

ORIGINAL ARTICLE

Predictive Accuracy of Full Outline of Unresponsiveness Score (FOUR Score) and Glasgow Coma Scale (GCS) to Predict Patient's Poor Outcome in Pediatrics ICU

SEHAR ZAHID¹, SADIA QASIM², MUHAMMAD ANWAR³, SYED ABDULLAH MAZHAR⁴, SHAHZIA SIDDIQUE⁵, ARSHAD RAFIQUE⁶¹Senior Registrar, Department of Pediatrics, Services Hospital, Lahore²Senior Registrar, Department of Pediatrics, The University of Child Health & Children's Hospital, Lahore³Associate Professor, Department of Pediatrics, Rashid Latif Medical College, Lahore⁴Assistant Professor, Department of Ophthalmology, Fatima Memorial Hospital/College of Medicine & Dentistry, Lahore⁵Senior Registrar, Department of Medicine, Jinnah Hospital, Lahore⁶Associate Professor, Department of Pediatrics, Avicenna Medical College, Lahore**Correspondence:** Dr. Sehar Zahid, E-mail: dr.seharzahid@yahoo.com Cell: 0333-4721711**ABSTRACT****Aim:** To compare the predictive accuracy of Glasgow coma Scale (GCS) versus full outline of unresponsiveness score (FOUR score) for poor out-come prediction in children admitted in paediatric ICU.**Study design:** Descriptive cross-sectional study.**Place and duration of study:** Department of Pediatrics, Services Hospital Lahore from 29th June 2017 to 29th December 2017.**Methodology:** One hundred and seventy children were enrolled. Both GCS and FOUR scale scores were recorded in paediatric intensive care unit (ICU) by clinical examination within 30 minutes of arrival in ICU. Both GCS and FOUR score were calculated on each and every patient. Responses were noted by clinically examining the eye, motor, verbal and brain stem reflexes. Patients were followed upto 7 days and poor outcome was noted.**Results:** The frequency of pediatric mortality was 52 (30.59%). Predictive accuracy of Full Outline of Unresponsiveness Score (FOUR score) for poor outcome prediction in children admitted in paediatrics ICU showed 63.46% for sensitivity, 86.44% for specificity, 67.35% for PPV, 84.30% for NPV and 79.41% for accuracy rate, whereas predictive accuracy of GCS Score for prediction of poor outcome in children admitted in paediatrics ICU shows 55.76% for sensitivity, 83.89% for specificity, 60.42% for PPV, 81.15% for NPV and 75.29% for accuracy rate.**Conclusion:** The FOUR and GCS both showed good results in terms of mortality after one week of admission in pediatric ICU.**Key words:** Children, poor outcome, FOUR score, Glasgow coma scale, predictive accuracy**INTRODUCTION**

As a consequence of brain damage sometimes patients may awake but remain unresponsive i.e. vegetative state¹. Although some patients recover to a minimally conscious state in which patients can have self and environmental awareness and pain processing but still they cannot communicate^{2,3}. Assessment of neurological status in these comatose patients is problematic due to the difficulty of capturing the different details of the clinical examination⁴. In respect to these inconveniences, many scales have been made to conduct the uniform neurological examination. The Glasgow Coma Scale (GCS) is most commonly used scale⁵. GCS is considered as standard scale for measuring the level of consciousness in emergency unit.⁶ But with the passage of time, certain limitations are also associated with GCS scale including verbal components cannot be tested in intubated patients, unable to detect neurological subtle changes, difficulties in the evaluation of brainstem reflexes^{7,8}. To overcome these issues, Wijdicks et al⁹ introduced a new coma scale named the Full Outline of Unresponsiveness (FOUR) scale as an alternative to the GCS in the evaluation of consciousness in severely brain-damaged patients. It is mainly composed on four components such as brainstem reflexes, eyes and motor responses and respiration.

In a study conducted in Belgium by Wijdicks et al⁹, they recruited 1,695 critically ill patients, comparing Full Outline of Unresponsiveness Score and the Glasgow Coma Scale. They evaluated significant difference between Glasgow coma scale score and FOUR score. Similarly, another study conducted in California also reported the similar results¹⁰. Result of these studies highlighted that FOUR would be a more appropriate prognostic tool for the evaluation of ICU mortality than GCS.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at Department of Pediatrics, Services Hospital Lahore from 29th June 2017 to 29th December 2017 and 170 cases were enrolled. All patients age less than 12 years having GCS <10 on admission and patients having meningitis, seizures, stroke, hydrocephalus, severe diarrhea and pneumonia were included. All the patients whose eye, verbal, or motor GCS components were not identifiable and history of brain trauma and neurosurgical cause were excluded. Demographic details of the patients (name, age, gender, address, diagnosis) were obtained. Both GCS and FOUR scale scores were recorded by staff doctors having clinical experience in a paediatric intensive care unit (ICU) by clinical examination within 30 minutes of arrival in ICU. Both GCS and FOUR score were calculated on each and every patient. Responses were noted by clinically examining the eye, motor, verbal and brain stem reflexes. Examiners completed the assessment at the same point in time and recorded their scores on separate rater score cards and data was collected. Patients were followed upto 7 days and poor outcome was noted.

The data was entered and analyzed through SPSS-20. Numerical variables i-e age GCS and FOUR scale scores were Cross tabulation was done with for four scale score and predictive accuracy was assessed by calculating sensitivity, specificity, positive and negative predictive value.

RESULTS

There were 84(49.41%) children between 1-6 years whereas 86(50.59%) between 7-12 years with 6.41±2.79 years. Eighty nine (52.35%) were males and 81(47.65%) were females. The neonatal mortality was 52(30.59%) whereas 118(69.41%) were alive. The mean FOUR score was 12.06±7.91 and mean GCS score was 8.94±1.73 (Table 1).

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Predictive accuracy of FOUR score for poor outcome prediction in children admitted in paediatric ICU shows 63.46% for sensitivity, 86.44% for specificity, 67.35% for PPV, 84.30% for NPV and 79.41% for accuracy rate (Table 2)

Predictive accuracy of GCS Score for prediction of poor outcome in children admitted in paediatric ICU shows 55.76% for sensitivity, 83.89% for specificity, 60.42% for PPV, 81.15% for NPV and 75.29% for accuracy rate (Table 3)

Table 1: Demographic information of the children (n=170)

Variable	No.	%
Age (years)		
1 – 6	84	49.41
7 – 12	86	50.59
Gender		
Male	89	52.35
Female	81	47.65
Neonatal Mortality		
Yes	52	30.59
No	118	69.41
FOUR score	12.06±7.91	
GCS score	8.94±1.73	

Table 2: Predictive accuracy of FOUR score for poor outcome prediction (n=170)

FOUR score	Neonatal Mortality		Total
	Yes	No	
≤ 11	33	16	49
> 11	19	102	121
Total	52	118	170

Sensitivity = 63.46% Specificity = 86.44%
+ve-predictive-value = 67.35% -ve predictive-value = 84.30%

Table 3: Predictive accuracy of Glasgow Coma Scale (GCS) for prediction of poor outcome (n=170)

GCS	Neonatal Mortality		Total
	Yes	No	
≤ 8	29	19	48
> 8	23	99	122
Total	52	118	170

Sensitivity = 55.76% Specificity = 83.89%
+ve predictive-value = 60.42% -ve predictive-value = 81.15%

DISCUSSION

The assessment of comatose patients is an important part of critical care. Further, the assessment of the level of coma relies on clinical scores. Although the Glasgow Coma Scale is the most widely accepted and used scale for the evaluation of unconsciousness in critically ill patients though it has few limitations as well. The FOUR score contain four main components including motor response (M), eye (E), respiration (R) and brainstem reflexes (B).

In the present study, mean FOUR score of the cases was 12.06±7.91 and mean GCS score was 8.94±1.73. The neonatal mortality was 52 (30.59%) (Table 1), Predictive accuracy of FOUR score for poor outcome prediction showed 63.46% for sensitivity, 86.44% for specificity, 67.35% for PPV, 84.30% for NPV and 79.41% for accuracy rate, whereas predictive accuracy of GCS Score showed 55.76% for sensitivity, 83.89% for specificity, 60.42% for PPV, 81.15% for NPV and 75.29% for accuracy rate (Tables 2-3).

Kochar et al¹¹ compared the Full Outline of Unresponsiveness score with Glasgow Coma Scale as a predictor

of mortality and poor functional outcome at hospital discharge in children with nontraumatic impairment of consciousness they concluded that both scores showed good predictive values for functional outcome and mortality. Thus, statistically both scales showed significantly similar results.

Nair et al¹² and Jamal et al¹³ also tried to find out the validity of both scales. They showed that FOUR scale better predictive values especially in traumatic injured patients. It can be used for widely and easily for critically ill patients. Though, we found FOUR score slightly more sensitive than GCS to predict poor outcome in children admitted in paediatric ICU.

CONCLUSION

The FOUR and GCS both showed good results in terms of mortality after one week of admission in pediatric ICU.

Conflict of interest: Nil

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