



PREDICTORS OF MORTALITY IN ACUTELY ILL CHILDREN ADMITTED IN PEDIATRIC ICU IN A TERTIARY CARE CENTER

Pediatrics

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ABSTRACT

Background:- Mortality is the most frequently assessed outcome. So, it is very important to look for the predicting factors of PICU mortality including PRISM III score.

Aim:- To assess the risk factors contributing to the increased mortality in our PICU.

Material and methods:- This is a prospective observational study done at NSCB Medical college Jabalpur, India. Standard demographic, clinical and laboratory data was obtained prospectively from all the patients stayed in PICU for >6 hours. Patients who had history of chronic disease were excluded. Patient's hospital course followed to determine the early outcome of their acute sickness (as dead or survived).

Results:- Out of 138 patients admitted to the PICU, 22 (15.9%) patients died. Children with acute respiratory distress syndrome at admission were at 5.4 times higher risk of death

(95% CI: 2.33-8.59). Children with PRISM III scores of >10 were at 3.4 folded higher risk of death in the PICU (95% CI: 1.4-5.4). Children with PICU stay >4 days, Sepsis and Congestive cardiac failure at presentation were having 1.31, 1.79 and 1.82 folds higher risk of death with the values of 95% CI of 0.93-1.73, 0.29-3.29 and 0.82-2.82 respectively.

Conclusion:- we conclude that In addition to PRISM III score ARDS at admission and, Congestive cardiac failure were independent predictors of mortality in PICU.

KEYWORDS

mortality, PRISM III score, PICU

INTRODUCTION:-

The practice of pediatric critical care is dynamic and evolving. Whether adult or pediatrics, severities of illness, assessments are critical for wide range of ICU management and administration [1, 2]. Mortality is the most frequently assessed outcome. For pediatric intensive care, various methods are available for mortality prediction, including the Pediatric Risk of Mortality (PRISM, PRISM III) and the Pediatric Index of Mortality (PIM and PIM2) [3,4,5,6]. PRISM III is a widely accepted and is a standard against which other scores are compared. However there are some limitations with the use of PRISM III; a lot of information is needed to calculate it and many units do not calculate it routinely, worst reading of 12/24h is used and a lot of deaths occur (in one study over 40%) within first 24hrs, so the score may be diagnosing death rather predicting it. So, it is very important to look for other predicting factors of PICU mortality rather than PRISM-III score. The main objective of this study is to assess the risk factors contributing to the increased mortality in our PICU.

SUBJECTS AND METHODS:-

Study design:- Prospective observational study

Ethics:- The study was approved by the institutional ethics committee. Informed consent was obtained from the parents prior to inclusion of subjects into the study.

Sample size:- A total of 138 patients fulfilled the eligible criteria for inclusion.

Inclusion criteria & Exclusion criteria:- This study included children from 1 month till 12 years and who stayed in pediatric intensive care unit more than 6 hours. Patients with history suggestive of a previous chronic disease were excluded. A total of 138 patients fulfilled the eligible criteria for inclusion.

Methodology:- This study was done at NSCB MC Jabalpur, India. It is a tertiary referral hospital with a 10-bed pediatric intensive care unit (PICU).

The initial vital signs and basic laboratory investigations were recorded.

Following parameters were recorded:

- Age, sex and locality
- Day of presentation in the PICU (since the onset of symptoms)
- PRISM III score at admission
- ARDS Pa₂/FiO₂ < 300

- Shock at presentation
- Heart failure
- Encephalopathy
- Gastrointestinal disease at presentation
- Acute kidney injury as per pRIFLE criteria
- Sepsis as per SIRS definition
- Need for mechanical ventilation
- Use of >2 fluid boluses
- Length of PICU stay
- Blood tests: including arterial blood gas (pH, total CO₂, PaO₂ and PaCO₂), serum levels of sugar, BUN and creatinine, platelet and white blood cell counts, prothrombin time and partial thromboplastin time
- Patient outcome:- dead or alive

No patient was imposed by any excessive cost or hazard for mere study.

Statistics:- Statistical Package for Social Sciences SPSS version 20 and Microsoft Office Excel® 2007 was used for statistical analysis of recorded data. Categorical (qualitative) variables were sorted in Contingency Tables and compared by Chi-square test or Fisher's exact test. Quantitative variables were assessed by student t-test. Multivariate logistic regression analysis was performed including significant variables in bivariate analysis in order to control for confounding. Results were considered to be statistically significant if there was $P \leq 0.05$.

RESULTS:-

During the study period 138 patients were admitted to the PICU, of whom 22 (15.9%) died. 56 (40.6%) children admitted to the ICU during the study period were one year or younger. Table 1 presents the factors that could contribute to death in children admitted to the ICU. Younger children reported slightly higher death rate compared to older children (20% for children aged less than 12 months compared to 13% among those aged more than 12 months) however it was statistically insignificant (p value 0.149).

Univariate analysis (table 2) showed that PRISM III score >10 at admission was found in 72% of the patients who died as compared to 32% of the patients who survived and this difference was statistically significant (p Value 0.001). 95.5% patients of Acute respiratory distress syndrome at admission died in PICU whereas only 13.8% patients had ARDS at admission survived and this difference was also statistically significant (p value 0.001). Shock at presentation was found in 91% of the patients who died as compared to 48% of the patients who

survived which is statically significant with the p value of 0.01. Patients required >2 boluses at admission were 95.5% who died as compare to 50.9% of the patients who survived which is statically significant with the p value of 0.01. Hematological abnormality was found in 18.2% of the patients who died as compare to 9.5% of the patients who survived which is statically insignificant with the p value of 0.23. 77% of children who needed mechanical ventilation died in PICU compared to only 29.3 % of those who survived needed mechanical ventilation. This difference was statistically significant (p value 0.001). Children who stayed in pediatric ICU for more than 4 days reported higher mortality rate opposed to those stayed for less than 4 days (77% versus 57%). However, this difference was statistically insignificant, p=0.09.

In multivariate logistic regression analysis (table 3), children with acute respiratory distress syndrome at admission were at 5.46 times higher risk of death (95% CI: 2.33-8.59. Patients with CCF were also at 2 fold higher risk of death (95% CI: 0.82-2.82). Children with PRISM III scores of >10 were at almost 3.45 folded higher risk of death in the PICU opposed to those with PRISM III score of <10 (95% CI: 1.4-5.4). Children with PICU stay >4days, Sepsis and Congestive cardiac failure at presentation were having 1.31, 1.79 and 1.82 folds higher risk of death with the values of 95% CI of 0.93-1.73, 0.29-3.29 and 0.82-2.82 respectively.

DISCUSSION:-

The overall mortality rate at our PICU (15.9%) is similar to the mortality rates reported at PICUs in USA and Europe (4.4-16.2%) [16-20]. The clinical judgment of the severity of a disease process is not uniform and is related to the experience and clinical ability of physician. Prediction of patient outcome is important for the patients and family and is relevant for policy formulation and resource allocation; the optimum usage of ICU beds will obviously allow maximum utilization of limited resources [7, 9]. Because of the shortage of available beds in PICUs [10], and the cost of critical care borne by the families, the selection of patients has always been a factor determining patient care. Factors such as availability of beds and cost frequently delay the hospitalization and transfer of patients [11]. In our study we found that various risk factors affecting outcome in children admitted in PICU. Univariate analysis showed that mortality was significantly higher in children in whom PICU stay was >4days, i/v fluid bolus was given, children with PRISM >10, children requiring ventilation and children presented with shock and respiratory failure at the time of admission (p<0.01). However no statistical association between outcome and other variables was observed.

This study confirms many previous observations about deaths within a PICU, and adds some details of value. The current study proved that patients who underwent mechanical ventilation were more likely to die in the PICU. the current, in a multivariate logistic regression analysis, after controlling for confounding, proved that PRISM III>10, respiratory and cardiac failure at admission are 3 independent variables for poor prognostication of a patients admitted in the PICU.

CONCLUSION:-

The mortality in PICU is still very high and in addition to PRISM III score ARDS and CCF were also found to be independent predictors of mortality in PICU however we need to have further multicentre studies on predictors of mortality in PICU to strongly support our analysis.

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Table 1- Distribution according to sociodemographic variables

Sociodemographic variables	Frequency (n=138)	Percent
Age (years)	<1	56
	>1	82
Gender	Male	84
	Female	54
Residence	Rural	106
	Urban	32

Table 2- Association of various risk factors with outcome

Predictors	Death (n=22)	Discharge (n=116)	P value
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Age (years)	<1	11 (50)	45 (38.8)	0.23
	>1	11 (50)	71 (61.2)	
Gender	Male	14 (63.6)	70 (60.3)	0.77
	Female	8 (36.4)	46 (39.7)	
Residence	Rural	17 (77.3)	89 (76.7)	0.96
	Urban	5 (22.7)	27 (23.3)	
Days of presentation	>2 days	15 (68.2)	81 (69.8)	0.88
PICU stay	>4 days	17 (77.3)	67 (57.8)	0.09
Bolus dose at admission	Yes	21 (95.5)	59 (50.9)	0.001
PRISM	>10	16 (72.7)	37 (31.9)	0.001
Ventilation required	Yes	17 (77.3)	34 (29.3)	0.001
Shock at presentation	Yes	20 (90.9)	56 (48.3)	0.001
ARDS	Yes	21 (95.5)	16 (13.8)	0.001
CCF at presentation	Yes	1 (4.5)	11 (9.5)	0.45
Encephalopathy	Yes	12 (54.5)	60 (51.7)	0.81
GI disease at presentation	Yes	0 (0)	12 (10.3)	0.11
Hematological abnormality	Yes	4 (18.2)	11 (9.5)	0.23
Sepsis as per SIRS	Yes	10 (45.5)	41 (35.3)	0.37

Table 3- Multivariate analysis

Risk factors	Odds Ratio	95% Confidence interval	P value
PICU stay	1.31	0.93-1.73	0.06
Bolus dose at admission	0.87	0.75-0.98	0.94
PRISM	3.45	1.4-5.4	0.001
Ventilation required	0.40	0.015-1.93	0.59
Shock at presentation	0.81	0.65-0.97	0.32
Respiratory failure at presentation	5.46	2.33-8.59	0.001
CCF at presentation	1.82	0.82-2.82	0.04
Encephalopathy at presentation	0.78	0.14-4.4	0.99
GI disease at presentation	1.12	0.83-1.41	0.65
Hematological disease at presentation	1.14	0.56-1.49	0.12
Sepsis as per SIRS guidelines	1.79	0.29-3.29	0.53

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