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Original Research Article

Prediction of the risk of mortality in paediatric intensive care unit using PRISM III score

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ABSTRACT

Background: is the Pediatric risk of mortality (PRISM) score which has been devised by Pollock et al, to predict the mortality in hospitalized children. PRISM score is a revised form of physiologic stability index of mortality score.
Methods: A observational prospective study was conducted at tertiary care hospital, Udaipur Rajasthan over period of March 2017 to September 2018. Total 207 patient were enrolled in study as per inclusion and exclusion criteria.
Results: Total 29.92% had PRISM III score of 0 to 5, 25.45% had score of 6-10, 16.53% had score of 11-15, 13.12% had score of 16-20, 7.61% between 21 to 25, 4.72% between 26-30 and 2.62% had score of greater than 30. There was no mortality when the PRISM score of the child was between 0 to 5. The percentage of deaths increased progressively with increasing PRISM score.
Conclusions: There was no significance difference in predicted from PRISM score and the actual death. The expected mortality was comparable to actual death, except in children who required mechanical ventilation and vasopressor drugs.

Keywords: Disease, Pediatric intensive care unit, Pediatric risk of mortality score

INTRODUCTION

PRISM is the Pediatric risk of mortality score which has been devised by Pollock et al to predict the mortality in hospitalized children.[1] PRISM score is a revised form of physiologic stability index of mortality score. This score uses 14 physiologic variables (34 ranges) based on abnormalities observed at the bedside examination and laboratory assessment. The patient's past medical history is also taken into the account, particularly chronic illness and previous hospital admissions.

The PRISM score has a consistently strong relationship between the numbers of Malfunctioning organ system at 12 and 24 hours and the mortality risk in a given PICU. Attempts to use PRISM for decision making in a single patient are not valid, owing to less than "adequate certainty". The PRISM is most useful in assessing case mix adjustments between units and the overall outcomes for a population of patients in a PICU. A PICU that performs a periodic self-assessment-using PRISM can determine if its performance is on a par with the reference population. If performance is below standard, a chart review may reveal the reasons, such as high secondary infection rates, co-morbidity issues and decision to withdraw or limit therapy.

Therefore, PRISM serves as an objective and efficient method for the physicians to predict the outcome and risk of mortality, as well as helps them to provide the medical services with valuable epidemiological criteria. An updated version of this model, PRISM III has recently

been developed based on 11,000 consecutive admissions in 32 PICUs in various centres in United States.[1]

Many studies have validated the use of prognostic scores like PIM II, PRISM III, and so forth and their association with outcome of patients receiving intensive care in the west. Few such studies have been conducted in rural settings in the developing world.[2-4]

Despite of the availability of many severity predicting scoring systems, the outcome of PICUs in India has not been widely reported. Therefore, with the above concept authors have conducted this study in our PICU using PRISM III score.

METHODS

All the cases admitted to PICU, meeting the above criteria is included in the study. Following admission, a detailed history, a written informed consent will be taken, followed by thorough general and systemic examination will be done by the on-duty resident.

The PRISM score is a measure of illness severity based on the abnormality observed in the bedside examination and laboratory assessment. Therefore, all the patients will be further evaluated by the following study variables, which include 14 physiological variables of PRISM.

Inclusion criteria

- All the patients admitted to the PICU as per the guidelines of (Indian Academy of Pediatrics) I.A. P's PICU admission guidelines.[5]
- Both Pediatric medical and surgical cases.

Exclusion criteria

- All the patients less than one month old.
- Patients staying in PICU less than one hour
- Patients with history of burns
- Patients who do not give consent to participate in the study and decide to opt out of the study.

The study variables include age, sex, length of hospital stay, primary affected system, PRISM variables.

Indications for PICU admission: ACC to (Indian Academy of Pediatrics) I.A.P.[5]

All patients requiring mechanical ventilation

Patients with impending respiratory failure

- Upper airway obstruction
- Lower airway obstruction
- Alveolar disease and
- Unstable airway

All paediatric patients after successful resuscitation

- Comatose patients
- Meningitis, Encephalitis
- Hepatic encephalopathy
- Cerebral malaria
- Head injury
- Poisoning and
- Status epilepticus

All types of shock/ hemodynamic instability

- Septic shock
- Hypovolemic shock
- Bleeding emergencies such as gastrointestinal bleeding,
- Bleeding diathesis, DIC
- Cardiogenic shock: Myocarditis, cardiomyopathy, CHDs
- Neurogenic shock
- Multiple trauma

Others are as below

- Cardiac arrhythmias
- Hypertensive emergencies
- Severe acid base disorders
- Severe electrolyte abnormalities
- Acute renal failure: Patients requiring haemodialysis, hemofiltration and peritoneal dialysis.
- Post-operative patients: Requiring ventilation, unstable patients.
- Acute hepatic failure.

RESULTS

The present study revealed that most of the children (45.15%) were in the age group between 1 month to 12 months out of which (54.33%) were male and (45.66%) females, with male to female ratio of 1.18:1 as mentioned in (Table 1).

Out of 207 children, (87.66%) children were successively discharged from hospital and (11.28%) expired. 1.09% left against medical advice as mentioned in (Table 2).

Most common cause for admission in ICU was respiratory disease followed by malaria and neurological disease. There were (28.8%) of respiratory disease, 15.54% with severe complicated malaria, 14.30% with neurological disease, 10.06% with diarrhea-dehydration, 9.48% with cardiovascular disease, 8.86% with severe anemia, 7.81% with septicemia and 3.51% with diabetic ketoacidosis. A 11.37% were admitted because of other diseases as mentioned in (Table 3).

Table 1: Age and sex distribution of children enrolled in the study.

Age group	Male		Female		Total no. of children	Percentage
	No.	Age (%)	No.	Age (%)		
> 1 to <12 months	50	24.21	43	20.73	93	45.15
1-5 years	36	17.58	28	12.86	64	30.44
5-10 years	14	7.08	13	6.29	27	13.38
>10 years	10	5.24	12	5.77	23	11.02
Total	110	54.33	96	45.66	207	

Table 2: Outcome of patients admitted.

Outcome	No. of children	Percentage
Discharge	181	87.66
Expired	23	11.28
LAMA/absconded	3	1.06
Total	207	

Table 3: Diagnostic profile of children enrolled in the study.

Disease	No. of children	(%)
Respiratory disease	120	18.8
Severe complicated malaria	99	15.40
Neurological disease	91	14.30
Diarrhea/ dehydration	69	10.06
Cardiovascular disease	63	9.48
Severe anemia	52	8.86
Septicemia	49	7.81
Diabetic ketoacidosis	22	3.51
Other diseases	75	11.37

In present study, 29.92% had PRISM III score of 0 to 5, 25.45% had score of 6-10, 16.53% had score of 11-15, 13.12% had score of 16-20, 7.61% between 21 to 25, 4.72% between 26-30 and 2.62% had score of greater than 30. There was no mortality when the PRISM score of the child was between 0 to 5.

The percentage of deaths increased progressively with increasing PRISM score. It increased to 1.96 % deaths when the score was between 6 to 10, 5.88% when the score was between 11 to 15, 14.81% when the score was between 16 to 20, 33.33 percent deaths with score between 21 to 25, 70% mortality when the score was between 26 to 30. 87.51% of with PRISM score more than 30 expired. there were no deaths when the PRISM III score was between 0 to 5.

Expected percentage of deaths increased with increasing PRISM score, with maximum deaths predicted when the score was greater than 30. There was no significant difference in the predicted death from PRISM score and the actual deaths, with p value of 0.298 as mentioned (Table 4).

Table 4: PRISM score profile of total study subjects and mortality.

PRISM score	No. of patients (percentage)	Mortality (percentage)
0-5	62 (29.92)	0
6-10	51 (25.45)	1 (1.96)
11-15	34 (16.53)	2 (5.88)
16-20	27 (13.12)	4 (14.81)
21-25	15 (7.61)	5 (33.33)
26-30	10 (4.72)	7 (70.00)
>30	8 (2.62)	7 (87.51)
Total	207	

The expected mortality was comparable to the actual deaths, except in children who required mechanical ventilation and those requiring vasopressor drugs. Children requiring mechanical ventilation, mortality were more than expected deaths. There was no statistically significant difference in mortality with duration of mechanical ventilation as mentioned in (Table 5).

Table 5: Comparison between actual mortality and predicted mortality with respect to PRISM III score.

PRISM score	No. of patients	Actual deaths	Expected death (%) (as per PRISM score)
0-5	62	0	3.02
6-10	51	1	6.82
11-15	34	2	10.1
16-20	27	4	19.82
21-25	15	5	25.22
26-30	10	7	22.22
>30	18	7	14.22

All the diseases, there was no significant difference between expected deaths and actual deaths in this study. Only exception was children with diarrhea/dehydration, where actual deaths were far less than expected with p value less than 0.05 (0.029).

DISCUSSION

The outcome of patients in PICU relies on various factors. Factors like severity of illness, treatment received

by the patient before seeking intensive care, time required to transfer the patient from the referring doctor to tertiary care canter and mode of transport used to shift the patient (Private vehicle /ambulance) have a direct and significant impact on the intensive care therapy and the outcome of the patients.

On the other hand, the correct and timely utilization of resources in the ICU, use of sophisticated equipment, staffing, and the effectiveness of an aggressive therapy are some of the important factors which have to be looked into in terms of cost factor. At the same time, caring for financial affordability of the patient's family should also be taken into consideration.

All this can be achieved successfully if the outcome of the patient is predicted early and managed accordingly. Since the beginning of the era of pediatric intensive care units, various scoring systems with individual basis have been formulated. One such scoring system is the PRISM score, with a basis to predict the outcome in terms of mortality of patients admitted to the PICU.

The PRISM score is developed from the physiologic stability index, a Pediatric severity of illness measure used to predict mortality. The score describes the severity of illness according to physiological derangement detected on clinical examination and standard laboratory tests. The revised model of PRISM score named PRISM III is available, and authors thus choose this model to assess our ICU since authors are predicting the outcome of the patients for the first time using a scoring system.

All the diseases, there was no significant difference between expected deaths and actual deaths in this study except diarrhea in present study.

Our observation that, increase in PRISM score is associated with an increase in the mortality, showing a significantly positive correlation with the outcome, was similar to previous studies.[6-8]

In a study from South Africa, there was discrepancy between observed and the predicted mortality rates. There was under prediction of mortality at lower PRISM scores and over prediction at higher scores.

The author suggested that this might be related to their "lead time bias". Late presentation to the hospital and delay in admission to the PICU might be responsible. The PRISM, score at admission to the PICU may have been masked by their initial treatment causing a falsely low PRISM score and under estimation of mortality.[9]

Therefore, authors consider PRISM score to be highly sensitive in predicting the outcome for our population. But at the same time other predictors of outcome influence the sensitivity of PRISM score.

CONCLUSION

There was no significance difference in predicted from PRISM score and the actual death. The expected mortality was comparable to actual death, except in children who required mechanical ventilation and vasopressor drugs.

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