Epidemiological Profile, Outcome Analysis and PRISM III Score of Patients Admitted in PICU at Bal Chikitsalaya, M.B Hospital, R.N.T. Medical College, Udaipur

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ABSTRACT

Introduction: *Epidemiology is defined as study of the distribution and determinants of health related states or events in specified populations, and application of this study to the control of health problems. The process of care varies in different ICU's, and this could affect final outcome. This study was conducted to know epidemiological profile and outcome of patients admitted at RNT Medical College, Udaipur.*

Result: *A total of 380 children were enrolled. There were 14.8% deaths in our study. Mortality rate was found to be slightly higher in males than females, although this was not statistically significant. 32.9% of admitted children had severe (grade 3 and 4) malnutrition and 22.37% had grade 2 malnutrition. Vaccine preventable diseases such as Diphtheria and Tetanus contributed to mortality indicating vaccine coverage in rural parts of Rajasthan. Pyogenic Meningitis is found to be the single most important cause of mortality. Area under ROC curve was 0.895, indicating good caliberation for the population. However, it was found that though PRISM score was accurate in predicting mortality of study population, it could not be used for predicting mortality of the given subject as primary organ system involved was found to affect final outcome.*

Keywords: *Pediatric ICU, PRISM III score, epidemiological profile, outcome analysis, predictors of mortality*

INTRODUCTION

Epidemiology is defined as study of the distribution and determinants of health related states or events in specified populations, and application of this study to the control of health problems.[1] Epidemiology includes study of disease frequency, disease distribution and study of disease determinants. Knowledge of epidemiological reports concerning the morbidity and mortality of a health care unit can assist in strategic decisions aimed at improving patient quality of care.

The process of care varies in different ICU's, and this could affect final outcome. There have been few efforts[3-7] regarding collecting such data from various pediatric ICU's across the country and various scoring systems have been used to compare the quality of health service provided by them. PRISM III score is most acceptable and widely used scoring system[2].

Hence, this prospective observational study attempted to characterize the profile of children admitted to a tertiary PICU in India over a period of 6 months (from 1st Jan 2015 to 30th June 2015) with various disease entities, factors affecting mortality, nutritional status, adjusted mortality according to PRISMIII scores, overall outcomes to know the quality of care in PICU of Bal Chikitsalaya, M.B. Hospital, R.N.T Medical College, Udaipur.

AIMS AND OBJECTIVES OF THE STUDY

1. To study the demographic profile of children admitted in PICU at BAL CHILKITSALAY, MB hospital, RNT Medical College, Udaipur.
2. To determine PRISM III score in all type of patients at admission or within 24 hour of admission in PICU.
3. To determine the discriminative ability and calibration of PRISM III scoring system in predicting the outcome (mortality) in children admitted to pediatric intensive care unit (PICU) of RNT Medical College, Udaipur, Rajasthan, India.
4. To determine possible factors leading to mortality.

MATERIALS AND METHODS

This was prospective single centre study done on children admitted from 1st Jan 2015 to 30th June 2015 at PICU of BAL CHIKITSALAY, MB HOSPITAL, RNT MEDICAL COLLEGE, UDAIPUR. The study was done after approval from ethical committee of RNT medical college, Udaipur.

METHOD OF COLLECTION OF DATA

Selection of Subjects- since quantum of patients admitted to PICU is very large, and it was not possible to study each admitted patients, every 3rd child admitted to PICU, who gave consent for the study ware enrolled in the study. Following children were excluded from the study

1. Children who stayed ≤ 4 hours in the PICU, either due to death or early shifting to wards
2. Parents who did not gave written consent
3. Patients who left against medical advice
4. All neonates

In case 3rd child had to be excluded from the study, the next admission was enrolled. After getting written

informed consent from parents, all data was collected and recorded. For PRISM, the worst physiologic values in first 24 hrs were recorded and scored. The data were recorded prospectively, on a daily basis.

In addition, other data including nutritional status (weight and length) were collected.

Values of arterial blood gas analysis are recorded using GEM PREMIER 3000 installed at our PICU, which was calibrated regularly. Other routine blood investigations were performed using standard methodology in central lab. Treatment of the enrolled children was continued as per ICU protocols. Outcome of all enrolled children were recorded. To ensure blinding, expected mortality rates were calculated only after completion of the study. Expected outcome of child was calculated by entering data in online PRISM III calculator[10].

ROC curve[9] (receiver operating curve) is a graphical plot that illustrates the performance of a binary classifier system as its discrimination threshold is varied. The curve is created by plotting the true positive rate against the false positive rate at various threshold settings. The accuracy of the test depends on how well the test separates the group being tested into those with and without the disease in question. Accuracy is measured by the area under the ROC curve. An area of 1 represents a perfect test; an area of 0.5 represents a worthless test. ROC curve was drawn by entering data in online site[8].

OBSERVATIONS AND RESULTS

A total of 380 children were enrolled in the study, out of which 205 were male and 175 were female. Three hundred and thirty children were successfully discharged while 49 (14.8%) children succumbed. Out of a total of 380 patients, 53.94% were males and 46.05% females. Average PRISM score was 10.98 Average duration of stay in our PICU was 77.05 hours.

No. of enrolled patients	380
Discharge	331 (87.10%)
Deaths	49 (14.8%)
Male	205 (53.94%)
Female	175 (46.05%)
Average Duration of stay in ICU	77.05 hours

Demograpgic characteristics of patients

Most common reason for admission in ICU was respiratory disease followed by central nervous system, gastrointestinal system, infectious disease, cardiovascular disease, hematological and renal disease. Maximum deaths were attributed to central nervous system disease (20) followed by infectious disease (10), respiratory disease (6), cardiovascular and hematological (5 each).

Age	No. of Patients	Observed Mortality	Expected Mortality	SMR
<1 year	171(45)	19	21.44	0.886194
1-5 year	116(30.52)	12	14.23	0.843289
>5 years	93(24.47)	18	15.44	1.165803

Age distribution of study population and PRISM score adjusted mortality

45% (171) of children were less than 1 years of age, 30.52% (116) were between 1 to 5 years of age and 24.47% (93) greater than 5 years of age. Expected mortality was comparable to observed mortality. This is comparable to study conducted by Thukral A[3], where 42% children were of age group less than 1 year and 26% in age group 1 year to 5 year.

	No. of Patients	Observed Deaths	Expected Deaths	SMR
Male	205	31	29.19	1.06
Female	175	18	21.91	0.82

Adjusted death rate was slightly higher in male population than female. However, this difference was not statistically significant, with p value 0.368.

Diagnosis at Admission	No. of Patients	%age	No. of Deaths	%age of Deaths
Respiratory	76	20	6	7.894737
CNS	73	19.21053	20	27.39726
Gastrointestinal Diseases	72	18.94737	3	4.166667
Infectious diseases	72	18.94737	10	13.88889
Cardiovascular diseases	34	8.947368	5	14.70588
Hematological	15	3.947368	0	0
renal diseases	10	2.631579	5	50
Others	28	7.368421	0	0
Total	380			

Reason for admission to PICU

There were 115 patients with PRISM score between 0 to 5, 97 had score of 6 to 10, 63 had score in the range of 11 to 15, 51 had score between 16 to 20, 29 had score 21 to 25, 17 had PRISM score 26 to 30 and 8 had score greater than 30. PRISM score adjusted mortality was calculated by entering scores at www.medal.org and it was compared with observed mortality. The PRISM score adjusted mortality was found to correlate with actual deaths in the ICU. Cause of death in decreasing order were pyogenic meningitis(9), septicemia with MODS(8), CHD with CHF(4), intracranial hemorrhage(4), acute renal failure(4), TBME(3), tetanus(2), reyes syndrome(2), diphtheria with myocarditis(2), post traumatic head injury(2), rheumatic heart disease with CVA(1), Brainstem glioma(1), diarrhea with severe dehydration with shock(1), nephrotic syndrome with septicemia(1), pneumonia(1), disseminated tuberculosis(1), pyopneumothorax (1), ARDS(1), and pulmonary embolism(1).

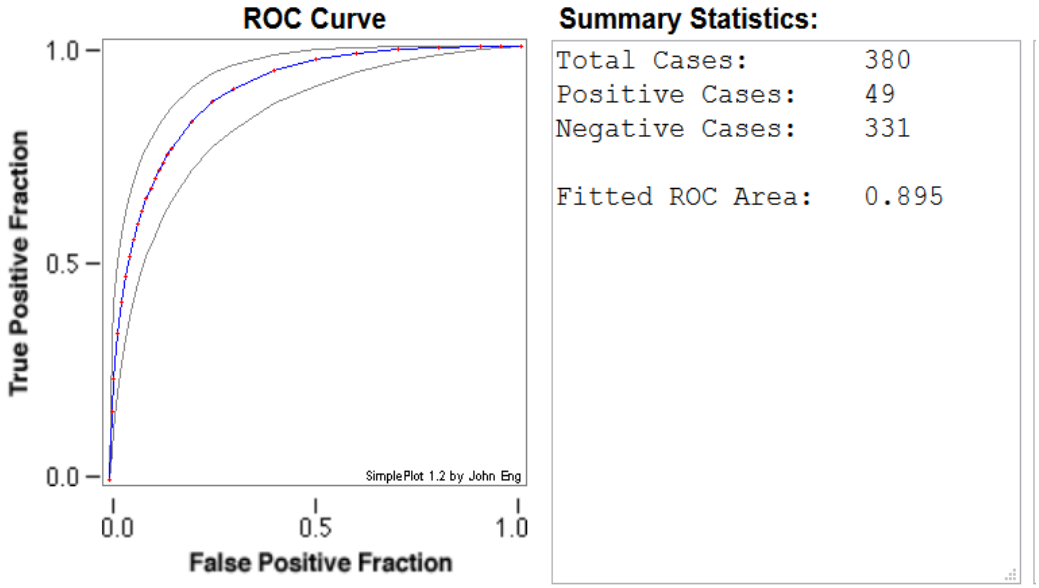
PRISM Score	No. of Patients	Observed Deaths	Expected Deaths	SMR
0 to 5	115	1	1.52	0.657895
6 to 10	97	3	3.38	0.887574
11 to 15	63	5	5.045	0.99108
16 to 20	51	11	10.06	1.093439
21 to 25	29	11	12.19	0.902379
26 to 30	17	11	11.74	0.936968
>30	8	7	7.11	0.984529

PEM Grade(IAP class)	No. of Children	% of Population	Observed Deaths	Expected Deaths	SMR
0	121	31.84	18	16.61	1.083685
1	87	22.89	10	9.88	1.012146
2	85	22.37	7	9.846	0.710949
3	49	12.89	10	10.198	0.980584
4	38	10	4	4.34	0.921659
	380				

According to IAP classification of malnutrition, 121 children were normal, 87 children were Grade 1 malnutrition, 85 children were having Grade 2 malnutrition, 49 children had grade 3malnutrition while 38 children were suffering from grade 4 PEM. Adjusted deaths were comparable in each groups.

Diagnosis at Admission	No. of Patients	No. of Deaths	Expected Deaths	SMR
Respiratory	76	6	4.05	1.481481
CNS	73	20	14.62	1.367989
Gastrointestinal system	72	3	7.83	0.383142
Infectious disease	72	10	11.37	0.879507
cardiovascular system	34	5	5.687	0.879198
Hematological	15	0	0.781	-
Renal	10	5	3.05	1.639344
Others	28	0	3.72	-

There were more deaths than expected in children suffering from respiratory, central nervous system and renal diseases, while it was found that deaths were significantly less than expected in gastrointestinal and hematological disease.



DISCUSSION

There were 14.8% deaths in our study, which was comparable to other studies from India[3-7]. Mortality rate was found to be slightly higher in males than females, although this was not statistically significant. Similar picture was found in some of previous studies. 32.9 % of admitted children had severe (grade 3 and 4) malnutrition and 22.37% had grade 2 malnutrition. However unlike previous study[3], malnutrition was not found to be associated with increased mortality. Vaccine preventable disease such as Diphtheria and Tetanus contributed to mortality indicating poor vaccine coverage in rural parts of Rajasthan.

Pyogenic Meningitis was found to be single most important cause of mortality. Area under ROC curve was 0.895, indicating good caliberation for the population. However, it was found that though PRISM score was accurate in predicting mortality of study population, it could not be used for predicting mortality of the given subject as primary organ system involved was found to affect final outcome.

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