|
| Cerebral Malaria | 17 | 21.25 |
| Viral encephalitis | 12 | 15.0 |
| Pyogenic meningitis | 12 | 15.0 |
| Seizure disorder | 10 | 12.5 |
| Atypical febrile seizures | 08 | 10.0 |
| Enteric encephalopathy | 09 | 11.25 |
| Hepatic coma | 05 | 6.25 |
| TBM | 02 | 2.5 |
| Hypoglycemic seizures | 02 | 2.5 |
| unknown | 03 | 3.75 |
| Total | 80 | 100 |

The neurological examination along was done in the cases Stupor, coma and meningeal signs were found in n=25(31.25%) each. Cranial nerve deficit with 7th nerve was found in n=9(11.25%) cases and plantar extensor response was found n=30(37.5%). The Modified Glasgow Coma Scale score of less than 8 was found in n=42(52.5%) of patients shown in table-5

**Table 5:** Neurological signs and Modified Glasgow Coma Scale scores

| Score | Cases | Percentage |
|---|---|---|
| Confusion | 12 | 15 |
| Stupor | 25 | 31.25 |
| Drowsy | 18 | 22.5 |
| Coma | 25 | 31.25 |
| Decerebrate posture | 15 | 18.75 |
| Cranial Nerve deficit 7th | 9 | 11.25 |
| Extensor plantar response | 30 | 37.5 |
| Meningeal signs | 25 | 31.25 |
| < 8 | 38 | 47.5 |
| > 8 | 42 | 52.5 |

**Table 6**: Neurological signs and outcome of patients with MGCS < 8

| MGCS < 8 | Number of cases (n=38) | Percentage |
|---|---|---|
| Confusion | 05 | 13.15 |
| Stupurous | 10 | 26.31 |
| Drowsy | 05 | 13.25 |
| Coma | 20 | 52.63 |
| Cranial Nerve deficit | 07 | 18.42 |
| Decerebrate Posture | 09 | 23.68 |
| Extensor Plantar Response | 20 | 52.63 |
| Meningeal signs | 20 | 52.63 |
| Improved and discharged | 32 | 84.21 |
| Expired | 06 | 15.79 |
| Discharged against Medical advice | 03 | 7.89 |

In n=38 patients with MCGS score of <8 n=32 (84.21%) were treated successfully and later they improved and were discharged. N=3 patients were discharged against medical advice and n=6(15.79%) expired during the period. The other neurological signs and their distribution is shown in table 6.

## Discussion

The prognosis of a coma always is dependent on its severity. Therefore, assessing the severity of coma by subjective and poorly defined terms like stupor, semi-coma, and deep coma is insufficient in the prediction of the outcome and inter-reporter inconsistencies [11]. The Glasgow Coma Scale is a standardized system developed initially in a traumatic coma to assess the degree of coma and to identify the seriousness of brain injury concerning outcome [12]. Since it is highly reproducible without inter-reporter inconsistencies it has gained widespread popularity and it can be quickly performed at the bedside. It can provide useful information on the progress and prognosis of comatose patients [13]. The important causes of non-traumatic coma include infections such as meningitis (bacterial, tubercular), encephalitis, brain abscess, subdural/epidural empyema, cerebral malaria, enteric encephalopathy and sepsis [14]. The metabolic causes can be hypoglycemia, hyperglycemia, Reye's syndrome, acidosis/alkalosis, hepatic failure, and uremia. In the present study, the total number of cases of non-traumatic coma with the role of the Glasgow Coma Scale was n=80 cases. The study showed that a low total MGCS score was found to be associated with adverse short-term outcomes. The likelihood of death in patients with GCS less than 8 was much higher than when the GCS was >8 i.e., n=6 (15.78%) cases expired out of n=38 cases with GCS ≤8 and n=2 (4.7%) cases expired out of n=42 cases with GCS > 8. PC Nayana et al; [15] in their study have shown that the ratio of mortality in GCS < 8 and > 8 was 78.9%, 27.1% respectively. In this study n=17 children were diagnosed with cerebral malaria, n=12 children had viral encephalitis, n=12 had pyogenic meningitis, n=10 had a seizure disorder, n=8 had atypical febrile seizures, n=2 TBM, in n=3 cases the

cause remained unknown. The CNS infections were the cause of coma in 72.5% of cases. These findings were similar to studies by Vijay Kumar et al; [16] Ogun Mekan et al; [17], Seshia et al; [18] Sofiah et al; [19] all of them have shown that the CNS infections are the leading cause of non-traumatic coma in children. Type of infections varied based on the region such as cerebral malaria was common in Africa [20] DHF was commonly found in the studies of Southeast Asia [19] In the current study, n=4 (5%) deaths occurred within the 24 hours of admission using the MGCS we could identify children at highest risk of death even on admission. An earlier study showed that 44.2% of death occurred within 72 hours of admission and these cases could be identified on admission with the help of GCS scores [21]. In our study, total n=7 cases of metabolic causes were admitted, n=5 hepatic coma, n=2 hypoglycemic seizures n=1 death occurred. In this study out of n=38 with MGCS < 8 n=32(84.21%) were managed successfully and they were discharged n=3 (7.89%) were discharged against medical advice. This study has shown that the outcome of coma is dependent on etiology which is similar to other authors who have conducted their studies in this field [11, 21, 22]. Several factors are involved in the prognosis of cases of coma that includes the belt-fulfilling nature of the disease, host response, and treatment strategies. Death in the coma is not due to failure of the primary neurological mechanism but from secondary non-neurological causes. The study shows that children with non-traumatic coma with MGCS scores of less than 8 on admission have the worst prognosis and high probability of death. Those with MGCS > 8 have a good prognosis and better improvement. Identification of these cases right at the onset can help to treat physicians to plan for critical care and also give a preliminary assessment of the outcome to the family.

## Conclusion

Acute non-traumatic coma is a pediatric emergency. In the present study, we found Most of the causes of non-traumatic coma in this study were CNS infections. The commonest age group involved in the study was 6 –10 years. Assessment of the severity of a coma is essential to plan the management. Those patients with MGCS <8 are at higher risk of mortality, they require aggressive management which may include mechanical ventilation and intracranial pressure monitoring.

***Conflict of Interest:*** *None declared*
***Source of Support:*** *Nil*
***Ethical Permission:*** *Obtained*

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