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To study the validity of pediatric logistic organ dysfunction (Pelod) score for predicting outcome among pediatric intensive care unit (PICU) patients

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Abstract
Aim & Objectives: To study the validity of PELOD score for predicting outcome among PICU patients. Correlation of PELOD score with various outcomes of PICU patients and incidence of various etiologies in PICU.
Material & Methods: A prospective observational study was done in the PICU of Rohilkhand Medical College & Hospital from 1 November to 2016 to 31 october 2017. All patients admitted in PICU during study period fulfilling the specified inclusion criteria after taking consent were assesed for eligibility. After initial evaluation, physical examination and investigations pertaining to PELOD Scoring was done at the time of admission, at 24 hours and on day 4 of admission in addition to standard management of the patient. For the PELOD score, six organ systems:-neurologic, cardiovascular, hepatic, renal, respiratory and hematologic were considered, each with upto 3 variables (total 12 variables). Each variable is assigned points as 0,1,10 and 20 based on the level of severity. Those patients who survived till 96 hours in PICU, were then followed till they were shifted out from PICU or expired after 96 hours in the PICU. Their outcome was defined as Survived and Expired.
Results: There were total 51 patients admitted during the study period. Maximum number of patients were of septicemia. In our Study we found that as the number of organ dysfunction increases, PELOD score also increases. This correlates with the increase in mortality which corresponds to the increase in PELOD score. The mean PELOD score of expired patients was significantly high at time of admission, 17.9, which decreased slightly to 15.5 at 24 hour and which further increased to significantly high level of 26.0 on day 4.
Conclusion: PELOD score has been found to have a direct relation with mortality among patients admitted in PICUs as with increase of PELOD score, chances of mortality are proportionately increased. The PELOD score were calculated at time of admission in PICU and subsequently to estimate the severity of the organ dysfunction and to predict mortality. The change in PELOD score differed in survivors and expired patients and a worsening (increase) in PELOD score was a strong prognosticator of death.

Keywords: PELOD and PICU

Introduction
The World Health Organisation (WHO) estimates that 10 million children die annually worldwide and that 99% of these deaths occur in developing countries [1]. Many of these children are at risk for multiple organ dysfunction syndrome (MODS), which is a major cause of death in the intensive care unit (ICU) [2]. Various scoring systems to predict ICU morbidity and mortality have been developed over the last 30 years. According to Gregoire and Russel [3], these scoring systems help identify the severity of illness for administrative decisions, such as resource allocation; they serve as an audit tool to assses ICU performance and quality of care; and they help predict patient outcomes. A score that predicts the severity of MODS in critically ill children would be a key outcome measure [1].
Two scoring systems; the Pediatric Logistic Organ Dysfunctionscore (PELOD) used to quantify the physiological status and can be used as indicator of severity of illness throughout the clinical course and compute the expected mortality risk. The PELOD score is derived from the MODS criteria. Because the MODS is closely associated with Pediatric Intensive Care Mortality (PICU) mortality, the PELOD score can be considered a surrogate for the probability of death [4].

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As mortality is tightly linked to multiple organ dysfunction syndrome (MODS) [5-12] and prevalence of MODS in PICUs range from 11% to 18% [8, 9], the MODS scores may be a good alternative outcome to use as a surrogate for death in the PICU.

It has been a consistent observation that intensive care unit mortality correlates with the number of failing organ systems and the degree of dysfunction within any given organ system. Almost every patient in PICU has some organ dysfunction [9, 11, 13, 14]. Thus, MODS (dysfunction involving 2 or more organs) has been viewed as inexorable pathway to death [15] and death has been viewed as the most reliable end point for clinical trials in ICUs.

In children, several organ dysfunction scores have been described to predict MODS, such as PELOD (pediatric logistic organ dysfunction), PEMOD (pediatric multiple organ dysfunction score), PRISM (pediatric risk of mortality) and SOFA (sepsis organ failure assesment). Of these, only PELOD score is validated to estimate the severity of MODS IN PICUs [16].

PELOD score is a quantitative score and is used as indicators of the severity of illness throughout the clinical course. The score was developed by prospective, observational and multicentre study conducted by Leteurte S *et al* and was validated by the same group in a multidisciplinary tertiary care PICUs [16]. PELOD score quantify organ dysfunction precisely. For the PELOD score, 6 organ systems are considered such as neurological, cardiovascular, renal, respiratory, haematological, and hepatic, each with upto 3 variables(total 12 variables). Each variable is assigned points (0,1,10,20) based on level of severity [16, 17].

Estimation of disease severity and probability of death are important elements in determining the prognosis of patients in ICU [18]. Children in ICU usually present with multiple organ dysfunction syndrome (MODS). Frequency of MODS in the ICU setting ranges from 10% to 90% [16, 19-22]. In our study, we performed PELOD scoring at time of admission, at 24 hours and on day 4. Because of our resource limited setting, it was not possible to perform PELOD scoring daily because of high cost of investigations, PICU charges and poor income families. Of natural concern to the parents/guardians of a PICU patient is the prediction of the outcome of the child.

After 24-36 hours of admission, prognosis is expected by the parents about the improvement or deterioration, therefore a predictive scoring system appears to be more objective method of assessment than clinical opinion which is subjective, which justifies the need for the study.

Materials and Methods

All patients admitted in PICU of the Rohilkhand Medical College and Hospital from 1st November to 31st October 2017 study period fulfilling the specified inclusion criteria from 2 month of age to 18 year of age were admitted after taking consent. Those who do come under the specified exclusion criteria such as children >18 years and less than 2 months, patients with surgical conditions, patients who stay in PICU for less than 96 hrs and patients whose parent/guardian refused consent were not enrolled for the study. After initial evaluation, physical examination and investigations pertaining to PELOD Scoring was done at the time of admission, at 24 hours and on day 4 of admission in

addition to standard management of the patient. For the PELOD score, six organ systems:-neurologic, cardiovascular, hepatic, renal, respiratory and hematologic were considered, each with upto 3 variables (total 12 variables). Each variable is assigned points as 0,1,10 and 20 based on the level of severity. We did not include Glasgow coma scores obtained within two hours after administration of sedatives or anesthetic agents. Those patients who survived till 96 hours in PICU, were then followed till they were shifted out from PICU or expired after 96 hours in the PICU. Their outcome was defined as survived or expired.

Results

There were total 51 patients admitted during the study period. 26 patients (50.98%) were males and 25 patients (49.02%) were females. Maximum number of patients (49.02%) admitted were of 1 to 10 year of age group which were 25 patients followed by 20 patients (39.22%) of more than 10 year of age and 6 patients (11.76%) of infancy age group. In our study, maximum number of patients were of septicemia, 13 patients (25.49%) and 9 patients (17.69%) were of bacterial meningitis. Acute encephalitis and cerebral malaria both had 7 patients each. 6 patients had dengue fever while 5 patients were of hepatic failure and 2 patients had pneumonia. HUS and gastroenteritis included 1 patient each. Study we found that as the number of organ dysfunction increases, PELOD score also increases. This correlates with the increase in mortality which corresponds to the increase in PELOD score. The mean PELOD score of expired patients was significantly high at time of admission, 17.9, which decreased slightly to 15.5 at 24 hour and which further increased to significantly high level of 26.0 on day 4. This was statistically significantly (p=0.001).
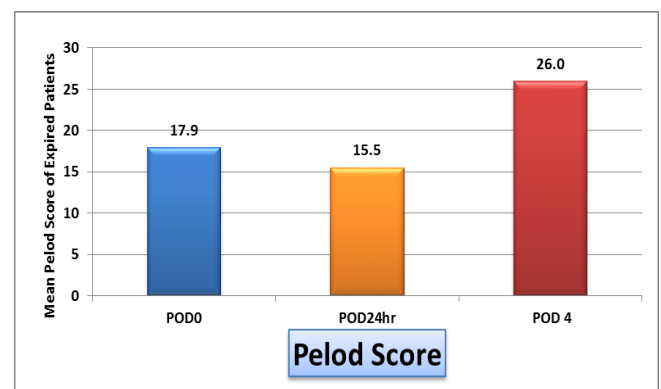

Fig 1: Pelod score

Discussion

The diagnosis of multiple organ dysfunction is supported by the observation in a critically ill patient of the simultaneous dysfunction of at least two organ systems. In children, the number of dysfunctional organs is frequently used to describe the severity of cases of pediatric, the risk of mortality varies directly as the PELOD score increases. As the number of organ dysfunction increases, mortality increases. 23 patients had 2 organ dysfunction of which, 4.3% patient expired. With 3 organ dysfunction, 16.7% patients expired. The number of patients expired with 4 organ dysfunction reached 50% of total expiry patients, while 100% mortality was present with 5 organ dysfunction. This is statistically significant (p=0.001). Ajay Gaur *et al.*

[23] found that there was 10.34% mortality rate with one organ dysfunction, increasing to 35% with 2 organ dysfunction and 100% with 6 organ dysfunction. Anu Thukral et al. [20] study also showed similar results. S. Leteurte et al. [16] in his study had 0.6% mortality with 1 organ dysfunction, 11.5% with 2 organ dysfunction and increasing to 50% mortality with 6 organ dysfunction.

The mean PELOD score was significantly higher in the expired patients at the time of admission, at 24 hour and on day 4 of PICU stay which were 17.9, 15.5 and 26 respectively. The mean PELOD score at time of admission, 17 patients had score of more than 15 of which 35.29% patients expired while there were 17.65% mortality in patient of score of less than 15. Our study was in accordance with Ajay Guar et al. [23], in those patients whose PELOD score was <10, mortality was 10.4%, whereas in patients whose PELOD score was ≥10, mortality increased significantly to 46.4% and also with Anu Thukral et al. [20] in which 6.7% mortality with PELOD score of less than 16 and 26.8% mortality with score of more than 16.

Conclusion

The following conclusion were reached on the basis of this study a total of 51 patients from the age group 2 months to 18 years of age group presenting with MODS with varying etiologies were studied. There were maximum number of patients from age group of 1 to 10 years of age group estimating 49.02% while there was almost equal gender prevalence of 1:1. Largest number of patients (45.09%) belonged to group in which there were 2 organ dysfunction. In the present study, 23.5% of patients expired while 76.5% patients survived. Mortality rate was higher among septicemic patients (41.7%). 100% mortality was there with 5 organ dysfunction while 50% mortality was there with 4 organ dysfunction. The mean PELOD score of survived patients was continuously declining, decreasing from time of admission (13.56) to 9.26 at 24 hour to 0.62 on day 4. The PELOD score were calculated at time of admission in PICU and subsequently to estimate the severity of the organ dysfunction and to predict mortality. The change in PELOD score differed in survivors and expired patients and a worsening (increase) in PELOD score was a strong prognosticator of death. Hence, PELOD score can be used as a prognostic predictor of mortality in PICU.

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