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Original Research Article

A COMPARATIVE STUDY BETWEEN FOUR SCORE AND GLASGOW COMA SCALE IN PREDICTION OF MORTALITY AND OUTCOME IN CHILDREN WITH ALTERED LEVEL OF CONCIOUSNESS

G. Mohanapriya[1], S. Selvakumar[2], R. Raguvaran[3]

[1]*Assistant Professor, Department of Pediatrics, Government Thiruvarur Medical College, Thiruvarur, India.*
[2]*Assistant Professor, Department of Pediatrics, Government Thiruvarur Medical College, Thiruvarur, India.*
[3]*Senior Assistant professor, Department of Pediatrics, Government Thiruvarur Medical College, Thiruvarur, India.*

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Corresponding Author:
Dr. R. Raguvaran,
Senior Assistant professor, Department of Pediatrics, Government Thiruvarur Medical College, Thiruvarur, India.
Email: dr.ragu06@gmail.com

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ABSTRACT

Background: Altered level of consciousness in children is a critical clinical condition requiring early assessment and prognostication. The Glasgow Coma Scale (GCS) is widely used for neurological assessment, while the Full Outline of UnResponsiveness (FOUR) score provides additional evaluation of brainstem reflexes and respiratory pattern. This study compared the utility of GCS and FOUR score in predicting mortality and outcome among children with altered level of consciousness.

Materials and Methods: This comparative observational study was conducted among 60 children presenting with altered level of consciousness. Demographic details, etiology, comorbidities, clinical parameters, GCS, and FOUR scores were recorded. Both scores were assessed at admission, 24 hours, 48 hours, and 72 hours. Outcomes were categorized as survival or mortality. Statistical analysis included Chi-square test, independent *t*-test, and receiver operating characteristic (ROC) curve analysis.

Results: The mean age of the study population was 2.77 ± 3.39 years, with female predominance (52.5%). CNS causes were the most common etiology (35.6%). There was no significant association between gender or etiology and outcome. GCS and FOUR scores at admission and 24 hours were not significantly associated with mortality. However, at 48 and 72 hours, both scores were significantly lower among non-survivors than survivors ($p < 0.001$). ROC analysis showed that 72-hour GCS had an AUC of 0.83, while 72-hour FOUR score had an AUC of 0.84. FOUR score showed marginally higher sensitivity, specificity, PPV, NPV, and diagnostic accuracy.

Conclusion: Both GCS and FOUR score are useful predictors of mortality in children with altered level of consciousness, with FOUR score demonstrating slightly better diagnostic performance.

Keywords: Altered consciousness; FOUR score; Glasgow Coma Scale; Mortality prediction; Pediatric intensive care.

INTRODUCTION

Altered level of consciousness in children is a critical neurological emergency and is frequently encountered in pediatric emergency and intensive care settings.[1] It may result from a wide spectrum of etiologies, including central nervous system infections, seizures, traumatic brain injury, metabolic disturbances, shock, respiratory failure, cardiovascular compromise, poisoning, and systemic sepsis.[2] Regardless of the underlying cause, impaired consciousness reflects significant dysfunction of the central nervous system and often indicates severe illness. Early recognition, systematic assessment, and continuous monitoring are therefore essential for timely intervention and improved clinical outcomes.[3]

Assessment of the level of consciousness forms an important component of initial evaluation and ongoing monitoring in critically ill children.[4] A reliable scoring system helps clinicians quantify neurological status, detect clinical deterioration, guide treatment decisions, communicate severity among healthcare professionals, and estimate prognosis.[5] In pediatric patients, this assessment is particularly important because neurological deterioration may occur rapidly, and clinical examination can be challenging due to variations in age, developmental status, verbal ability, and cooperation.[6]

The Glasgow Coma Scale (GCS) has traditionally been the most widely used tool for assessing consciousness in both adult and pediatric populations.[7] It evaluates eye opening, verbal response, and motor response and provides a simple numerical score that can be used for serial neurological assessment.[8] However, the GCS has certain limitations, especially in critically ill children.[9] The verbal component may be difficult to assess in preverbal children, intubated patients, or those receiving ventilatory support. In addition, GCS does not directly assess brainstem reflexes or breathing patterns, which are important indicators of neurological function and prognosis in patients with impaired consciousness.[10]

The Full Outline of UnResponsiveness (FOUR) score was developed to overcome some of these limitations.[11] It assesses four components: eye response, motor response, brainstem reflexes, and respiration. Unlike GCS, the FOUR score does not depend on verbal response, making it useful in intubated and mechanically ventilated patients.[12]

Its inclusion of brainstem reflexes and respiratory pattern provides additional neurological information, which may be clinically relevant in children with severe neurological impairment. Therefore, FOUR score has gained attention as a potentially useful alternative or complementary tool to GCS in pediatric critical care.[13]

Previous studies have shown that both GCS and FOUR score are useful in predicting mortality and functional outcomes among children with impaired consciousness.[14] Several pediatric studies have reported comparable predictive performance between the two scores, while some have suggested that FOUR score may offer better sensitivity, specificity, or prognostic discrimination in selected clinical settings.[15] However, the available evidence remains variable, and the relative advantage of FOUR score over GCS in children remains an area of continued research, particularly in pediatric intensive care settings where serial assessment over time may be more informative than a single admission score.[16]

In this context, the present study was conducted to compare the prognostic utility of GCS and FOUR score in children presenting with altered level of consciousness. By assessing both scores at admission and during follow-up intervals, the study aimed to evaluate their ability to predict mortality and clinical outcome. The findings may help determine whether FOUR score offers additional prognostic value over the routinely used GCS and support the use of an appropriate neurological scoring system for critically ill children in clinical practice.

Aims and Objectives

Aim

To compare the prognostic utility of the Glasgow Coma Scale (GCS) and the FOUR score in predicting mortality and clinical outcomes among children presenting with altered level of consciousness.

Objectives

- To evaluate and compare the predictive accuracy of GCS and FOUR score at different time intervals (admission, 24, 48, and 72 hours) in relation to mortality among children with altered level of consciousness.
- To assess and compare the diagnostic performance of GCS and FOUR score using receiver operating characteristic (ROC) analysis, including area under the curve (AUC), sensitivity, specificity, and overall diagnostic accuracy in predicting mortality.

MATERIALS AND METHODS

Study Design and Setting

This was a hospital-based comparative observational study conducted among children presenting with altered level of consciousness. The study was carried out in the pediatric emergency and pediatric intensive care unit setting of a tertiary care hospital. The study was designed to compare the prognostic utility of the Glasgow Coma Scale (GCS) and the Full Outline of UnResponsiveness (FOUR) score in predicting mortality and clinical outcome among critically ill children.

Study Population

The study population included children admitted with altered level of consciousness during the study period. Eligible children were assessed clinically and neurologically after admission, and both GCS and FOUR scores were recorded at predefined time intervals. Children were followed during hospitalization to determine survival status and clinical outcome.

Study Duration

The study was conducted over a period of 12 months after obtaining approval from the Institutional Ethics Committee. Data collection was carried out from the time of admission until hospital outcome, including survival or mortality, was documented.

Inclusion and Exclusion Criteria

Children presenting with altered level of consciousness and admitted to the pediatric emergency unit or pediatric intensive care unit were included in the study. Children whose parents or guardians provided informed consent were enrolled.

Children with incomplete clinical records, those discharged against medical advice before adequate outcome assessment, and those in whom serial

neurological assessment could not be completed were excluded from the study. Children receiving deep sedation or neuromuscular blockade at the time of assessment, where reliable scoring could not be performed, were also excluded.

Sample Size and Sampling Technique

A total of 60 children with altered level of consciousness were included in the study. The sample size was based on the number of eligible children admitted during the study period who fulfilled the inclusion criteria. A consecutive sampling technique was used, whereby all eligible children presenting during the study duration were enrolled until the required sample size was achieved.

Study Procedure

After obtaining informed consent from the parents or legal guardians, eligible children were enrolled in the study. A detailed history was obtained, including demographic details, presenting complaints, duration of altered sensorium, underlying etiology, and associated comorbidities. A complete general physical examination, systemic examination, and neurological examination were performed at admission.

The level of consciousness was assessed using both the Glasgow Coma Scale and the FOUR score. The initial GCS and FOUR scores were recorded at admission, followed by repeat assessments at 24 hours, 48 hours, and 72 hours. All assessments were performed using standard scoring criteria. The GCS was evaluated based on eye opening, verbal response, and motor response, while the FOUR score was assessed using eye response, motor response, brainstem reflexes, and respiratory pattern.

Relevant clinical details, including etiology of altered consciousness, comorbidities, need for mechanical ventilation, duration of mechanical ventilation, duration of pediatric intensive care unit stay, and clinical outcome, were recorded. The outcome was categorized as survival or mortality during hospitalization. Functional outcome was assessed using the Pediatric Overall Performance Category (POPC) scale wherever applicable.

Operational Definitions

Altered level of consciousness was defined as any impairment in awareness, arousal, responsiveness, or sensorium requiring clinical evaluation and hospital admission.

Glasgow Coma Scale (GCS) was defined as the composite score derived from eye opening, verbal response, and motor response. Lower GCS scores indicated greater impairment of consciousness.

FOUR score was defined as the Full Outline of UnResponsiveness score consisting of four components: eye response, motor response, brainstem reflexes, and respiratory pattern. Lower FOUR scores indicated poorer neurological status.

Survivors were defined as children who were alive at the time of hospital discharge or final outcome assessment.

Non-survivors were defined as children who died during the hospital stay.

Diagnostic performance was assessed using receiver operating characteristic (ROC) curve analysis, including area under the curve (AUC), sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy.

Poor outcome was defined as mortality or worse functional status based on clinical outcome assessment and POPC scale findings.

Statistical Analysis

Data were entered into a spreadsheet and analyzed using SPSS version 26. Continuous variables were summarized as mean and standard deviation, while categorical variables were expressed as frequency and percentage. The association between categorical variables such as gender, etiology, comorbidity, and outcome was assessed using the Chi-square test or Fisher's exact test where appropriate. The mean GCS and FOUR scores between survivors and non-survivors were compared using the independent samples *t*-test. Serial scores at admission, 24 hours, 48 hours, and 72 hours were analyzed to determine their association with mortality. Receiver operating characteristic (ROC) curve analysis was performed to assess the diagnostic accuracy of GCS and FOUR score in predicting mortality. Area under the curve (AUC), 95% confidence interval, cut-off values, sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were calculated. A *p*-value of less than 0.05 was considered statistically significant.

Ethical Consideration

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from the parents or legal guardians of all participating children before enrollment. Confidentiality of patient information was maintained throughout the study, and all data were used only for academic and research purposes. The study involved observational assessment only and did not interfere with the standard clinical management of the children.

RESULTS

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (N = 60)

Variable	Category	Frequency (n)	Percentage (%)	Mean ± SD
Age (years)	—	—	—	2.77 ± 3.39
Gender	Male	28	47.5	—
	Female	32	52.5	—
Etiology	CNS causes	21	35.6	—
	Cardiovascular diseases	9	15.3	—

	Traumatic brain injury	8	13.6	—
	Respiratory illness	7	11.9	—
	Shock	3	5.1	—
	Renal causes	2	3.4	—
	Others	9	15.3	—
Comorbidity	Nil	16	27.1	—
	Sepsis	12	20.3	—
	Others	12	20.3	—
	Cardiovascular disease	5	8.5	—
	Renal disorder	5	8.5	—
	Shock	4	6.8	—
	CNS causes	3	5.1	—
	Respiratory illness	2	3.4	—

The baseline demographic and clinical characteristics of the study participants are presented in Table 1. The mean age of the study population was 2.77 ± 3.39 years, indicating that the majority of participants were young children. There was a nearly equal gender distribution, with 52.5% females (n = 32) and 47.5% males (n = 28). With respect to etiology, central nervous system (CNS) causes were the most common (35.6%), followed by cardiovascular diseases (15.3%), other causes (15.3%), traumatic brain injury (13.6%), and respiratory illnesses (11.9%). Less frequent causes included shock (5.1%) and renal disorders (3.4%). Regarding comorbidity status, 27.1% of participants had no comorbid conditions, while sepsis (20.3%) and other comorbidities (20.3%) were the most commonly observed. Additional comorbid conditions included cardiovascular diseases (8.5%), renal disorders (8.5%), shock (6.8%), CNS-related comorbidities (5.1%), and respiratory illnesses (3.4%). Overall, CNS etiologies and sepsis-related comorbidities constituted a significant proportion of the study population.

Table 2: Etiological Distribution and Comorbidity Profile of Children with Altered Level of Consciousness (N = 60)

Variable	Category	Frequency (n)	Percentage (%)
Etiology	CNS causes	21	35.6
	Cardiovascular diseases	9	15.3
	Traumatic brain injury	8	13.6
	Respiratory illness	7	11.9
	Shock	3	5.1
	Renal causes	2	3.4
	Others	9	15.3
Comorbidity	Nil	16	27.1
	Sepsis	12	20.3
	Others	12	20.3
	Cardiovascular disease	5	8.5
	Renal disorder	5	8.5
	Shock	4	6.8
	CNS causes	3	5.1
	Respiratory illness	2	3.4

The etiological distribution and comorbidity profile of children with altered level of consciousness are summarized in Table 2. Among the etiological factors, central nervous system (CNS) causes were the most predominant (35.6%), followed by cardiovascular diseases (15.3%) and other causes (15.3%). Traumatic brain injury accounted for 13.6% of cases, while respiratory illnesses contributed to 11.9%. Less frequent etiologies included shock (5.1%) and renal causes (3.4%). In terms of comorbidity, 27.1% of children had no associated comorbid conditions. Among those with comorbidities, sepsis (20.3%) and other conditions (20.3%) were the most common, followed by cardiovascular diseases (8.5%) and renal disorders (8.5%). Additional comorbidities included shock (6.8%), CNS-related conditions (5.1%), and respiratory illnesses (3.4%). Overall, CNS-related etiologies and sepsis-related comorbidities constituted a significant proportion of the study population.

Table 3: Serial Mean Glasgow Coma Scale (GCS) and FOUR Score at Admission and Follow-up Intervals (0, 24, 48, and 72 Hours)

Time Interval	GCS Mean ± SD	FOUR Score Mean ± SD
Admission (0 hour)	6.93 ± 2.01	8.02 ± 2.15
24 hours	6.61 ± 2.49	7.25 ± 2.93
48 hours	6.75 ± 2.67	7.17 ± 3.34
72 hours	6.85 ± 3.13	7.19 ± 4.01

The serial mean Glasgow Coma Scale (GCS) and FOUR scores at admission and during follow-up intervals are presented in Table 3. At admission, the mean GCS was 6.93 ± 2.01, while the mean FOUR

score was 8.02 ± 2.15. At 24 hours, the mean GCS decreased slightly to 6.61 ± 2.49, and the mean FOUR score to 7.25 ± 2.93. At 48 hours, the mean GCS was 6.75 ± 2.67, and the FOUR score was 7.17 ± 3.34. By 72 hours, the mean GCS showed a marginal increase to 6.85 ± 3.13, and the FOUR score to 7.19 ± 4.01. Overall, both GCS and FOUR scores demonstrated relatively stable trends over the observation period, with minor fluctuations across time intervals.

Table 4: Association of Demographic and Clinical Variables with Outcome (Survival vs Mortality) (N = 60)

Variable	Category	Dead n (%)	Alive n (%)	p-value
Gender	Male	15 (53.6)	13 (46.4)	0.393
	Female	20 (64.5)	11 (35.5)	
Etiology	CNS causes	12 (57.1)	9 (42.9)	0.190
	Respiratory illness	3 (42.9)	4 (57.1)	
	Cardiovascular diseases	5 (55.6)	4 (44.4)	
	Shock	0 (0.0)	3 (100.0)	
	Traumatic brain injury	6 (75.0)	2 (25.0)	
	Renal causes	2 (100.0)	0 (0.0)	
	Others	7 (77.8)	2 (22.2)	

The association of demographic and clinical variables with outcome is presented in Table 4. There was no statistically significant association between gender and outcome (p = 0.393), although a higher proportion of females (64.5%) died compared to males (53.6%). Similarly, etiology did not show a statistically significant association with survival (p = 0.190). However, variation in mortality proportions was observed across different etiological categories. Higher mortality was noted among children with renal causes (100%), other causes (77.8%), and traumatic brain injury (75.0%), whereas lower mortality was observed in respiratory illnesses (42.9%) and shock (0.0%), with all children in the shock category surviving. Despite these differences in distribution, the lack of statistical significance suggests that etiology and gender were not independent predictors of outcome in this study population.

Table 5: Comparison of Glasgow Coma Scale (GCS) and FOUR Score Between Survivors and Non-Survivors at Different Time Intervals (N = 60)

Time Interval	Score	Outcome	n	Mean ± SD	p-value
Admission (0 hr)	GCS	Dead	35	6.94 ± 1.63	0.961
		Alive	24	6.92 ± 2.50	
	FOUR score	Dead	35	7.94 ± 1.75	0.753
		Alive	24	8.13 ± 2.68	
24 hours	GCS	Dead	35	6.20 ± 2.22	0.128
		Alive	24	7.21 ± 2.78	
	FOUR score	Dead	35	6.69 ± 2.65	0.072
		Alive	24	8.08 ± 3.18	
48 hours	GCS	Dead	35	5.77 ± 2.12	<0.001*
		Alive	24	8.17 ± 2.79	
	FOUR score	Dead	35	5.89 ± 2.71	<0.001*
		Alive	24	9.04 ± 3.34	
72 hours	GCS	Dead	35	5.37 ± 2.38	<0.001*
		Alive	24	9.00 ± 2.87	
	FOUR score	Dead	35	5.29 ± 3.17	<0.001*
		Alive	24	9.96 ± 3.50	

**-statistically significant*

The comparison of Glasgow Coma Scale (GCS) and FOUR scores between survivors and non-survivors at different time intervals is presented in Table 5. At admission, there was no statistically significant difference between survivors and non-survivors for both GCS (p = 0.961) and FOUR score (p = 0.753). Similarly, at 24 hours, although survivors had relatively higher mean scores compared to non-survivors, the differences were not statistically significant for both GCS (p = 0.128) and FOUR score (p = 0.072). However, at 48 hours, a statistically significant difference was observed, with survivors demonstrating higher mean scores compared to non-survivors for both GCS (8.17 ± 2.79 vs 5.77 ± 2.12, p < 0.001) and FOUR score (9.04 ± 3.34 vs 5.89 ± 2.71, p < 0.001). This trend continued at 72 hours, where survivors had significantly higher GCS (9.00 ± 2.87 vs 5.37 ± 2.38, p < 0.001) and FOUR scores (9.96 ± 3.50 vs 5.29 ± 3.17, p < 0.001) compared to non-survivors. Overall, these findings indicate that both GCS and FOUR scores become significant predictors of mortality after 48 hours, with consistently higher scores observed among survivors, highlighting their prognostic utility in the later stages of assessment.

Table 6: Diagnostic Performance of Glasgow Coma Scale (GCS) and FOUR Score in Predicting Mortality (ROC Curve Analysis) (N = 60)

Time Interval	Score	AUC	95% CI	Cut-off	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Diagnostic Accuracy (%)
48 hours	GCS	0.75	0.62–0.86	≤6	71.4	70.8	76.9	65.4	70.8
	FOUR score	0.78	0.66–0.88	≤7	74.3	75.0	80.0	68.2	74.7
72 hours	GCS	0.83	0.72–0.91	≤6	82.9	79.2	85.3	76.0	81.3
	FOUR score	0.84	0.74–0.92	≤7	85.7	83.3	88.2	80.0	84.7

The diagnostic performance of the Glasgow Coma Scale (GCS) and FOUR score in predicting mortality is presented in Table 6. At 48 hours, both scoring systems demonstrated moderate predictive ability, with an area under the curve (AUC) of 0.75 (95% CI: 0.62–0.86) for GCS and 0.78 (95% CI: 0.66–0.88) for FOUR score. Using a cut-off value of ≤6 for GCS, the sensitivity and specificity were 71.4% and 70.8%, respectively, with a positive predictive value (PPV) of 76.9%, negative predictive value (NPV) of 65.4%, and diagnostic accuracy of 70.8%. For the FOUR score at a cut-off of ≤7, the sensitivity and specificity were 74.3% and 75.0%, respectively, with a PPV of 80.0%, NPV of 68.2%, and diagnostic accuracy of 74.7%. At 72 hours, both scores showed improved predictive performance. The AUC increased to 0.83 (95% CI: 0.72–0.91) for GCS and 0.84 (95% CI: 0.74–0.92) for FOUR score, indicating good discriminative ability. At the same cut-off values, GCS demonstrated a sensitivity of 82.9% and specificity of 79.2%, with a PPV of 85.3%, NPV of 76.0%, and diagnostic accuracy of 81.3%. The FOUR score showed slightly superior performance, with a sensitivity of 85.7% and specificity of 83.3%, along with a PPV of 88.2%, NPV of 80.0%, and diagnostic accuracy of 84.7%. Overall, both GCS and FOUR score exhibited good predictive ability at 72 hours, with the FOUR score demonstrating marginally better diagnostic performance compared to GCS.

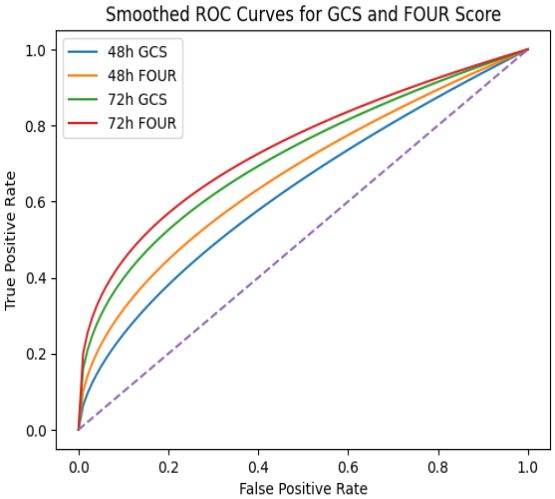

Chart 1: ROC curve

DISCUSSION

In the present study, the mean age of children with altered level of consciousness was 2.77 ± 3.39 years, indicating that younger children constituted a major proportion of the study population. Female children were slightly more represented than male children. This age profile was lower than that reported by Mittal et al., who observed a mean age of 6.64 ± 4.13 years among children aged 1–14 years admitted with altered sensorium.[5] Similarly, Dwivedi et al. reported a predominance of older children, particularly those aged 9–12 years, in their study of unconscious children admitted to PICU.[2] Jamal et al. included children aged 5–12 years with impaired consciousness, while Kochar et al. studied children aged 5–18 years, making their cohorts older than the present study population.[8,10] These differences may be due to variation in inclusion criteria, referral patterns, disease burden, and age groups admitted to different pediatric intensive care units.

Central nervous system causes were the most common etiology in the present study, accounting for 35.6% of cases, followed by cardiovascular diseases, traumatic brain injury, and respiratory illness. This finding is comparable to Dwivedi et al., who reported acute encephalitis syndrome as the most common final diagnosis among unconscious children, suggesting that CNS-related causes remain a major contributor to pediatric impaired consciousness in Indian settings.[2] Khajeh et al. also evaluated children admitted to PICU with varied neurological and systemic illnesses and demonstrated that altered consciousness in critically ill children commonly arises from diverse etiologies.[3] Jamal et al. included children with impaired consciousness of less than 7 days and excluded traumatic brain injury, thereby focusing more on non-traumatic neurological causes.[8] Kochar et al. similarly studied children with non-traumatic impairment of consciousness and showed that both GCS and FOUR score were useful in predicting outcomes in this population.[10] Thus, the predominance of CNS causes in the present study is consistent with earlier pediatric studies, although the inclusion of traumatic and systemic causes makes the present study more clinically heterogeneous.

In the present study, gender and etiology were not significantly associated with mortality. Although mortality was numerically higher among females, the association was not statistically significant.

Similarly, etiology showed variation in mortality proportions, with higher mortality among renal causes, traumatic brain injury, and other causes, but this difference did not reach statistical significance. Jamal et al. also emphasized that the prognostic value of coma scores was more important than demographic variables in predicting mortality and functional outcome.[8] Kochar et al. reported that both GCS and FOUR scores were good predictors of in-hospital mortality, without demonstrating a major superiority based on etiological subgrouping.[10] Mittal et al. also showed that outcome prediction was strongly related to score values over time rather than demographic characteristics alone.[5] Khajeh et al. demonstrated that mortality prediction was significantly associated with neurological scoring systems, particularly FOUR score, rather than relying only on baseline clinical categories.[3] These findings support the view that objective neurological scoring systems may be more useful predictors of outcome than demographic or broad etiological classifications alone.

The present study showed that both GCS and FOUR score at admission and 24 hours were not significantly different between survivors and non-survivors, whereas significant differences emerged at 48 and 72 hours. Survivors had consistently higher mean GCS and FOUR scores at these later intervals. This finding suggests that serial neurological assessment may provide stronger prognostic value than a single admission score. Gaur et al. reported significant differences in both FOUR and GCS scores between survivors and non-survivors at admission, 24 hours, and 48 hours, with FOUR score showing slightly higher predictive accuracy at admission.[1] Mittal et al. similarly observed that lower GCS and FOUR scores were significantly associated with mortality and that both scores correlated well with outcome at admission, 12 hours, 24 hours, and discharge.[5] Dwivedi et al. also concluded that both FOUR and GCS scores were good predictors of disease severity and mortality in unconscious children admitted to PICU.[2] Khajeh et al. demonstrated through logistic regression that FOUR score was a good predictor of in-hospital mortality among PICU patients.[3] Compared with these studies, the present study highlights that the prognostic separation between survivors and non-survivors becomes more evident after 48 hours, emphasizing the value of repeated score assessment.

The ROC analysis in the present study demonstrated that both GCS and FOUR score had good predictive ability for mortality, particularly at 72 hours. At 48 hours, the AUC was 0.75 for GCS and 0.78 for FOUR score, while at 72 hours, the AUC increased to 0.83 for GCS and 0.84 for FOUR score. These findings are consistent with Gaur et al., who reported slightly higher AUC for FOUR score at admission compared with GCS, with FOUR score also showing better sensitivity and specificity.[1] Jamal et al. found that the AUC for in-hospital mortality was 0.83 for GCS and 0.80 for FOUR score, with no statistically significant difference between the two scores.[8] Kochar et al. reported AUC values of 0.916 for GCS and 0.940 for FOUR score, again showing that both scores were good predictors of in-hospital mortality, with no significant difference between them.[10] Abdallah et al., in an adult population with reduced level of consciousness, also found comparable AUROC values for FOUR score and GCS, supporting the broader applicability of both scores for mortality prediction.[6] Thus, the present findings align with previous evidence that FOUR score is at least comparable to GCS and may offer marginally better discrimination in certain clinical settings.

In the present study, the FOUR score showed marginally superior diagnostic performance compared with GCS at both 48 and 72 hours, with higher sensitivity, specificity, PPV, NPV, and diagnostic accuracy. This supports the clinical utility of FOUR score as an effective prognostic tool in children with altered level of consciousness. Similar findings were reported by Khajeh et al., who concluded that FOUR score was more capable than GCS in predicting mortality and discharge outcome among PICU patients.[3] Gaur et al. also found FOUR score to be a better predictor of outcome compared with GCS, with higher sensitivity, specificity, and negative predictive value.[1] Shalaby et al. reported that FOUR score had higher accuracy and prognostic power than modified GCS during the first three assessment days.[9] In contrast, George et al. reported that FOUR score did not provide significant advantage over GCS, and Jamal et al. also observed comparable predictive performance between the two scores.[4,8] Therefore, while the present study suggests a slight advantage of FOUR score, the overall evidence indicates that both scoring systems are clinically useful, with FOUR score offering additional advantages in intubated or mechanically ventilated children due to its assessment of brainstem reflexes and respiratory pattern.

Limitations

The study was limited by its relatively small sample size and single-center design, which may restrict the generalizability of the findings to broader pediatric populations.

CONCLUSION

The present study concluded that both Glasgow Coma Scale (GCS) and FOUR score were useful prognostic tools for predicting mortality among children with altered level of consciousness. Admission and 24-hour scores were not significantly associated with outcome; however, both GCS and FOUR score at 48 and 72 hours showed significant differences between survivors and non-survivors. ROC curve analysis demonstrated good predictive ability for both scores, with improved performance at 72 hours. The FOUR score showed marginally better sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy

compared with GCS, suggesting that it may provide additional prognostic value in critically ill children. Based on these findings, serial neurological assessment using both GCS and FOUR score is recommended in children presenting with altered level of consciousness, particularly during the first 72 hours of admission. The FOUR score may be especially useful in pediatric intensive care settings because it includes brainstem reflexes and respiratory pattern, making it applicable even in intubated or mechanically ventilated children. Larger multicentric studies with long-term functional outcome assessment are recommended to further validate the comparative prognostic accuracy of FOUR score and GCS in pediatric populations.

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