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RESEARCH ARTICLE

EPIDEMIOLOGICAL PROFILE AND OUTCOMEANALYSISWITHPRISMIIISCORE OF PATIENTS ADMITTED TO A PEDIATRIC INTENSIVECAREUNITINATERTIARYCARE CENTER

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Abstract

Introduction:-

Epidemiology is defined as study of the distribution and determinants of health-related states or events in specified population and application of study to the control of health problems. Epidemiology includes study of diseasefrequency,diseasedistribution,andstudyofdiseasedeterminants. Knowledge of epidemiological reports concerning the morbidity and mortality of the health care centre can assist in strategic decisions aimed at improving patient quality of care.[1]

Paediatricpopulationisavulnerablegroupnecessitatingstandardcarefor medically and surgically ill children. The practice of paediatric critical care is dynamic and evolving. Critically ill children are managed in paediatricintensivecareunit(PICU)topreventmortality,andthisisdone by intensively monitoring and treating these children. A wide variety of patients with acute illnesses requiring intensive monitoring and management are admitted in paediatric intensive care unit. These are mainly in the following categories-shock, respiratory distress, seizure disorders, encephalopathy, postsurgical complications, multiorgan failure, renal failure, hepatic failure etc.

Manyoftheissuesthatpaediatriccriticalcarefaces,canbeinfluencedby a severity-of-illness assessment. These include defining, measuring, and improving quality; understanding the importance of structures and processesof care; applyingappropriate riskadjustment for both research and administrative studies; and aiding clinical decision making. Scoring systems, especially those that measure acuity or severity of illness, help in understanding and even solving many of these issues by assimilating and quantifying clinical data that are otherwise difficult to objectively summarize.Mostscoringsystemsobjectivelymeasureseverityofillness, either directly through derangements in physiologic status or indirectly through surrogate markers, such as therapiesor diagnoses, and the many scoring systems calibrate these quantitative observations to a risk of a particular outcome, usually survival or death.[2]

Various scoring systems are used which allow evaluation of the effectiveness and efficiency of paediatric intensive care[3] and evaluation ofseverityof thepatientatthetimeofadmission.Thestandardmortality prediction modelfor paediatric intensive care is PRISM[4]. It is calculated from the most abnormal values of 14 variables over a 24-hour period.

The relationship between physiologic status and mortality risk was re- evaluated as new treatment protocols, therapeutic interventions, and monitoring strategies are introduced and as patient populations change.[5] Pollak MM et

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al developed and validated a third-generation paediatric physiology-basedscoreformortalityrisk,PaediatricRiskofMortalityIII (PRISM III)[5]

PRISMIII,anupdatedthird-generationphysiology-basedscoringsystem, was developed in 1996 at the Children's National Medical Center in Washington, DC based on the data collected at 32 paediatric intensive care units using 11,165 admissions[4]. PRISM III has 17 physiologic variables subdivided into 26 ranges and 8 other risk factors and is population independent. Mortality predictions can be made by using either thefirst12hours(PRISMIII-12)orthefirst24hours(PRISMIII- 24) of physiologic, demographic, and diagnostic data[5].

The objective of the study was assessment of risk of mortality using PRISM III-24 score in children admitted to PICU oftertiarycare center in Mumbai

PRISM III resulted in several improvements over the original PRISM. Reassessment of physiologic variables and their ranges, better age adjustmentforselectedvariables,andadditionalriskfactorsresultedina mortality risk model that is more accurate and discriminates better. The largenumberofdiverseICUsinthedatabaseindicatesPRISMIIIismore likely to be representative of United States units. [5]

Presently PRISM III andPIM are the best and latest scores available for PICU mortality prediction[6]

Reviewof Literature:-

HistoricPerspective

The "modern" history of PICU scoring systems started with the Clinical Classification Scoring System, a subjective categorization of a patient's anticipated clinical needs, ranging from routine ward care to frequent physician and nursing assessments and therapeutic interventions. Although the methodology is simple by today's standards, it established the basis of severity of illness as a concept related to both physiologic instability and amount of therapy.[2]

The Clinical Classification system was quickly followed by the Therapeutic Intervention Scoring System (TISS)[7]. The fundamental concept underlying the TISS score was that, as sick patients worsened, theyreceivedmoretherapy,suchasmechanicalventilationorvasoactive agent infusions; thus, the number and sophistication of therapies served asasurrogateforseverityofillness.Initially,76therapiesandmonitoring techniques were graded from 1 to 4 based on the complexity, skill, and cost required to provide these modalities. The quantity of therapy (TISS points)wasalsosignificantlycorrelatedtodailyandtotalPICUcost.Both ofthesescoringsystemswereusedinpaediatriccriticalcareevaluations. The TISS score still exists today, although the number of therapies have been reduced and objectivity has been added to the score [8]. Mortality increases with increasing numbers of dysfunctional organs and the duration of such failure and is reflected in severity of illness scoring systems. Indeed, these were devised to provide standardized definitions of organ dysfunction so that the incidence and relevance of morbidity (rather than mortality) could be compared. Thus, the Multiple Organ Dysfunction Score (MODS), which is used to measure severity of organ failure, correlates strongly with ultimate risk for ICU and in-hospital mortality and has been shown to reflect the progression of organ dysfunction when measured sequentially. The Sequential Organ Failure Score (SOFA), devised by the European Society of Intensive Care Medicine, also is well validated, simple, and reliable.[9]

Organ system failures have recently been proposed as an outcome measure. In that death is a relatively uncommon occurrence in PICUs, it isappealingtopostulatethatthenumberoforganfailuresorthetemporal resolution of these organ failures could be apractical and more plentiful outcomevariable.Thisistheconceptualapproachtaken bythePaediatric Logistic Organ Dysfunction (PELOD) score [11]. Unfortunately, some of thevalidationdataofthePELODscorerequiredretraction,andtheutility of the score at this time is in question [10].

Physiologic status was the conceptual basis for MOSF and the TISS score.Physiologicinstabilitywasthereasonforthetherapeuticneeds,and physiologic status and therapeutic needs comprised the underlyingbases ofthedefinitionoforgansystemfailure.Conceptually,severityofillness may be considered a continuous variable with extremes of outcomes (survival, death) that occur at low and high values. The threshold value that determines the outcome is unknown and may vary from patient to patient.Intermediateoutcomesmayoccuratintermediatepointsbetween intactsurvivalanddeath;theelucidationofthisissuerepresents,perhaps, the next breakthrough in severity-of-illness research.[2]

Development ofScoring Systems

Important steps in the development of a severity-of-illness scoring system include defining a clear and relevant outcome (dependent variable) and adhering to well-defined methodologic standards [12]. The most commonly measured PICU outcomes are mortality, organ dysfunction, length of stay, and functional outcome.

Thesecondstepindevelopingascoringsystemistoidentifythepredictor (independent) variables. To minimize observation bias, data elements usedtocreateascoreshouldbeselectedaprioriandcollectedinablinded manner from the outcome. The final selection of predictor variables and their relative weights or importance is accomplished statistically from candidate variables usinga combination of expert opinion and statistical analyses. For example, in selecting predictor variables for a mortality predictionscore,suchvariablesasbloodpressure,heartrate,temperature, mental status, and creatinine levels should be seriously considered becauseexpertopiniondeterminestheirimportance.Thesepredictor variables must be available and reliably measured. Reliability may be assessedintwo ways:whena measurementthatoneobserverobtainsfor a predictor variable is remeasured by the same person (intraobserver reliability) or when it is remeasured by a different person (interobserver reliability).[2]

The statistical methods for score development have become relatively routine. In the univariate step, the contribution of each variable or each variable range is tested for its relationship to the outcome without the effect of other variables. Multivariable analysis is the current statistical standard for both variable selection as well as the determination of the relative weights or variable coefficients in a prediction model. Variables thataresignificantintheunivariatestepsarecombinedinthemultivariate step. Usually, rather liberal statistical criteria for inclusion of variables from the univariate analyses are used (e.g., $p < 0.30$). Multivariable logistic regression is most often utilized for dichotomous outcomes (includingsurvivalanddeath),multivariable linearregression analysis is most often utilized for continuous variables (e.g., length of stay), and multivariable linear analysis or quadratic discriminant function analysis is most often used for categorical outcomes (e.g., diagnoses) [13]. The coefficients for the independent variables may be converted into the scoring system.

For scoring systems that predict a dichotomous outcome (e.g., survival, death),importantmeasuresofperformancearethesensitivity,specificity, and positive and negative predictive values. For scoring systems that generate ordinal or continuous outcomes (e.g., probabilityof death), two essential and objective measures of a score's performance are discrimination and calibration. Discrimination, or the ability of a model todistinguishbetweenoutcomegroups,ismostoftenassessedbythearea under the receiver operatingcharacteristic (ROC) curve. This measure is alsocommonlyreferredtoasthe“c-statistic.”TheROCareaisameasure ofhowwellamodelseparatesthosepredictedtoexperiencetheoutcome from those predicted not to experience the outcome. For example, the ROCforthePRISMscoreapproximates0.9inmostdatasets.Ifallofthe PRISM scores of survivors were placed in one bucket, all of the PRISM scoresofdeathswereplacedinanotherbucket,andscoreswererandomly pickedfromeachbucket,aROCof0.9wouldmeanthat90%ofthetime, the PRISM score of the death would be higher than that of the survivor. Chance performance results in a ROC of 0.5.

The calibration of a model is a comparison of the number of predicted outcomes with the number of actual outcomes for a range of prediction intervals. The most accepted method for measuring calibration is the goodness-of-fit statistic proposed by Lemeshow and Hosmer.

PhysiologicStabilityIndex(PSI).

Physiologic Stabilityindex(PSI) wasdevelopedbya groupofpaediatric intensivistsin1984fromTISSasTISSonlyindirectlyreflectstheseverity ofillnessbyassessingtherapeuticneeds.PSIassessestheseverityofacute illness inthe totalpopulationof paediatric intensive care unit patients by quantitating the degree of derangement in 34 variables from 7 major physiologicsystems.Eachvariablewasassignedascoreof1(abnormality worthconcernbutnottochangetherapy),3(needtochangetherapy),and 5 (life threatening). (Table1) This reflected the clinical importance of derangementsbutnotnecessarilytheamountofdeviationfromthenormal value. The most abnormal value of a variable recorded within 24 hours was used.[6]

Table1PhysiologicstabilityIndex:

Physiologic Systems(7)andVariables(34)

1. Cardiovascular:systolicbloodpressure,diastolicbloodpressure,heart rate, cardiac index, C(a-v)O2, CVP, PCWP
2. Respiratory:respiratoryrate,PaO2,PaO2/FIO2, PaCO2

3. Neurologic:Glasgowcomascore,intracranialpressure,seizures, pupils
4. Hematologic:haemoglobin,WBCcount,plateletcount,PT/PTT,FSP
5. Renal:BUN,creatinine,urine output
6. Gastrointestinal:AST/ALT,amylase,totalbilirubin,albumin
7. Metabolic:sodium,potassium,calcium,glucose,osmolality,pH, HCO3

Pointsfor eachvariable:

- 0, 1, 3, 5
  - reflectclinicalimportanceofderangement,withmoreabnormalhaving higher point value
- notintendedtoreflectmagnitudeofdeviation fromthenormalvalue

Prismscore:

The PRISM scoring is third generation physiologic based prognostic scoringsystemcommonlyusedinpediatriccriticalcareunit.Itisobtained and validated from the Physiological Stability Index (PSI) with 1415 patients with median age of 33 months evaluated from 9 U. S PICU environments between 1984-1985.Statistical analyses eliminated the insignificant PSI categories, thus reducing the number of physiological parameters, creating and validating the PRISM. It uses 14 parameters (physiological and laboratory) and for each their highest severity value recorded in first 24 hours. [4]

This scoring system was developed to assess the severity illness- related mortality irrespective of the diagnosis. It presents an excellent discriminatory performance and prediction thus being used in many PICUs as a prognostic score to assess gravity of disease. The PRISM score variables and score is shown in table below.

Prismscore:

(systolic blood pressure points) + (diastolic blood pressure points) + (heart rate points) + (respiratory rate points) + (oxygenation points) + (Glasgowcomascalepoints) +(pupillaryreactionpoints) +(coagulation points)+(Bilirubinpoints)+(potassium points)+(Calcium points)+(glucose points)+(Bicarbonate points).

The total score is then obtained, minimum score is 0 and is seen to have excellent prognosis, and a maximum score of 76 is almost invariably associated with death.

Theriskofdeathiscalculatedbyalogisticregressionequationasshown below which uses the total score of the PRISM, patient age and need of surgeryonadmissiontothePICU[14]butperformancewasnotsignificantly influenced by the post-operative status of the patients. The operative status is indicated by 1 if post-operative or 0 if non-Operative

R={0.207*(PRISMSCORE)}-{0.005*(ageinmonths)}-
{0.433*(operativestatus)}-4.782
ProbabilityofMortality=EXP(R)/{(1+EXP(R)}

ProbabilityofSurvival=1-probabilityof mortality

The assessment of this scoring system includes sensitivity which is correct prediction of non-survival and specificity which is correct prediction of survival.

Several studies have been done and show that PRISM is able to assess and predict mortality [4,15]while other studies show that it overestimates mortality[5,16].Itisinstitutionindependentandcanbeusedwithinlimitsto compare different critical care units [17].

Below is a table summarizing different studies that have been done to assess the performance of the PRISM score in different populations and institutions.

Table-1:- PerformanceofPRISM Score.

Author and year	**Title**	**Discrimination**	**Calibration.**
Antonyetal[18] 2006 United Kingdom	Assessmentand optimization of mortality prediction tools for admission toPICUinUnited	Cindex-0.82	P=0.01

	Kingdom		
Grazielaetal [19]2010 Brasil	Application of the PRISM score and determination of mortalityriskfactors in a tertiaryPICU	0.76(0.69-0.83)	P=>0.05
Marthaetal[20] 2005 Brazil	Comparison of two prognostic scores (PRISMandPIM) at PICU	0.87(0.81-0.93)	P=0.10
Qureshietal [21] 2007 Pakistan	Comparisonof three prognostic scores (PRISM, PIM2, PELOD)atPICU under Pakistan circumstances	0.78(0.67-0.89)	P=0.49
Wellsetal[22] 1996 SouthAfrica	Poor discriminatory performance of PRISMscorein southAfricanICU	0.73=/-0.01	

Prism3scoringsystem:

This was based upon a sample of 11,165 consecutive admissions to 32 pediatricICUs(10% of PICUsof USA) representinga wide diversityof organizational and structural characteristics. The variables which were which were most predictive of mortality were minimum systolic BP, abnormalpupillaryreflexesandstupor/coma wereretainedfromPRISM score. Variables which were not included in PRISM III are diastolic BP, Respiratory rate, PaCO2/FIO2, serum bilirubin and calcium concentration. PRISM III is widely accepted and is the standard score against which other scores are compared.[5]

PRISM-IIISCORES(17Variablesand26ranges)[6] Sub scores:

1. cardiovascularandneurologic vitalsigns:5measures
2. acid-baseandbloodgas:5measures
3. chemistrytests:4 measures
4. hematologytests:3measures(withPT andPTTcountedasone) Grading variables:

Usethehighestand/orlowestvaluesfor scoring.

The PRISM III score is an improved version of the PRISM score developedattheChildren'sNationalMedicalCenter inWashington,DC basedondatacollectedat32 paediatric intensivecareunitsusing11,165 admissions.

AgeGroupAgeRange neonate 0 to < 1 month infant 1to 12 months
child > 12 to 144 months (12 years)
adolescent>144months(>12years)

Table 2-2.1:- Systolicbloodpressure:

AGEandFINDINGS	SCORE
neonateAND>55mm Hg	0
neonateAND40-55mmHg	3
neonateAND<40mm Hg	7
infantAND> 65mmHg	0
infantAND45-65mmHg	3
infantAND< 45mmHg	7
childAND>75mm Hg	0
childAND55-75mm Hg	3
childAND<55mm Hg	7
adolescentAND>85mm Hg	0
adolescentAND65-85mmhg	3

adolescentAND<65mm Hg	7

Table 2.2:- HeartRate.

neonateAND<215 beats/minute	0
neonateAND215-225bpm	3
neonateAND>225beats/minute	4
infantAND<215 beats/minute	0
infant AND215-225bpm	3
infantAND>225 beats/minute	4
child AND<185 beats/minute	0
childAND185-205bpm	3
child AND>205 beats/minute	4
adolescentAND< 145beats/minute	0
adolescentAND145 -155bpm	3
adolescentAND>155beats/minute	4

Table 2.3:-

Temperature	<33°C	3
	33 - 40°C	0
	>40°C	3
Mentalstatus	Glasgowcomascore>=8	0
	Glasgowcomascore<8	5
Pupillary response	bothreactive	0
	1 reactive AND (1 fixed AND > 3 mm)	7
	bothfixedANDboth> 3 mm	11

where:

- Theheartrateshouldnotbemonitoredduringcryingoriatrogenic agitation.
- Pupillarysizeshouldnotbeassessedafter iatrogenic dilatation.
- Bodytemperature maybe rectal,oral, andaxillaryorblood.
- Mental status should not be scored within 2 hours of sedation, paralysisoranesthesia.Ifsedation,paralysisoranesthesiaiscontinuous, score based status prior to sedation, paralysis or anesthesia.

Table 2.4:- Acid-Baseand BloodGasesFindingsPoints:

Acidosis	pH>7.28ANDtotalCO2>=17 mEq/L	0
	(pH7.0 -7.28)OR(totalCO25- 16.9 mEq/L)	2
	pH< 7.0ORtotalCO2<5	6
Ph	<7.48	0
	7.48 - 7.55	2
	>7.55	3
PCO2	<50mmHg	0
	50–75mmHg	1
	>75mmHg	3
total CO2	<=34mEq/L	0
	>34mEq/L4	4
PaO2	>= 50mmHg	0
	42.0-49.9 mmHg	3
	<42mmHg	6

where:

PaO2requiresarterialblood
PaCO2canbemeasuredfromarterial,venousorcapillaryspecimens

Table 2.5:- ChemistryTestsFindingsPoints:

Glucose	<=200mg/dL	0
	>200 mg/dL	2
Potassium	<=6.9mEq/L	0
	>6.9mEq/L3	3
Creatinine	neonateAND<=0.85mg/dL	0
	neonateAND>0.85mg/dL	2
	infantAND<=0.90mg/dL	0
	infantAND>0.90mg/dL	2
	childAND<=0.90mg/dL	0
	child AND>0.90mg/dL	2
	adolescentAND<=1.30mg/dL	0
	adolescentAND>1.30mg/dL	2
BUN	neonateAND<=11.9mg/dL	0
	neonateAND>11.9mg/dL	3
	notneonateAND<= 14.9mg/dL	0
	notneonateAND>14.9mg/dL	3

Where:

- Wholebloodmeasurementsforglucoseareincreased10%overserum; for potassium 0.4 mEq/L.

Table 2.6:- HematologicTestsFindingsPoints:

White bloodcell Count	>=3,000 perµL	0
	<3,000 perµL	4
Platelet count	>200,000 perµL	0
	100,000 -200,000 perµL	2
	50,000 -99,999 perµL	4
	<50,000 perµL	5
PTand PTT	neonateANDPT<= 22seconds AND PTT<=85seconds	0
	neonateAND(PT> 22secondsOR neonateandPTT>85seconds)	3
	not neonateANDPT<= 22seconds ANDPTT<=57seconds	0
	not neonate AND(PT> 22seconds OR PTT>57seconds)	3

Where:

- TheupperlimitofthenormalreferencerangesforPTandPTTarenot given.

Otherfactorsto document:

1. Non-operativecardiovasculardisease
2. Chromosomalanomaly
3. Cancer
4. PreviousICUadmissionduringcurrentadmission
5. Pre-ICUCPRduringcurrentadmission
6. Post-operative(notincludingcatheterizations)duringpast24hours
7. Acutediabeteswithketoacidosisorotherseverecomplication
8. Admissionfrominpatientunit(donotcountifinICUfor<2hours or if transferred from surgical recovery room)

Cardiovascular and neurologic sub score = (points for systolic pressure)+(pointsfortemperature)+(pointsformentalstatus)+ (pointsforheartrate)+(pointsforpupillaryreflex) Acid-baseandbloodgassubscore=(pointsforacidosis)+(pointsfor pH)+ (pointsforPaCO2) +(pointsfor totalCO2) +(pointsforPaO2)

Chemistrysubscore=(pointsforglucose)+(pointsforpotassium)+ (points for Creatinine) + (points for blood urea nitrogen)

Hematologysubscore=(pointsforWBCcount)+(pointsforplatelet count) + (points for PT and PTT testing)

TotalPRISMIIIscore=(cardiovascularandneurologicsubscore)+ (acid base and blood gas sub score) + (chemistry sub score)+(hematology sub score)

Interpretation:
1. Minimumsub score and totalscore:0
2. Maximumcardiovascularandneurologicsubscore:30
3. Maximumacid-baseandbloodgassubscore:22
4. Maximumchemistrysub score:10
5. Maximumhematologysubscore:12
6. MaximumtotalPRISMIIIscore:74

Thehigher thetotalscore,theworsetheprognosis.
1. Arisingscoreindicatesdeterioration.
2. Ifperformedduringthefirst12hoursintheICU,thescoreis designated PRISM-12.
3. Ifperformedduringthefirst24hoursintheICU,itisdesignated PRISM-24.
4. Predictiveequations:
5. Predictiveequationsforprognosisareavailableforthe12hourand 24- hour scores.

The suitability of PRISM III model for this study was evaluated by Hosmer-Lemeshow goodness-of-fit test. The capacity of PRISM III-24 score for discrimination between survived and expired patients was calculated by Receiver Operator Characteristics (ROC) Curve.[6]

Thisstudyshowedabsenceofsignificantcalibrationerrors,andexcellent discriminationandaccuracy.Thisstudywas alsocomparedwithoriginal PRISM score and it showed several improvements over the original PRISM. Reassessment of physiologic variables and their ranges, better age adjustmentforselected variables, and additionalriskfactorsresulted in a mortality risk model that is more accurate and discriminates better. Thelargenumber ofdiverseICUs inthedatabaseindicatesPRISMIIIis more likely to be representative of United States units. [5]

PRISM III is a widely accepted and is a standard against which other scores are compared. We used only PRISM III-24 model in our study. PRISM III-24 score was calculated using the methodology as recommended. We used the most abnormal value of each parameter within the first 24 hours of ICU stay to obtain the PRISM III-24 score.

TherewerefewstudiesdoneonPRISMIIIScore.

Choi et al did a study in which he compared two models of PIM and PRISMIIIasmortalitypredictorinPICUofHonkKong.Theprediction of mortality by both PRISM III-24 and PIM systems were comparable when applied in a PICU in Hong Kong. The AUC for both models was greater than 0. 75 and he concluded that PIM and PRISM III scoring systemsaregoodpredictorsofmortalityinPICUandthevalidityofthese models are high such as in our study. [23]

BradyetaldidastudytoassessthePaediatricRiskofMortality(PRISM, PRISM III-12, and PRISM III-24) systems and the Paediatric Index of Mortality(PIMandPIM2)systemsforuseincomparingtherisk-adjusted mortality of children after admission for paediatric intensive care in the United Kingdom. All PICUs in the United Kingdom were invited to participate. Of 26 PICUs in the United Kingdom, 22 (85%) were recruited, and sufficient prospective data were collected from 18 (69%) units on 10,197 (98%) of 10,385 admissions between March 2001 and February 2002. All published tools were found to have poor calibration butprovidedgooddiscriminatorypower.AfterestimationofUK-

specific coefficients, only PIM2, PRISM III-12, and PRISM III-24 had satisfactory calibration. found that PIM2 and PRISM III are good scales to estimate PICU mortality in the United Kingdom.[24]

Gemke RJ, et al did a study to compare to compare the performance of two different clinical scoring systems that were developed to assess mortality probability in paediatric intensive care. Data from303 patients werecollectedovera9-monthperiod.Twentypatients(6.6%)diedinthe PICU. Expected mortality based on PRISM III (12 h) was 6.96% (SMR 0.95;95%CI0.68-1.23),basedonPRISMIII(24h)was6.95%(SMR 0.95;0.67-1.22)andbasedonPIMwas7.5%(SMR0.88;0.55-1.20).

Calibration by Hosmer-Lemeshow goodness-of-fit test showed for PRISMIII(12h)chi(2)(8)=10.8,p=0.21;forPRISMIII(24h)chi(2) (8) =13.3, p=0.21 and for the PIM score chi(2) (8) = 4.92, p=0.77. Discriminatory performance assessed by ROC curves showed an area under thecurveof0.78(95%CI0.67-0.89)forthePRISMIIIscoreboth after12and24hand0.74(0.63-0.85)forthePIMscore.Studyconcluded that PRISM III and PIM scores are both adequate indicators of mortality probabilityforheterogeneouspatientgroupsinpaediatricintensivecare.[25]

Slater A, Shann F did a study to compare the performance of the Paediatric Index of Mortality (PIM), PIM2, the Paediatric Risk of Mortality (PRISM), and PRISM III in Australia and New Zealand. Discrimination between death and survival was assessed by calculating the area under the receiver operating characteristic plot for each model. Theareas(95%confidenceinterval)forPIM,PIM2,PRISM,andPRISM IIIwere0.89(0.88-0.90),0.90(0.88-0.91),0.90(0.89-0.91),and0.93 (0.92-0.94).[26]

InIndia,aprospectivecohortstudywasdonePICUofBTGH,Gulbarga, KarnatakabyNaiketalfor AssessmentofriskofmortalityusingPRISM III-24score.Total404patientswereenrolledinthetimeperiodof12hrs. Mean age, length of hospitalization, and mean PRISM III-24 score were 59.22±51.12 months, 99.84±91.61 hours, and 4.92±7.74 (range 0-36). The test was well designed for the study (goodness-of-fit value P-value 0.186). ROCanalysis indicated a strongpredictive power for thePRISM III-24 (AUC 0.936). Study concluded PRISM III-24 score is a good predictor of mortality in PICU patients under Indian circumstances.[27]

Anotherstudywasdone withKulkarnietalinBJMCPune,in which400 patientswereenrolledintimeperiodof18months,toevaluatesensitivity of PRISM III Score to predict mortality and to determine cut off score AveragePRISMIIIscorewashigherinnon-survivors(14.6)ascompared to survivors (4.1). The mortality was significantly higher with high PRSIM III score. The area under the receiver operating characteristics curve was 0.96. Studyconcluded, PRISM IIIscorecan be applied with a gooddegreeofaccuracyforseverityassessmentandmortalityprediction to paediatric patients in PICU.[28]

Another study done by N. Bilan et al, in Tabriz children hospital for assessment of mortality by PRISM III score in which 220 patients were enrolled in period of 13 months.The mean value of the PRISM-IIIscore was 14.22±9.57 (2-42). ROC analysis indicated a strongpredictivepowerforthePRISM-III(areaunderthecurve=0.898) andthetestwaswellfittothedesignedstudy(goodness-of-fitp- value=0.161).Theobservedshort-termmortalityratewas9.05% andtheexpectedmortalityratebythe PRISM-IIIscoringwas9% (O/E ratio =1.005). The PRISM-III scoring system was highly calibrated.[29]

Lacunaeinliterature:-

A Pediatric intensive care unit (PICU) in a developing country has to provide thebest possiblecaretothesickchildrentakingintoaccount the large patient load, scarcity of resources, lack of man power etc while ensuringaproperfunctioning.Evaluationoftheoutcomesrequiresuseof accurate and easily applied methods. Pediatric Risk of Mortality III (PRISM III) score is an updated version developed in 1996, has several improvements over the original PRISM score.There is lack of study about PRISM III in Indian scenario.

Researchquestion:

Can PRISM III score be usedto predict mortalityin critically illpatients admitted in PICU of Tertiary Care Center in Mumbai?

Aimsand Objective:-

Aims:-

To Study the demographic profile of children admitted in PICU of a tertiary care center and to predict the outcome of children according to PRISM III score

Objectives:-

Primaryobjectiveofthe Study:

To Study the demographic profile of children admitted in PICU of a tertiary care Centre and to predict the outcome of children according to PRISM III score done at admission or within 24 hours of admission.

Secondaryobjectiveofthestudy:

To determine the sensitivity of PRISM III scoring system to predict mortality in pediatric Intensive care unit of Tertiary care center.

Material And METHODS

Study area:

Study will be conducted at Paediatric Intensive Care UnitofKokilabenDhirubhaiAmbaniHospitalandMedicalResearch Institute which has capacity of 10 beds.

Studypopulation:

Allchildrenbetween1 monthand18yearsofage admitted to PICU (except for exclusion criteria), Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute.

Samplesize:

Basedontheliterature,it wasfoundthat theaccuracyof paediatric risk of mortality score (PRISM-III) in predicting mortalityratewas93%.ForoursamplesizeconsideringaccuracyofPRISM-IIIin predicting mortality rate to be 93%. With a 5% allowable variation, the sample size at 95% confidence level. Total 100 patients will be required in this study.

Stepwisecalculationofsamplesize:

$$N = \frac{[Z^2 * p * (1-p)]}{e^2}$$

HereNis sample size, Z^2=1.96*1.96,p=0.93,(1-p)=0.07 and e^2=0.05

Studydesign:

ThisisProspectiveObservationalStudywillbe conducted in PICU of KDAH hospital.

InclusionCriteria:

1. Allcriticallyillchildrenbetween1monthand18yearsofageof either sex admitted in PICU.
2. Patientswhowouldvoluntarilyagreetosigninformedconsent form.

ExclusionCriteria:

1. Children withcongenitalmalformations.
2. Childrenwhodiedwithin8hoursofadmission.
3. Children whoweredischargedfromthe unitwithin24hoursof admission.

StudyIntervention:

NoInterventionisdoneinthisstudy.

StudyDuration:

Thisstudywouldbeconductedoveraperiodof 6 months post IEC-A approval. (Nov/17-May/18)

Method of measurement of outcome of interest:
All the data willbechartedonthemasterchartinexcelsheet.Statisticalanalysisof accuracy will be done by appropriate tests.

DataCollectionMethods:
asdescribedinmethodology.

Methodology:-

1. This study was conducted in patients admitted in Paediatric ICU.100 consecutive patients in the age group of 1 month to 18 years (except for exclusion criteria) admitted for various clinical conditions in the paediatric ICU were studied, until they were discharged or die. Study wasconductedfrommidofNov/18toMay/18.Neonateswereexcluded from the study.
2. Readmissions in Pediatric ICU during same hospitalization were analyzedasseparatepatientbecauseeachadmissionprovidedaseparate opportunity for PICU outcome

Datacollection:

1. Basicinformationabout thepatient andtypeof diseaseisberecorded.
2. Following consent, a detailed history of symptoms and physical examinationwascarriedoutandrequiredinformationisfilledinstudy proforma.
3. Patient data included following information-age, gender, presenting complaints, diagnosis classified bysystem, involved, pediatric ICU and hospital outcomes, operative status, admission source (inpatient ward/BMT, Referred, or from home), selected critical care modalities (ventilation,ivboluses,inotropes)usedinfirst24hrofPICUadmission.
4. Physiologicalandlaboratorydataincludedthemostabnormalvalue was recorded within 24hr of admission in PICU.
5. Physiologicalvariableswherevalueschangewithagearestratifiedby age (neonate, infant, and child, adolescent).
6. The data consist of following variables-systolic BP, Heart rate, temperature,Mental status,Pupillarystatus(sizeandreactiontolight), arterial blood gas parameters (Acidosis, PH, PCO2, PaO2, TCO2), Glucose, BUN, Creatinine, Potassium, WBC, Platelet count, PT, APTT.
7. Theexaminationofheartrate,respiratoryrateandpupillaryreaction was made by paediatric resident doctor. Blood pressure (BP) was checked usingstandardNIBPmonitor withappropriatecuffsizeandinvasiveBP monitoring as when feasible, temperature using a standard mercury thermometer. Mental status was recorded according to Glasgow coma scale and modified Glasgow coma scale. Blood parameters were measured by standard laboratory test, and most abnormal value within 24hr was recorded.
8. Totalscorewillbecalculatedas
9. TotalPRISMIIIscore=(cardiovascularandneurologicsubscore)+(acid baseandbloodgassubscore)+(chemistrysubscore) +(hematologysub score)
10. Thechildren werefollowed upduringhospitalstayand theoutcome was recorded as died or survived.

DataCollectionForms:
DatawillbecollectedasperAnnexureA enclosed*Statisticalanalysis:*
Datawascollectedusingpreformed datacollectionformandcase record form**.** Data was entered into Microsoft Excel and analysed using SPSS (StatisticalPackageforSocialSciences)Softwareversion20.Categorical variable was expressed in terms of frequency and percentage and continuouswereexpressedintermsofmeanandSD.Associationbetween mortality and PICU categorical variable were analysed using chi square testanddifferenceinprismscoreamongdiedandsurvivedanalysedusing T test with $p<0.05$ as statistically significant value at 95% Confidence interval. Correlation between PICU and Hospital Stay among survived withprismscorewasanalysedusingPearsoncorrelationco-efficientwith $p<0.05$asstatisticallysignificantcorrelationat95%Confidenceinterval.

Ethicalconsideration:-
Patient'sparticipationwillbekeptentirelyconfidentialandprivacyofthe datawillbemaintained.Inordertoensureconfidentialityandprivacy,we will codify and anonymize the data and collected data will be secured in order torestrict the access tostudyteammembers, ethics committee and representatives of national and local health authorities only. Patient's name willbereplaced withaspecialcodethatidentifiesthepatient.This code, along with patient's Study Information, will be used for the study purposes as mentioned in the study protocol. Patient name will be availableonlytothefollowingpeopleoragencies:TheStudyDoctorand staff; and authorized representatives of the Study Doctor; ethics committees, health authority inspectors, such as (but not limited to) the DrugControllerGeneralofIndia,designatedstudymonitorsandauditors.

Studywillbe initiatedonlypostIEC -Aapproval,alsostudyprocedures will be initiated only post written consent (IEC - A approved) from the patient.

Observations& Results:-

Atotalof107patientswereenrolledinthestudyduration.

Table3:- Age Wise Distributionofcases.

Agegroup	Frequency	Percent
0-1yr	14	13.1
1.1-5yrs	29	27.1
5.1-10yrs	24	22.4
10.1-15yrs	29	27.1
>15yrs	11	10.3
Total	107	100

ItwasnotedthatMaximumnoofpatientsbelongstoagegroup1-5yr and 10-15 yrs.

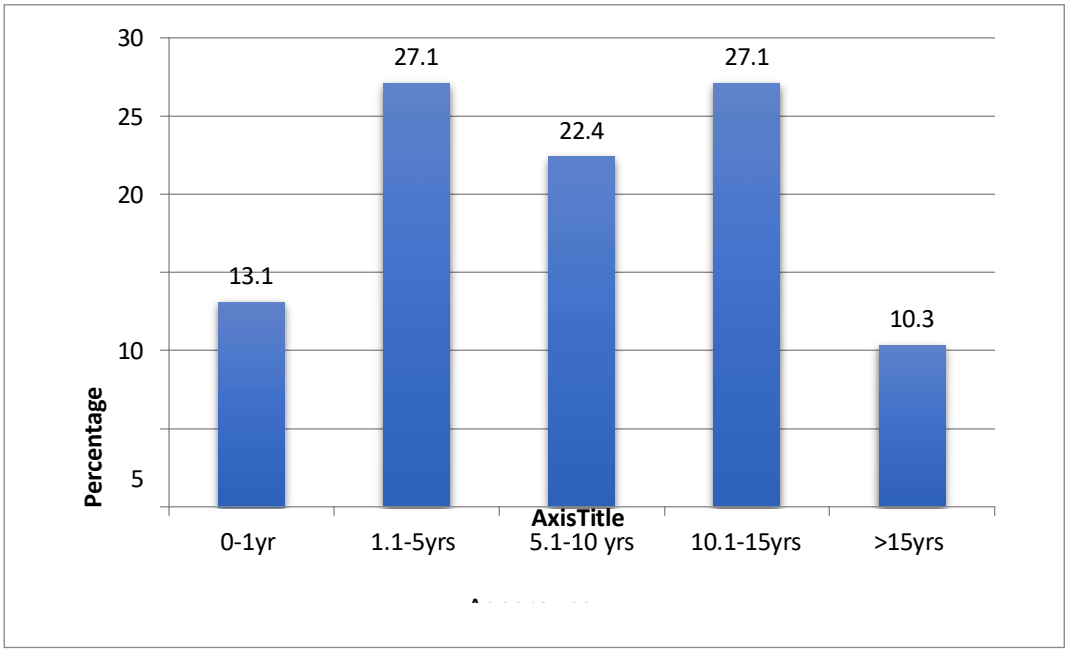

Figure1:- Age Wisedistribution.

Table4:- Genderwisedistributionofcases.

Gender	Frequency	Percent
Female	46	43.0
Male	61	57.0
Total	107	100.0

61patientsweremale(57%)and46were female patients(43%).

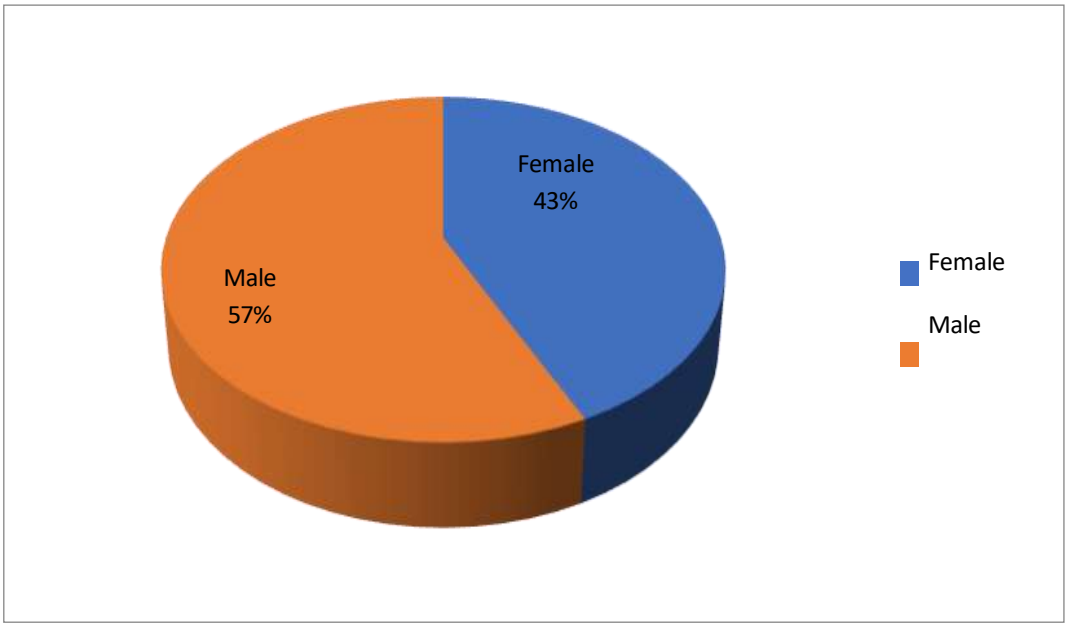

Figure2:- Genderwisedistribution.

Table 5:- Clinicalpresentationofthepatients On Admission.

Symptoms	Frequency	Percent
Fever	51	47.7
Cough	6	5.6
Cold	2	1.9
Breathlessness	31	29.0
Seizure	15	14.0
Postop	11	10.3
Altered sensorium	11	10.3
Rash	7	6.5
Abdominalpain	8	7.5
Vomiting	10	9.3
Loosemotion	2	1.9
Headache	5	4.7
Decreasedurine output	3	2.8
Low count	10	9.3
Yellow colouration	3	2.8
Other		

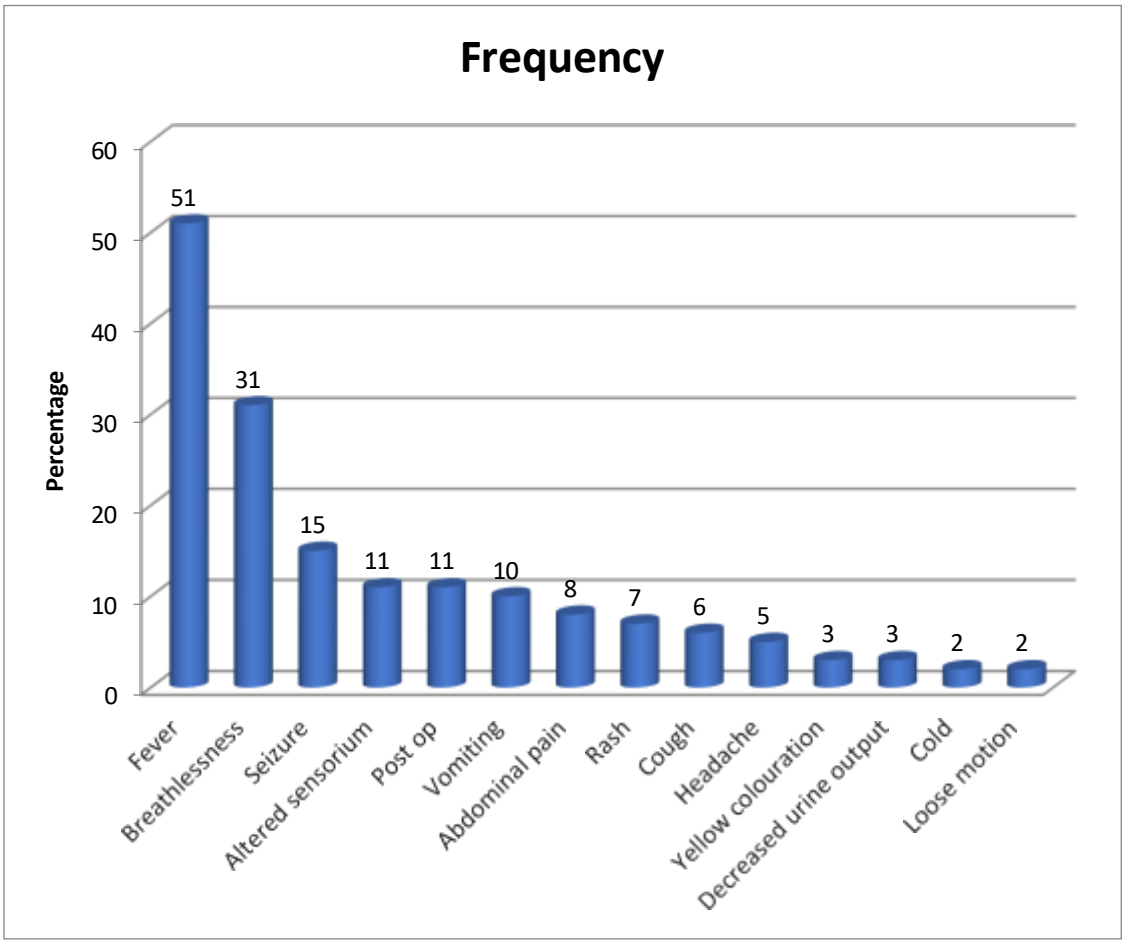

Figure 3:- Clinical Presentation Of The Patients On Admission.

Mostcommonpresentingcomplaintofthepatientsadmittedto PICU was fever (51%) followed by breathlessness.

Table 6:- Systemwisedistributionofpatients.

System	Frequency	Percentage
CentralNervous System	35	32.7
Hemato-oncology	24	22.4
RespiratorySystem	18	16.8
CardioVascular System	17	15.9
Metabolic	6	5.6
GastroIntestinalSystem (hepatobiliary)	5	4.7
Renal	3	2.8
Other (skin, Connective tissue, skeletal)	5	4.7

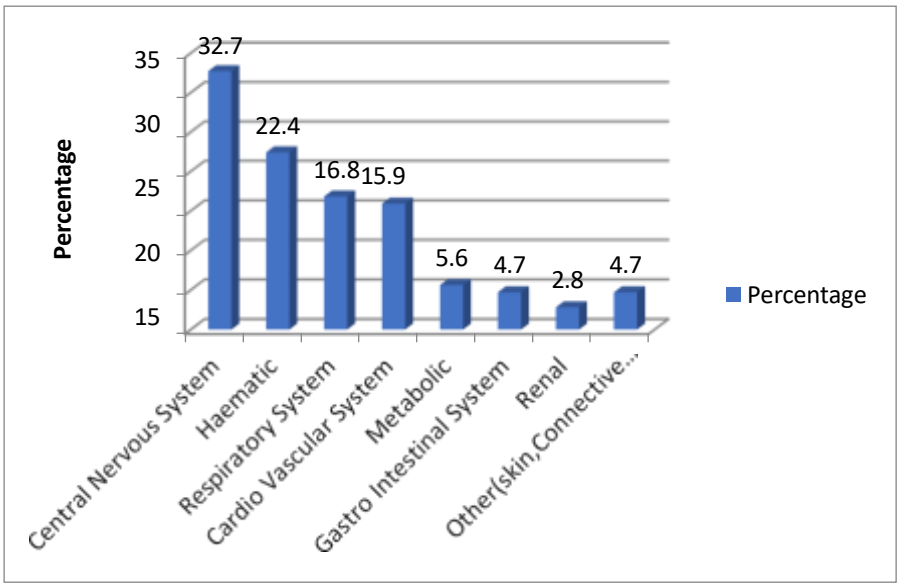

Figure-4:- System Wisedistributionof Patients

In our study Central nervous system was the most common system involved(32%) followed by Hemato-oncology(22.4%), and Respiratory system(16.8%).

Most common presenting complaints of patient having CNS involvementwasSeizures,andthoseofhemato-oncologypatientwas Breathlessness.

Table 7:- Distributionofpicuvariablesinstudypopulation.

PICU Variables		Frequency	Percent
Source of admission	Inpatient	82	76.6
	Referred	25	23.4
Ventilation required	No	77	72.0
	Yes	30	28.0
Inotropes	No	80	74.8
	Yes	27	25.2
Shock	No	68	63.6
	Yes	39	36.4

Table-8:- Distributionofstudygroupasperoutcome

Outcome	**Frequency**	**Percent**
Died	**17**	**15.9**
Survived	**90**	**84.1**
Total	**107**	**100%**

Outof 107patients17patientdied(15.9%)and90patientssurvived(84%)

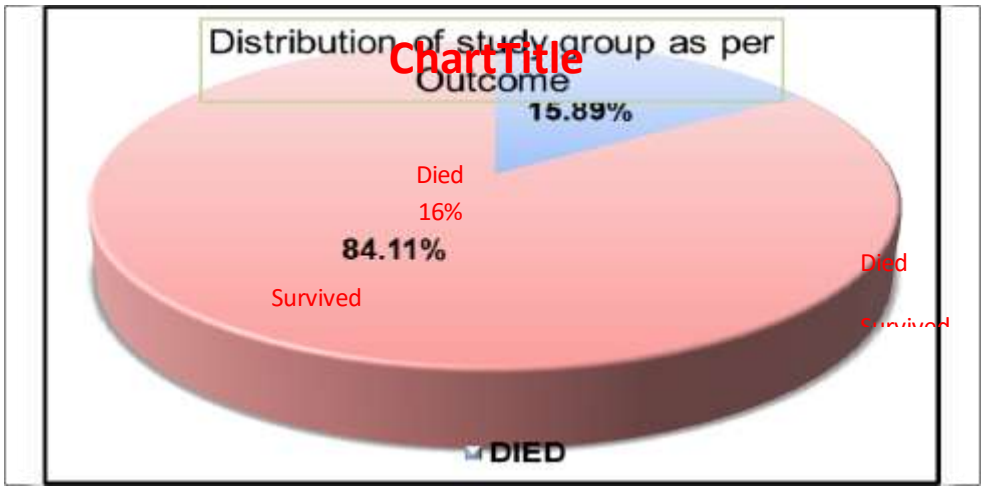

Figure 5:- Distributionofstudygroupasperoutcome.

Table 9:- Distributionofcontinuousvariableinstudy Group.

continuous variable	Mean	Sd
SystolicBP	106.60	19.38
HR	123.73	28.73
Temp	99.743	1.82
PH	7.35	0.13
PCO2	36.75	15.81
TotalPco2	22.61	11.13
ArterialPao2	93.74	31.04
Glucose	103.83	72.76
Potassium	3.87	0.67
srcreate	0.53	0.63
BUN	11.18	12.68
WBC	9108.64	5706.66
Platelet	228774.51	158628.023

Table10:- Associationofprismiiiscoreandoutcome.

PRISMIIIscore	Outcome		Total
	Died	Survived	
0-10	0	86	86
%	0.0%	100.0%	100.0%
11-20	6	4	10
%	60.0%	40.0%	100.0%
>20	11	0	11
%	100.0%	0.0%	100.0%
TotalPATIENT	17	90	107
%withinPrism Code	15.9%	84.1%	100.0%

Chi-SquareTests	Valuedf	PValue	Associationis
PearsonChi-Square	89.040	2	0.000Sig
a. 2 cells (33.3%) have expectedcountlessthan5.The minimum expected count is 1.59.			

In our studypatient were divided into 3 groups based on therePRISM IIIscoreie0-10,10-20,>20.ItwasnotedthatmortalityratewasleAst (0%) inthosewithPRISM-IIIscore0-10andwas highest (100%) in those

with score more than 20. Moratlity rate was 60 % in those with score between 11-20. Pearson chi-square test shows significant association of high PRISM III score with higher mortality

Table11:- Comparisonofprism-Iiiscoreamongsurvived And Died Subjects.

Total score	**Count**	**Mean**	**StdDev**	IQR	Mann-Whitney Test	**P Value**
DIED	**17**	**24**	**7**	8	-6.607	**0.000**
SURVIVED	**90**	**4**	**4**	5	**Differenceissig**	

MeanPRISM-IIIscoreis24±7inpatientswho diedand4±4patients who survived. The difference is statistically significant.

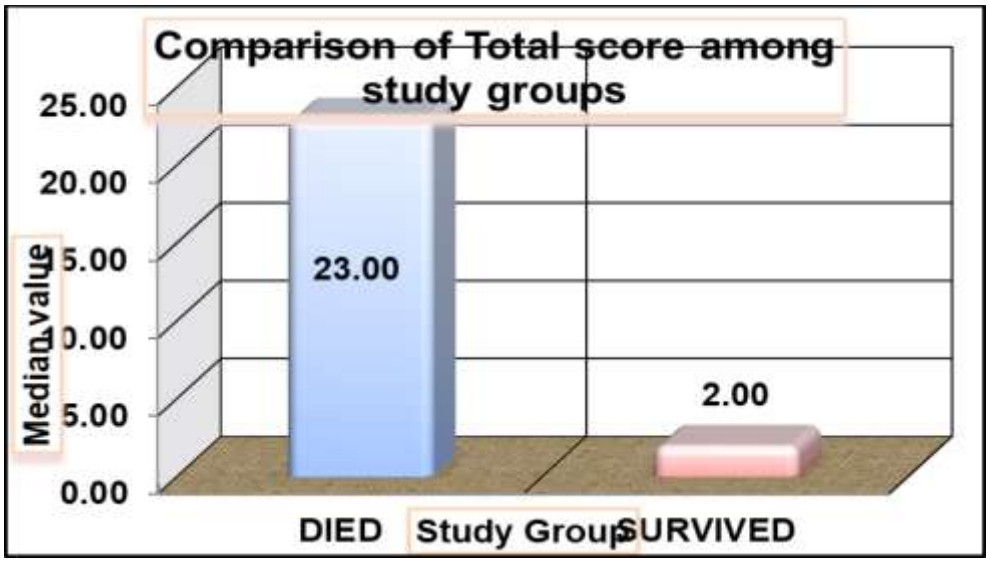

Figure 7:- Comparisonofprismscoreamongsurvivedanddied Subjects

Table 12:- Associationofageand Outcome.

Agegroup	OutCome		Total
	Died	Survived	
0-1Yr	3	11	14
Row%	21.4%	78.6%	100.0%
1.1-5Yrs	2	27	29
Row%	6.9%	93.1%	100.0%
5.1-10Yrs	4	20	24
Row%	16.7%	83.3%	100.0%
10.1-15Yrs	6	23	29
Row%	20.6%	79.3%	100.0%
>15 Yrs	2	9	11
Row%	18.2%	81.8%	100.0%
Total	17	90	107
Row%	15.9%	84.1%	100.0%

Mostofthedeathswereinagegroups1.1-5yrsand10.1-15yrs.

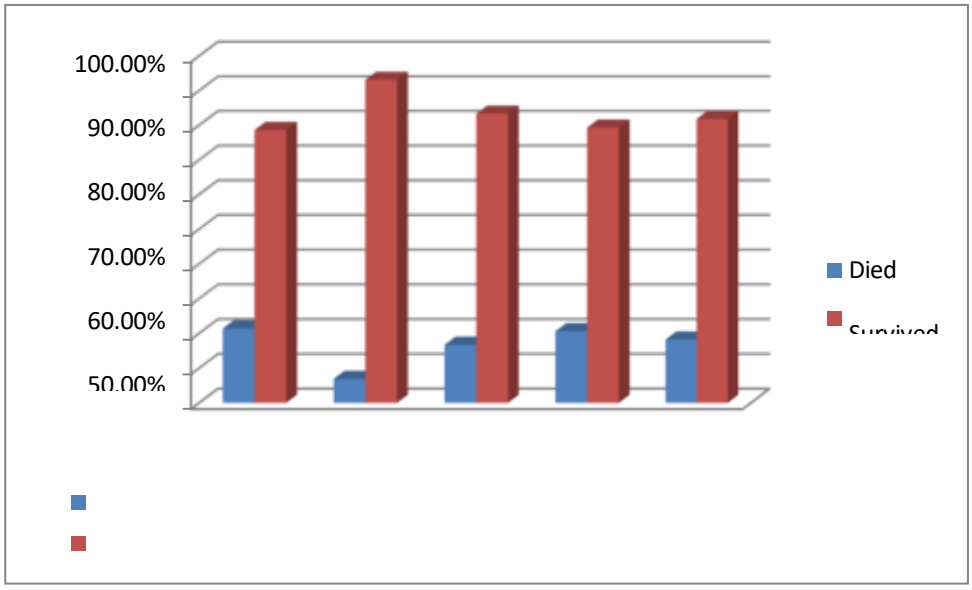

Figure 8:- Associationofageandoutcome

Table 13:- Associationofgenderandoutcome.

Gender	Output		Total
	Died	Survived	
Female	8	38	46
Row%	17.4%	82.6%	100.0%
Male	9	52	61
Row%	14.8%	85.2%	100.0%
Total	17	90	107
Row%	15.9%	84.1%	100.0%

It was observed that morta

Figure 9:- Associationofgenderand Outcome.

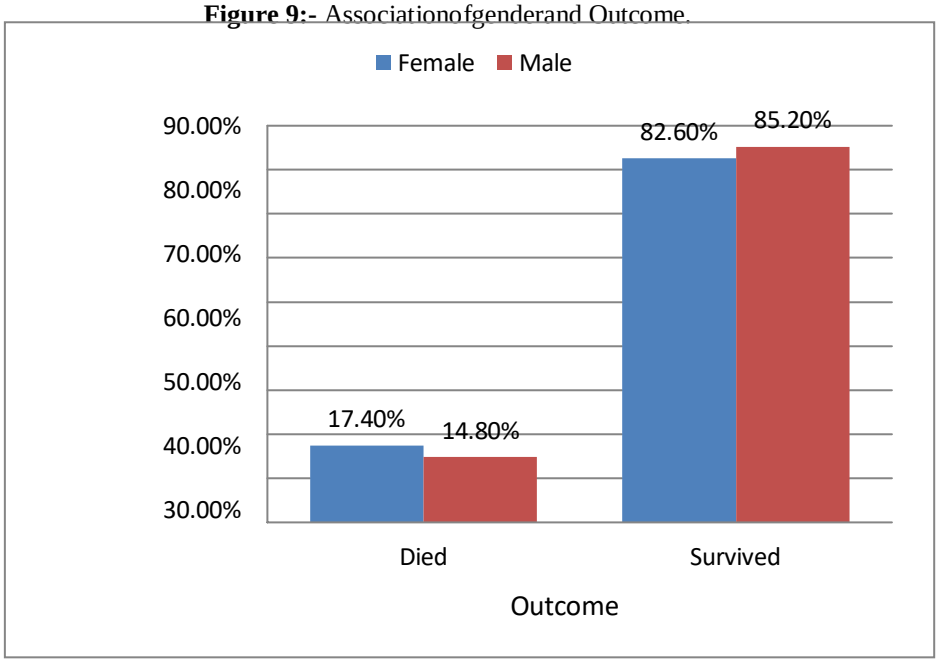

Table 14:- Univariateanalysis:Riskfactorsofmortality.

PICU Variables		Output			
		Died Frequency(%)	Survived Frequency (%)	Total	Pvalue
Source of admission	Inpatient	12(14.6%)	70(85.4%)	82	0.358
	Referred	5(20%)	20(80%)	25	
Ventilation required	No	2(2.6%)	75(97.4%)	77	0.001
	Yes	15(50%)	15(50%)	30	
Inotropes	No	0	80(100%)	80	0.001
	Yes	17(63%)	10(37%)	27	
Shock	No	0	68(100%)	68	0.001
	Yes	17(43.6%)	22(56.4%)	39	
Acidosis	No	8(9.5%)	76(90.5%)	84	0.002
	Yes	9(39.1%)	14(60.9%)	23	

It was also noted that variable like ventilation, shock, iv boluses, inotropes, acidosisareassociatedwithmortality.Althoughsourceofadmission(inpatient /referred)isnot relatedtomortality.

Table 15:- Associationofprism-Iiivariableswithoutcome.

Variables	outcome	N	Mean	Std. Deviation	Pvalue
SystolicBP	Survived	90	107.81	17.75	0.127
	Died	17	99.53	26.74	
HR	Survived	90	121.62	27.58	0.081
	Died	17	134.88	32.85	
Temp	Survived	90	99.44	1.64	0.001
	Died	17	101.28	1.96	
PH	Survived	90	7.37	0.09	0.006
	Died	17	7.21	0.20	
PCO2	Survived	90	34.63	12.79	0.042
	Died	17	47.90	24.25	
TotalPco2	Survived	90	22.32	11.63	0.533
	Died	17	24.16	7.98	
Arterial Pao2	Survived	90	97.29	31.02	0.006
	Died	17	74.95	24.13	
Glucose	Survived	90	105.99	78.64	0.483
	Died	17	92.41	22.34	
Potassium	Survived	90	3.90	0.60	0.353
	Died	17	3.68	0.91	
sr creat	Survived	90	0.45	0.57	0.008
	Died	17	0.98	0.69	
BUN	Survived	90	7.94	5.38	0.002
	Died	17	28.27	23.10	
WBC	Survived	90	9488.72	5295.22	0.218
	Died	17	7096.47	7393.63	

Itwasnotedthatthereissignificantassociationof Temperature,PH,PCO2, Arterial PaO2, BUN and creatinine with mortality.

Table 16.1:- Associationofinfectionandoutcome.

Diagnosis	**Died**	**Survived**	**Total**
Infectious	10(27.8%)	26(72.2%)	36(100%)
Non-infectious	07(9.8%)	64(90.2%)	71(100%)

It was also observed that mortality was higher due infectious causes, as comparedtoothers.Amongthosehavinginfectiouscause, deathduetoseptic shock 42.7% , other infections was 18.2%.

Table-16.2:- Associationofinfectionandoutcome.

Infection	Died	Survived	Total
Septicshock	6(42.9%)	8(57.1%)	14(100%)
OtherInfection	4(18.2%)	18(81.8%)	22(100%)
Total	10(27.8%)	26(72.2%)	36(100%)

Table 17:- Association Ofinotropeswith Mortality.

Inotropes	Died		Survived	
No.of inotropes	N	Percentage	N	Percentage
0	0	0	80	88.9
1	3	17.6	4	4.4
2	2	11.8	6	6.7
3	12	70.6	0	0.0
Total	17	100	90	100.0

ROCcurve

Variable	Total_score Total score	
Classificationvariable	Outcome	
Samplesize		107
Positivegroup:	outcome=1	17
Negativegroup:	outcome=0	90
Diseaseprevalence(%)		unknown

AreaundertheROCcurve(AUC)

Area undertheROCcurve(AUC)	0.973
StandardError[a]	0.0204
95%Confidenceinterval[b]	0.922to0.995
zstatistic	23.145
SignificancelevelP(Area=0.5)	<0.0001

[a]DeLongetal.,1988
[b]Binomial exact

Youdenindex

YoudenindexJ	0.9301
Associatedcriterion	>15
Sensitivity	94.12
Specificity	98.89

SummaryTable

Estimatedspecificityatfixedsensitivity			
Sensitivity	Specificity	95%CI[a]	Criterion
80.00	98.89	63.10to100.00	>17.4
90.00	98.89	64.04to100.00	>15.7

95.00	72.44	52.50to100.00	>4.85
97.50	66.78	50.14to98.89	>4.425

Estimatedsensitivityatfixedspecificity

Specificity	Sensitivity	95%CI[a]	Criterion
80.00	94.12	70.71to100.00	>6.75
90.00	94.12	72.96to100.00	>9
95.00	94.12	14.28to100.00	>10.5
97.50	94.12	5.88to100.00	>13.75

[a]BCabootstrapconfidenceinterval(1000iterations;randomnumberseed:978).

CriterionvaluesandcoordinatesoftheROC curve[Hide]

Criterio n	Sensitivi ty	95%CI	Specifici ty	95%CI	+LR	95%CI	-LR	95%CI
≥0	100.00	80.5-100 .0	0.00	0.0-4.0	1.00	1.0-1.0		
>4	100.00	80.5-100 .0	61.11	50.3-71. 2	2.57	2.0-3.3	0.00	
>5	94.12	71.3-99. 9	74.44	64.2-83. 1	3.68	2.5-5.3	0.07 9	0.01-0.5
>15	94.12	71.3-99. 9	98.89	94.0-100 .0	84.7 1	12.0-597 .0	0.05 9	0.009-0. 4
>27	23.53	6.8-49.9	98.89	94.0-100 .0	21.1 8	2.5-178. 0	0.77	0.6-1.0
>28	23.53	6.8-49.9	100.00	96.0-100 .0			0.76	0.6-1.0
>42	0.00	0.0-19.5	100.00	96.0-100 .0			1.00	1.0-1.0

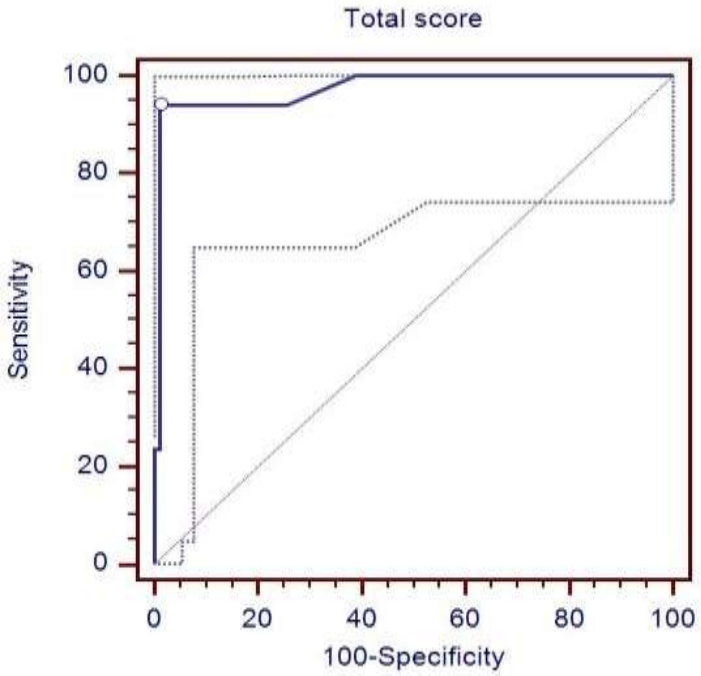

Figure-11:- Receiveroperatingcharacteristicscurvesfor The Paediatric Risk of Mortality (PRISM) III-24.

ThecapacityofPRISMIIIScorefordiscriminationbetweensurvivedand expired subjects as analysed by ROC curve showed a strong predictive powerforthePRISM-III-24(AUC=0.97).Thecapacityofdiscrimination is considered to be high whenever the area under curve is close to 1.TheROCcurveanalysisconfirmsthatPRISMIIIscoreishighlysensitive in predicting the outcome as noted by many studies.

Table 19:- Correlationofsurvivedprismscorewith Picu And Hospital Stay.

Stay	CorrelationwithPrism ScoreIII	PValue
PICUstay	0.255	0.001
Hospitalstay	0.158	0.104

TableshowstherewasfaircorrelationbetweenPICUStayandprismscoreIII withp<0.05.Therewas nosignificant correlation withhospitalstayandprism score among survived. With p>0.05

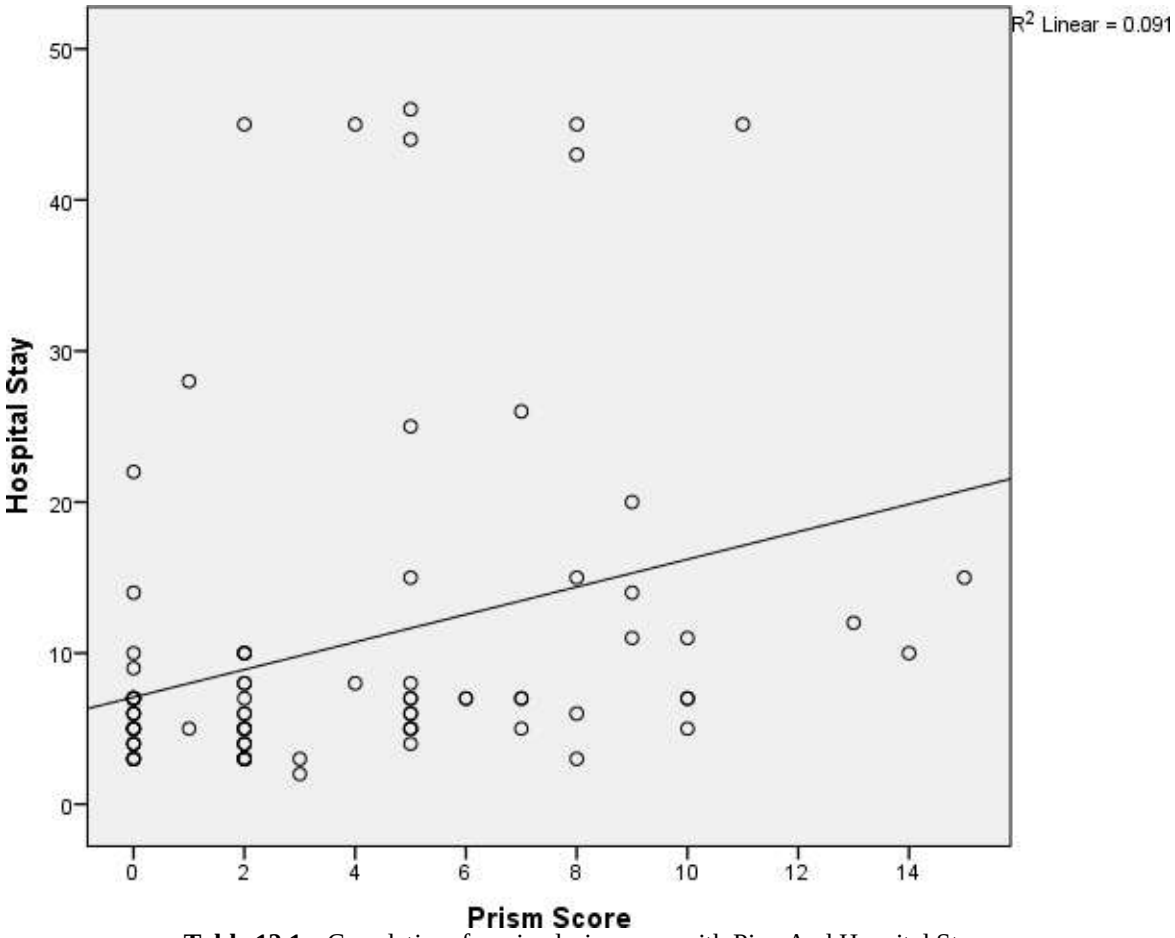

Table 12.1:- Correlationofsurvivedprismscorewith Picu And Hospital Stay.

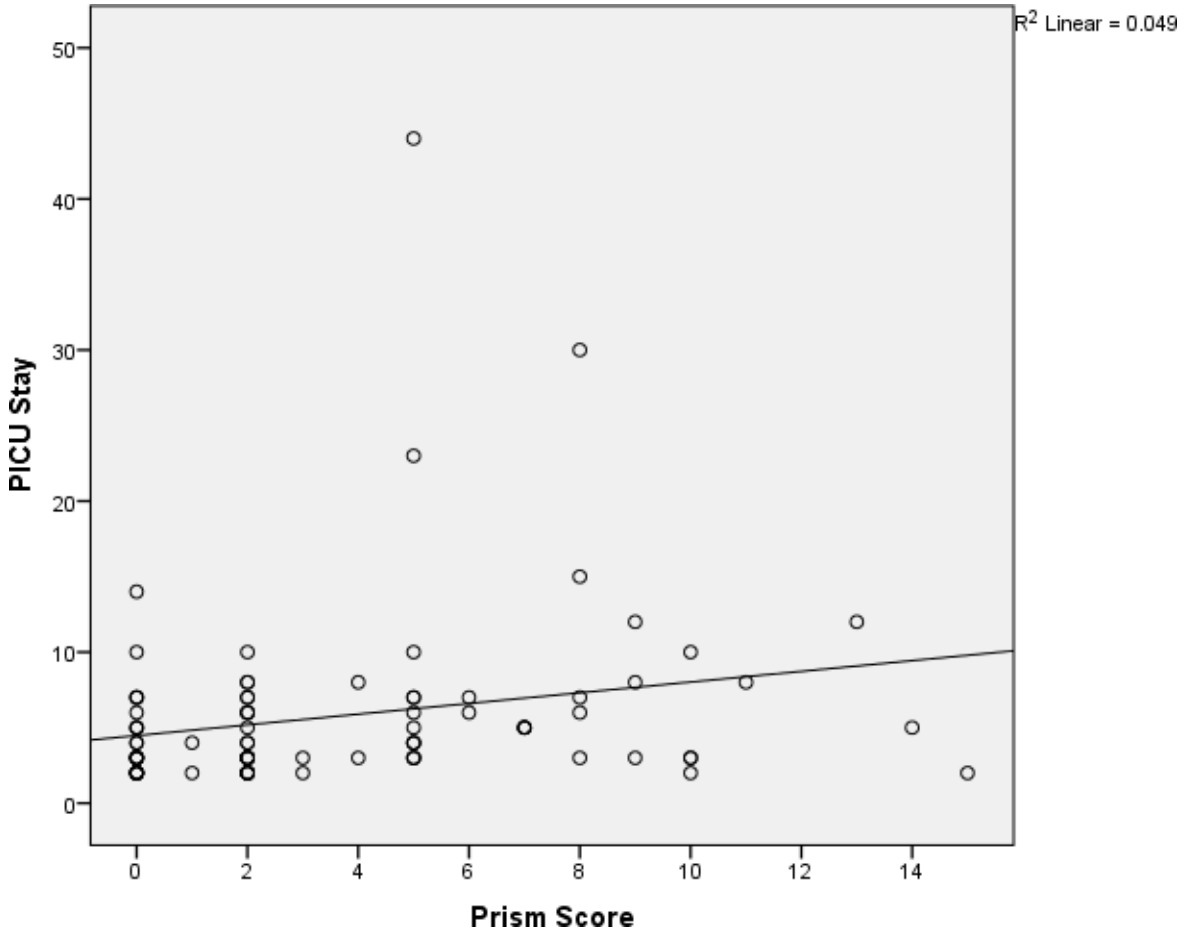

Table 12.2:- Correlationofsurvivedprismscore With Picu And Hospital Stay

Discussion:-

ThepredictionofmortalityinPICUisalwaysuncertain.Notwonumbers ofpatientswiththesameclinicalmanifestationswillrespondtothesame insultinasimilar way.Thisiscertainlytruewiththediversespectrumof patientcharacteristics,lackofuniformityintheclinicaljudgementbythe physicians, and most importantly with the quality of PICU care. Predictionofpatientoutcomeisimportantforthepatientsandfamilyand is relevant for policy formulation and resource allocation; the optimum usage of ICU beds will obviously allow maximum utilization of limited resources[6].

Improvement of care for critically ill patients is a goal in all countries. Different care systems have been created to increase the quality of care for children who need special care. Efforts to decrease children's mortality led to PICU establishment. It is necessary to develop models which predict the mortality risk in PICU in order to monitor the effectivenessofthecarescarriedout.Theyenableustocomparedifferent units and evaluate the associations between the severity of diseases, hospitalization duration and the costs. The predictor model must be independent fromtimeandplace.Itisimportant toknowtheaccuracyof these scoring systems to estimate the mortality risk in ICUs of different groups and countries.[30]

Majority of children in our study was in age group 1.1-5yrs-10.1-15 yrs (27.1%).InaStudydone byHarilalNaiketal[27]alsohadmostofpatients between 1-5yrs,but majority of the studies had predominance in the PICU admission under 1mnth to 1 year. Study by Gemke et al[25] had predominant admissions in infantile age group, Roshani N Taori et[39] al had 37.8% infants. Similarly, study done in Pakistan by Anwarul Haque et al[32] had 37% patients as infants.

Maximum mortality in our study was observed in age group 1.1-5yrs (29%)-10.1-15yrs(29%)followed by5.1-10 yrs(24%)whileincontrast to study done by Sonika et al[33] where maximum death were observed at age >15 years (42.9%) followed by 1 month to 1 year of age (33.33%).

Whilein,PraveenKhilnani[34]studyinwhichtheagerelatedmortalitywas greater in the 1-5 year age group. This might also be due to the fact that age cut off in their study was 12 years

In our study, the percentage of males (57%) admitted to PICU was more thanthepercentageoffemales(43%).Thiswasinsimilartothemaximum studies which showed male preponderance. Our study showed higher mortality rate in males (52%) as compared to females (38%).This was consistent with Bilan et al[29] and Ana Lilia Ponce et al[35] in which the mortality rate was higher among males

ThoughinmostoftheotherstudiesChoietal[23,]Bilanetal[29]andSinghal[31], respiratorydiseasesformedthemajority,inourstudyCNSgroup(32.7%) topped the majority (similar to study)[27]followed by hemato-oncology (22.4%), respiratory (16.5%), cardiovascular (15.9%). Being a super speciality hospital, it has specialised paediatric bone marrow transplant unitandpaediatricneurologydeptsothiscanexplaindifferentpatternof distribution of patient admitted in PICU.

Blood related infections and Sepsis carry major load of mortality. This was consistent with De Leon et al[36] where maximummortalitywas due tosepticshockandSurekhaJoshietal[37] wheremaximummortalitywas due to infection/sepsis.

WeattemptedtoseeifanyindividualvariablesofPRISMIIImodelhad an individual capacity to predict mortality independent of the other variables. In our study variables which are maximum predictive value were Temperature, PH, PCO2, Arterial PaO2, BUN and creatinine with mortality. These results were consistent with a study done by sonica etal[38] where temperature, GCS, BUN and creatinine showed significant relation with mortalityat 72-84 hours. In a Studydone Surekha Joshi et al [37], the variables that had maximum predictive value were BP, HR, GCS,PupillaryReflexes,pH,Creatinineand Platelet count.Inthestudy by Ana Lilia Ponce et al[35] only 4 of the 17 variables were significant.

Theywereabnormalpupillaryreflexes,acidosis,BUNandWBCcount.

Our study showed a statistically significant relationship between PRISMIIIscoreandmortality.Ourresultswereconsistentwithmostof the studies. In our study patient were divided into 3 groups based on therePRISMIII scoreie0-10,10-20,>20.[30]It was notedthat mortality rate was least (0%) in those withPRISM-IIIscore 0-10and was highest (100%) in those with score more than 20. Mortalityrate was 60 %inthosewithscorebetween11-20.

Study done by Karambelkar GR et al [36]showed 22.2% deaths with PRISM score 0-5, 25% deaths with score 6-10, 37.5% with score 11-15 and50%withscore16-20.StudydonebySachinPawaretal[38]had1.6% mortality with score 5 and 98.6 % with score 30. Studydone by Singhal et al[31] showed 8.2% mortality with score 1-9, 24.4% mortality withscore10-19,33.3%mortalitywithscore20-29and66.3%mortalitywith score>30.

Theoverallmortalitywas 15.9% which was comparabletoastudyfrom India.[28]InthestudybyAna LiliaPonceetalwas24.7%andthatinthe study by Gemke et al[25] was 20%. Our study co-relates more with the Singhal et al in which mortality was 17%.

In our study mean PRISM III score of 24±7 for nonsurvivors within 24hrofadmission.InstudydonebyBilanetal[29]hadmeanPRISMIII score of 14.22±9.57.

ThecapacityofPRISMIIIScorefor discriminationbetween survivedand expired subjects as analysed by ROC curve showed a strong predictive power for the PRISM-III-24(AUC=0.97). The capacity of discrimination is consideredtobehighwheneverthe areaundercurveiscloseto1.

TheROCcurveanalysisconfirmsthatPRISMIIIscoreishighlysensitivein predictingtheoutcomeasnotedbymanystudies. Instudydonebychoi et al AUC for both models was greater than 0. 75 and he concluded that PIM and PRISM III scoring systems are good predictors of mortality in PICU. In a study done by Bilan et al[29]ROC analysis indicated a strong predictivepowerforthePRISM-III(areaunderthecurve=0.898)

ThisinformationwouldhelptheattendingPICUphysiciantoassessand prognosticate the critical status of the patients arriving in the PICU objectively.

Summary:-
This prospective observational study is attempted to characterize the profile of children admitted to a tertiaryPICU over a period of 6 months withvariousdiseaseentities.Thisisalsotoevaluatetheoveralloutcome, based on PRISM III scoring system and to assess the sensitivity of this score in predicting mortality. This study was conducted in patients admittedinPaediatricICU.100consecutivepatientsintheagegroupof1 month to 18 years (except for exclusion criteria) admitted for various clinical conditions in the paediatric ICU were studied, until they were dischargedordie.Basicinformationaboutthepatientandtypeofdisease will be recorded.

Physiologicalandlaboratorydatawastakenwithin24hrofadmissionin PICU.Physiologicalvariableswherevalueschangewithagearestratified by age (neonate, infant, and child, adolescent). Total score is calculated and patient was followed up till outcome (Survived/died). Statistical analysis was done and following observations are made

Majority of children in our study was in age group 1.1-5yrs-10.1-15 yrs (27.1%). In our study, the percentage of males (57%) admitted to PICU was more than the percentage of females (43%).

In our study CNS group (32.7%) topped the majority (similar to study)[27]followed by hemato-oncology (22.4%), respiratory (16.5%), cardiovascular (15.9%). Blood related infections and Sepsis carry major load of mortality.

WeattemptedtoseeifanyindividualvariablesofPRISMIIImodelhad an individual capacity to predict mortality independent of the other variables. In our study variables which are maximum predictive value were Temperature,PH, PCO2, Arterial PaO2, BUN and creatinine with mortality.

OurstudyshowedastatisticallysignificantrelationshipbetweenPRISM III score and mortality. Our results were consistent with most of the studies.

The overall mortality was 15.9% which was comparable to a study from India .[28]

InourstudymeanPRISMIIIscoreof24±7fornonsurvivorswithin24hr of admission which is higher as compared to survivors whose mean PRISM III score was 4±4.

ThecapacityofPRISMIIIScorefordiscriminationbetweensurvivedand expired subjects as analysed by ROC curve showed a strong predictive power for the PRISM-III-24(AUC=0.93).

Limitations:-
PRISM III is a widely accepted and is a standard against which other scores are compared. However there some problems 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 12/24 hours is used and a lot of deaths occur (in one study over 40%) with in first 24 hours, so the score may be diagnosing death rather predicting it.

There may be blurring of differences of 2 units as patient in a good unit mayrecoverrapidlyandscoremaybelowerandthesamepatientinabad unit might have had higher score due to poor management and high mortality of bad unit may be interpreted as due to sicker patients.

The time spent in the hospital before coming to ICU could improve the PRISM score and predict lower than actual mortality (lead time bias).[13]

In my study, I have not included cases of heart diseases, as there is different cardiac ICU for them.

Conclusion:-

High total PRISM III score was significantly associated with poor outcome i.e. death in this study. As the total PRISM III score increases, the mortality in PICU increases. Thus, PRISM III score was found to be a valid predictor of outcome in our PICU

Recommendations:-

1. PRISM III score was done at 12 and 24 hr of admission which predicts the outcomeofpatientinPICU.WestudiedtheoutcomeanalysiswiththePRISM- III score, which co-related well with the outcome.
2. PRISM-III-24scorecanbe usedroutinelyinpaediatricICU.
3. PRISM-IIIscoringsystemhelps in evaluationofseverityofthepatientatthe time of admission, which can help in counselling of parents regarding child's condition, decision making for any intervention.

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