Original Research Article

Value of coma scale in prediction of outcome in non-traumatic coma in 1-12 years old children

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Abstract

Background: Coma is a state of altered level of consciousness in which there is a loss of both wakefulness and awareness of the self and the environment. It is a very serious condition that necessitates immediate medical decision making upon arrival at the pediatric emergency department or pediatric intensive care unit (PICU). The most common scoring system used for assessment of consciousness is the Glasgow coma scale (GCS), and a modified version of the GCS is used in pediatric patients. **Methods:** A prospective study was conducted at Inpatient services of intensive medical care unit and general medical wards of Institute of child Health and Hospital for children, Egmore, Chennai, between October 1998 to November 1999. A Study Population consisting of children in the age group 1-12 years admitted in intensive care unit and medical wards with alteration in sensorium as one of the predominant complaints and admitted within 7 days of onset of coma were included. Sample size was 148. Chi-square test was used to study the association between the scores at Various times points and outcome. **Results:** Optimum score that predict good recovery, at Presentation – Score 6 or more predicts good recovery. For score 6 sensitivity 89.3%, specificity 70.7%. At 24 hrs of admission - Score 6 or more predicts good recovery. For score 6 sensitivity 89.3%, specificity 72.2%. At 48 hrs of admission - Score 7 or more predicts good recovery. For score 7 sensitivity 85.7%, specificity 76.1%. At 72 hrs of admission - Score 8 or more predicts good recovery. For score 8 sensitivity 87.5%, specificity 84.6%. **Conclusion:** There is highly statistically significant association between the GSC score levels and outcome. As the score increases the proportion of having good recovery increases and vice versa.
Key Words: Glasgow coma scale, good recovery, Non traumatic coma.

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INTRODUCTION

Coma is a state of altered level of consciousness in which there is a loss of both wakefulness and awareness of the self and the environment. It is a very serious condition that necessitates immediate medical decision making upon arrival at the pediatric emergency department or pediatric intensive care unit (PICU).[1] The most common scoring system used for assessment of consciousness is the Glasgow coma scale (GCS), and a modified version of the GCS is used in pediatric patients.[2,3] Because of the multifactorial origin of coma, and the outcome of each differs considerably it is very difficult to prognosticate in a given a case about the final outcome. Because of these limitations in assessing the prognosis, we need to device a system so that the prognosis can be easily assessed. It should be simple so that it can be practiced universally. It should be cheap, reproducible and reliable. Interpretation should be easier and should not require sophisticated training. As far as the use of Glasgow coma scale in children is concerned it cannot be directly applied to all age groups. So modification of the scoring system is necessary to suit the younger children. Hence this study was conducted to evaluate the usefulness of coma scale in prediction of outcome in children between 1-12 years old admitted with coma of non-traumatic origin.

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MATERIALS AND METHODS

A prospective study was conducted at Inpatient services of intensive medical care unit and general medical wards of Institute of child Health and Hospital for children, Egmore, Chennai, between October 2018 to November 2019. A Study Population consisting of children in the age group 1-12 years admitted in intensive care unit and medical wards with alteration in sensorium as one of the predominant complaints and admitted within 7 days of onset of coma were included. Coma recovering within 24 hrs, coma following trauma, poisoning, cardiac or respiratory illness as the main underlying problem were excluded. Sample size was 148. Severity of coma is assessed using Glasgow coma scale in children above 5 years and Adelidescore for children below 5 years. Serial scoring was done at 8 hr interval in the first 24 hrs and then at 24 hrs intervals till 5th day Of admission. Statistical analysis: The sensitivity and Specificity of Various Scores regarding the prediction of mortality were arrived at and the optimal cut Off point was arrived by construction of Receiver Operative Characteristic Curve (ROC). Chi-square test was used to study the association between the scores at Various times points and outcome.

RESULTS

Table 1: Age and sex distribution

Age Group	Male n (%)	Female n (%)	Total n (%)
1-3 Years	34(23.0)	21(14.2)	55(37.2)
4-6 Years	28(18.9)	20(13.5)	48(32.4)
7-9 Years	10(6.8)	14(9.5)	24(16.2)
10-12 Years	8(5.4)	13(8.8)	21(14.2)
Total	**80(54.1)**	**68(45,9)**	**148(100)**

Infections were the leading causes coma 78(52.7%) in children. Acute encephalopathies including the viral encephalopathy accounted for 36(24.39%) followed by bacterial meningitis 18(12.2%) tuberculous meningitis 14 (9.46%) and cerebral malaria 10 (6.75%). Viral infections are the leading cause of Coma in children (24.3%)· Following infections metabolic causes are common accounting for 38 (25.68%). Among them Hepatic encephalopathies 21(14.19%) were the most common and it is second cause of coma in children next to meningoencephalitis in our series. It is followed by renal encephalopathy 10(6.75) and diabetic ketoacidosis 7 (4.72%). Other important causes noticed were vascular stroke 8(5.4%) and hypoxia ischemic encephalopathy 7 (4.72%) and Seizure disorder presenting with Status epileptics 5(3.38%). Other rarer cause noticed were hypertensive encephalopathy in 2 cases (1.35%), space occupying leision in 2(1.35%), Stevens-Johnson syndrome in 2 cases (13.5%) viral hemorrhagic fever 2 cases(1.35%) heavy metal poisoning 1 case (0.67%), Homocystinuria 1 case (0.67%) encephalomyeloradiculopathy 1 case (0.67%) and chickenpox encephalopathy 1 case (0.67%).

Table 2: Association between the minimal score and good recovery, disability.

Score	Good Recovery n(%)	Disability n(%)	Total No. n(%)
3-5	10 (12.7)	16(20.3)	79(53.4)
6-8	33(62.3)	11 (20.8)	53 (35.8)
≥ 9	13 (81.3)	3(18.7)	16 (10.8)
Total No. (%of Total	**56 (37.*)**	**30(20.3)**	**148(100)**

Chi-Square = 57.31, P – < 0.000001

Table 3: Association between coma score at presentation and good recovery, disability.

Score	Good Recovery n(%)	Disability n(%)	Total No. n(%)
3-5	6 (8.5)	16 (22.5)	71 (48.0)
≥ 6	50 (64.9)	14 (18.2)	77(52.0)
Total No. (%of Total	**56 (37.8)**	**30 (20.3)**	**148(100)**

Chi-Square = 55.45, p = 0.00001

Table 4: Association between coma score after 24 hrs of admission and good recovery, disability.

Score	Good Recovery n(%)	Disability n(%)	Total No. n(%)
3-5	7 (10.9)	12 (18.8)	64 (47.4)
≥ 6	49 (69.)	18 (25.4)	71(52.6)
Total No.(%of Total	**56 (41.5)**	**30 (22.2)**	**135(100)**

Chi-Square = 60.63, p = < 0.00001

Table 5: Association between coma score after 48 hrs of admission and good recovery, disability.

Score	Good Recovery n(%)	Disability n(%)	Total No. n(%)
3-5	2 (4.7)	10 (23.3)	43 (35.0)
≥ 6	54 (67.5.)	20 (25.0)	80(65.0)
Total No. (%of Total	**56 (45.5)**	**30 (24.4)**	**123(100)**

Chi-Square = 63.1, p < 0.00001

Table 6: Association between coma score after 72 hrs of admission and good recovery, disability.

Score	Good Recovery n(%)	Disability n(%)	Total No. n(%)
3-5	0	8 (33.3)	24 (22.2)
≥ 6	56 (66.7)	22 (26.2)	84(77.80)
Total No.(%of Total	**56 (51.9)**	**30 (27.8)**	**108(100)**

Chi-Square = 72.1, p < 0.00000001

Table 7: Association between the coma scores trends and good recovery, disability.

Change in core over 24 hrs	Good Recovery n(%)	Disability n(%)	Total No. (% of Total)
No change deterioration	18 (22.8)	17 (21.5)	79 (58.5)
Improvement ≥1	38 (67.9)	13 (23.2)	56 (41.5)
Total n (% of total)	56 (41.5)	30 (22.2)	135(100)

Chi-square = 38.8, P <0.000001

Table 8: Association between the coma scores trends over 48 hrs and good recovery, disability.

Change in core over 48 hrs	Good Recovery n (%)	Disability n(%)	Total No. (% of Total)
No change deterioration	10 (17.9)	14 (25)	56 (45.5)
Improvement ≥1	46 (68.7)	16 (23.9)	67 (54.5)
Total	**56 (45.5)**	**30 (24.4)**	**123 (100)**

Table 9: Association between the coma scores trends over 72 hrs and good recovery, disability.

Change in core over 72 hrs	Good Recovery n (%)	Disability n(%)	Total No. (% of Total)
No change deterioration	1 (3.7)	10 (37)	27 (25)
Improvement ≥1	55 (67.9)	20 (24.7)	81 (75)
Total	**56 (51.9)**	**30 (27.8)**	**108 (100)**

Chi-Square = 43.93, P < 0.000001

Table 10 : Association between the coma scores overall changes and good recovery, disability.

Score	Good Recovery n (%	Disability n(%)	Total No. (% of Total)
No change deterioration	1 (1.4)	13 (18.6))	70 (47.3)
Improvement ≥1	55 (70.5)	17 (21.8)	78 (52.7)
Total	56 (37.8)	30 (20.3)	148 (100)

Chi-Square = 92.76, P < 0.000001

Table 11: Sensitivity and specificity of different scores at presentation as predictors of good recovery

Scores that predict Good Recovery		Good Recovery	Poor Outcome	Sensitivity (%)	Specificity (%)
4 or more	≥ 4	56	75	100	18.5
	3	0	17		
5 or more	≥ 5	54	53	96.4	42.4
	≤ 4	2	39		
6 or more	≥ 6	50	27	89.3	70.7
	≤ 5	6	65		
7 or more	≥ 7	35	16	62.5	82.5
	≤ 6	21	76		
8 or more	≥ 8	25	13	44.6	85.9
	≤ 7	31	79		
9 or more	≥ 9	18	6	32.1	93.5

	≤ 8	38	86		
10 or more	≥ 10	10	2	17.8	97.5
	≤ 9	46	90		
11 or more	≥ 11	6	0	10.7	100
	≤ 10	50	92		

By constructing a receiver operating characteristic curve we can arrive at optimum score with high sensitivity and specificity. The optimum specificity and sensitivity were 89.3 and 70.7. This corresponds to score of 6 at presentation score 6 at presentation predicts good recovery with optimum sensitivity and specificity.

DISCUSSION

Coma scale is a simple clinical tool which can be applied by any trained person. But inter observer variations are likely to occur. When uniform training is given to all those who would be applying the scale the variations can be minimized to a large event. The association between the coma score at various time points, change in scores with time and the final outcome were studied using chi-square test. In our study we found that there is highly statistically significant association between the GSC score levels and outcome. As the score increases the proportion having good recovery increases and vice versa. This type of association has been observed at different time points (Initial, 24 hrs,48 hrs and 72 hrs). The significance of this association increases with the progression of time since admission. P value for the degree of association at various time points are: At presentation $P < 0.00001$, 24hrs - $P < 0.000001$, 48 hrs - $P < 0.000001$ and 72 hrs $P < 0.00000001$. This high degree of association is in accordance with the study conducted by Soustiel *et al.* [4] who reported that among the clinical parameters GCS provided the most accurate prognosis (in 80%). We have found that there is high statistically significant association between the change in GCS level and the outcome. That is as the improvement in GCS is increasing the proportion of patients having good recovery is increasing and vice versa. Similar pattern of association has been observed at different time points 24 hrs, 48 hrs and 72 hrs) as indicated by the p values as different time points. 24 hrs - $P < 0.000001$, 48 hrs $P < 0.000001$ and 72 hrs $P < 0.000001$. Hence we can infer that as the improvement in GCS is higher there is significant good recovery of the patients and vice versa. This finding is in accordance with the study done by Grewal *et al.*[5] who found that GCS trend or brain stem reflexes used alone were significantly correlated with outcome. Their study is with comatose children following head injury where as we have conducted the study in non- traumatic coma in children. We have studied the ability of different scores to predict the final outcome using their sensitivity and specificity at various time points viz. initial, 24hrs,48 hrs and 72 hrs. We have arrived at the optimum scores that form a cutoff point in prediction of good recovery at various time points. Optimum score that predict good recovery, at Presentation – Score 6 or more predicts good recovery. For score 6 sensitivity 89.3%, specificity 70.7%. At 24 hrs of admission - Score 6 or more predicts good recovery. For score 6 sensitivity 89.3%, specificity 72.2%. At 48 hrs of admission - Score 7 or more predicts good recovery. For score 7 sensitivity 85.7%, specificity 76.1%. At 72 hrs of admission - Score 8 or more predicts good recovery. For score 8 sensitivity 87.5%, specificity 84.6%. It can be seen that the optimum scores that predict outcome increase with time since admission. Longer a patient remains in a lower score poorer is the prognosis. The finding that the score of 5 or less within 24 hrs of hospitalization if associated with poor prognosis is in accordance with the study done by Awasthi *et al....* [6] from Lucknow. Rober H A Haslam [7] in Nelson textbook of pediatrics also reports that score 5 or less is associated with grave prognosis. Though many studies have analysed the scores at presentation, cutoff points for different time intervals after admission were not analysed. In a study done by Biradar S [8] on 30 cases, 5 cases expired (16.66%), 2 cases were discharged against medical advice (6.67%), 23 cases improved and discharged, among these, 3 cases were discharged with complication (76.67%). Overall mortality was (16.66 %) (5/30), males outnumbered females in frequency with ratio of 1.41:1. CNS infection accounted for almost about 75%. It was concluded that children with GCS and MGCS scores of less than 8 have poor prognosis and very high probability of death. Those with GSC score of more than 8 have good prognosis. Identification of these cases at the outset can help prepare of outcome to the family.

REFERENCES

1. Evaluation of the comatose child. In: Nichols DG (editor) 2008. pp. 846–861.
2. Teasdale G Jennett B Assessment of coma and impaired consciousness: a practical scale. The Lancet. 1974; 304:81–84.
3. Kirschen MP Snyder M Smith K Lourie K Agarwal K Inter-rater reliability between critical care nurses performing a pediatric modification to the Glasgow Coma Scale. Pediatric Critical Care Medicine . 2019;20:660–666.

4. Soustiel JF, Hafner H, Guilburd JN, Zaroor M, Leri L, Feinsod M. A physiological coma scale; Grading of coma by combined use of brain stem trigeminal and auditory evoked potentials and the Glasgow coma scale, electro encephalography and clinical Neurophysiology. 1993; 85(5): 277-283
5. Grewal M, Sutcliffe AJ. Early prediction of outcome following head injury: an assessment of Glasgow coma scale score trend and abnormal plantar and papillary reflexes. Journal of pediatric surgery. 1991; oct: 26(10): 1161-3
6. Awasthi S, Moin S, Tyer SM, Rehman H. Modified Glasgow coma scale to predict mortality in children with acute infections of central nervous system. National medical journal of India. 1997; sept-oct:10(5), 214-216.
7. Rober H A Haslam, Coma in children In :. Nelson Textbook of pediatrics 15th edition vol 2. Richard E Behrman, Robert M Kliegman.1996, p 1716-1718.
8. Biradar S. Role of Glasgow coma scale in pediatric non - traumatic coma. Journal of Evolution of Medical and Dental Sciences.2015 Jan; 04(02):248-252.

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