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PREDICTION OF OUTCOME OF PAEDIATRIC PATIENTS BY VALIDATING PRISM III SCORING WITHIN 12 HOURS AND PRISM III AT 72-84 HOURS AFTER INITIATION OF THE TREATMENT

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ABSTRACT: BACKGROUND: One of the scoring systems in Pediatric Intensive Care is the PRISM III (PAEDITRIC RISK OF MORTALITY III) which is an updated version of PRISM. Study was done at time point 72 hrs of initiation of therapy as well in a view that it will better prognosticate the outcome. **AIMS:** 1. To find out PRISM III within 1st 12 hours of admission and at 72-84 hours of admission, 2. To evaluate any correlation between PRISM III and mortality, 4.To find out correlation between individual components of PRISM III and mortality **DESIGN:** A prospective cross-sectional study from 1st June 2011 —31st December 2013. Data was collected for 81 patients. **METHODS AND MATERIAL:** Variables used in the study were: Systolic BP, Heart rate, Temperature, Mental status, Pupillary reaction, Acidosis, pH, Total CO₂, PaCO₂, PaO₂, Glucose, Potassium, BUN, Creatinine, WBC count, Platelet count, PT/aPTT. A detailed entry of various parameters included in the scoring system was made in the first 12 hours and thereafter 72-84 hours. The most abnormal value recorded. **STATISTICAL ANALYSIS:** All the data collected analyzed using STATA 8 after entering in excel sheet. Based on the clinical and laboratory data, PRISM III score was calculated. Categorical variables were compared with Chi-Square test. Calibration was assessed using Hosmer Lemeshow's goodness of fit test. **CONCLUSION:** Overall mortality rate was 27%. Among all the variables of PRISM III Systolic blood pressure, Heart rate, pupils, platelets, PT/APTT had statistical significance with mortality at both 0-12 and 72-84 hours. Temperature, GCS, BUN and creatinine showed statistical significance at 72-84 hours. Mortality was high with the as the scores increased in Systolic blood pressure, Heart rate, Temperature, GCS, BUN, Creatinine, WBC, PT/APTT at both 12 hours and 72 hours. Study showed significant relationship between PRISM III score and outcome. p value at 12 hours was 0.00961 which was significant and p value at 72-84 hours was 0.0000 which was extremely significant which suggested that mortality increased as the PRISM score increased and PRISM III score at 72-84 hours has depicted it better.

KEYWORDS: PRISM III score, mortality, correlation.

INTRODUCTION: Pediatric intensive care has seen development of various scoring systems to predict mortality of patients admitted to PICUs. Though scoring systems do not alter or hinder management of any critical illness, they aid in explaining the illness in terms of mortality and duration of hospital stay to parents.

One of these scoring systems is the PRISM III (PAEDITRIC RISK OF MORTALITY III) which is an updated version of PRISM which surprisingly is not studied in great detail in developing nations like INDIA. Hence, we decided to conduct PRISM III study at our hospital. Evaluation of outcome of such therapy serves as a guide for prognosis, cost analysis, staff allocation and inter institutional comparisons.

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We are doing the study to predict outcome of paediatric patients by validating PRISM III scoring within 12hrs and PRISM III at 72-84 hrs after initiation of the treatment, in a view that it will better prognosticate the outcome than doing the same at 48 hours.

Primary Objective: 1. To find out PRISM III within 1st 12 hours of admission, 2. To find out PRISM III at 72-84 hours of admission after initiation of the treatment, 3. To evaluate any correlation between PRISM III and mortality.

Secondary Objective: To find out correlation between individual components of PRISM III and mortality.

MATERIALS AND METHODS:

STUDY DESIGN: A prospective cross-sectional study to evaluate pediatric outcome using the Pediatric Risk of Mortality III scoring system in 12 hours and 72 hours. Done between 1st June 2011 to 31st December 2013. Study was conducted in 17 bedded PICU at Narayana Hrudayalaya Institute of Medical Sciences, Bangalore (a tertiary care referral centre for various districts of Karnataka along with bordering areas of Tamilnadu and Andhra Pradesh). Data for 81 patients was collected.

Inclusion Criteria: 1. All consecutive patients requiring PICU admission, 2. Only medical cases were considered for inclusion.

Exclusion Criteria: 1. Patients < 1 month, 2. Patient staying in PICU for < 72 hrs, 3. All pediatric surgical cases, 3. Discharged & deaths within scoring period.

Method of data Collection: For all the children admitted to PICU meeting the above criteria, a detailed history was taken followed by thorough general and systemic examination. Therefore, a detailed entry of various parameters included in the scoring system was made in the first 12 hours and thereafter 72-84 hours following admission. The most abnormal value was recorded.

Outcome: Outcome of children admitted to PICU was measured in terms of: Discharge and Death.

Ethical Considerations: The study protocol was approved by Institutional Review Board which cleared it from ethical angle. All the relevant investigations are routinely done in children admitted to PICU.

Data Analysis²⁹⁻³¹: All the data collected over the first 24 hours of admission during the study period was entered in a Microsoft Excel spreadsheet and analyzed using STATA 8. Based on the clinical and laboratory data, PRISM III score was calculated. The performance of scores was evaluated by assessing the calibration and discrimination. Discrimination was assessed by Area under the Receiver Operating Characteristic (ROC) curve.

The ROC curves were generated and comparisons were made using STATA 8 software. Categorical variables were compared with Chi-Square test. Calibration was assessed using Hosmer Lemeshow's goodness of fit test.

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RESULTS:

Study Design: A cross-sectional, prospective, descriptive, correlation study consisting of 681 children was undertaken to evaluate the risk of mortality using PRISM III score at Narayana Hrudayalaya Institute of Medical Sciences, Bangalore.

Outcome	Number	%
Discharged	59	73
Died	22	27
Total	81	100

Table 1

Total of 81 children were admitted to PICU during the study period. The cases which were discharged against medical advice were also considered as death in view of poor prognosis of these children as assessed by PICU duty doctor and failure to follow up those cases. So, out of 81 cases 59 survived and 22 expired.

Age	Frequency	Percentage
1m-1yr	21	27
1yr-5yr	17	21
5yr-10yr	22	28
10yr-15yr	14	17
>15 yr	7	7
Total	81	100

Table 2: Age wise Distribution of Children

Of 81 children in ICU, 27% (n=21) presented between 1yr-5yr, 28% (n=22) resented between 5yr-10 yrs, 17% (n=14) resented to us between 10yr-15 yrs, 7% (n=7) resented to us at > 15 yrs.

Age	Discharge	Death
1m-1yr	14 (66.7%)	7(33.3%)
1yr-5yr	13 (76.5%)	4(23.5%)
5yr-10yr	17 (77.3%)	5(22.7%)
10yr-15yr	11(78.6%)	3(21.4%)
>15 yr	4 (57%)	3(42.9%)
Total	59(73%)	22(27%)

Table 3: Age versus Outcome

Of the 81 children between 1m-1yr of age, 66.70% (n=14) were discharged while 33.30% (n=7) died. Out of children between 1yr-5yr 76.50% (n=13) got discharged while 24% (n=4) died. Out of children between 5yr-10yr 77% (n=17) got discharged while 22.70% died. Out of children between 10yr-15yr 78.60% (n=11) got discharged while 21.40% (n=3) died. Out of children >15 yrs 57% (n=4) got discharge while 43% (n=3) died.

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Gender	Frequency	Percentage
Male	28	35
Female	53	65
Total	81	100

Table 4: Gender wise distribution

Among 81 children admitted 46% had weight lower than their weight for age and 54% had normal weight.

Gender	Discharge	Death
Male	20(71.4%)	8(28.6%)
Female	39(73.6%)	14(26.4%)
Total	59(73.0%)	22(27.0%)

Table 5: Gender versus Outcome

Of the 28 males 71.40% (n=20) were discharged while 28.60% (n=8) died. Out of 53 females 73.60% (n=39) were discharged while 26.40% (n=14) died. $\chi^2=0.04$; $p>0.05$ No significant difference.

Wt. For Age	Frequency	Percentage
<2 SD	37	46
Normal	44	54
Total	81	100

Table 6: Weight for age wise distribution

Among 81 children admitted 46% had weight lower than their weight for age and 54% had normal weight.

SD	Discharge	Death
<2SD	27(72.9%)	10(17.1%)
Normal	32(72.7%)	12(17.3%)
Total	59(73%)	22(27%)

Table 7: Weight for age Versus Outcome

$\chi^2=0.00$; $p>0.05$ No significant difference

Weight for age did not affect the outcome as such as for the children having weight < 2SD mortality rate was 17.1% (n=10) whereas those having normal weight also had mortality rate 17.3% (n=12), p value >0.05. Thus, no significant correlation.

Ventilation in the 1 st hour	Frequency	Percentage
Yes	37	45.7
No	44	54.3
Total	81	100

Table 8: Ventilation Requirement in the 1st hour

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Out of 81 admissions 46% (n=37) were intubated within 1st hr of admission while 54% (n=44) were intubated later or did not require intubation at all.

Ventilation in the 1 st hour	Discharge	Death
Yes	17(45.90%)	20(54%)
No	42(95.5%)	2(4.50%)
Total	59(73%)	22(27%)

Table 9: Ventilation requirement in 1st hour versus outcome

45.90% (n=17) patients ventilated within first hour were discharged, while 54% (n=20) expired. 95.50% (n=42) of children who were intubated later or never intubated were discharged while 4.50% (n=2) died.

$\chi^2=24.90$; $p<0.0001$ highly significant difference showing association between mortality and ventilation requirement in 1st hour (Surprising higher deaths among the children ventilated in the 1st hour).

Infection	Frequency	Percentage
Yes	61	75
No	20	25
Total	81	100

Table 10: Infection at presentation

75% (n=61) of the children had infection at presentation while 25% (n=20) had no evidence of infection.

Infection	Discharge	Death
Yes	42(68.9%)	19(31.1%)
No	17(85%)	3(15%)
Total	59(73%)	22(27%)

Table 11: Infection at presentation versus outcome

$\chi^2=1.99$; $p>0.05$ No significant difference.

68.90% (n=42) of the children who had infection at presentation were discharged while 31.10% (n=19) died. 85% (n=17) of the children who did not have with infection on presentation were discharged while 15% (n=3) died. p value >0.05 suggested no significant association of infection at presentation and outcome.

No. of organ failures on admission	Frequency	Percentage
1	48	59
2	11	13
3	15	19
>3	7	9
Total	81	100

Table 12: Number of organ failures on admission

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59% (n=48) children had 1 organ failure at admission, 13% (n=11) had 2, 19% (n=15) had 3 and 9% (n=7) had more than 3 organ failures at admission.

No. of organ failures on admission	Discharge	Death
1	42(87.5%)	6(12.5%)
2	8(72.7%)	3(27.3%)
3	7(46.7%)	8(53.3%)
>3	2(28.6%)	5(71.4%)
Total	59(73%)	22(27%)

Table 13: Number of organ failure at admission versus outcome

$\chi^2_{\text{trend}}=16.987$; $p<0.0001$.

Mortality rate was observed to be higher when no. of organ failures were 3 or more than 3 i.e 53.3% and 71.4% respectively, while it was 27.3% and 12.50% when no. of organ failures were 2 and 1 respectively.

Highly significant, showing a significant linear trend of deaths and no. of organ failures on admission.

Primary system affected	Frequency	Percentage
CVS	5	6
CNS	21	26
RS	11	13
RENAL	8	10
BLOOD	25	31
ENDOCRINE	4	5
OTHERS	7	9
TOTAL	81	100

Table 14: Primary system affected

BLOOD was involved in maximum 31% (n=25) of cases and endocrine system was involved in minimum cases i.e 5% (n=4).

Primary system affected	Discharge	Death
CVS	3(60%)	2(40%)
CNS	11(52.3%)	10(47.6%)*
RS	10(90.9%)	1(9.09%)
Renal	8(100%)	0(0%)
Blood	17(68%)	8(32%)
Endocrine	4(100%)	0(0%)
Others	6(85.7%)	1(14.3%)
Total	59(73%)	22(27%)

Table 15: Primary system affected versus outcome

* $\chi^2=6.00$; $p<0.05$ Significant

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Mortality rate was highest when CNS was involved i.e. 47.6%, and mortality was least or none when renal and endocrine were involved 0%.

Hospital stay	Frequency	Percentage
0-5 days	11	13
6-10	28	35
11-15	21	26
>15	21	26
Total	81	100

Table 16: Length of hospital stay

35% (n=28) of the children had hospital stay of 06-10 days, while 13% (n=11) had stay of 0-05 days.

Length of hospital stay	Discharge	Death
0-5	4(36.3%)	7(63.6%)
6-10	22(78.6%)	6(21.4%)
11-15	15(71.4%)	6(28.6%)
>15	18(85.7%)	3(14.3%)
Total	59(73%)	22(27%)

Table 17: Length of hospital stay versus outcome

$\chi^2=8.56$; $p<0.001$ Significant.

Maximum mortality was seen among the patients who had hospital stay of 0-5 days, 63.60%(n=14), while minimum mortality was seen among patients who had hospital stay of 15 days, 14.30%(n=3).

Systolic B.P score	Discharge	Death
0	21(80.7%)	5(19.3%)
3	28(84.8%)	5(15.2%)
7	10(45.5%)	12(54.5%)
Total	59(73%)	22(27%)

Table 18: Systolic B.P score versus outcome at 0-12 hours

$\chi^2_{\text{trend}}=7.830$; $p=0.00514$ significant linear trend of increase in score and higher chances of deaths.

Mortality was high when systolic B.P at 0-12 hrs was low or score was high i.e. 3 and 7 i.e. 15.2% and 54.5% as compared when score was low i.e. 0 (19.3%).

Systolic B.P	Discharge	Death
0	43(86%)	7(14%)
3	16(57.1%)	12(42.9%)
7	0(0%)	3(100%)
TOTAL	59(73%)	22(27%)

Table 19: Systolic B.P score versus outcome at 72-84 hours

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$\chi^2_{\text{trend}}=15.713$; $p=0.00007$ highly significant linear trend of increase in score and higher chances of deaths.

Patients who remained hypotensive or became hypotensive at 72-84 hrs had high mortality rate (100% for score of 7) and (42.9% for score of 3). While, those whose score improved to 0 or remained normotensive had very low mortality (14%).

Heart rate score	Discharge	Death
0	33(75%)	11(25%)
3	23(79.3%)	6(20.7%)
4	3(37.5%)	5(62.5%)
TOTAL	59(73%)	22(27%)

Table 20: Heart Rate Score versus Outcome at 0-12 hours

Within first 12 hrs there was no linear relationship between worsening of heart rate score and mortality. While 62.5% expired who had heart rate score of 4, 20.7% with score of 3 and 25% with score of 0.

$\chi^2_{\text{trend}}=0.752$; $p=0.385$, not significant no linearity in score and deaths

$\chi^2=5.60$; $p<0.05$ Significant (score 4 v/s 0+3).

Heart rate score	Discharge	Death
0	56(77.8%)	16(22.2%)
3	3(42.8%)	4(57.2%)
4	0(0%)	2(100%)
TOTAL	59(73%)	22(27%)

Table 21: Heart rate score versus outcome at 72-84 hours

At 72-84 hrs, there was a linear relationship of mortality with heart rate score with a significant p value. Patient's whose heart rate score improved or had normal heart rate had mortality of 22.22%. Patients with score of 3 had maximum mortality 57.2%. While whose score worsened to 4 or remained tachycardiac since admission had 100% mortality. $\chi^2_{\text{trend}}=8.671$; $p=0.00323$ significant linear trend of increase in score and higher chances of deaths.

Temperature score	Discharge	Death
0	50(74.6%)	17(25.4%)
3	9(64.2%)	5(35.7%)
Total	59(73%)	22(27%)

Table 22: Temperature versus outcome at 0-12 hours

Mortality rate was high in patients who had high temperature score of 3(35.7%) compared to those who had score of 0(25.4%) $\chi^2=0.63$; $p=0.4288$; No significant difference.

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Temperature score	Discharge	Death
0	59(77.6%)	17(22.4%)
3	0(0%)	5(100%)
Total	59(73%)	22(27%)

Table 23: Temperature versus outcome at 72-84 hours

All the patients who had high temperature score (3) at 72-84 hrs or whose score worsened to 3 expired. While who had score 0 or whose score improved to 0 had good survival of 77.6% with p value being 0.0001566 suggested high association between temperature and outcome. $\chi^2=14.29$; $p=0.0001566$; Highly significant difference.

Mental status Score	Discharge	Death
0	26(78.8%)	7(21.2%)
3	33(68.8%)	15(31.2%)
Total	59(73%)	22(27%)

Table 24: Mental status score versus outcome at 0-12 hours

The mortality rate was higher (31.2%) in patients with higher mental status score compared to normal score. $\chi^2=1.00$; $p=0.3182$; No significant difference.

Mental status Score	Discharge	Death
0	46(85.2%)	8(14.8%)
3	13(48.1%)	14(51.9%)
Total	59(73%)	22(27%)

Table 25: Mental status score versus outcome at 72-84 hours

Mortality rate was significantly high in patients whose mental status score worsened to 3 or remained at that at 72-84 hrs (51.9%) as compared to those whose score improved or remained 0(14.8%). P value also suggested strong association between mental status and outcome. $\chi^2=12.48$; $p=0.0004112$; Highly significant difference.

Pupillary reaction score	Discharge	Death
0	57(76%)	18(24%)
7	1(25%)	3(75%)
11	1(50%)	1(50%)
Total	59(73%)	22(27%)

Table 26: Pupillary reaction score versus outcome at 0-12 hours

Mortality is high at score 7(75%) as compared to score 0(24%) but again mortality is less at score 11 as compared to 7 (50%). p value 0.04138 suggest strong association of pupillary reaction with outcome.

$\chi^2_{\text{trend}}=4.160$; $p=0.04138$ significant linear trend of increase in score and higher chances of deaths.

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Pupillary reaction score	Discharge	Death
0	55(79.7%)	14(20.3%)
7	3(42.8%)	4(57.2%)
11	1(20%)	4(80%)
Total	59(73%)	22(27%)

Table 27: Pupillary reaction score versus outcome at 72-84 hours

$\chi^2_{\text{trend}}=11.612$; $p=0.00066$ significant linear trend of increase in score and higher chances of deaths.

Acidosis score	Discharge	Death
0	35(71.4%)	14(28.6%)
2	20(71.4%)	8(28.6%)
6	4(100%)	0(0%)
Total	59(73%)	22(27%)

Table 28: Acidosis score versus outcome at 0-12 hours

Acidosis score at 0-12 hours had no effect on mortality as evident from the above table.

$\chi^2_{\text{trend}}=0.564$; $p=0.4528$, not significant.

Acidosis score	Discharge	Death
0	51(77.2%)	15(22.7%)
2	8(3.3%)	7(46.7%)
6	0	0
Total	59(73%)	22(27%)

Table 29: Acidosis score versus outcome at 72-84 hours

The mortality score was higher in patients whose worsened to 2 or remained 2(46.7%) as compared to the lower scores.

$\chi^2_{\text{trend}}=3.54$; $p=0.05988$ not significant.

pH Score	Discharge	Death
0	53(71.6%)	21(28.4%)
2	5(83.3%)	1(16.7%)
3	1(100%)	0
Total	59(73%)	22(27%)

Table 30: pH score versus outcome at 0-12 hours

pH at 0-12 hours showed no correlation with the outcome.

$\chi^2_{\text{trend}}=0.64$; $p=0.4229$, not significant.

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pH Score	Discharge	Death
0	51(72.8%)	19(27.2%)
2	8(72.7%)	3(27.3%)
3	0	0
Total	59(73%)	22(27%)

Table 31: pH score versus outcome at 72-84 hours

Patients whose pH score worsened at 72-84 hrs or remained high (2) had high mortality(27.3%) as compared to those whose score improved or remained low i.e 0 (27.2%). Thus, pH at any time did not correlate with outcome.

$\chi^2=0.00$; $p=0.9928$, not significant.

Total CO ₂ score	Discharge	Death
0	58(72.5%)	22(27.5%)
4	1(100%)	0(0%)
Total	59(73%)	22(27%)

Table 32: Total CO₂ score versus outcome at 0-12 hours

$\chi^2=0.38$; $p=0.5389$, not significant.

Mortality had no correlation with the total CO₂ score at 0-12 hours.

Total CO ₂ score	Discharge	Death
0	57(73.1%)	21(26.9%)
4	2(66.7%)	1(33.3%)
Total	59(73%)	22(27%)

Table 33: Total CO₂ score versus outcome at 72-84 hours

Patients who had worsening Total CO₂ score or whose score remained high i.e. 4 had high mortality (33.3%) as compared to low score (26.9%).

$\chi^2=0.06$; $p=0.8064$, not significant

PaCO ₂ score	Discharge	Death
0	50(73.5%)	18(26.5%)
1	7(63.6%)	4(36.3%)
3	2(100%)	0(0%)
Total	59(73%)	22(27%)

Table 34: PaCO₂ score versus outcome at 0-12 hours

Mortality was higher for the patients who had high PaCO₂ score (36.3%) as compared to those who had low score (26.5%). As the score worsens mortality increases.

$\chi^2_{\text{trend}}=0.002$; $p=0.4229$, not significant.

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PaCO ₂ score	Discharge	Death
0	54(75%)	18(25%)
1	5(62.5%)	3(37.5%)
3	0(0%)	1(100%)
Total	59(73%)	22(27%)

Table 35: PaCO₂ score versus outcome at 72-84 hours

At 72-84 hrs worsening PaCO₂ score or whose scores remained high i.e 3 showed 100% mortality as compared to the low scores.

$\chi^2_{\text{trend}}=2.419$; $p=0.1198$, no significant linearity.

PaO ₂ score	Discharge	Death
0	49(73.1%)	18(26.9%)
3	3(75%)	1(25%)
6	7(70%)	3(30%)
Total	59(73%)	22(27%)

Table 36: PaO₂ score versus outcome at 0-12 hours

Mortality is more for higher PaO₂ score of 6 as compared to 0 but there is no linear relation between mortality and PaO₂ score.

$\chi^2_{\text{trend}}=0.031$; $p=0.8594$, no significant linearity.

PaO ₂ score	Discharge	Death
0	57(74%)	20(26%)
3	2(50%)	2(50%)
6	0(0%)	0(0%)
Total	59(73%)	22(27%)

Table 37: PaO₂ score versus outcome at 72-84 hours

Mortality increases as the PaO₂ score worsens or remains high (3) at 72-84 hrs 50% as compared to other low scores.

$\chi^2=0.11$; $p=0.2921$, not significant.

Glucose score	Discharge	Death
0	36(72%)	14(28%)
2	23(74.1%)	8(25.8%)
Total	59(73%)	22(27%)

Table 38: Glucose score versus outcome at 0-12 hours

There was no linear relation between glucose score and mortality.

$\chi^2=0.05$; $p=0.8291$, not significant.

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Glucose score	Discharge	Death
0	49(75.4%)	16(24.6%)
2	10 (62.5%)	6(37.5%)
Total	59(73%)	22(27%)

Table 39: Glucose score versus outcome at 72-84 hours

At 72-84 hours patient's whose score worsened or remained high i.e 2 had high mortality (37.5%) as compared to those with low score (24.6%).

$\chi^2=1.08$; $p=0.9927$, not significant.

Potassium score	Discharge	Death
0	55(72.4%)	21(27.6%)
3	4(80%)	1(20%)
Total	59(73%)	22(27%)

Table 40: Potassium score versus outcome at 0-12 hours

There was no relation between potassium score and mortality.

$\chi^2=0.14$; $p=0.7101$, not significant.

Potassium score	Discharge	Death
0	59(73%)	22(27%)
3	0	0
Total	59(73%)	22(27%)

Table 41: Potassium score versus outcome at 72-84 hours

At 72-84 hrs also there was no relation between potassium score and mortality.

$\chi^2=0.00$; $p=0.0000$, not significant.

BUN score	Discharge	Death
0	30(81%)	7(19%)
3	29(66%)	15(34%)
Total	59(73%)	22(27%)

Table 42: BUN score versus outcome at 0-12 hours

As the BUN score increased mortality increased as evident from table. But p value being 0.1262 does not suggest a significant correlation.

$\chi^2=2.34$; $p=0.1262$, not significant.

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BUN score	Discharge	Death
0	36(85.7%)	6(14.3%)
3	23(59%)	16(41%)
Total	59(73%)	22(27%)

Table 43: BUN score versus outcome at 72-84 hours

At 72-84 hours patient's whose BUN score worsened or remained high at 3 had high mortality of 41% as compared to low scores.

$\chi^2=7.31$; $p=0.0068$, highly significant association between scores and death.

Creatinine score	Discharge	Death
0	45(76.2%)	14(23.8%)
3	14(63.6%)	8(36.4%)
Total	59(73%)	22(27%)

Table 44: Creatinine score versus outcome at 0-12 hours

Mortality score is higher with high creatinine scores (36.4%) as compared to low score.

$\chi^2=1.29$; $p=0.2554$, not significant.

Creatinine score	Discharge	Death
0	51(81%)	12(19%)
2	8(44.4%)	10(55.6%)
Total	59(73%)	22(27%)

Table 45: Creatinine score versus outcome at 72-84 hours

At 72-84 hours also patient's whose creatinine score worsened or remained high i.e 2 had high mortality (55.6%) as compared to low scores.

$\chi^2=9.43$; $p=0.0021$, highly significant association between scores and outcome.

WBC score	Discharge	Death
0	57(74%)	20(26%)
4	2(50%)	2(50%)
Total	59(73%)	22(27%)

Table 46: WBC score versus outcome at 0-12 hours

Mortality increases as the WBC score increases as evident from table. But p value (0.2921) does not suggest any significant correlation between scores and outcome.

$\chi^2=1.11$; $p=0.2921$, not significant.

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WBC scores	Discharge	Death
0	57(74%)	20(26%)
4	2(50%)	2(50%)
Total	59(73%)	22(27%)

Table 47: WBC score versus outcome at 72-84 hours

At 72-84 hours also mortality increased as WBC score increased, but again correlation is not significant.

$\chi^2=1.11$; $p=0.2921$, not significant.

Platelet score	Discharge	Death
0	34(83%)	7(17%)
2	4(40%)	6(60%)
4	5(55.6%)	4(44.4%)
5	16(76.2%)	5(23.8%)
Total	59(73%)	22(27%)

Table 48: Platelet score versus outcome at 0-12 hours

Platelet score had no effect in the outcome.

$\chi^2=0.69$; $p=0.4063$, not significant.

Platelet score	Discharge	Death
0	31(88.5%)	4(11.5%)
2	11(64.7%)	6(35.3%)
4	7(63.6%)	4(36.3%)
5	10(55.5%)	8(44.5%)
Total	59(73%)	22(23%)

Table 49: Platelet score versus outcome at 48-72 hours

At 72-84 hours, mortality increases as the score increases. A score 5 had highest mortality of 44.5% and score of 0 had lowest mortality of 11.5%.

$\chi^2_{\text{trend}}=6.973$; $p=0.0082$, significant linear trend showing increase in deaths as the score increases.

PT/APTT score	Discharge	Death
0	51(79.7%)	13(20.3%)
3	8(47%)	9(53%)
Total	59(73%)	22(27%)

Table 50: PT/APTT score versus outcome at 0-12 hours

Patients who had a high PT/APTT score of 3 had high mortality (53%) as compared to those having low score of 0 (20.3%).

$\chi^2=7.23$; $p=0.0071$, highly significant association between scores and outcome.

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PT/APTT score	Discharge	Death
0	55(76.4%)	17(23.6%)
3	4(44.4%)	5(55.6%)
Total	59(73%)	22(27%)

Table 51: PT/APTT score versus outcome at 72-84 hours

At 72-84 hrs also PT/APTT score had significant relationship with outcome. Patients whose score worsened or remained high had high mortality (55.6%) as compared to those with low scores. $\chi^2=4.13$; $p=0.0422$, highly significant association between scores and outcome.

Non-operative Cardiovascular score	Discharge	Death
No	57(76%)	16(24%)
Yes	2(33.3%)	6(66.7%)
Total	59(73%)	22(27%)

Table 52: Non-operative cardiovascular disease score versus outcome

Mortality was high in patients who had non-operative cardiovascular disease (66.7%) as compared to those who did not have the disease and p value (0.0013) suggested highly significant association.

$\chi^2=10.27$; $p=0.0013$, highly significant.

Chromosomal anomaly score	Discharge	Death
No	57(73.8%)	21(26.2%)
Yes	0	1(100%)
Total	59(73%)	22(27%)

Table 53: Chromosomal anomaly score versus outcome

Out of 81 children in the study only 1 had chromosomal anomaly and he expired. $\chi^2=2.62$; $p=0.1052$, not significant.

Cancer score	Discharge	Death
No	57(72.2%)	22(27.8%)
Yes	2(100%)	0(0%)
Total	59(73%)	22(27%)

Table 54: Cancer score versus outcome at 0-12 hours

Only 2 patients out of the study population had cancer and both of them survived. So presence of cancer in patient had no effect on the outcome.

$\chi^2=0.00$; $p=1.0000$, not significant.

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Previous PICU admission score	Discharge	Death
No	41(78.8%)	11(21.2%)
Yes	18(62%)	11(38%)
Total	59(73%)	22(27%)

Table 55: Previous PICU admission score versus outcome

The mortality rate of those who were previously admitted in PICU was high(38%) as compared to those who did not have PICU admission.

$\chi^2=2.65$; $p=0.1036$, not significant previously (21.2%).

Previous ICU CPR score	Discharge	Death
No	57(74%)	20(26%)
Yes	2(50%)	2) (50%)
Total	59(73%)	22(27%)

Table 56: Previous ICU CPR score versus outcome at 0-12 hours

50% of the patients who underwent ICU CPR died as against 26% who did not undergo CPR.
 $\chi^2=1.11$; $p=0.2921$, not significant.

Postoperative score	Discharge	Death
No	55(73.3%)	20(26.7%)
Yes	4(66.6%)	2(33.7%)
Total	59(73%)	22(27%)

Table 57: Postoperative score versus outcome

Patients were post operated had minimal higher score (33.7%) than those who were not (26.7%) of mortality.

$\chi^2=0.12$; $p=0.7238$, not significant.

Acute Diabetes score	Discharge	Death
No	54(72%)	21(28%)
Yes	5(83.3%)	1(16.7%)
Total	59(73%)	22(27%)

Table 58: Acute Diabetes score versus outcome at 0-12 hours

Presence of acute diabetes had no effect on mortality.

$\chi^2=0.36$; $p=0.5481$, not significant.

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Admission from inpatient unit score	Discharge	Death
No	58(72.5%)	22(27.5%)
Yes	1(100%)	0(0%)
Total	59(73%)	22(27%)

Table 59: Admission from inpatient unit score versus outcome

There is no effect of admission from inpatient unit on outcome.

$\chi^2=0.38$; $p=0.5389$, not significant.

SCORE	Number	Percentage
≤5	6	8
6-10	15	18
11-15	15	18
16-20	17	21
21-25	14	17
26-30	8	10
31-35	3	4
36-40	3	4
>40	0	0

Table 60: Distribution of children in different groups of PRISM III at 0-12 hrs

21% children had PRISM III score between 16-20 and 4% each between 31-35 and 36-40.

PRISM III	DISCHARGE	DEATH
<5	5(83.3%)	1(16.7%)
6-10	13(86.6%)	2(13.3%)
11-15	12(80%)	3(20%)
16-20	11(64.7%)	6(35.3%)
21-25	11(78.6%)	3(21.4%)
26-30	6(75%)	2(25%)
31-35	1(33.3%)	2(66.6%)
36-40	0	3(100%)
>40	0	0
Total	59(73%)	22(27%)

Table 61: Relationship of PRISM III at 0-12 hours with outcome

$\chi^2_{\text{trend}}=6.705$; $p=0.00961$, highly significant linear trend showing increase in deaths as the score increases. i.e. higher mortality significantly associated with higher score.

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Mortality rate was higher predominantly in certain groups; 16-20 (35.30%), 31-35 (66.60%). Among the group having score 36-100% mortality was noted.

Total PRISM III score @ 0-12 hrs	Discharge	Death
≤15	30(83.3%)	6(16.7%)
>15	29(64.4%)	16(35.6%)

Table 62: Total PRISM III score at 0-12 hours versus outcome

16.7% of the patients with score ≤15 died while 35.6% of the patients with score >15 expired. $\chi^2=3.61$; $p=0.5753$, not significant.

Score	Number	Percentage
<5	26	32
6-10	24	30
11-15	15	19
16-20	5	6
21-25	5	6
26-30	5	6
31-35	1	1
36-40	0	0
>40	0	0
Total	81	100

Table 63: Distribution of children in different groups of PRISM III score at 72-84 hours

32% of children had score <5, 30% had score between 6-10 and least i.e 1% had score between 31-35.No one had score >35 at 72-84 hours.

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PRISM III	Discharge	Death
<5	25(96%)	1(4%)
6-10	21(87.5%)	3(12.5%)
11-15	8(53.3%)	7(46.7%)
16-20	4(80%)	1(20%)
21-25	1(20%)	4(80%)
26-30	0	5(100%)
31-35	0	1(100%)
36-40	0	0
>40	0	0

Table 64: Relationship of PRISM III at 72-84 hours with outcome

$\chi^2_{\text{trend}}=30.747$; $p=0.0000$, very highly significant linear trend showing increase in deaths as the score increases. i.e. higher mortality significantly associated with higher score.

Group having score of 26-30 and 31-35 witnessed 100% mortality. Group 21-25 also had high mortality 80%.

Total PRISM III score @ 72-84 hrs	Discharge	Death
≤15	54(83%)	11(17%)
>15	5(31.2%)	11(68.8%)
Total	59(73%)	22(27%)

Table 65

The association between scores and outcomes is considered to be extremely statistically significant.

$\chi^2=17.43$; $p=0.00002$, Very Highly significant.

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DISCUSSION: Ours is a tertiary care referral centre where sick and morbid children with varied spectrum of diseases are referred for appropriate care and management. The cost incurred in treating these sick children in PICU is major hindrance in providing quality care. Hence we decided to evaluate our PICU with a scoring system which would predict the outcome of the child at the time of admission using PRISM III model.

The overall mortality in our study was 27%. There was a huge variations in the mortality rates across the world, ranging from 29.0%⁴ to 2.6%.³ The overall mortality rate in the study by Praveen Khilnani et al¹ was 6.72% that in the study by Ana Lilia Ponce et al⁶ was 24.7% and that in the study by Gemke et al² was 20%. In the study by GH tan et al was 4.5%, that by Karambelkar GR was 24%. Our study correlates more with Surekha Joshi et al⁴ whose study witnessed mortality of 29%. The difference in the mortality can be attributed to the regional cohort with a different set of problems and better access to advanced health care facilities in case of developed world when compared to developing country like ours.

Majority of children in our study was in age group 5yrs-10 yrs (27%) and 1 month to 1 year (26%). Majority of the studies had predominance in the PICU admission under 1mnth to 1 year. Study by Gemke et al² had predominant admissions in infantile age group, Roshani N Taori et al had 37.8% infants. Similarly study done in Pakistan by Anwarul Haque et al had 37% patients of <1 year of age. Choi KMS et al³ and Bilan et al⁷ also had predominant admissions under 1 year of age.

Maximum mortality in our study was observed in age group >15 years (42.9%) followed by 1 month to 1 year of age (33.33%) and maximum survival was observed in age group 10-15 years. This was in contrast to Praveen Khilnani¹ study in which the age related mortality was greater in the 1-5 year age group. This might be due to the fact that age cutoff in their study was 12 years.

In our study, the percentage of females (65.4%) admitted to PICU was more than the percentage of males (34.6%). This was in contrast to the maximum studies which showed male preponderance. Our study showed higher mortality rate in males (28.6%) as compared to females (26.4%). This was consistent with Bilan et al⁷ and Ana Lilia Ponce et al⁶ in which the mortality rate was higher among males.

The primary system affected in the decreasing order of frequency were Blood, Central nervous system, respiratory, renal, others and cardiovascular system then endocrine. The most common cause of admission in our ICU was blood related diseases or infection. This was in contrast to that in the studies conducted by Praveen Khilnani et al,¹ Bilan et al,⁷ Singhal et al⁵ and Choi KMS et al⁹ in which respiratory failure was the most common cause of PICU admission. This difference may be due to different demographic profile of the studies.

The mortality rate was highest when the primary affected system was central nervous system followed by blood and followed by cardiovascular system. Thus, CNS and blood related infections or sepsis carried the major load of mortality. This was consistent with De Leon et al⁶ where maximum mortality was due to septic shock and Surekha Joshi et al⁴ where maximum mortality was due to infection/sepsis followed by CVS then Respiratory diseases.

26% of the patients had a prolonged hospital stay (>15 days). This was in contrast to the study made by Ana Lilia Ponce et al⁶ in which 88% of the patients had stay of >15 days.

We attempted to see if any individual variables of PRISM III model had an individual capacity to predict mortality independent of the other variables. Systolic BP, heart rate, pupillary reaction, platelets and PT/APTT scores had significant relationship with mortality at both 0-12 hours and 72-

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84 hours of study, while temperature, GCS, BUN and creatinine showed significant relation with mortality at 72-84 hours thus solving the purpose of our study that PRISM III scoring done at 72-84 hours after initiating the treatment predicts better outcome in PICU than at early hours of admission.

It was more or less consistent with Surekha Joshi et al,⁴ where the variables that had maximum predictive value were BP, HR, GCS, Pupillary Reflexes, pH, Creatinine and Platelet count. In the study by Ana Lilia Ponce et al⁶ only 4 of the 17 variables were significant. They were abnormal pupillary reflexes, acidosis, BUN and WBC count.

Our study showed a statistically significant relationship between PRISM III score and mortality. Mortality increased as the PRISM score at 0-12 hrs worsened or higher. PRISM score 0-5 had 16.7% mortality while those with PRISM score 36-40 had 100% mortality. Similarly, at 72-84 hours mortality increased as the PRISM score increased with the PRISM score ranging 0-5 showing 4% mortality while 30-35 showed 100% mortality.

Our results were consistent with most of the studies. Study done by Karambelkar GR et al⁸ showed 22.2% deaths with PRISM score 0-5, 25% deaths with score 6-10, 37.5% with score 11-15 and 50% with score 16-20. Study done by Sachin Pawar et al⁹ had 1.6% mortality with score 5 and 98.6 % with score 30. Study done by Singhal et al⁵ showed 8.2% mortality with score 1-9, 24.4% mortality with score 10-19, 33.3% mortality with score 20-29 and 66.3% mortality with score >30. Similarly, study done by Prashanth MR et al showed 4.4% mortality with score 0-9, 71.4% mortality with score >30.

Our study showed mean PRISM score at 12 hours 16.9 while at 72 hours 10.4. Study done by Karambelkar GR et al⁸ showed mean PRISM score of 7.71 ± 4.72 for survivors and 14.83 ± 7.29 for the non-survivors. Study done by Sachin Pawar et al⁹ had mean PRISM score of 9.80 ± 6.5 . Study by Anwarul et al¹⁰ suggested mean PRISM score of 13.2 while Bilan et al⁷ study had mean PRISM score of 14.22 ± 9.57 . Sachin Pawar et al⁹ study had mean PRISM score of 9.80 ± 6.5 .

In our study, though maximum variables were contributing to the outcome of PRISM III score. Variables like potassium, glucose and various components of ABG like Acidosis, pH did not contribute towards the PRISM III score. The reason may be active interventions done in ICU for severe acidosis, active ventilation which corrects acidosis to lower PRISM score though the patient is quite

RECOMMENDATIONS: PRISM III score is done at 12 hours and 48 hours of admission which predicts the outcome of patients in PICU. We did the study at 12 hours and 72-84 hours of admission which correlated well with the outcomes. Thus more studies should be undertaken to see the relation of PRISM III score at 72 hours with the outcome.

More variables correlated with the outcome at 72-84 hours than at 12 hrs thus giving support to our Aim of doing the study at 72-84 hours and thus studies should be done at this time period to see correlation of more variables with the outcome which was not so often seen in maximum studies.

ABG values may skew the total PRISM III score as they will have huge variations depending on whether they are taken prior to intubation or post intubation. Maximum studies and even our study showed no correlation between Acidosis, pH, PaCO_2 , PaO_2 and outcomes as they are affected by interventions like ventilation and acidosis correction in the ICUs. Necessary steps have to be taken to overcome this drawback.

BIBLIOGRAPHY:

1. Khilnani P, Sarma D, Singh R, Uttam R, Rajdev S, Makkar A, et al. Demographic Profile and Outcome Analysis of a Tertiary Level Pediatric Intensive Care Unit. *Indian J Pediatr* 2004; 71 (7): 587-591.
2. Reinoud J, Gemke, Johannes A. Van Vught. Scoring systems in pediatric intensive care: PRISM III versus PIM. *Intensive Care Med.* 2002; 28: 204-207.
3. Choi KMS, Ng DKK, Wong SF, Kwok KL, Chow PY, Chan CH, et al. Assessment of the Pediatric Index of Mortality and the Pediatric Risk of Mortality III score for prediction of mortality in a pediatric intensive care unit in Hong Kong. *Hong Kong Med J.* 2005; 11: 97-103.
4. Joshi S, Padia C, Malik S, Save S, Tank S. Predicting mortality in PICU based on PRISM III score.
5. Singhal D, Kumar N, Puliye JM, Singh SK, Srinivas V. Prediction of mortality by application of PRISM score in intensive care unit. *Indian Pediatr.* 2001; 38: 714-719.
6. Ana Lilia Ponce-Ponce de Leon, Gustavo Romero-Gutierrez, Carlos Aldana Valenzuela, Francisco Ernesto González-Bravo. Simplified PRISM III score and outcome in the pediatric intensive care unit. *Ped International* 2005; 47: 80-83.
7. Bilan N, Galehgalab BA, Emadaddin A, Shiva SH. Risk of mortality in pediatric intensive care unit, assessed by PRISM-III. *Pak J Biol Sci.* 2009; 12: 480-485.
8. Karambelkar GR, Mane SV, Agarkhedkar SR, Karambelkar RP. The relevance of 24 hour PRISM III score in predicting mortality in pediatric intensive care unit. *International J Pharmacy and Biomedical Sciences* 2012; 03 (04):214-219.
9. Pawar S, Joji P, Gupta N. Prediction of Outcome in Patients Admitted in PICU by Application of Severity of Illness Score (Prism-III Score – Pediatric Risk of Mortality).
10. Haque A, Bano S. Clinical profile and outcome in a paediatric intensive care unit in Pakistan. *J Coll Physicians Surg Pak* 2009; 19 (8): 534-5.

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