PREDICTION OF OUTCOME OF THE CHILDREN ADMITTED IN PEDIATRIC INTENSIVE CARE UNIT USING PRISM III SCORING SYSTEM

Dissertation submitted for

M.D., DEGREE EXAMINATION

BRANCH VII PEDIATRIC MEDICINE

THE TAMIL NADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI

INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN
MADRAS MEDICAL COLLEGE
CHENNAI

APRIL 2017

CERTIFICATE

This is to certify that the dissertation titled "**Prediction Of Outcome Of The Children Admitted In Pediatric Intensive Care Unit Using Prism III Scoring System"** submitted by Dr.T.Yashwanth Raj to the Faculty of Pediatrics**,** the TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY, Chennai in partial fulfillment of the requirements for the award of M.D., DEGREE (PEDIATRICS) is a bonafide research work carried out by him under our direct supervision and guidance.

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I DR.T.YASHWANTH RAJ solemnly declare that the dissertation titled "**PREDICTION OF OUTCOME OF THE CHILDREN ADMITTED IN PEDIATRIC INTENSIVE CARE UNIT USING PRISM III SCORING SYSTEM"** has been prepared by me.

This is submitted to the Tamil Nadu DR.M.G.R Medical University**,** in partial fulfillment of the rules and regulations for the M.D Degree examination in Pediatrics.

Place : Chennai **DR.T.YASHWANTH RAJ**

Date :

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INSTITUTIONAL ETHICS COMMITTEE
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CERTIFICATE OF APPROVAL

To

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Dear Dr. Yashwanth Raj.T.

The Institutional Ethics Committee has considered your request and approved your study titled **"PREDICTION OF OUTCOME OF THE CHILDREN ADMITTED IN PAEDIATRIC INTENSIVE CARE UNIT USING PRISM III SCORING SYSTEM " No. 35102015.**

The following members of Ethics Committee were present in the meeting held on 06.10.2015 conducted at Madras Medical College, Chennai-3.

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We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

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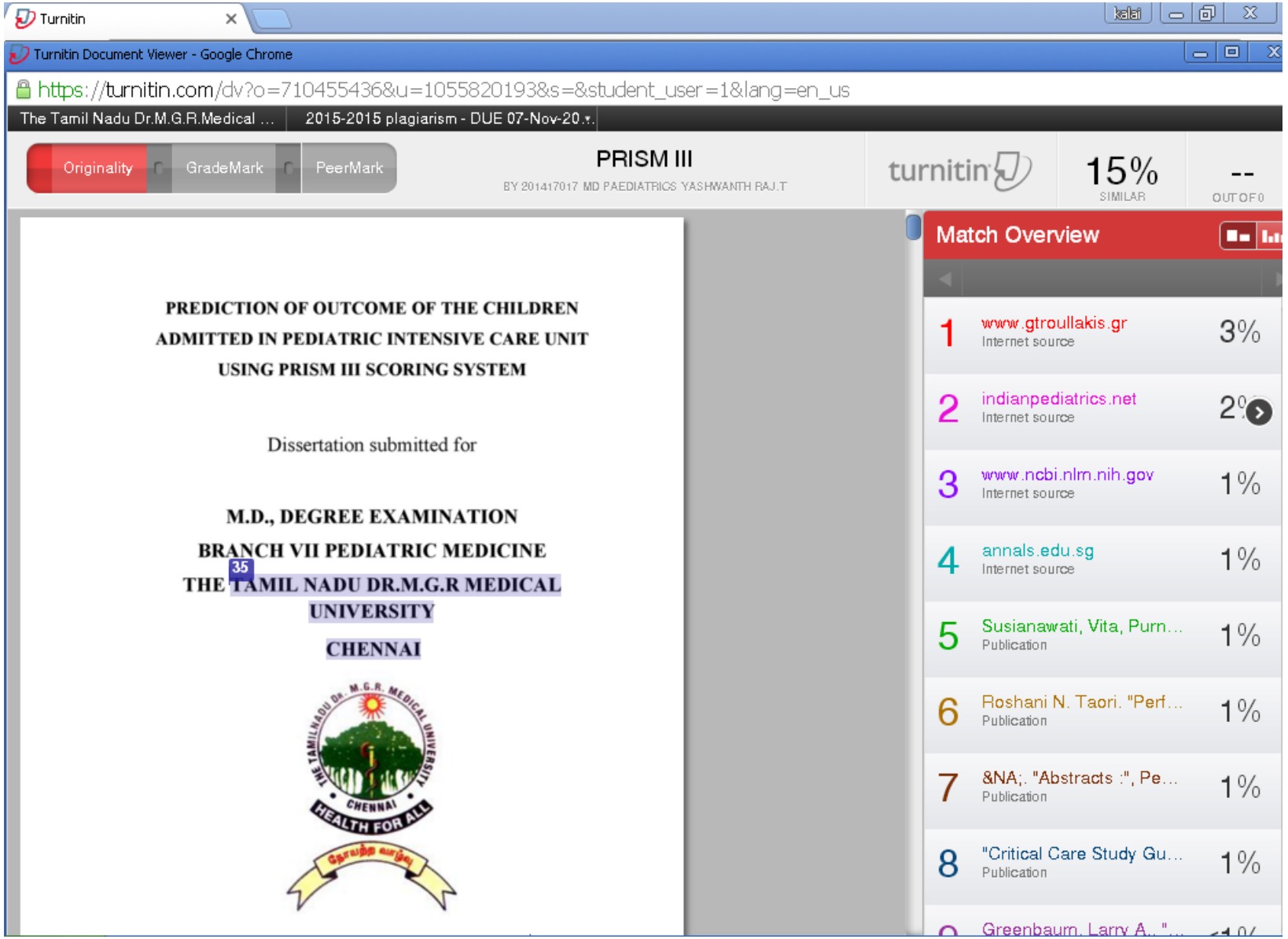
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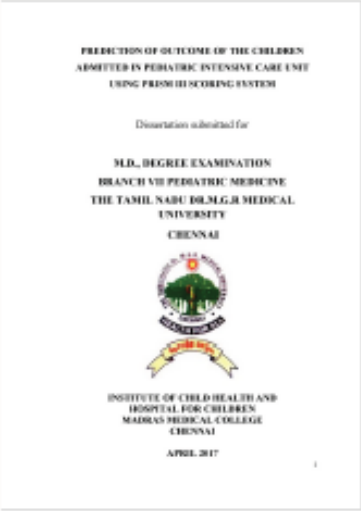

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ABBREVIATIONS

meq/L	–	milli-equivalents per litre
mg/dl	–	milligrams per decilitre
mmol/L	–	milli-moles per litre
mmHg	–	millimetres of mercury
AUC	–	Area under the curve
BP	–	Blood Pressure
BUN	–	Blood Urea Nitrogen
BVM	–	Bag valve Mask
PICU	–	Paediatric Intensive Care Unit
Cm	–	centimetres
CHD	–	Congenital Heart Disease
CCF	–	Congenital Heart Disese
CKD	–	Chronic Kidney Disease
CPR	–	Cardiopulmonary resuscitation
Cl	–	Chloride
DIVC	–	Disseminated Intravascular Coagulation
ER	–	Emergency Room
FiO2	–	Fraction of Inspired oxygen
GCS	–	Glasgow Coma Scale
HCO3	–	Bicarbonate
HUS	–	Hemolytic Uremic Syndrome
IEM	–	Inborn Error of Metabolism
MODS	–	Multi Organ Dysfunction Syndrome
Na	–	Sodium
PaO2	–	Partial Pressure of oxygen in artery

PaCO2	–	Partial Pressure of carbon dioxide
PAO2	–	Partial Pressue of oxygen in Alveoli
PIM	–	Paediatric Index of Mortality
PRISM	–	Paediatric Risk of Mortality
PSI	–	Physiological Stability Index
PT	–	Prothrombin Time
aPTT	–	activated Partial Thromboplastin Time
ROC	–	Receiver Operator Curve
RRT	–	Renal Replacement Therapy
SIRS	–	Systemic Inflammatory Response Syndrome
TTP	–	Thrombotic Thrombocytopenic Purpura
T3	–	Tri-iodo thyronine
T4	–	Thyroxine
UA	–	Unmeasured Anion
UC	–	Unmeasured Cation
WBC	–	White Blood Cell

CONTENTS

INTRODUCTION

The field of Pediatrics has shown a lot of advancements and improvements in the recent past, which is definitely essential, as we pediatricians care for the young, tender, budding and yet to bloom part of the society. Pediatrics has been considered as one of the most sensitive fields of medicine and with the growing burden of illness among children, it has become a huge responsibility as a lot has to be shouldered by the Pediatric physician. This is aptly applicable especially for the Pediatric Intensivist who deals with children who are critically ill and at the verge of mortality many a times.

To deal with children who are critically ill is a matter of high complexity. Hence they are catered in Pediatric Intensive Care Units designed especially for intensive monitoring of these children. These Pediatric Intensive Care Units have to be highly sophisticated with the latest technological advancements to treat these children, which costs a lot.

Though reducing the mortality is the primary aim of a PICU, how much ever the technological advancements may be, they have not always succeeded in improving the quality of patient care. At times, these advances which were made to augment the life expectancy have resulted in increasing the suffering and also have led to mere prolonging of the death of critically ill children. Thus it became mandatory to accurately identify the severity of illness of a child at admission which helps the physician to assess the prognosis.

A physician how much ever experienced he may be, his ability to estimate the risk of mortality for children admitted in PICU accurately is largely subjective. Hence, it became necessary to device prediction models and scoring systems, in order to quantify the severity of illness in a rational and objective manner. So the factors which reflect this severity of illness in a critically ill child include the physiological disturbances and the degree of co-morbidities they are suffering from. The Physician needs to measure how far apart these variables fall from the normal range and should weigh them objectively to assess their contribution to the child's mortality. This could aid the physician in different areas of care and treatment, such as selection of appropriate treatment, addressing various ethical issues and applying economic strategies.

It also allows him to classify patients according to severity and also helps him to compare various technological resources and clinical studies. When a child gets admitted it is difficult to establish criteria to treat him based on the clinical and laboratory values which allows to quantify the number of organs damaged along with the intensity of damage suffered. Thus after a lot of research, probability models and mortality scores were devised for the above purpose and since their introduction into PICUs, they have been used frequently as a part of quality control and research.

The PRISM (Pediatric Risk of Mortality) III [1] score is one of such scores which has been used commonly in PICUs. This was actually formulated from what called PSI (Physiological Stability Index) is obtained from 1415 patients treated in 9 PICUs of nine hospitals in the U.S between 1984 and 1985. The first devised PRISM score had 14 variables including laboratory and clinical data. The score was institution independent and was used to compare the different PICUs. Later in 1996, Pollack et al re-evaluated the physiological variables and their ranges in order to improve and update the performance of PRISM score belonging to the second generation. Thus was developed the PRISM III score.

The PRISM III score was developed after observing consecutively about 11,165 patients who were admitted in the various PICUs of about 32 hospitals. This was done to observe diversity among the organizations. Certain variables of all were found to be better predictors of outcome. They were minimum systolic BP, abnormal pupillary reflexes and Glasgow coma scale obtained from the PRISM III score.

The PRISM III score totally has about 17 physiological variables. They have been further subdivided into 26 ranges and are also independent of the population under study. The PRISM III scoring system was developed at the Children's National Medical Centre situated in Washington DC.

Children were classified based on their respective ages into four possible categories.

Neonate – a child less than 30 days old from birth

Infant – from age of 1 completed month to 12 months

Child – one completed year to 12 years of age

Adolescent – more than 12 years of age

SUBSCORES

1) Cardiovascular variables – 3
2) Neurological variable – 2
3) Acid base and blood gas variables – 5
4) Biochemical variables – 4
5) Hematological variables – 3

Each variable was given a score based on the range into which they fell. These parameters which included data obtained from clinical and biochemical and hematological parameters were obtained by the attending physician. They were summed up to obtain a final score to predict the outcome of the child in an objective manner.

Total PRISM III score = (cardiovascular & neurological subscore) + (acid base & blood gas sub score) + (Biochemical subscore) + (hematological subscore)

INTERPRETATION

Minimum subscore and total score = 0

Maximum cardiovascular and neurological subscore = 30

Maximum acid-base and blood gas subscore = 22

Maximum biochemical subscore =10

Maximum hematological subscore = 12

Maximum total PRISM subscore = 74

The higher the total score, the worse the prognosis. A rising score indicates deterioration. The PRISM III score has been considered as a standard scoring system yet it is difficult to use because a lot of variables have to be collected to obtain the score and interpret it. But it helps us in organizing the PICU and also aids us to find the effects change in practice modalities have, by observing the trends within the same PICU over a period of time. It is also used for monitoring the resources allocated for these critically ill children. PRISM III final score is obtained only at the end of 24 hours. Hence it cannot be utilized for deciding regarding admission into PICU.

The components included in the PRISM score are :

Cardiovascular Parameters

1) Systolic blood pressure
2) Heart rate
3) Temperature

Neurological Parameters

1) Glasgow coma scale
2) Pupillary response

Acid-Base & Blood gas Parameters

1) Acidosis
2) Alkalosis
3) PaO2
4) PCO2
5) HCO3

Biochemical Parameters

1) Glucose
2) Potassium
3) Creatinine
4) BUN

Hematological Parameters

1) Total WBC count
2) Platelets
3) PT/aPTT

When a critically ill child is admitted in the PICU, the clinical parameters are noted and blood samples are sent to the pathology and biochemistry laboratories and the reports are made available within the first 24 hours of admission. Hence after obtaining a certain value for all the parameters, subscores are calculated and finally the total score is obtained. Depending upon how high/low the score is, we plan accordingly regarding the modality and course of further management.

SYSTOLIC BLOOD PRESSURE

Blood pressure is defined as the pressure that is exerted laterally by the column of blood flowing on the walls of the vessels. Blood pressure refers to the arterial pressure that is present in the systemic circulation usually.

It is expressed in terms of the maximum pressure (systolic blood pressure) and the minimum (diastolic blood pressure). It is usually measured in terms of millimeters of mercury (mm Hg). Blood pressure is considered to be one of the four vital signs which also include Heart rate, Respiratory rate and Temperature.

Blood pressure varies depending on the disease state. The nervous system and the endocrine system play vital roles in regulation of blood pressure.

The normal range of systolic blood pressure in children falls between the 5^{th} percentile and the 95^{th} percentile.

Systolic blood pressure[2] more than 95^{th} percentile is referred to as Hypertension and blood pressure less than the 5^{th} percentile refers to Hypotension. There are formulas to calculate these variables as they are dependent on the age, sex and height of the child.

The Formula for Upper limit of blood pressure that corresponds to 95^{th} percentile is 90 + (age * 2).

The formula that corresponds to the lower limit of blood pressure i.e. the 5^{th} percentile is 70 + (age * 2).

The most important fact to be noted is that blood pressure is last vital to alter. Hence a change is blood pressure indicates significant alteration in the physiological status. Children's response to shock/ hypo perfusion is different from that of the adults. Initially they tend to have compensated hypertension as a response to shock rather a fall in blood pressure, which if unattended goes in for relative hypotension followed by absolute hypotension.

Hence, when a child is in absolute hypotension, it indicates that all her body's compensatory mechanism has fatigued and she is in a state of imminent arrest. Such children have to be resuscitated cautiously and aggressively

depending on their etiology as their prognosis is guarded. Children who had been in state of prolonged hypotension land up usually in multi-organ dysfunction syndrome and DIVC. Hence aggressive resuscitation with isotonic fluids and vasopressors is essential in such scenarios.

HEART RATE

Heart rate is the next parameter included in the cardiovascular system and being one among the vitals is undoubtedly considered to be of prime importance. Heart rate can be simply defined as the number of times the heart contracts in one minute as it is expressed as beats per minute. Usually it correlates well with the pulse measured in the periphery and it varies widely according to the body's physiological needs.

Heart rate depends basically on the number of impulses generated spontaneously from the Sino-atrial node located in the right atrium and this SA node function well under the influence two systems i.e. the sympathetic and the parasympathetic system. The sympathetic system accelerates the heart rate by releasing nor-epinephrine whereas the parasympathetic system decreases the heart rate by releasing acetylcholine.

Heart rate depends on a numerous factors. Some of the factors responsible for increasing the heart rate are:

Hypoxia, hypercarbia, acidosis, fall in blood pressure, increased catecholamine surges, physical activity, emotions, increased circulating T3 and T4, increased calcium, increased temperature, etc.

Factors decreasing the Heart rate and force of contraction are:

Increased levels of oxygen, hypocarbia, alkalosis, baroreceptor activation, relaxation, sleep, decreased epinephrine, decreased T3 and T4, decreased calcium, increased potassium, hypothermia, etc.

Heart rate[3] just like the blood pressure varies depending on the age of the child. Heart rate that is more than 2 standard deviation from the mean is said to be tachycardia and if less than 2 standard deviation from mean, then it is said to be bradycardia. A child in bradycardia is said to be in a state of imminent arrest. Hence appropriate resuscitative measures starting from chest compressions and BVM ventilation to vasopressors have to be initiated as soon as possible. The normal ranges of heart rates for various age groups are:

Age	**Awake Rate**	**Sleeping Rate**
Neonate (<28 d)	100-205	90-160
Infant (1 mo-1 y)	100-190	90-160
Toddler (1-2 y)	98-140	80-120
Preschool (3-5 y)	80-120	65-100
School-age (6-11 y)	75-118	58-90
Adolescent (12-15 y)	60-100	50-90

TEMPERATURE

Temperature is considered to be one of the four vital signs measured, which stratifies its significance being a part of the PRISM III scoring system coming under the cardiovascular parameters. Temperature depends on age, sex, health, reproductive status, environment, activity and emotion etc. Euthermia or normothermia is a narrow range of body temperature in which the person enjoys optimal health. The physiological process involved in maintaining this euthermia is called thermoregulation.

Temperature[4] can be measured usually at three different sites in the body.

1) Oral
2) Axillary
3) Rectal

The order of higher to lower temperature proceeds as Rectal >Oral>Axillary. The body temperature normally shows diurnal variation of 0.5 degree Celsius with lowest being in morning and highest in the evening. The cut-off values to deem the child to be suffering from fever varies depending on where we measure the temperature. If is from rectum, value > 38 degree Celsius is considered to be fever.

If measured from oral cavity, value more than 37.5 degree Celsius is considered to be fever. If measured from axilla, value more than 37.2 degree Celsius is considered to be fever. Pyrexia occurs as a result of the inflammatory

mediators released in response to evoke an inflammatory response in order to kill the invading pathogen, yet, temperature regulation is very important as the basal metabolic rate increases in pyrexia and body's physiological demands shoot up.

Also, Hyperpyrexia defined as a temperature more than 41.5 degree Celsius is extremely hazardous, especially in a critically ill child, as we know "Hyperpyrexia fries the brain. '' Hence, treatment modalities like tepid sponging, cooling and antipyretics such as Paracetamol and Mefenamic acid play a vital role in bringing down the temperature which act by inhibiting the synthesis of inflammatory mediators like prostaglandins and interleukins. Just like hyperthermia hypothermia also has devastating effects when goes beyond physiological tolerance.

Therapeutic hypothermia has been used as a cerebro-protective strategy in many centers especially for children with encephalopathy as it brings down the basal metabolic rate. However when the core temperature goes below 35 degree Celsius, hypothermia has its own devastating effects on the child's physiology.

Glasgow Coma Scale

It is important to monitor the neurological intactness of a critically ill child. This is achieved using the Glasgow Coma Scale. It was devised[5] by Graham Teasdale and Bryan. J. Jennet in the year 1974 and was initially used to assess the victims of traumatic brain injury. The GCS scale is used as a

component of scoring systems in many PICUs worldwide. The GCS scale uses three basic parameters to guide the physician to assess the neurological state of the acutely ill child. The scoring systems three parameters:

1) Eye opening
2) Verbal response
3) Motor response

Each component has a minimum score of 1, hence the minimum total possible score falling at three, whereas the maximum possible score varies in fashion of 4 for eye opening, 5 for verbal response and 6 for motor response making the maximum possible total score being 15. The aspects used to assess the neurological status of an infant vary slightly from that of an older child.

The GCS scale used for the neurological status of an infant comprises following:

S.NO	PARAMETER	SCORE
	EYE OPENING	
1	Spontaneous	4
2	To shout/ verbal stimuli	3
3	To pain	2
4	No response	1

	VERBAL RESPONSE	
1	Coos, babbles, smiles	5
2	Cries irritably	4
3	Cries only to pain	3
4	Moans/Grunts to pain	2
5	No response	1
	MOTOR RESPONSE	
1	Moves limbs spontaneously	6
2	Withdraws to touch	5
3	Withdraws to pain	4
4	Decorticate rigidity	3
5	Decerebrate rigidity	2
6	No response	1

The GCS scale used for the neurological status of an older child comprises following:

S.NO	PARAMETER	SCORE
	EYE OPENING	
1	Spontaneous	4
2	To shout/ verbal stimuli	3
3	To pain	2
4	No response	1
	VERBAL RESPONSE	
1	Well oriented	5
2	Confused	4
3	Talks incoherently	3
4	Makes incomprehensive sounds	2
5	No response	1
	MOTOR RESPONSE	
1	Obeys commands	6
2	Localizes pain	5
3	Withdraws/flexes to pain	4
4	Decorticate rigidity	3
5	Decerebrate rigidity	2
6	No response	1

PUPILLARY REACTION

Pupils are the apertures present in the center of the iris of the eye. It is through the pupils that light travels through the lens to reach the retina to stimulate visual processing. Iris is made of smooth muscles arranged in a circular fashion around the pupil. Hence, when light enters the eye through the pupil, the amount of light traversed is usually controlled by the contraction of iris musculature. The iris contains two groups of muscles namely

1) Circular group called as sphincter pupillae
2) Radiant group of muscles called dilator pupillae

When the sphincter pupillae contract, the pupils constrict/ decrease in size. When the dilator pupillae contract, the pupils dilate/ or increase in size. The sphincter pupillae is innervated by the parasympathetic system whereas the dilator pupillae is innervated by the sympathetic system (i.e.) by the superior cervical ganglion. When the parasympathetic system is activated, the other system is inhibited. Eg: When pilocarpine drops is applied topically, it causes the pupils to constrict and atropine drops causes the causes the pupils to dilate.

When bright light is allowed to fall on the eyes, it causes the pupils to undergo reflex constriction and similarly when a person enters into a dim lit room, the pupils tend to dilate. This mechanism can be explained by the pupillary reflex.

Light from the environment enters the eye through the pupils and lens to reach the retina. When retina is stimulated, impulses are generated from retina and they pass through the optic nerve to reach the Optic chiasma. From the optic chiasma impulses generated from the temporal half of the retina are carried through the ipsilateral optic tract whereas the impulses from the nasal half of retina of the same eye cross over at the optic chiasma to enter the optic tract of the opposite side.

These impulses travel via the optic tract and separate themselves from the tract before reaching the lateral geniculate body. These nerve fibers enter the brainstem at the level of superior colliculus to reach the pre-tectal nucleus. Nerve fibres from pre-tectal nucleus of one side innervate the Edinger Westphal nucleus present on both sides of the midbrain. This mechanism is responsible for the consensual light reflex seen in the opposite eye.

The impulses generated from the edinger westphal nucleus are carried along the oculomotor nerve to reach the ciliary ganglion. And the short ciliary nerve from the ganglion is the one that finally innervates the sphincter pupillae to cause pupillary constriction. In cases of space occupying lesions, compression of the oculomotor nerve/optic nerve causes pupillary dilatation.

ACIDOSIS

The normal pH range[6] that is required to maintain the homeostasis of our body is from 7.35 to 7.45. This is because the various cellular functions and the enzymes of our body function optimally only in neutral pH. Any pH that is less than 7.35 is said to be called as academia whereas acidosis refers to the fall in the level of bicarbonate secondary to utilization of the bicarbonate ions for neutralizing the accumulated H+ ions due to some pathological process.

An altered pH has its deleterious effects on the various body systems. Acidosis causes accumulation H+ ions which in turn cause stimulation of the respiratory centre to cause reflex hyperventilation. When the pH of the body falls below 7.2 the chances for mortality greatly increase. Such acidemia causes refractoriness of the cardiovascular system to endogenous and exogenously administered inotropes making the child more prone for tachyarrhythmias.

Further acidosis causes transcellular shift of potassium into the intravascular compartment causing hyperkalemia. Severe acidosis causes impairment of the cerebral metabolism causing the child to be stuporous or comatosed.

Acidosis can be of two types.

1) Metabolic
2) Respiratory

For metabolic acidosis to occur, two basic processes are required.

a) Loss of bicarbonate from the body
b) Addition of H+ ions to the body

Whereas respiratory acidosis occurs when there excess accumulation of CO2 in the body. Usually caused by conditions like type 2 respiratory failure, air leak syndromes & central hypoventilation disorders.

When there is metabolic acidosis, the body tries to compensate for the same via the Respiratory system

Metabolic acidosis – Winter's formula

Expected pCO2 = 1.5 * HCO3 + 8 (+/-) 2

Respiratory acidosis

Acute – bicarbonate increases by 1 for every 10 mmHg increase of pCO2

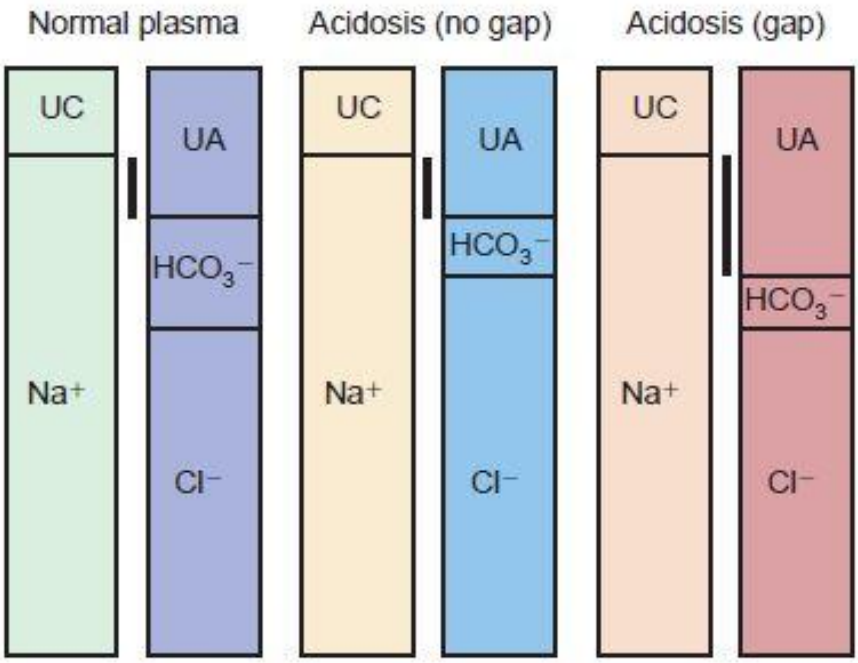
Chronic – bicarbonate increases by 3.5 for every 10 mmHg rise in pCO2

In case of metabolic acidosis, it is essential to classify as normal or wide anion gap metabolic acidosis. This is done after measuring the anion gap.

Hence anion gap is calculated using the formula :

Anion gap = Na – (Cl + HCO3) or UA – UC

Normal anion gap[2] ranges from 4 to 12.



The above picture explains the anion gap concept where the anion gap is the difference between the unmeasured anions and the unmeasured cations or the difference between the measured cations and measured anions. This is obtained by taking an arterial blood gas analysis using which we classify the child having acidosis as either normal anion gap or wide anion gap acidosis.

This is particularly important because it helps us in identifying the etiology and also plan the course of treatment depending on the cause.

Table 55-12	Normal Values of Arterial Blood Gases
pH	7.35-7.45
$[HCO_3^-]$	20-28 mEq/L
PCO_2	35-45 mm Hg

ALKALOSIS

The patient is said to be in a state of alkalosis[2] when there is excess bicarbonate ions in the body than required. Any pH greater than 7.45 is called as alkalemia. Alkalosis can be further classified as metabolic or respiratory alkalosis.

Primary buildup of bicarbonate ions refers to metabolic alkalosis whereas fall in the level of CO2 due to hyperventilation refers to respiratory alkalosis.

Metabolic alkalosis is classified based on the response to chloride therapy as :

1) Chloride responsive

2) Chloride resistant metabolic alkalosis

CHLORIDE-RESPONSIVE (URINARY CHLORIDE <15 MEQ/L)
Gastric losses
Emesis
Nasogastric suction
Diuretics (loop or thiazide)
Chloride-losing diarrhea (OMIM 214700)
Chloride-deficient formula
Cystic fibrosis (OMIM 219700)
Post-hypercapnia
CHLORIDE-RESISTANT (URINARY CHLORIDE >20 MEQ/L)
High blood pressure
Adrenal adenoma or hyperplasia
Glucocorticoid-remediable aldosteronism (OMIM 103900)
Renovascular disease
Renin-secreting tumor
17β-Hydroxylase deficiency (OMIM 202110)
11β-Hydroxylase deficiency (OMIM 202010)
Cushing syndrome
11β-Hydroxysteroid dehydrogenase deficiency (OMIM 218030)
Licorice ingestion
Liddle syndrome (OMIM 177200)
Normal blood pressure
Gitelman syndrome (OMIM 263800)
Bartter syndrome (OMIM 607364/602522/241200/601678)
Autosomal dominant hypoparathyroidism (OMIM 146200)
EAST syndrome (OMIM 612780)
Base administration

Respiratory alkalosis associated with an inappropriate fall in the blood CO2 levels is usually seen with hyperventilation. The body counteracts the CO2 fall by renal regulation of bicarbonate ions causing increased excretion of HCO3 to cause a fall in the blood pH. However, compensation mechanisms never tend to overshoot to bring back the pH to normal level.

Causes for respiratory alkalosis include

HYPOXEMIA OR TISSUE HYPOXIA
Pneumonia
Pulmonary edema
Cyanotic heart disease
Congestive heart failure
Asthma
Severe anemia
High altitude
Laryngospasm
Aspiration
Carbon monoxide poisoning
Pulmonary embolism
Interstitial lung disease
Hypotension

LUNG RECEPTOR STIMULATION
Pneumonia
Pulmonary edema
Asthma
Pulmonary embolism
Hemothorax
Pneumothorax
Respiratory distress syndrome (adult or infant)

CENTRAL STIMULATION
Central nervous system disease
- Subarachnoid hemorrhage
- Encephalitis or meningitis
- Trauma
- Brain tumor
- Stroke

Fever
Pain
Anxiety (panic attack)
Psychogenic hyperventilation or anxiety
Liver failure
Sepsis
Pregnancy
Mechanical ventilation
Hyperammonemia
Extracorporeal membrane oxygenation or hemodialysis
Medications
- Salicylate intoxication
- Theophylline
- Progesterone
- Exogenous catecholamines
- Caffeine

The renal regulation for correcting the respiratory alkalosis takes some time to act.

The formula for calculating whether the compensation is adequate or not is :

Acute Respiratory alkalosis

HCO3 falls by 2 meq for every 10 mmHg fall in PCO2

Chronic Respiratory alkalosis

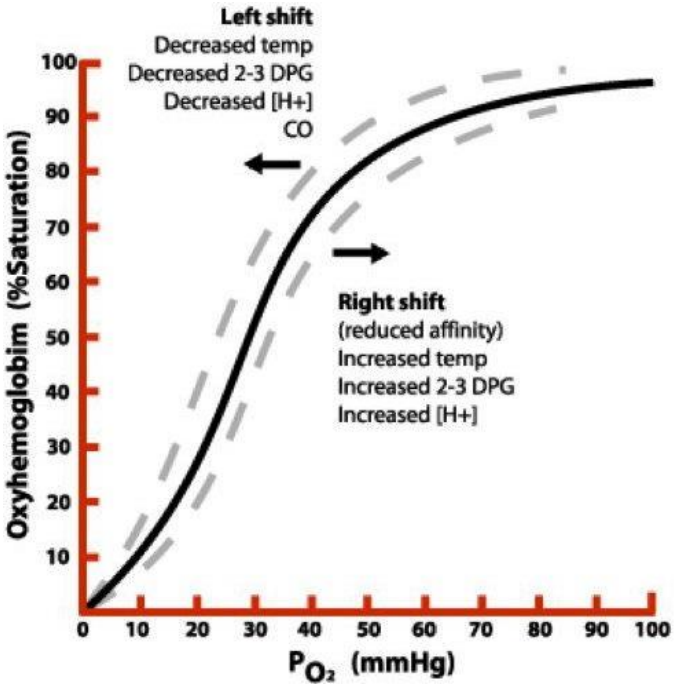
HCO3 falls by 4 meq for every 10 mmHg fall in PCO2

PULMONARY ARTERIAL O2

Partial pressure of oxygen[7] called as the PaO2 represents the partial pressure of oxygen that is present in the pulmonary arteries. This is a measured value obtained by arterial blood gas analysis. The partial pressure of oxygen varies in different regions of the body. It is around

1) 160 mmHg in external atmosphere at sea level
2) 100 mmHg in the alveoli
3) 80 – 100 mmHg in the pulmonary artery
4) 40 - 50 mmHg in the venous blood

This difference in the partial pressure of oxygen is responsible for diffusion of oxygen from high pressure to low pressure regions. The saturation or SpO2 is usually maintained in normal range unless the partial pressure falls below 60mmHg. Hence saturation alone is not a good reliable indicator of oxygenation status.



This can be understood with the help of oxygen dissociation curve (sigmoid shaped curve). Thus it is of prime importance to measure the partial pressure of O2 in pulmonary artery.

Also the difference between the ventilation and diffusion defects can be identified by measuring the A-a gradient.

PAO2(alveoli) = FiO2 (760 – 43) – 1.25 * PCO2

A-a gradient = PAO2 – PaO2 which is normal in ventilation defects and increased in diffusion problems.

Partial pressure of CO2

The partial pressure of carbon di oxide in the pulmonary artery is denoted by PCO2. It is again a measured value obtained from arterial blood gas analysis.

The partial pressure CO2 varies in different places.

1) In the external atmosphere – 0.3 mmHg
2) About 35 mmHg in the Alveoli
3) 40 mmHg in the arterial blood
4) 45 – 50 mmHg in the venous blood

This pressure difference helps in diffusion of CO2 from the tissues to the blood and from the blood to the alveoli.

Excess accumulation of PCO2 occurs in airway diseases or air leak syndromes (warrants intercostal drainage) or type 2 respiratory failure leading to respiratory acidosis causing compensatory increase in HCO3 ions. Any condition where the value goes beyond 65 mmHg acutely warrants mechanical ventilation. Whereas hyperventilation is contraindicated in chronic respiratory acidosis because these patients depend on the hypoxic state for respiratory stimulation which gets washed out on hyperventilation.

Serum Bicarbonate

The serum bicarbonate is a very important indicator of the electrolyte dispersion and anion deficit. Along with the pH it is used in the diagnosis and management of serious acid base disorders in metabolic and respiratory systems. It forms the second largest group of anions in the body. The normal value of serum bicarbonate ranges from 20 – 28 meq/L.

This bicarbonate buffer system[8] plays a major role in maintaining a neutral pH and normal homeostasis

$$CO_2 + H_2O \rightleftarrows H_2CO_3 \rightleftarrows HCO_3^- + H^+$$

Failure of this system to operate properly leads to derangements like acidemia or alkalemia. The CO2 produced by the cells is hydrated to form the HCO3 ion, which is carried in the blood to the lungs, where it is dehydrated back to CO2 and via the lungs into the atmosphere. The bicarbonate ion levels are also regulated by the renal system which regulates by means of either excreting excess H+ ions in the urine or by means of synthesizing and secreting HCO3 ions into the plasma. Exogenous bicarbonate available as sodium bicarbonate, citrate are usually used for treating condition of severe acidosis where the pH usually falls below 7. Renal failure, IEMs is some of such conditions warranting bicarbonate therapy.

SERUM CREATININE

Creatinine is obtained from the breakdown of creatinine phosphate seen in the muscle. Hence its serum value depends on the muscle mass of the person. It is widely used as an endogenous indicator of how well the renal system is performing. It is excreted by the kidneys not only via the glomerular filtration but also via tubular secretion. There does not occur much of tubular reabsorption of creatinine. If the filtration process in the kidneys are defective the serum creatinine value increases. Hence the urine and serum creatinine values are used for calculating Creatinine Clearance which parallels with the GFR. But at times it over-estimates the GFR because creatinine is secreted by the proximal tubule even when GFR is poor.

The BUN to creatinine ratio is a method of finding whether the renal failure is a pre-renal or intrinsic one. The ratio more than 20 usually indicates it to be of Pre-renal cause. Another disadvantage of creatinine is that it is a late marker of renal damage. Hence estimated GFR is considered a better marker of early renal dysfunction. Usually expressed as mg/dl. Values upto 0.7 mg/dl are usually normal in children up to 12 years of age.

BLOOD UREA NITROGEN

Blood urea nitrogen is an important indicator of proper renal functioning. Yet it depends on various other factors like intake of protein, perfusion status, presence of CCF, Gastro-intestinal hemorrhage, etc. Urea is synthesized in the liver from urea cycle and released into blood to be excreted

via kidneys. Hence it serum levels are a reflection of Liver and renal functioning. Usually expressed in mg/dl. The normal reference range in pediatrics being from 5 to 18 mg/dl. It can be derived even by measuring the value of urea.

BUN = Serum Urea / 2.14

The BUN to creatinine ratio more than 20 indicates pre-renal failure. This is because in a volume depleted state, the proximal tubules reabsorb sodium and water along with large quantities of urea. Similarly BUN to creatinine ratio more than 30 has a good sensitivity of detecting Gastro-intestinal hemorrhage. Children with elevated levels of both BUN > 100 - 150 mg/dl and elevated levels of creatinine are usual candidates for dialysis.

POTASSIUM

The potassium[9] is the positively charged cation forming a major chunk of the intracellular ions. Being an important component of the electrolyte family, it is essential for the normal cellular and electrical functioning of the body. It helps in regulating the acid base balance and water balance. The concentration of intracellular potassium is about 150 meq/L whereas the extracellular concentration is about 3.5 to 5.5 meq/L. Majority of body potassium is contained in the muscle. Majority of extracellular potassium is found in the bone. Since most of the body potassium is contained intracellularly, the serum potassium doesn't exactly reflect the body potassium.

The Na-K ATPase pump is the one that maintains the normal intracellular concentration of potassium.

The normal potassium requirement per day is usually 1-2 meq/kg/day. The intestine normally absorbs 90% of the potassium in the food. Most of the potassium is lost in the stools and some in the stools. The principle hormone regulating potassium is aldosterone. Potassium levels less than 3.5 meq/L is said to be hypokalemia and levels more than 5.5 meq/L is said to be hyperkalemia. Be it hyper or hyperkalemia, it has to be identified earlier and treated promptly as altered potassium level has adverse effects on the cardiovascular system.

BLOOD SUGAR

Blood sugar[2] measurement is the reflection of the concentration of glucose that is present in the blood. Usually it is expressed in the form of glucose present per deciliter of blood. Blood glucose is the main source of energy for the cells of the body. The glucose absorbed from the intestine is made available to the tissues via hormone insulin mediated via certain transport mechanisms. Blood glucose levels higher than normal is hyperglycemia i.e fasting more than 110mg/dL or post prandial more than 200 mg/dL and a blood glucose lower than 54 mg/dL is said to be hypoglycemia. Hormones involved in glucose homeostasis are insulin, glucagon, epinephrine, cortisol and growth hormone. They act mediated by the feedback mechanisms to sustain normoglycemia.

When a child is having hyperglycemia he/she may suffer from symptoms of hyperosmolarity such as polyuria, polydipsia, loss of weight, vomiting and abdominal pain, lethargy, etc. In case of hypoglycemia the child suffers from lethargy, irritability, diaphoresis, palpitations, tremors and seizures. Usually we measure glucose by Capillary blood glucose Glucometers which is higher than the serum glucose value of venous blood. Hence monitoring and maintaining normoglycemia is of core importance in a child who is critically ill as glucose is the basic fuel required for running the systems of the body.

TOTAL LEUCOCYTE COUNT

The complete blood count[2] panel includes the total leucocyte count, differential count, hemoglobin and platelet counts. Of these, the total leucocyte count is the most commonly used first line parameter in terms of assessing the presence of an infection. In order to interpret the total count value, one needs to know the normal range for various age groups.

Leucocyte Count normal range in * 1000 cells/mm cube

0 – 30 days	9.1 – 34.0
1 – 23 months	6.0 - 14.0
2 – 9 years	4.0 – 12.0
10 – 17 years	4.0 – 10.5

Hence whenever the counts are outside the above mentioned range the treating physician has to evaluate the child further for any potential source of infection. Counts less than the normal range is said to be leucopenia whereas counts above the range is leukocytosis. Between these two, Leucopenia has higher significance because it indicates the child to be suffering from overwhelming sepsis causing severe bone marrow suppression and peripheral destruction. The total leucocyte count is thus made an essential component of the SIRS criteria.

PLATELET COUNT

Platelets also called as thrombocytes are derived from the bone marrow from their precursors called megakaryocytes. Platelets are primarily involved in the process of hemostasis, In fact the entire process of formation of hemostasis plug occurs with the help of the coagulation factors on the surface of the platelets which are adhered to the endothelium by means of specific receptors. The normal platelet count ranges from 1,50,000 to 4,00,000. Values less than 1.5 lakhs is said to be called as thrombocytopenia whereas values more than 4.5 lakhs are said to be thrombocytosis.

Infections can cause both drop or an increase in the platelet count depending upon severity or the type. Thrombocytosis is usually associated with septicemia of bacterial origin whereas thrombocytopenia may be associated with infections like dengue, enteric fever, scrub typhus, overwhelming sepsis, DIVC, etc.

Hence, platelet count serves as an important indicator in predicting the outcome of a critically ill patient.

PROTHROMBIN TIME AND PARTIAL THROMBOPLASTIN TIME

Coagulopathy[10] is often a common cause for mortality in a critically ill patient. As the critically ill patient is more prone for circulatory failure, he is subjected to prolonged periods of hypotension, as a result of which he goes from a state of SIRS to Multi-organ dysfunction syndrome. Even when the ongoing pathology remains uncorrected at this point, the child's body triggers the process of Disseminated Intravascular coagulation. Once DIVC sets in, it causes enormous consumption of clotting factors and platelets, forming clots throughout the vessels all over the body. This overt consumption causes complete depletion of clotting factors and platelets in the body and the child starts bleeding profusely when the fibrinolytic system gets activated leading to death.

Prothrombin time is a measure of the intactness of the extrinsic pathway of coagulation. It depends mainly on the level of factor 7 and tissue factor. Similarly, PT gets elevated first in a case of liver disorder as synthesis of vitamin K dependent clotting factors 2,7,9,& 10 is affected. Partial thromboplastin time is a measure of intactness of the Intrinsic pathway of coagulation. It depends on the level of factors 12, 11, 9 & 8. Usually factor 12 deficiency doesn't cause severe bleeding manifestation clinically.

A problem involving the factors of the common pathway such as calcium, factor 10, thrombin result in prolongation of both PT and aPTT levels. In conditions like sepsis DIVC, TTP & HUS, factors involving both the intrinsic and extrinsic pathways are affected leading to prolongation of both PT and aPTT. Hence, measurement of PT & aPTT in a critically ill child is of utmost importance as early recognition of such pathology might help save the child's life as it warrants transfusion therapies like Fresh Frozen plasma and Cryoprecipitate to normalize the coagulopathy that has set in as a result of prolonged circulatory failure.

MODS

Defined as presence derangement of two or more organ systems[2] as given below

Cardiovascular	Despite administration of isotonic intravenous fluid bolus ≥60 mL/kg in 1 hr: decrease in BP (hypotension) systolic BP <90 mm Hg, mean arterial pressure <70 mm Hg, <5th percentile for age, or systolic BP <2 SD below normal for age *or* Need for vasoactive drug to maintain BP in normal range (dopamine >5 µg/kg/min or dobutamine, epinephrine, or norepinephrine at any dose) *or* Two of the following: Unexplained metabolic acidosis: base deficit >5.0 mEq/L Increased arterial lactate: >1 mmol/Liter or >2× upper limit of normal Oliguria: urine output <0.5 mL/kg/hr Prolonged capillary refill: >5 sec Core to peripheral temperature gap >3°C (5.4°F)

Respiratory	PaO_2/FIO_2 ratio <300 in absence of cyanotic heart disease or preexisting lung disease *or* $PaCO_2$ >65 torr or 20 mm Hg over baseline $PaCO_2$ *or* Need for >50% FIO_2 to maintain saturation ≥92% *or* Need for nonelective invasive or noninvasive mechanical ventilation
Neurologic	GCS score ≤11 *or* Acute change in mental status with a decrease in GCS score ≥3 points from abnormal baseline
Hematologic	Platelet count <100,000/mm^3 or a decline of 50% in the platelet count from the highest value recorded over the last 3 days (for patients with chronic hematologic or oncologic disorders) *or* INR >1.5 *or* Activated prothrombin time >60 sec
Renal	Serum creatinine >0.5 mg/dL, ≥2× upper limit of normal for age, or 2-fold increase in baseline creatinine value
Hepatic	Total bilirubin ≥4 mg/dL (not applicable for newborn) Alanine transaminase level 2× upper limit of normal for age

REVIEW OF LITERATURE

STUDY 1

Application of the Paediatric Risk of Mortality Score (PRISM) score and determination of mortality risk factors in a tertiary paediatric intensive care unit[11]

Graziela de Araujo Costa,I Artur F. Delgado,I Alexandre Ferraro,I Thelma Suely Universidade de Sa˜o Paulo, Sa˜o Paulo, Brasil.

The above study was conducted in pediatric intensive care unit in Sao Paulo in Brasil in 2010.

This was a retrospective cohort study done in the pediatric intensive care unit in Instituto da Crianca, Hospital das Clinicas, University of Sao Paulo. This institute is a tertiary care hospital that receives highly critical and complex cases which may be either medical or surgical. They had conducted the study over a period of one year. It included children from the age group of one year to 18 years of age. The study was approved by the regional ethics committee of Sao Paulo University.

Medical records were analysed and PRISM scores corresponding to the first 24 hours of hospitalisation were obtained. The scores were calculated according to the method proposed by Pollack et al. Patients who died within 8 hours of admission into the ICU or patients who were discharged within 24

hours of admission as they did not require ICU care were excluded from the study.

Further data regarding the study population characteristics, their physiological status and the treatment given to them were recorded. The data was tabulated in spread sheet and analysed using STATA software. Median value for PRISM scores of the individuals were obtained. Chi Square test was used to analyse the categorical variables.

The p values and Odds ratio were obtained using logistic regression models. Associations between the risk factors and PRISM score was studied using the Pearson correlation coefficient. A p value of 0.05 or less was considered to be significant. Logistic regression was applied and ROC curve was obtained, thus analysing the discriminative power and calibration of the model was obtained.

There were about 398 admissions during the study period. Children who met the inclusion criteria were 359. The median PRISM score in patients who met mortality was high compared to those who survived. The assessment of discriminatory power of the PRISM score was measured using the area under the ROC curve. It was found to be 0.76, proving to be fair. The calibration was calculated using the Hosmer Lemeshow Chi Square test was shown to be adequate.

Hence the PRISM score showed good discriminatory capacity and calibration in its ability to predict the outcome in the form of mortality in a critically ill child admitted in PICU of a tertiary care hospital.

STUDY 2

Performance of PRISM (Paediatric Risk of Mortality) Score and PIM (Paediatric Index of Mortality) Score in a Tertiary Care Paediatric ICU[12]

Roshani N. Taori, Keya R. Lahiri and Milind S. Tullu

Paediatric Intensive Care Unit, Department of Paediatrics, Seth G.S. Medical College and KEM Hospital, Mumbai

The objective of this study was to validate the PRISM score and the PIM score. The study was conducted in PICU of Seth G.S Medical college and KEM Hospital Mumbai. All consecutive patients admitted in the PICU meeting the inclusion criteria were studied. Patients who required ICU stay less than 2 hours or those who died within 24 hours of admission were excluded.

They computed the PRISM and PIM score of the patients included in the study. The outcome of the study was measured in the form of survived and not survived. ROC curve was made use to measure discriminatory power. Hosmer Lemeshow goodness of fit test was used to calculate the calibration.

Two hundred and thirty patients were included in the study. Mortality was more in infants compared to older children. The percentage of predicted deaths was 24 % for PRISM score and 7 % for the PIM score. The area under the curve was 0.851 for the PRISM score and 0.839 for the PIM score. The Hosmer Lemeshow goodness of fit test showed PIM score to have poor calibration.

Thus it was concluded that the PRISM score was a useful tool compared to the PIM score in predicting the outcome of the critically ill child as it includes both clinical and laboratory data.

STUDY 3

Risk Factors for Predicting Mortality in a Paediatric Intensive Care Unit[13]

G H Tan, *MBBS, M Med (Paed)*, T H Tan, *MBBS, M Med (Paed), MRCP*, D Y T Goh, *MBBS, M Med (Paed)*, H K Yap, *MBBS, MD, FRCP*

The above study was conducted in a tertiary care hospital in Singapore to assess the ability of PRISM score in predicting the outcome of children admitted in the PICU. The study included children meeting the inclusion criteria admitted in the PICU. This is a cohort study done over a period of one year. They included risk factors like presence of MODS, Requirement for RRT, Mechanical ventilation, etc along with PRISM 3 score to assess which among them was the most significant factor in predicting the outcome.

Univariate and multivariate analysis showed presence of MODS, need for RRT and mechanical ventilation were having significant p values.

It was concluded that PRISM III scoring was the single most important tool in predicting the outcome of critically ill children admitted in the PICU and there was 15.8 times increase in the mortality of patients with a PRISM score of 8 or above and this detail regarding the patient will help the treating doctor to deal with various ethical and clinical issues.

STUDY 4

EVALUATING THE PERFORMANCE OF PEDIATRIC RISK OF MORTALITY (PRISM) SCORE AS A TOOL TO PREDICT MORTALITY IN CHILDREN ADMITTED TO PAEDIATRIC MEDICAL WARDS OF KENYATTA NATIONAL HOSPITAL[14]

The above study was done in Kenyatta National hospital present in Nairobi targeting the acutely ill children from age 1 month to 12 years of age, admitted in the acute rooms in the pediatric wards.

The primary objective of the study was to predict the probability of death that occurred at various PRISM scores. The PRISM scores were tabulated and logistic regression was used to calculate the risk of mortality.

Totally, 210 patients were enrolled in the study. 61 patients died due to critical illness. There was 3 percent mortality among children with PRISM score 0 to 9 and it raised to more than 80 percent for children with PRISM score more than 29. Thus, there is an increasing probability of death with increasing PRISM scores with size being in an exponential manner. Hence, PRISM scores be adopted and used regularly in the PICUs to predict the outcome of children

STUDY 5

Prognostic predictor at Pediatrics Intensive Care Unit (PICU) with Pediatric Risk of Mortality III (PRISM III) scores[15]

Vita Susianawati, Purnomo Suryantoro, Roni Naning
Department of Pediatrics, Faculty of Medicine, Universitas Gadjah Mada/ Dr. Sardjito Hospital, Yogyakarta

The above study was conducted in the pediatric tertiary care hospital , situated in Yogyakarta, Indonesia. About 64 patients were included in the study after meeting the inclusion and exclusion criteria.

The study was conducted to assess the PRISM III scoring system's ability to predict the outcome in a critically ill child admitted PICU of Dr.Sardjito General Hospital. The PRISM scores corresponding to the first 24 hours of hospitalisation were calculated. Outcome was expressed as either death in PICU or discharged from the hospital.

Multivariate analysis was performed to find out the factor that was most accurate in predicting the outcome of the illness. Discriminative power was calculated using the Receiver operator curve (ROC). The results showed that mental status, WBC count and BUN values were found to be the main predictors of death in PICU. The cut off value of 51 for the PRISM score yielded best sensitivity and specificity. Hence, in conclusion, the PRISM III sscoring system has good accuracy in predicting the outcome of the critically ill child admitted in the PICU.

STUDY 6

Prediction of mortality by application of PRISM score in Intensive Care Unit[16]

D. Singhal, N. Kumar, J.M. Puliyel, S.K. Singh, V. Srinivas, From the St. Stephen's Hospital, Tis Hazari, Delhi

The above study was conducted in PICU of a ertiary care institute, St. Stephen Hospital in Delhi. The objective was to assess the functioning of PRISM score in predicting the outcome of critically ill children under Indian circumstances.

This is a prospective study where 100 sick pediatric patients admitted in the PICU were taken into consideration following the application of inclusion and exclusion criteria. Out of 100 patients, 18 died and 82 survived.

There was no significant difference between the expected and observed mortality in any of the groups. ROC analysis showed an area of 72 % under the curve showing the PRISM score to have good discriminative power. Hence, it was concluded that PRISM score has good predictive value in assessing and predicting the outcome of children admitted in PICU under Indian circumstances.

STUDY JUSTIFICATION

The main purpose of the pediatric intensive care unit (PICU) is to prevent mortality by intensively monitoring and treating critically ill children who are considered at higher risk of mortality. Also there is a need to accurately define prognosis. Thus, a scoring system helps in :

1) Assessing the Severity of illness
2) Guides the physician in clinical decision-making, regarding
   - Prioritizing specialized care as needed
   - Appropriateness of therapy
3) Evaluating the impact of newer technologies & medical interventions on the patient's outcome
4) Tracking ICU resource utilization
5) Obtaining severity of illness adjusted mortality ratio and
6) Controlling and matching severity of illness in clinical studies in an

OBJECTIVE MANNER

Information obtained would be useful to the attending physician, as it will allow him to address various ethical and clinical issues arising because of the critical state of the patient.

OBJECTIVES

PRIMARY OBJECTIVE

- To evaluate the performance of PRISM III score as a prognostic indicator in children admitted at the Pediatric Intensive Care Unit in ICH & HC.

SECONDARY OBJECTIVE

- Determination of mortality associated risk factors and to find the probability of mortality at various PRISM III score range.

METHODOLOGY

STUDY DESIGN **:** PROSPECTIVE DESCRIPTIVE STUDY

STUDY PERIOD **:** AUGUST 2015 – JULY 2016

STUDY PLACE **:** PICU, ICH & HC, EGMORE, CHENNAI.

STUDY POPULATION **:** All children aged from 1 month to 12 years of age

INCLUSION CRITERIA **:** All children from 1 month to 12 years of age requiring admission in PICU

EXCLUSION CRITERIA :

- Children with congenital malformations
- Children who died within 8 hours of admission
- Children who were discharged from the unit within 24 hours of admission
- Children with Neuromuscular diseases, Immunodeficiency disorders and Developmental delay
- Children with chronic illness (CKD, CHD, etc.)
- Post-operative status
- Elective PICU admission (Eg: planned surgical procedures)

ETHICS

Informed consent from the parents and institution ethical review board was obtained.

METHODS

Children who succumb to severe illness secondary to multiple aetiologies are referred from various corners of our state and nearby states to our institute as ours is being a tertiary care centre. Such children are initially received and triaged in the casualty and brought into the Paediatric Emergency medicine department for initial resuscitation. Once the child is stabilised by the ER personnel they are shifted to the ward or at times to the PICU directly. At times, critically ill children from the general paediatric medical wards, who might benefit from intensive care and monitoring, are also shifted to the PICU.

Such children are received in the PICU, their physiological status being assessed and treated accordingly. The basic details regarding the children such as name, age, weight, length or height, nutritional status, etc. along with the data regarding the 17 parameters required for assessing the PRISM score based on the physiological status of the child are collected within the first 24 hours of receiving the child in the PICU.

The details of the child collected after receiving in the PICU are :

- Name
- Age
- Sex
- IP number
- Weight
- Length/Height
- Nutritional Status
- Primary System affected by the illness of the child
- Diagnosis Suspected
- Requirement for Mechanical Ventilation
- Requirement for O2 therapy
- Requirement for Vasoactive agents
- No of Vasoactive agents used
- Presence of Multi-Organ Dysfunction Syndrome
- Requirement for Renal Replacement Therapy
- Duration of PICU stay
- Requirement for CPR

STUDY MANOEUVRE

AGE

The category for age was divided as

< 1 year

1 – 5 years

6 - 12 years

NUTRITION

The weight for length/height was calculated for children up to 5 years of age and Body Mass Index was calculated for children above 5 years of age to assess the presence of acute malnutrition which may serve as an aggravating/causative factor for the existing illness of the child. The values were plotted and analysed using the WHO charts using the 'z' scores. Values from -2 to -3 S.D were considered as Moderate acute malnutrition (1 – 5 years)/ Thinness (6 – 12 years). Values less than -3 S.D were considered as having Severe acute malnutrition (1- 5 years)/ Severe thinness (6-12 years). Values above -2 S.D were considered to have normal nutritional status.

SYSTEMS PRIMARILY AFFECTED

The primary system that had been affected during the illness was noted and the probable diagnosis suspected was recorded.

MECHANICAL VENTILATION

For children who required mechanical ventilation, the Positive inspiratory pressure, Positive end expiratory pressure, Fi O2 required and the Inspiratory-Expiratory time ratio during admission were recorded.

OXYGEN THERAPY

In children who did not require ventilation but needed oxygen therapy, the devise used for delivering high flow oxygen was recorded as either

Oxy-Hood

Jackson Reese circuit

Non Rebreathing mask

VASOACTIVE AGENTS

Children who required vasoactive agents for stabilisation during the resuscitative phase despite fluid therapy with isotonic crystalloids and colloids were recorded. The number and type of vasoactive agents required for their resuscitation were also noted.

MODS

Presence of multi-organ dysfunction syndrome was considered as one of the important risk factors contributing to mortality. A child was said to be having MODS when two or more of primary systems had been affected by the disease process.

RENAL REPLACEMENT THERAPY

Children with elevated renal parameters (urea and creatinine) due to acute kidney injury secondary to various causes such as sepsis, obstructive uropathy, HUS, etc. or with severe metabolic acidosis or dyselectrolytemia were benefitted by renal replacement therapy in the form of peritoneal dialysis done under sterile precautions. Requirement for RRT was considered to be a significant risk factor for mortality.

CPR

The requirement for cardio-pulmonary resuscitation was considered as a significant risk factor for mortality. Hence, children who had had the need for ICU/PRE-ICU CPR were noted and followed up until the outcome.

Details regarding the 17 variables required in calculating the PRISM III score were collected within the first 24 hours of admission to the PICU.

The highest or worst possible range into which the different variables fell within the first 24 hours of admission was taken into account. They are:

1. Systolic BP (mmHg)
2. Heart rate
3. Temperature (Celsius)
4. Glasgow Coma Scale
5. Pupillary Reaction
6. Acidosis

7. Alkalosis
8. Bicarbonate
9. PaO2
10. PaCO2
11. Glucose
12. Potassium
13. Blood Urea Nitrogen
14. Creatinine
15. WBC Count
16. Platelet Count
17. PT & aPTT

SYSTOLIC BLOOD PRESSURE

The systolic blood pressure was recorded using the Non Invasive Blood Pressure monitoring instrument and was counter checked using the manual sphygmomanometer device. Depending upon the range in which the Systolic blood pressure of the child fell, a particular score was allotted based on the scoring system devised by Pollack et al.

Infant AND > 65 Mm Hg	0
Infant AND 45 -65 Mm Hg	3
Infant AND < 45 Mm Hg	7
Child AND > 75 Mm Hg	0
Child AND 55 -75 Mm Hg	3
Child AND < 55 Mm Hg	7

HEART RATE

The heart rate was monitored and recorded using multi-parameter digital monitor. It was counter checked by auscultating the heart rate for one whole minute. The score for the child's heart rate was allotted based on the scoring system as follows:

infant AND < 215 beats/minute	0
infant AND 215 - 225 bpm	3
infant AND > 225 beats/minute	4
child AND < 185 beats/minute	0
child AND 185 - 205 bpm	3
child AND > 205 beats/minute	4

TEMPERATURE

The temperature of the child was recorded every time the child had fever spikes. It was measured using a digital thermometer. The axillary temperature was usually measured and recorded in units of degree Celsius. The scoring for the temperature was as follows:

< 33°C	3
33 - 40°C	0
> 40°C	3

GLASGOW COMA SCALE

The Glasgow coma scale was used for assessing the mental status of the child. Parameters like eye opening, verbal response and motor response were assessed clinically and a score from a minimum of 3 to a maximum of 15 was allotted according. The scoring for GCS of the child was :

Glasgow coma score >= 8	0
Glasgow coma score < 8	5

PUPILLARY REACTION

The pupils of the child were examined using a white light torch. The size of the pupils were compared with each other and their reaction/response to light was recorded. The pupillary response was graded and score was given as :

Both Reactive	0
1 Reactive And (1 Fixed And > 3 mm)	7
Both Fixed And Both > 3 mm	11

ACID-BASE AND BLOOD GASES

Arterial blood gas analysis was done for all patients included in the study under strict aseptic precautions. Insulin syringe was initially heparinised and arterial blood was withdrawn using it, usually from the radial artery by piercing it at an angle of 45 degrees. The sample was analysed immediately and the various parameters were recorded and scored as follows :

ACIDOSIS

pH > 7.28 AND HCO3 >= 17 mEq/L	0
pH (7.0 - 7.28) OR HCO3 (5 - 16.9 mEq/L)	2
pH < 7.0 OR HCO3 < 5	6

ALKALOSIS

< 7.48	0
7.48 - 7.55	2
> 7.55	3

pCO2

< 50 mm Hg	0
50 - 75 mm Hg	1
> 75 mm Hg	3

HCO3

<= 34 mEq/L	0
> 34 mEq/L	4

paO2

>= 50 mm Hg	0
42.0 - 49.9 mm Hg	3
< 42 mm Hg	6

The above parameters were obtained from arterial blood gas analysis and scoring was done according to the range in which the values fell, based on the scoring system devised by Pollack et al.

BLOOD GLUCOSE

The capillary blood glucose was measured using the Glucometer devise where a small prick was made over the lateral part of the heel of the child's foot after cleaning it with spirit. The initial drop of blood was cleared and Glucose was measured from the further ooze. Haemostasis was secured and scoring was given as:

<= 200 mg/dL	0
> 200 mg/dL	2

POTASSIUM

The children admitted in the PICU meeting the inclusion criteria were subjected to venepuncture under sterile aseptic precautions. The venous blood drawn was sent to analysis to the pathology and biochemistry department as soon as possible. Values obtained were recorded with the scores for their respective values were allotted based on the PRISM III scoring system as follows :

<= 6.9 mEq/L	0
> 6.9 mEq/L	3

BLOOD UREA NITROGEN

The value of urea was obtained from the venous sample sent for analysis. The relationship between urea and BUN is Urea = 2.14 * BUN. Hence, the BUN value was derived by dividing the Urea by 2.14 and values were recorded and score given accordingly.

Neonate And <= 11.9 mg/dl	0
Neonate And > 11.9 mg/dl	3
Not Neonate And <= 14.9 mg/dl	0
Not Neonate And > 14.9 mg/dl	3

CREATININE

Creatinine value was obtained from the venous sample sent for biochemical analysis. The value of creatinine was scored as :

Infant AND <= 0.90 mg/dL	0
Infant AND > 0.90 mg/dL	2
Child AND <= 0.90 mg/dL	0
Child AND > 0.90 mg/dL	2

WHITE BLOOD CELL COUNT

Venous blood of about 1ml was collected in EDTA tube and sent for analysis to the pathology lab. The WBC count was estimated using the automated CBC counter machine. The reported WBC count was recorded and scored as :

>= 3,000 per μL	0
< 3,000 per μL	4

PLATELET COUNT

The platelet count report obtained from the sample sent to the pathology lab was scored in the following manner :

> 200,000 per μL	0
100,000 - 200,000 per μL	2
50,000 - 99,999 per μL	4
< 50,000 per μL	5

PROTHROMBIN AND activated PARTIAL THROMBOPLASTIN TIME

About 2.5ml of venous blood collected under sterile precautions was sent for analysis to estimate the degree of coagulopathy the child was suffering from. The scoring was done as :

PT <= 22 seconds AND PTT <= 57 seconds	0
(PT > 22 seconds OR PTT > 57 seconds)	3

STATISTICAL ANALYSIS

All the variables such as age, sex, nutritional status, etc. were collected, categorised into specific ranges and tabulated. The score for individual parameters of PRISM III score were summed up and the total score for the individual was obtained and tabulated. Statistical analysis was made by comparing the contribution of each variable and PRISM III score to the outcome of the child in the form of either death or discharge. Statistical analysis was done using SPSS 17 version.

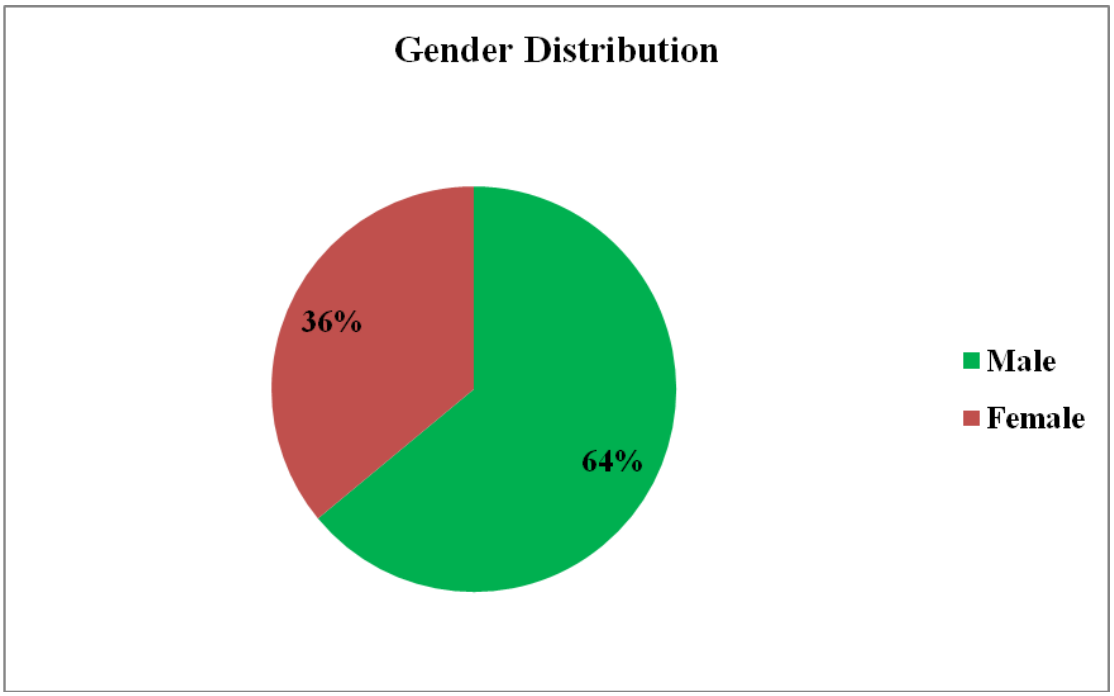
All categorical data as well as normally distributed continuous variables were presented as frequencies and percentages. To determine the association of clinical factors with outcome, Chi square test was used. To find out the most determining parameters among the variables, multiple logistic regression was used. Discriminatory power of the scoring system was assessed using the receiver operator curve and the calibration was assessed using the Hosmer Lemeshow Goodness of fit test. . All the values were considered significant when p value <0.05.

OVERVIEW

100 Critically ill children from the age of 1 month to 12 year of age, admitted consecutively in the PICU, meeting the inclusion criteria were included in the study. Children with congenital malformations, who died within 8 hours of admission, who were discharged from the unit within 24 hours of admission, children with neuromuscular diseases, Immunodeficiency disorders and Developmental delay, etc. were excluded from the study.

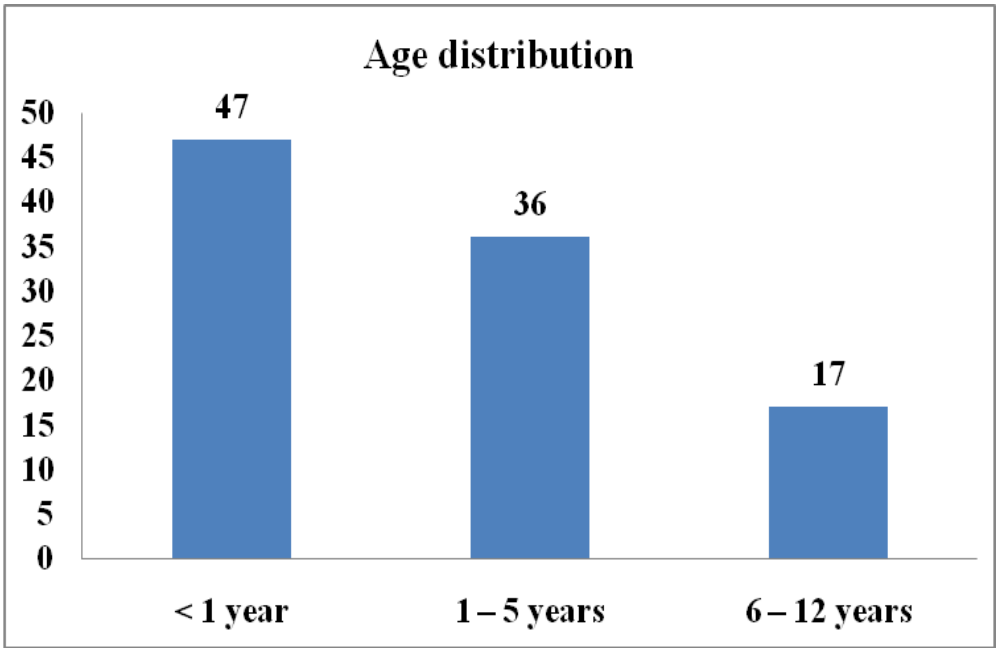
SEX RATIO

Out of the 100 children included, 64 were males and 36 were females.



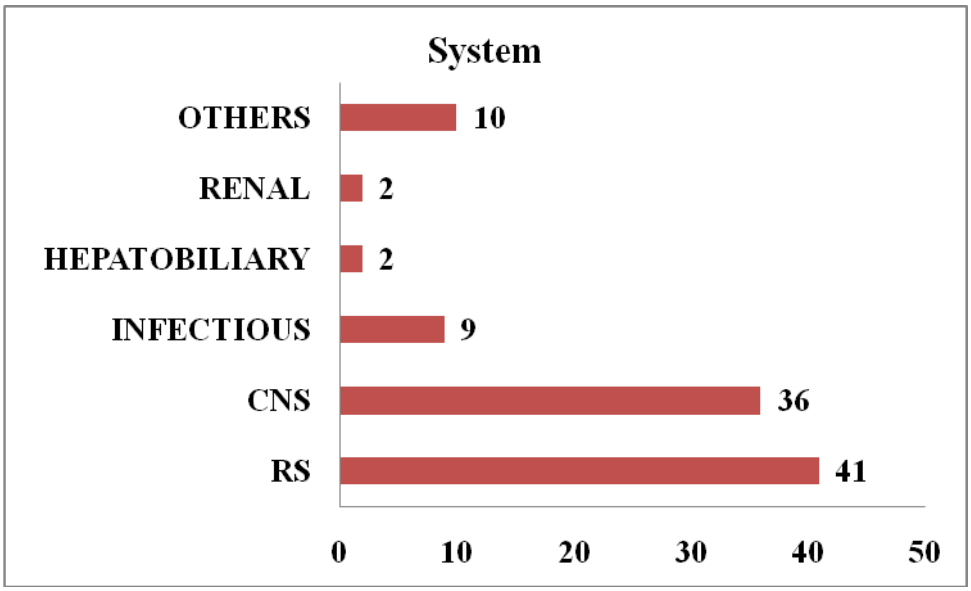
AGE DISTRIBUTION

Children in the study were categorised into three age groups as follows :



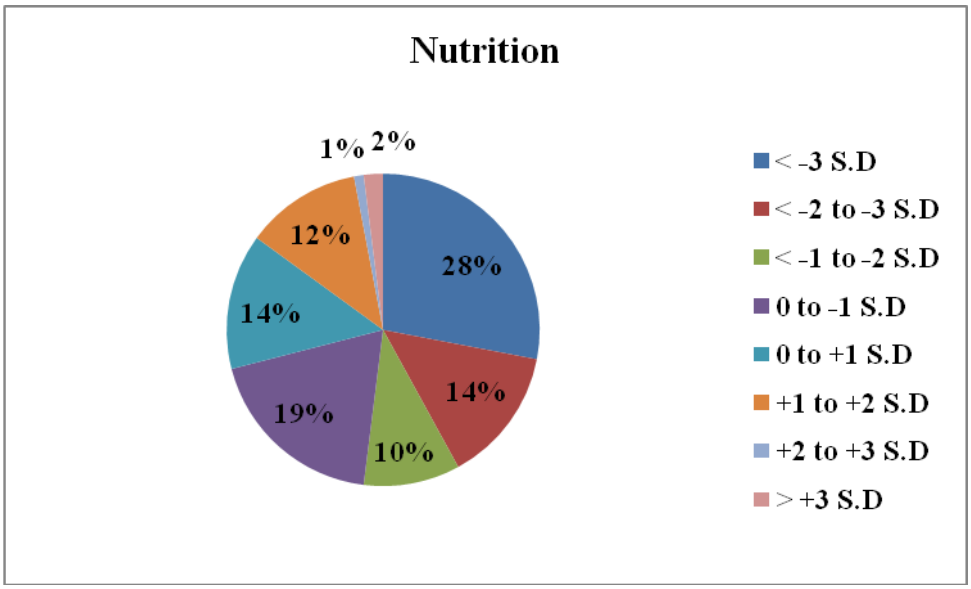
SYSTEMS AFFECTED

The systems affected were recorded and categorised as follows: Respiratory system being the predominant one to be involved.



NUTRITIONAL STATUS

To study the effect of acute malnutrition on the outcome of the children, data regarding nutritional status was obtained and categorised as follows:

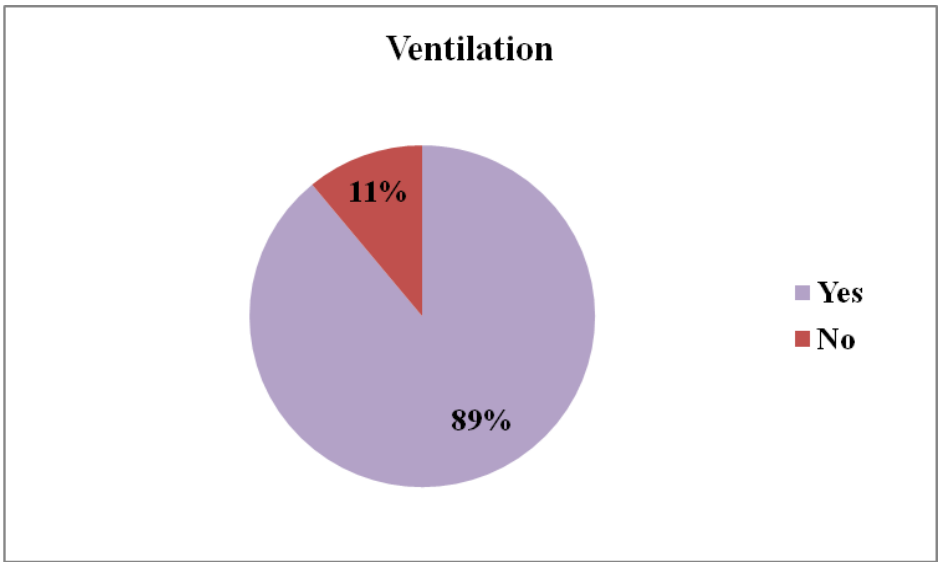


42% of the study population were found to have wasting and

28% were categorised to have Severe Acute Malnutrition.

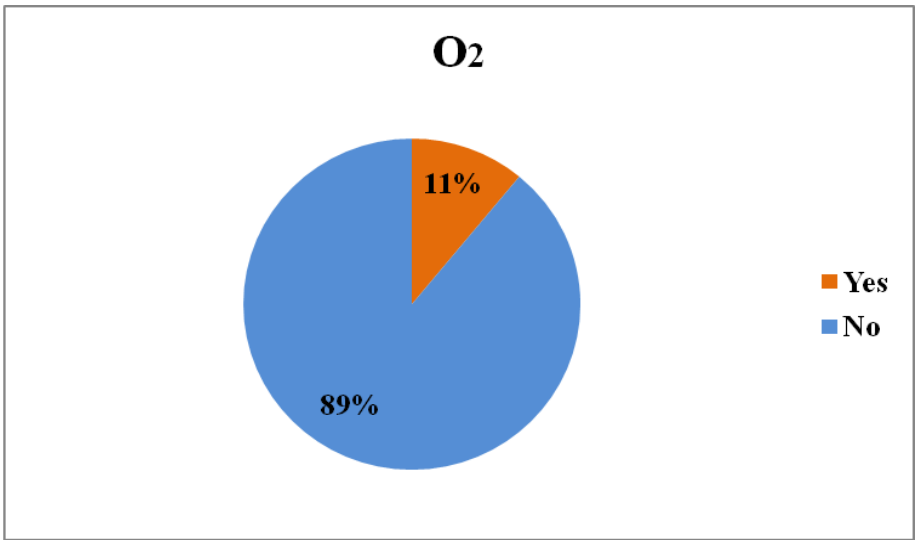
MECHANICAL VENTILATION

About 89% of children had required mechanical ventilation for respiratory support.



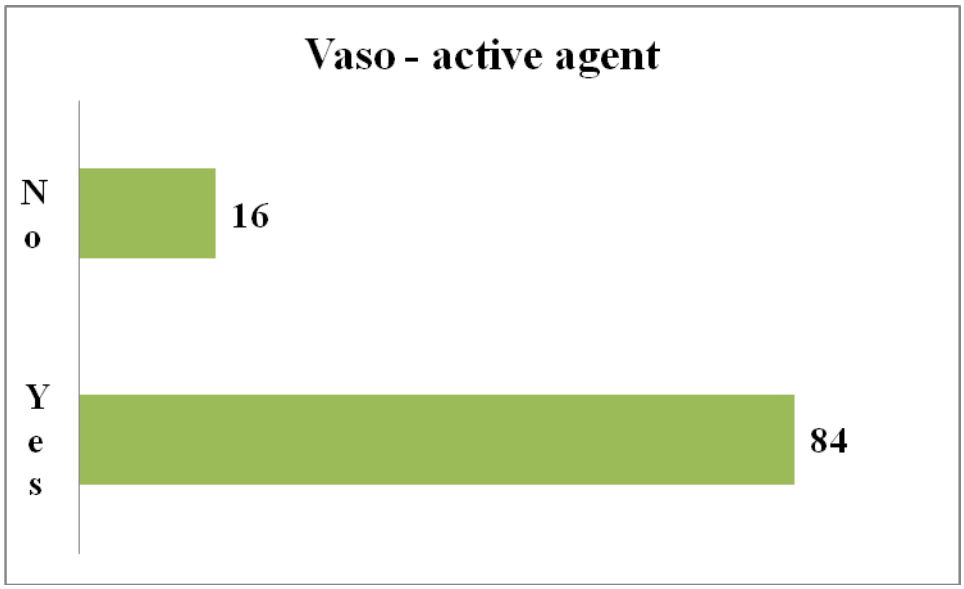
OXYGEN THERAPY

Oxygen therapy was given through high flow O2 devices such as Non-Rebreathing mask or Jackson Rees circuit. Only 11% required high flow oxygen therapy.



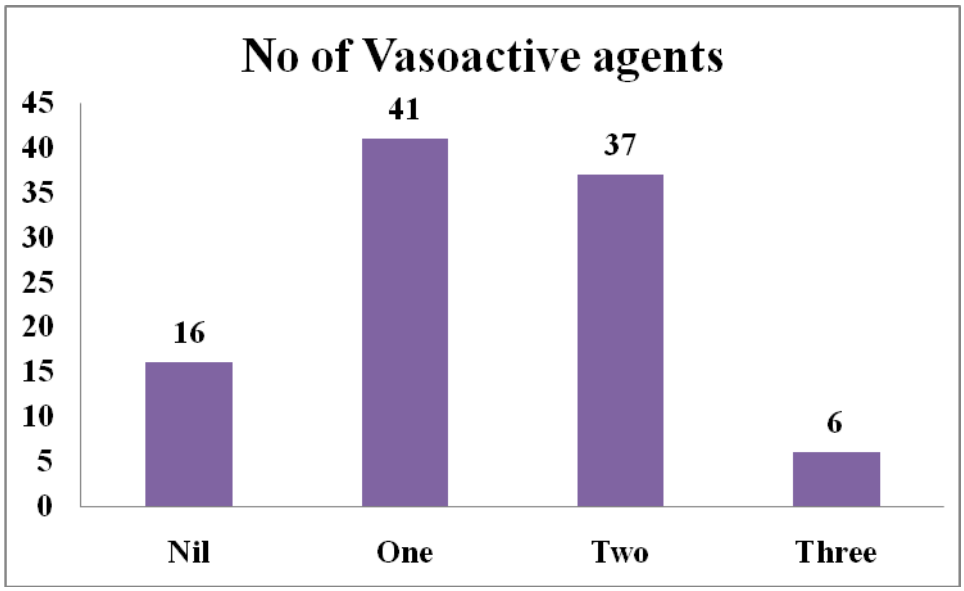
VASOACTIVE AGENTS

Requirement for vaso-active agents such dopamine, nor-epinephrine and epinephrine for hemodynamic support was noted.



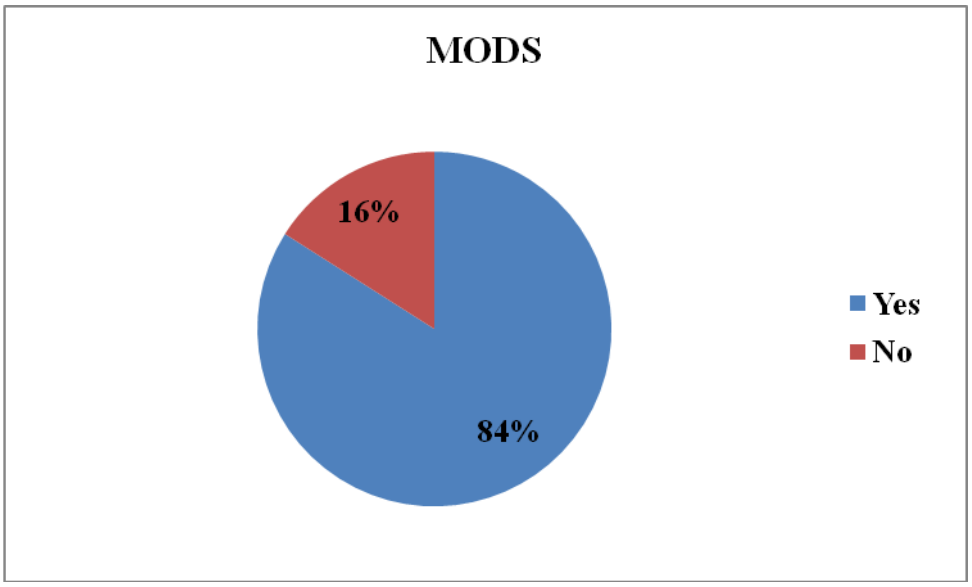
NUMBER OF VASOACTIVE AGENTS

41 % - required one, 37% - needed two & 6% required three inotropes.



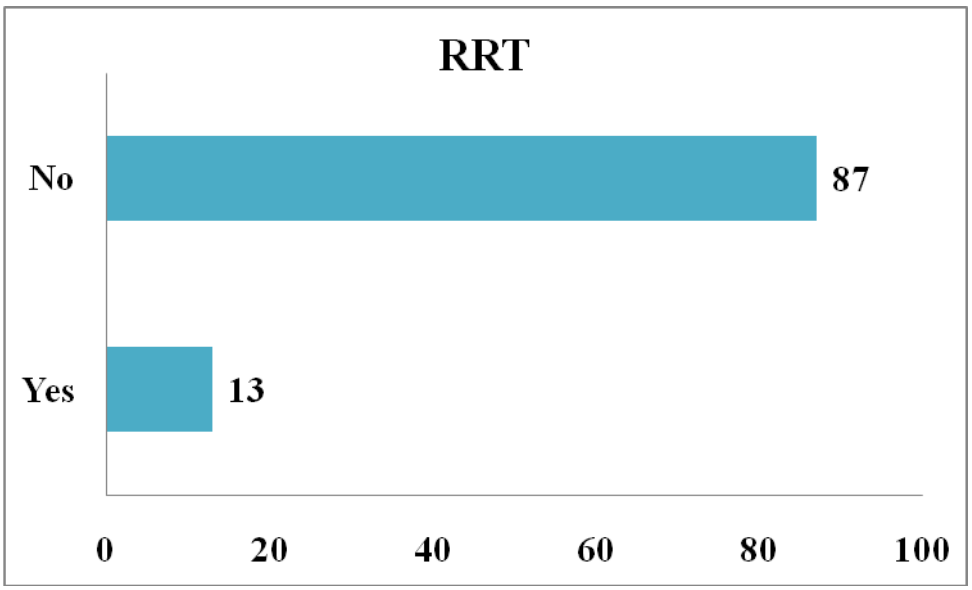
MODS

Presence of multi-organ dysfunction syndrome was seen in 84 % of children admitted in the PICU barring the rest of the 16%.



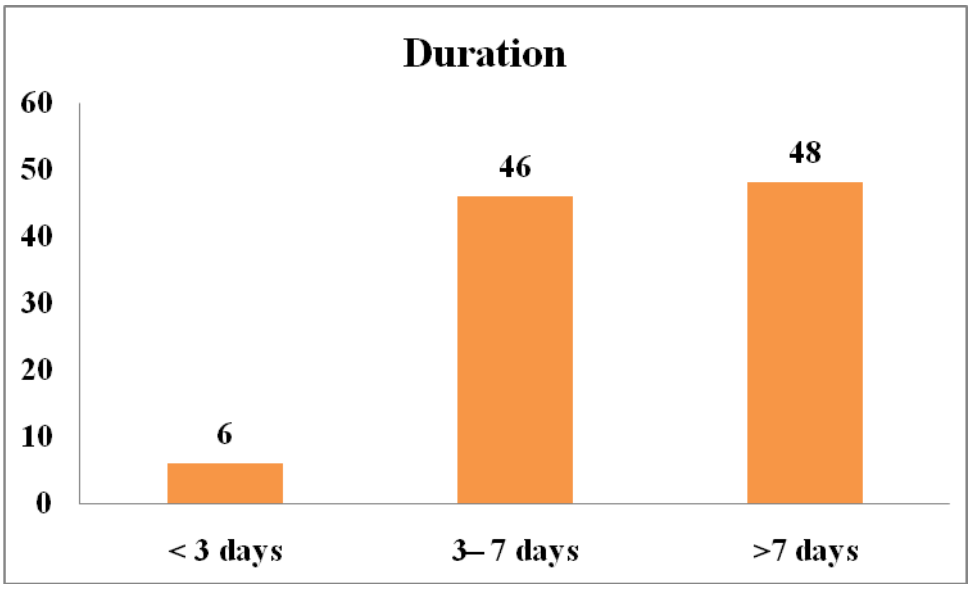
RENAL REPLACEMENT THERAPY

Out of the 100, about 13 children had the need for renal replacement therapy



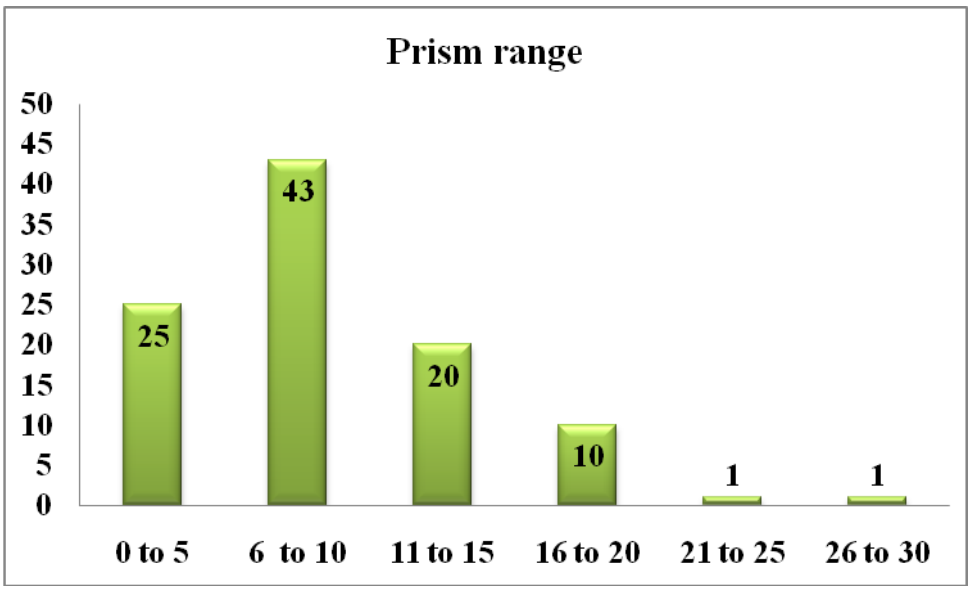
DURATION

Duration of PICU stay was categorised as follows:



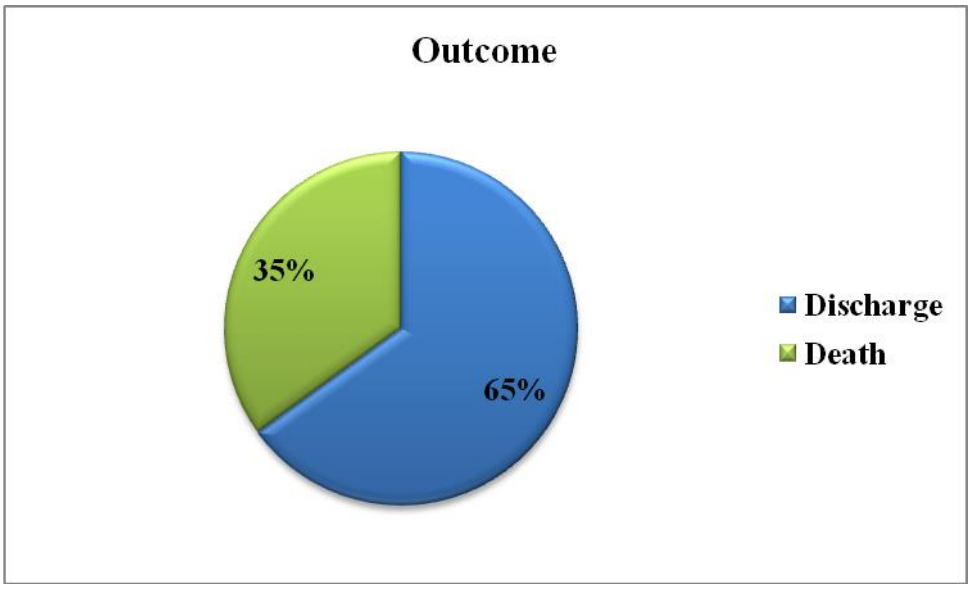
PRISM RANGE

The PRISM score of the child was calculated & categorised as follows:



OUTCOME

Outcome was recorded as either discharged from the PICU or Died in ICU. Among 100 children included in the study, 35 succumbed to their illness.

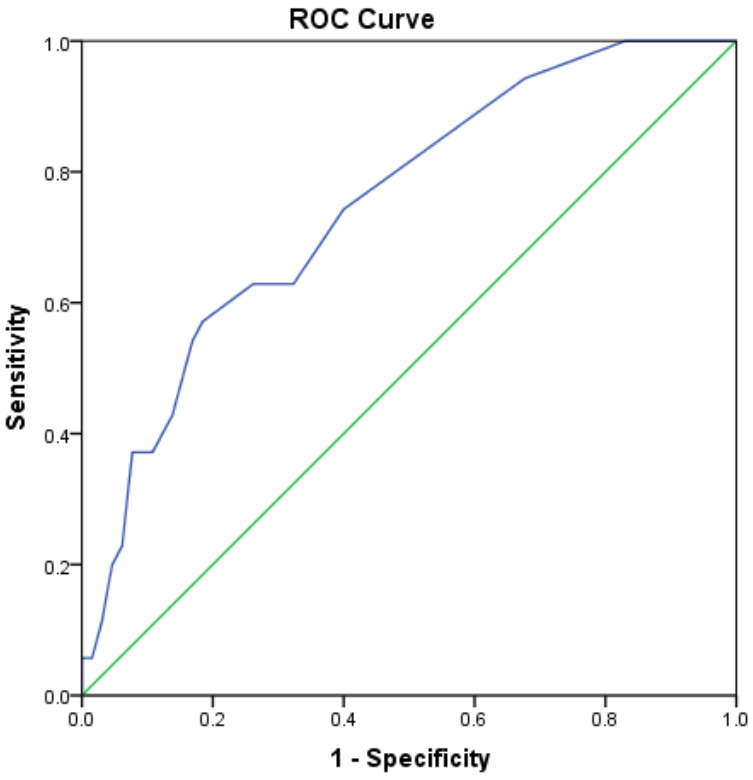


STATISTICAL ANALYSIS

RECEIVER OPERATOR CURVE

The receiver operator curve was constructed to determine the cut off with maximum sensitivity and specificity to find out mortality. The PRISM III score obtained was plotted against the outcome in the ROC curve graph.

According to the ROC curve if the area under the curve was below 0.5 then the diagnostic test is not considered significant .Higher the curve above the diagonal and more towards the left the test is considered significant.



AREA UNDER THE CURVE: 0.749

OPTIMUM CUT OFF POINT: 7.5

SENSITIVITY: 74.3%

SPECIFICITY: 60 %

POSITIVE PREDICTIVE VALUE: 50 %

NEGATIVE PREDICTIVE VALUE : 81%

Since area under the curve was 0.749 our score has a moderately fair significance in predicting the mortality.

Table for Hosmer and Lemeshow Test

		Total	outcome			
			Discharge		Death	
		Count	Observed	Expected	Observed	Expected
Prism range	1	25	22	16.3	3	8.8
	2	43	31	28.0	12	15.1
	3	20	8	13.0	12	7.0
	4	10	4	6.5	6	3.5
	5	1	0	.7	1	.4
	6	1	0	.7	1	.4
Total		100	65	65.0	35	35.0

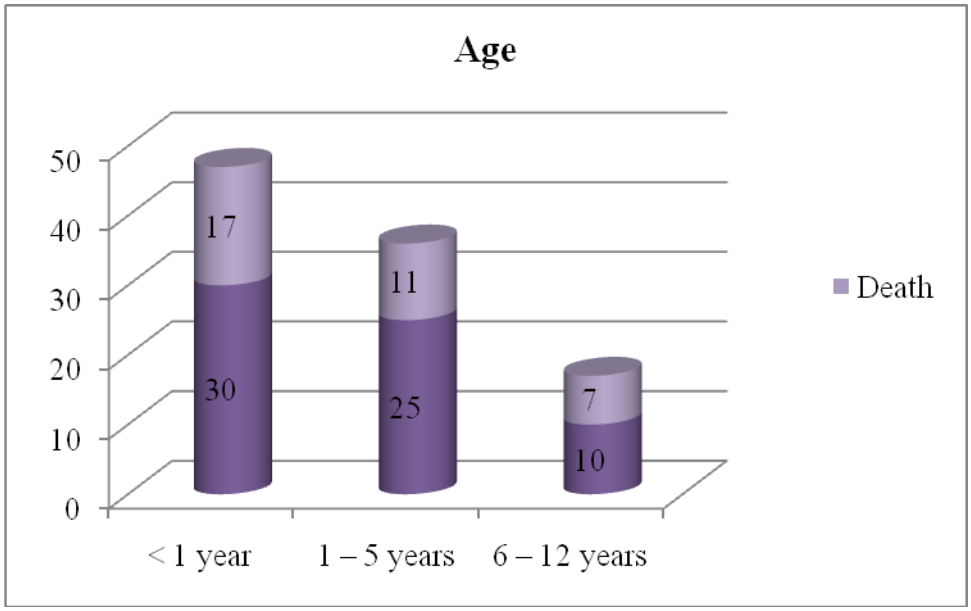
It is evident that the discrepancies between the expected and the observed across the various strata are not significant (p = 0.806) with a showing good calibration.

CHI-SQUARE TEST

All the individual variables were assumed to be a risk factor contributing for the outcome of the child and their significance on the outcome was assessed by comparing each variable with the outcome using Chi-square test. All values less than 0.05 were considered to be significant.

AGE AND OUTCOME

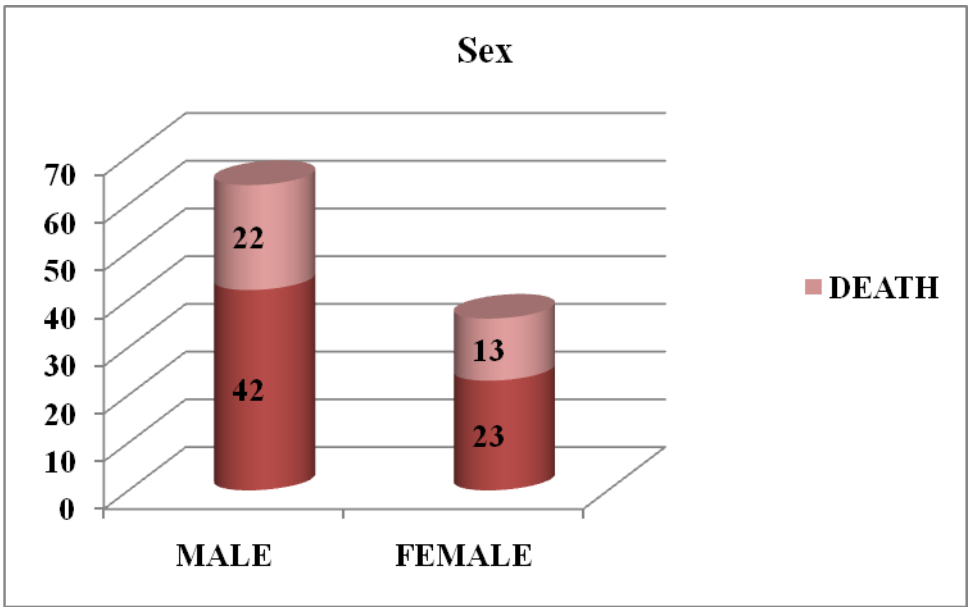
On applying the chi-square test between the age and the outcome, we yielded a p value of 0.731, disproving age to be a significant risk factor for mortality.



P value = 0.731

SEX AND OUTCOME

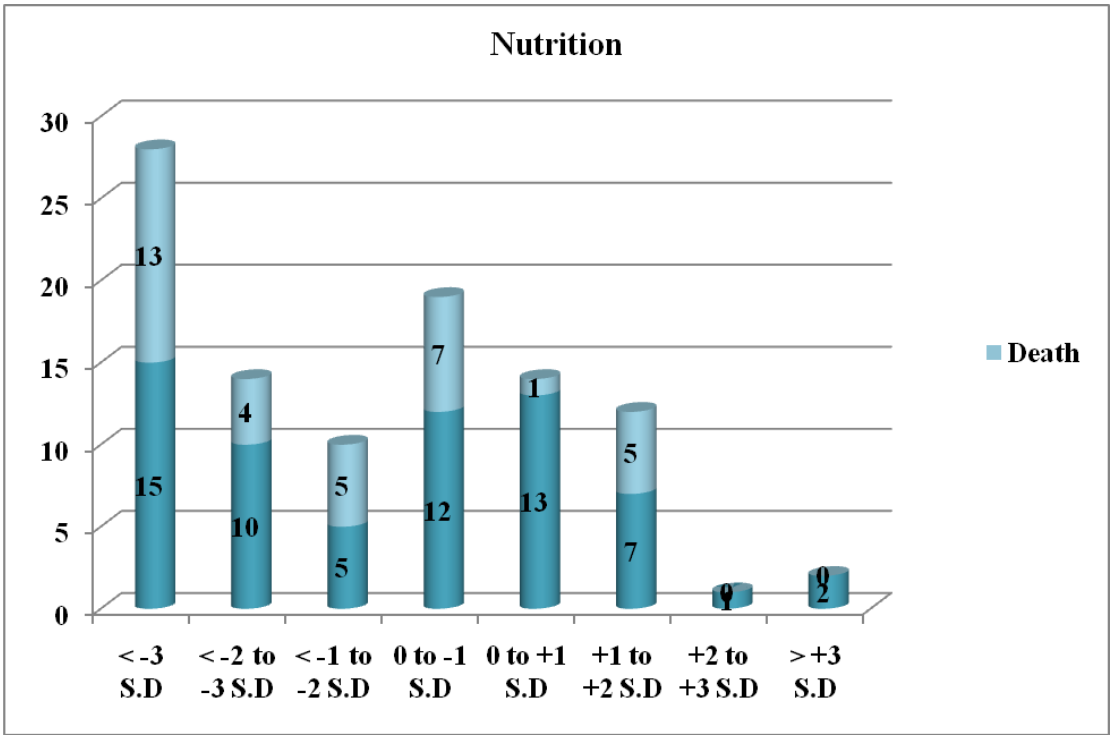
Sex of the child was not found to be contributing as a significant risk factor for the outcome of the child with a p value of 0.861



P value = 0.861

NUTRITION AND OUTCOME

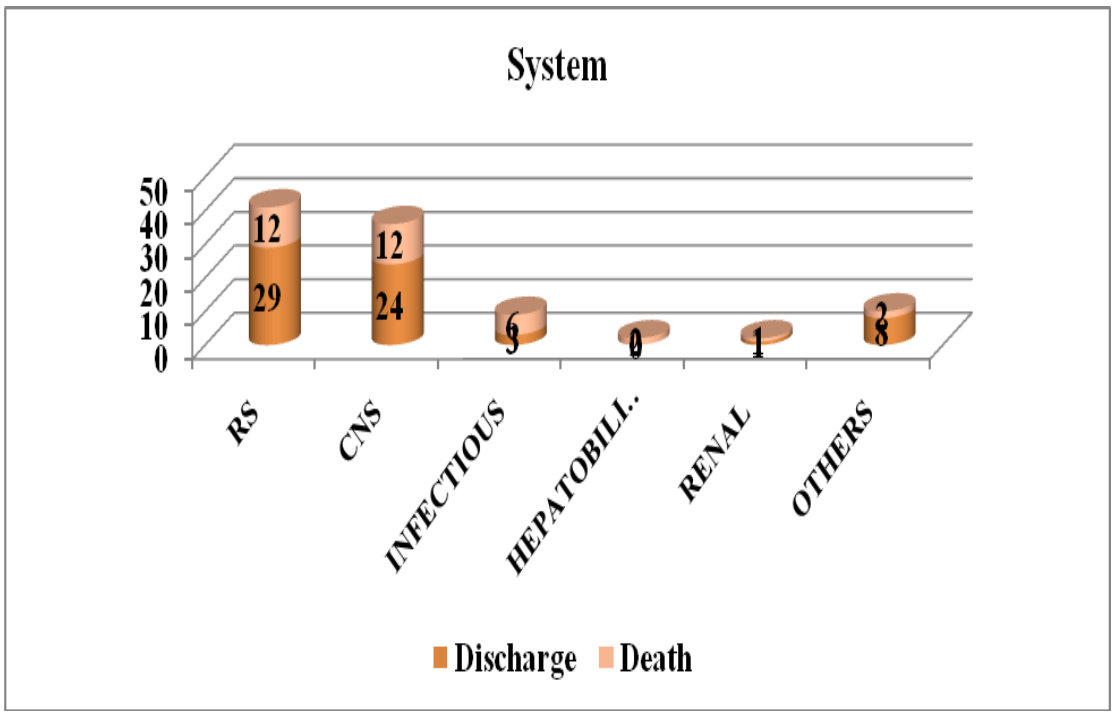
The nutritional status of the child (with or without acute malnutrition) did not contribute significantly to be a determining factor for the outcome with p value of 0.218



P value = 0.218

SYSTEM AND OUTCOME

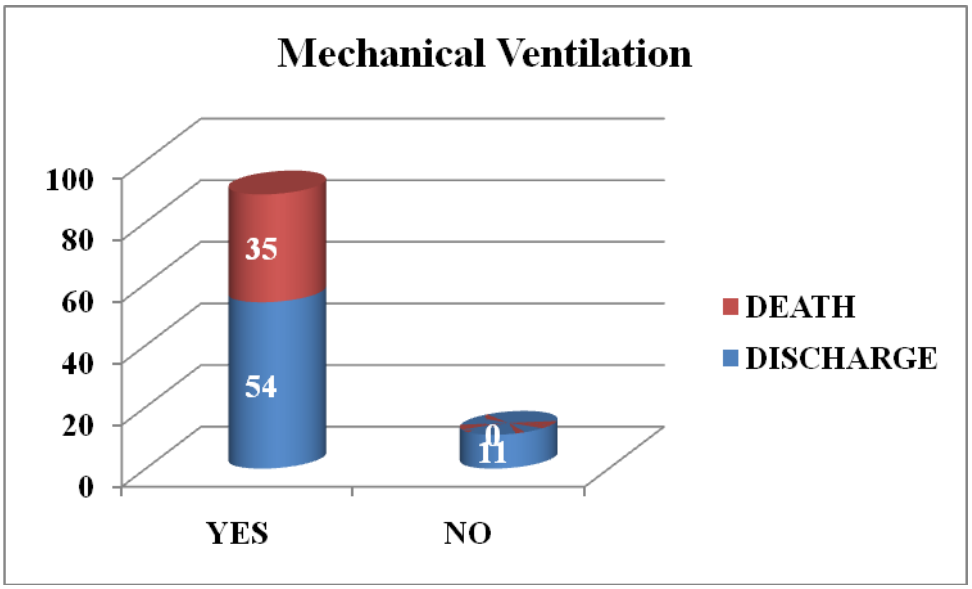
The system primarily affected by the illness did not have much significance as it produced a value of 0.091.



P value = 0.091

MECHANICAL VENTILATION AND OUTCOME

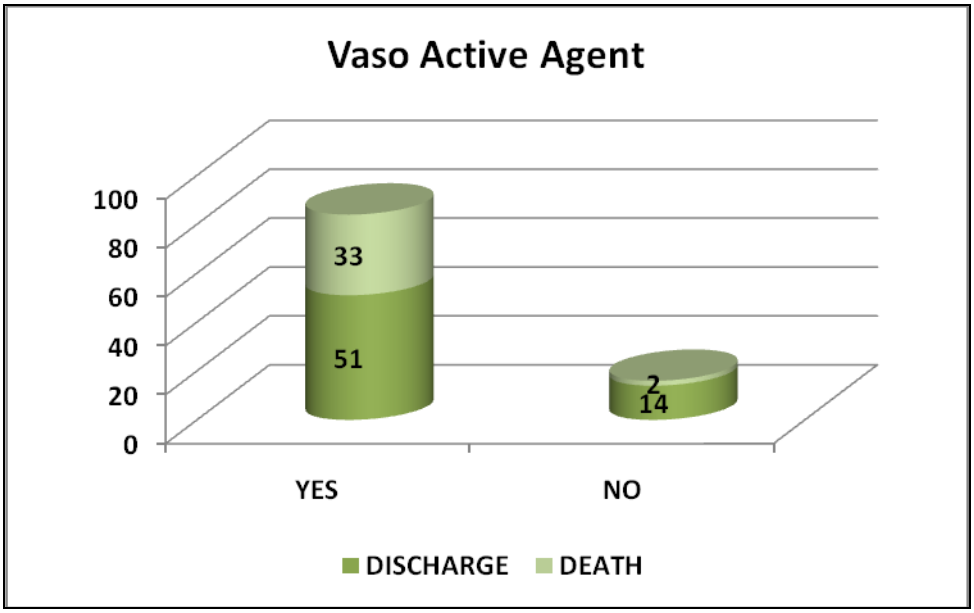
Requirement for mechanical ventilation proved to be a significant risk factor contributing for the outcome of the child with a p value of 0.010. Odds ratio being 6.92, children requiring ventilation had 6.92 times higher chances of mortality compared to those who did not.



P value = 0.010

VASOACTIVE AGENT AND OUTCOME

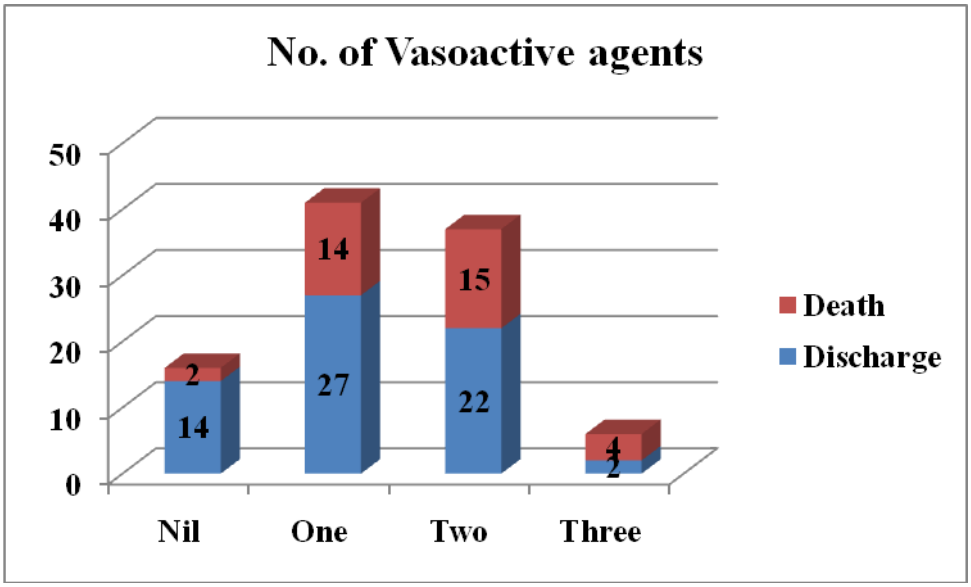
Requirement for vasoactive agent had significance in predicting the outcome of the child as it had a p value of 0.040. The Odds ratio being 4.52, children requiring treatment with vasoactive therapy had 4.5 times increased risk for mortality.



P value 0.040

NUMBER OF VASOACTIVE AGENTS USED VS OUTCOME

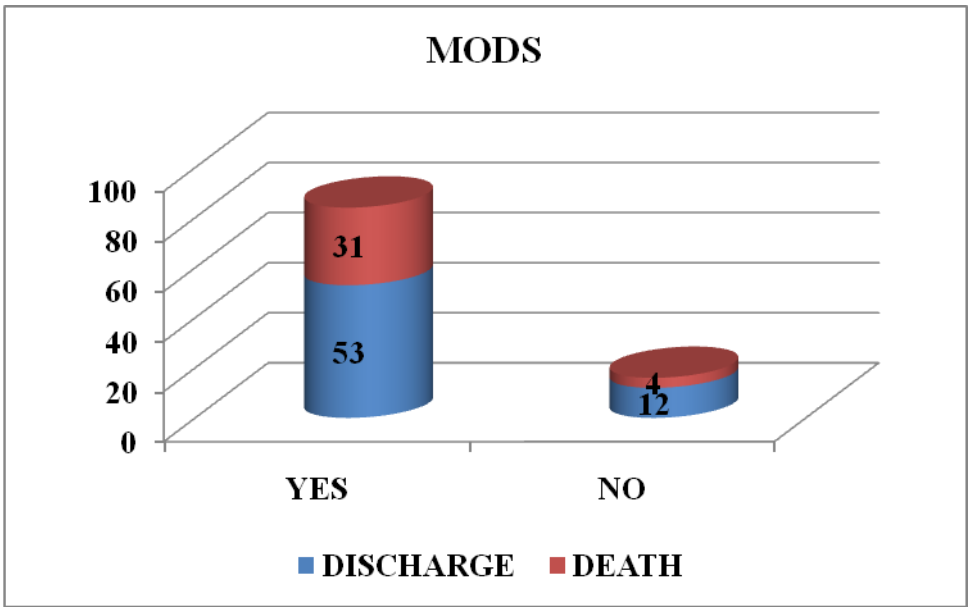
The linear by linear association using chi square analysis becomes significant to give a p value of 0.015 with the increase in number inotropes used.



P value = 0.015 (linear by linear association)

MODS VS OUTCOME

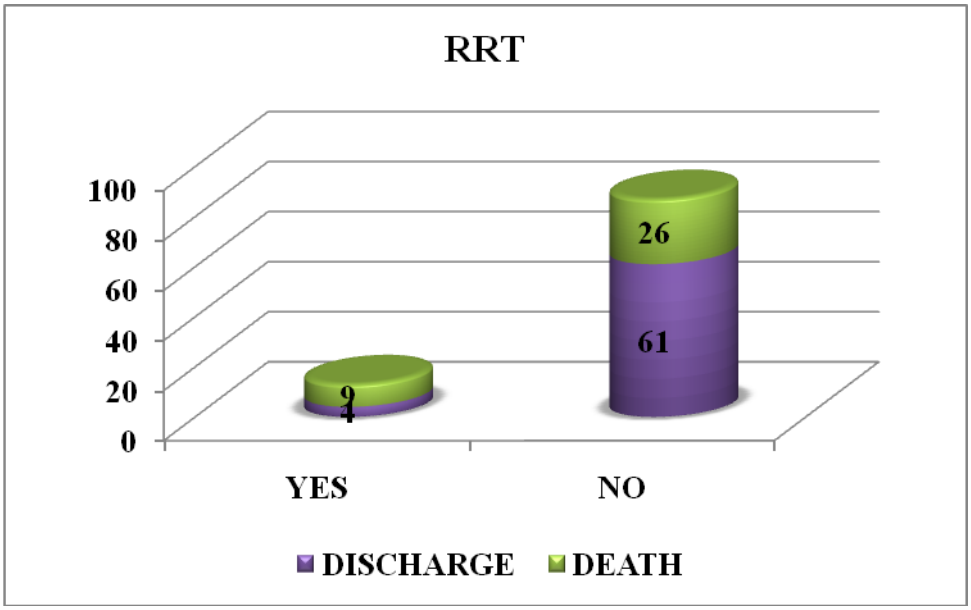
Presence of MODS was not significantly associated with the outcome of the child with a p value of only 0.360



P value = 0.360

RENAL REPLACEMENT THERAPY VS OUTCOME

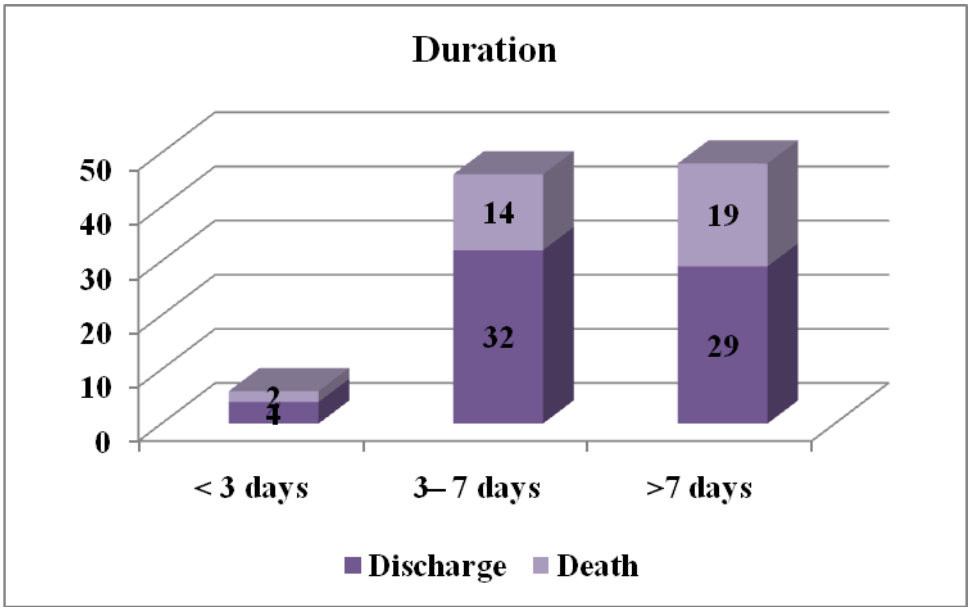
RRT was a significant risk factor in assessing the outcome of the child with a p value of 0.006. With the Odds ratio being 5.27, children requiring RRT had 5.2 times increased risk for mortality.



P value = 0.006

DURATION OF ICU STAY VS OUTCOME

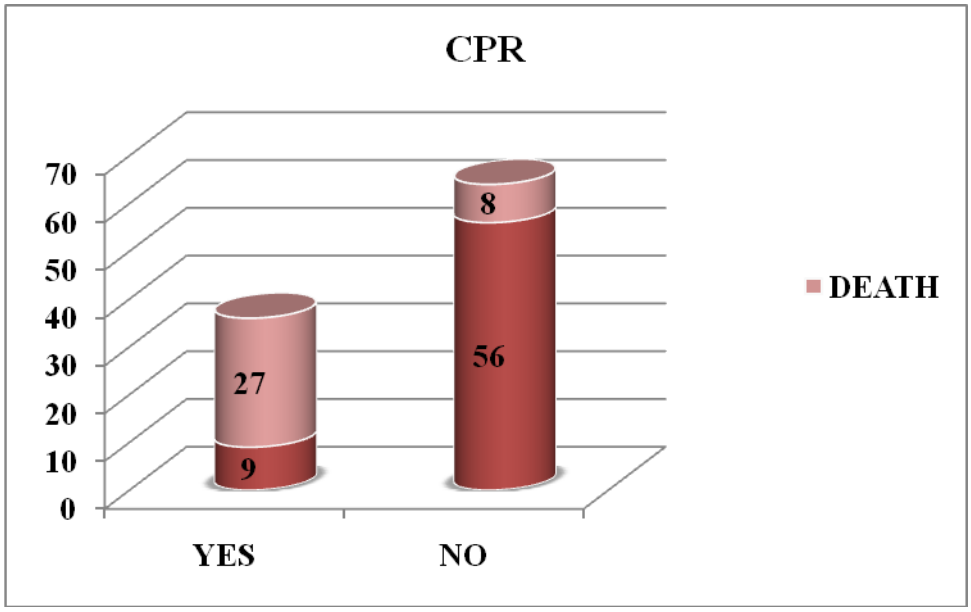
Duration of ICU stay was having poor association with the outcome with p value 0.647



P value = 0.647

CPR VS OUTCOME

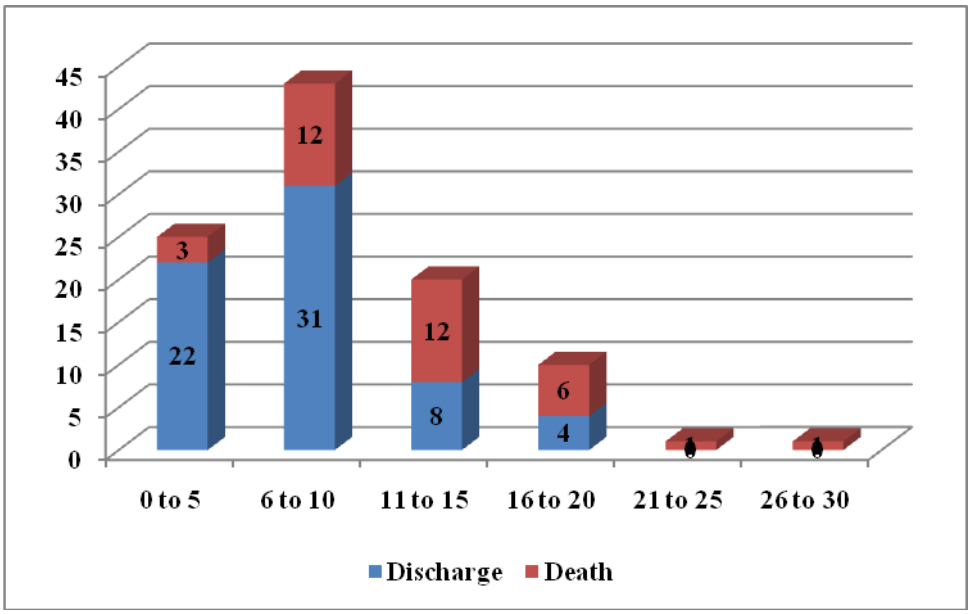
The need for CPR proved to be a highly significant factor in assessing the outcome of the child as it had a p value of less than 0.0001. After calculating Odds ratio, it was found that children requiring CPR had 21 times increased risk for mortality.



P value < 0.0001

PRISM III SCORE VS OUTCOME

The PRISM III score was categorised into ranges as shown below. On analysis it was found to be a good predictor of outcome with a p value of 0.002.



P value = 0.002

The linear by linear association showed a p value of < 0.0001, stressing the fact that with the increase in PRISM III score, the chances for mortality became higher.

PREDICTIVE PROBABILITY OF DEATH

Prism range	Probability of death (%)
1	13%
2	29%
3	51%
4	73%
5	88%
6	95%

Since the association between mortality and the PRISM score only turned out to be significant in the initial analysis, a logistic regression analysis was done on the discharge status (died/alive), taking PRISM score as a predictor for mortality. The analysis yielded a logit r = (0.962* PRISM range) – 2.839. The probability of death was calculated by formula: Probability of death = er/(1 + er), where r = (0.962* PRISM Range) – 2.839 (In our study). Here –2.839 is constant. This implies that the probability of death is 0.1327, for a child with a prism range of 1. The Odds Ratio corresponding to the model is 2.617 with the 95% confidence interval (1.582-4.329). In other words, for an increase of 1 in the PRISM Range, a child's odds of death increases by 13%. A child with a PRISM Range of 2 had a 29% chance of dying in ICU and a child with a range of 6 had 95% probability of dying in the ICU. A Prism range of above 3 yielded 50% probability of death in ICU.

DISCUSSION

Treating children who are critically ill requires intensive care and monitoring with the usage of vast number of resources in an ICU setup such as multi-para monitors, ABGs, NIBP monitoring, mechanical ventilation, inotropes, sedation, etc.

In such scenarios, there has been a growing need to accurately define the prognosis as it helps the treating physician in assessing the severity of illness, guides him in clinical decision making regarding prioritising the specialised care as needed and deciding regarding the appropriateness of therapy.

It also helps in evaluating the impact of newer technologies and medical interventions on the patient outcome, tracking regarding ICU resource utilisation, controlling and matching severity of illness in clinical studies in an objective manner. Information obtained will be useful to the attending physician as it will help him to assess the various ethical and clinical issues arising because of the critical state of the patient.

Our hospital, ICH & HC, being a tertiary care institute, has the responsibility of catering some of the critically ill children in the worst possible scenario, being referred from all over the state. Such being the case, it has to be equipped with a proper PICU with the up to date facilities to support these children. Also it is necessary to address the parents of these children regarding the critical state of their children objectively as soon as possible after admission due to growing issues of parental anxiety.

Previously done studies have established the usefulness of a scoring system in their respective PICUs. Hence, we tried to validate one such scoring system namely the PRISM III in our hospital setup.

Our study included about 100 children from the age group of one month to 12 years, admitted in the PICU for the purpose of intensive care & meticulous monitoring. Among the children admitted, infants contributed the major proportion (47%) whereas children from 1-5 years were 36% and 6-12 years contributing to just 17%.

This data shows that most of the children requiring ICU admissions were in the under-5 age group who were at more risk for acquiring infections. Male children occupied almost two third of the total population under study (64%) with females contributing to 36%. Age and sex, although did not contribute significantly to the outcome of the children.

The nutritional status of the children (especially acute malnutrition) was recorded using the WHO z scores. About 28% of the study population fell in the category of Severe acute malnutrition and 14% belonged to Moderate acute malnutrition. Yet in our study, the nutritional status of the child alone did not have a significant impact on the outcome. Similar results were obtained from a PRISM score study done in Nairobi[14] where Malnutrition had a p value of 0.125 only. Hence it is the severity of illness & physiological derangement that contributed more for the outcome.

In our study, the respiratory system 41% was the one predominantly affected followed by the central nervous system 36%. Conditions like snake envenomation, Scorpion sting and Diabetic ketoacidosis were tabulated under the category ‘others’. In our study, the primary system affecting the child did not contribute significantly (p value 0.09) to the outcome of the child. Study conducted by D. Singhal et al[16], from the St. Stephen’s Hospital, New Delhi yielded a similar result with a p value of 0.11 for the system affected which is slightly higher than ours.

The requirement for mechanical ventilation proved to be a significant risk factor affecting the outcome (p value 0.010). About 89 children included in the study required ventilation, of which 35 faced mortality. There was no mortality seen among children who had required treatment with high flow oxygen therapy, indicating, the need for invasive ventilation to be a major risk factor in determining the outcome. Vasoactive agents such as dopamine, epinephrine and nor-epinephrine were used to stabilise children in the critical phase of treatment. Requirement for the use of such inotropes was compared with the outcome of the children. About 84 children required vasoactive therapy of which, 33 died. There were 2 deaths among children who did not require vasoactive therapy. Hence, requirement for vasoactive therapy proved to be a significant factor in determining the outcome of the children. The need for addition of an inotrope further increased the chances for mortality which was determined by linear to linear association.

Presence of multi-organ system was defined by the derangement of two or more systems. But it did not prove to be a significant risk factor in determining the outcome (p value 0.360). Presence of MODS could have been a more significant factor if the criteria defining MODS had been restricted to derangement of 3 or more systems as most of the study population required invasive ventilation and usage of at least one inotrope for their stabilisation when received from the ER or ward.

Children with elevated renal parameters such as the BUN and creatinine warranted the need for renal replacement therapy in the form of peritoneal dialysis. Totally, 13 children had required RRT during our study of which 9 had expired in the PICU making RRT as one of the potent factors determining the outcome (p value 0.006). This signifies the importance of the renal system in maintaining a normal homeostasis and acid base balance in our body. The duration of PICU stay was recorded and categorised accordingly. It was noted that the duration of PICU stay did not have any significance regarding the outcome of the children. This is because treatment has to be tailored according to the individual. Children's requirement for ICU stay would obviously depend on how far their physiology has deviated from the norm, their healing potential and immune response to the on-going disease process.

Requirement for cardio-pulmonary resuscitation either as pre ICU or in the ICU was found to be a major factor in determining the outcome. About 36 children had required CPR, of which 27 had succumbed to the illness in PICU. PRISM III score was calculated within 24 hours for all children included in the study. The score proved to have a major effect in predicting the outcome of the child admitted in the PICU. As the PRISM III score increased, the chances for mortality increased significantly showed by the chi square trend test. The PRISM III scoring system had a fair discriminatory power as evidenced by the area of 0.749 under the ROC curve compared to 0.72 in study done by D. Singhal et al[16] and a good calibration evidenced by the Hosmer Lemeshow Goodness of Fit test.

Also the probability of death at various PRISM III score range was found to be on the higher side compared to the one done by D. Singhal et al[16] proving the need for further study and analysis regarding the causes for increased mortality such as Nosocomial infections, Ventilator associated pneumonias and Ventilation induced Lung injuries etc.

SUMMARY

- This prospective observational study included 100 children admitted consecutively in the PICU, of which 35 had expired.
- Major portion of the study population was contributed by infants – 47%
- About two third of the study population were male children – 64 %
- Majority of the admissions to PICU were due respiratory ailments – 41% followed by derangements involving the central nervous system 36%.
- Majority of children admitted had acute malnutrition of severe range 28% and moderate range 14%.
- Mechanical ventilation was considered to be an important risk factor is determining the outcome of the child; p value of 0.010.
- Treatment with vasoactive agents contributed significantly in deciding the outcome; p value 0.040.
- The chances for mortality increased with the addition of an inotrope with a linear by linear association p value of 0.015.
- Need for renal replacement therapy at any point contributed significantly to the outcome of the child; p value < 0.0001
- Multi-organ dysfunction syndrome's presence did not have a significant impact on the outcome; p value 0.360
- Duration of ICU stay did not have any statistical significance on the outcome

- Need for Cardio-pulmonary resuscitation had a high statistical significance in determining the mortality of the child.
- The PRISM III score had a good discriminatory power and adequate calibration in predicting the outcome of children admitted in PICU.

LIMITATIONS

Though our study involving validation of PRISM III scoring system showed the scoring system to have good discriminatory power and adequate calibration, it has certain pitfalls such as a sample size of 100 where the extrapolation of the results to a large population requires further studies with larger groups. There were only two children above a PRISM III score of 20. The calculation of the score requires 17 variables to be recorded and analysed which is a cumbersome and time consuming process requiring sophisticated instruments like multi-para monitors, ABG analyser, etc. Also, ranges of certain variables in the score do not include conditions like bradycardia which is equivalent to imminent arrest. Heart rates of 60 as well as 120 are being given the same score. Similarly, any WBC count that is higher than 3000 cells is being given the same score, be it 4000 or 20,000. Most importantly, at times, when the scores are high, it tends to literally diagnose mortality rather than predicting it.

CONCLUSION

Predicting a patient's outcome is always associated with uncertainty. Yet, it is important as patients don't respond to the same insult in the same way. Judging the disease process clinically cannot be uniform & is largely subjective, based on individual experience. Hence the need for a scoring system comes into play in places like PICUs. The PRISM III score in our study, being one such scoring system, showed adequate discriminatory capacity and calibration. Hence can be considered a good tool for assessing the outcome of Paediatric patients admitted in the PICU of a tertiary care hospital. In our study, the variables considered to have a significant effect (risk factors) on the outcome of the children were PRISM III score, Mechanical ventilation, Usage of vaso-active agents, renal replacement therapy and need for cardio-pulmonary resuscitation.

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PROFORMA

l. Study Id :

2. Name :

3. IP Number :

4. Age : _____ years _____months

Category : □ <1yr □ 1-5yrs □ 6-12yrs

5. Sex : □ Male □ Female

6. Weight : ……. kgs Height : ……. cms

7. Systems mainly affected by the primary illness :

□ Cardiovascular □ Hematological
□ Respiratory □ Renal
□ Central Nervous system □ Renal
□ Infectious
□ Hepatobiliary

Disease Specification ……

8. Is the patient on mechanical ventilation ? Yes/No

If yes a) Fi O_2 : d) RR :

b) PIP : e) I:E :

c) PEEP :

9.Is the patient on oxygen therapy ? Yes/No

If yes, mode of oxygen delivery used : a) Hood (90%)

b) Jackson Rees (100%)

10. Is the patient on vasoactive agents ? Yes/No

If yes, vasoactive agents used a)……..….

b) ……

c) …….

11. Presence of MODS Yes/No

12. Requirement for Renal Replacement therapy Yes/No

13. Duration of PICU stay □ <3 days □ 3 – 7 days □ > 7 days

14.Pre-ICU/ ICU CPR Yes/No

OUTCOME

15. Outcome: □ Discharge □ Death

PRISM III SCORE

S.NO	PARAMETER	VALUE	SCORE
1	SYSTOLIC BP(mmHg)		
2	HEART RATE(bpm)		
3	TEMPERATURE (Celsius)		
4	GCS		
5	PUPILLARY RESPONSE		
6	ACIDOSIS		
7	pH		
8	PCo2(mmHg)		
9	PO2(mmHg)		
10	BICARBONATE(mEq)		
11	GLUCOSE(mg/dl)		
12	POTASSIUM(mEq)		
13	CREATININE(mg/dl)		
14	BUN(mg/dl)		
15	WBC(cells/µL)		
16	PLATELETS(cells/µL)		
17	PT & aPTT		
	TOTAL SCORE		

PATIENT INFORMATION SHEET

Place of study : Institute Of Child Health And Hospital for Children, Egmore,Chennai-8.

Name of Investigator : Dr.T.YASHWANTH RAJ

Name of Participant: **Age**: **Sex**:

Hospital No:

Study title

"PREDICTION OF OUTCOME OF THE CHILDREN ADMITTED IN PEDIATRIC INTENSIVE CARE UNIT USING PRISM III SCORING SYSTEM"

We request your child to participate in the study.

Aim of the study :

- To evaluate the performance of PRISM III score as a prognostic indicator in children admitted at the Paediatric Intensive Care Unit
- To determine the risk factors associated with mortality and prediction of probability of mortality at various PRISM III score.

Methods :

- Clinical examination will be performed on all the admitted children to select the study population according to inclusion criteria. Prestructured proforma will be used to record the relevant information (personal data, clinical findings, laboratory findings etc.) of the study population.
- The structured proforma will include criteria based on pediatric risk of mortality III (PRISM III) score. Blood pressure will be measured using a NIBP cuff. Temperature will be measured using digital thermometer. Pupillary response will be examined using a pen torch. Arterial and venous blood will be drawn with aseptic precautions for required biochemical and hematological

investigations. Multichannel noninvasive monitor will be used to monitor the heart rate.

Can I refuse to participate in the study?

Participation in the study is purely voluntary. You may refuse to participate or withdraw from the study at any time. In both cases the treatment and care your child receives from this hospital will not be affected in any manner.

Benefits and harms of participating in the study:

Your child will not benefit directly by participating in this study. But by way of participating in this study, your child is contributing to updation of science which may benefit her/him and all other patients with this disease in future.

Confidentiality:

The data collected from the study will be used for the purpose of study only. The results of the study will be published. Personal information of the children participating in the study will be kept confidential. There will not be any disclosure about your child's information without your permission.

Subject rights:

If you wish further information regarding your child's rights as a research participant, you may contact the principal investigator in the mobile number or address mentioned below.

Principal Investigator	:	Dr.T.YASHWANTH RAJ
Mobile number	:	9043610038
Contact Address	:	MD 2nd yr Post Graduate, Institute of Child Health and Hospital for Children, Halls road, Egmore, Chennai.

Place :

Date: Signature of the Parent

தகவல் படிவம்

ஆய்வாளர் : மருத்துவர் தி. யஷ்வந்த் ராஜ்

பங்கு பெறுபவரின் பெயர் : வயது : பாலினம் :

மருத்துவமனை எண்.

1. ஆய்வு தலைப்பு : **1 மாதம் முதல் 12 வயது வரை தீவிர சிகிச்சை பிரிவில் சேர்க்கப்படும் குழந்தைகளின் உடல் நிலையின் தன்மையை "PRISM III Score" மூலம் ஆராய்ந்து அவர்களது விளைவை கண்டறிவது பற்றிய ஆய்வு.**

2. தங்கள் குந்தைகள் இந்த ஆய்வில் பங்கு பெற கேட்டுக் கொள்கின்றோம்.

3. குழந்தையைப் பற்றிய விவரங்கள் கேட்டு அறியப்படும். மருத்துவ பரிசோதனை மேற்கொள்ளப்படும். இரத்தப் பரிசோதனை மற்றும் XRay, Echo எடுக்கப்படும்.

4. இந்த ஆய்வில் பங்கு பெறுவது உங்கள் தனிப்பட்ட விருப்பமே. ஆய்வு ஆரம்பித்த பின் விருப்பம் இல்லை என்றால் தாங்கள் விலகிக் கொள்ளலாம். அவ்வாறு விலகுவதானது தங்கள் குழந்தையின் சிகிச்சைக்கு எவ்வித பாதிப்பையும் உருவாக்காது.

5. உங்களுக்கு இந்த ஆய்வில் பங்கு பெறுவதால் எந்த பயனும் இல்லை. ஆனால் இந்த ஆய்வில் வரும் முடிவுகளை வைத்து மற்ற குழந்தைகளுக்கு கிடைக்கும் சிகிச்சைமுறை மேம்படுத்தப்படும்.

6. இந்த ஆய்வில் உங்கள் குழந்தையைப் பற்றிய தனிப்பட்ட விவரங்கள் யாருக்கும் தெரிவிக்காமல் பாதுகாக்கப்படும்.

7. உங்கள் குழந்தையைப்பற்றிய விவரங்கள் தெரிய வேண்டுமென்றால் ஆய்வு செய்யும் மருத்துவரை அணுகவும்.

மருத்துவ ஆய்வாளர் : **தி. யஷ்வந்த் ராஜ் 9043610038**

நாள் :

இடம் :

INFORMED CONSENT FORM

Study place : Institute Of Child Health And Hospital For Children, Egmore, Chennai-8.

Title of the study : **"**PREDICTION OF OUTCOME OF THE CHILDREN ADMITTED IN PEDIATRIC INTENSIVE CARE UNIT USING PRISM III SCORING SYSTEM"

Name of the investigator : Dr.T.YASHWANTH RAJ

Name of the Participant: **Age**: **Sex**:

Hospital number:

1. I have read and understood the patient information sheet provided to me regarding the participation of my child in the study.
2. I have been explained about the nature of the study and had my questions answered to my satisfaction.
3. I have been explained about my rights and responsibilities by the investigator.
4. I will allow my child tocooperate with the investigatorand undergo clinical tests subjected during the study whole heartedly.
5. I have been advised about the risks associated with my child's participation in this study.*
6. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my child's future treatment in this hospital. *
7. I hereby give permission to the investigators to release the information obtained from my child as result of participation in this study to medical journals/conference proceedings.

8. I understand that my child's identity will be kept confidential if my child's data are publicly presented/published.

9. I have decided my child can participate in the research study. I am aware that if I have any question during this study, I should contact the investigator.

10. By signing this consent form I attest that the information given in this document has been clearly explained to me and understood by me, I will be given a copy of this consent document.

Name and signature / thumb impression of the parent/guardian

Name _____ Signature_____

Date_____

Name and Signature of the investigator

Name _____ Signature_____

Date_____

Name and Signature of impartial witness 1:

Name _____ Signature_____

Date_____

Name and Signature of impartial witness 2:

Name _____ Signature_____

Date_____

ஒப்புதல் படிவம்

ஆய்விடம் : அரசு குழந்தைகள் நல மருத்துவமனை மற்றும் ஆராய்ச்சி நிலையம்.

ஆய்வாளர் : மருத்துவர் தி. யஷ்வந்த் ராஜ்

பங்கு பெறுபவரின் பெயர் : வயது : பாலினம் :

மருத்துவமனை எண்.

ஆய்வுதலைப்பு : **1 மாதம் முதல் 12 வயது வரை தீவிர சிகிச்சை பிரிவில் சேர்க்கப்படும் குழந்தைகளின் உடல் நிலையின் தன்மையை "PRISM III Score" மூலம் ஆராய்ந்து அவர்களது விளைவை கண்டறிவது பற்றிய ஆய்வு.**

1. இந்த ஆய்வைப் பற்றிய அனைத்து தகவல்களும் எனக்கு தெரிவிக்கப்பட்டது.
2. இதில் பங்கு பெறுவதற்கான ஒப்பந்த படிவமும் எனக்கு விவரிக்கப்பட்டது.
3. ஆராய்ச்சியின் தன்மையும் எனது உரிமைகளும் எடுத்துரைக்கப்பட்டன.
4. இந்த ஆய்வினால் எனது குழந்தையின் நலனுக்கு எந்த தீங்கும் இல்லை என்பதை தெரிந்து கொண்டேன்.
5. இந்த ஆய்வில் எனது குழந்தை பங்கு பெற எனது மனமார்ந்த ஒப்புதலை தருகிறேன்.
6. இந்த ஆய்வில் உங்கள் குழந்தையைப் பற்றிய தனிப்பட்ட விவரங்கள் யாருக்கும் தெரிவிக்காமல் பாதுகாக்கப்படும்.
7. இந்த ஆய்வில் பங்கு பெறுவது உங்கள் தனிப்பட்ட விருப்பமே. ஆய்வு ஆரம்பித்த பின் விருப்பம் இல்லை என்றால் தாங்கள் விலகிக் கொள்ளலாம். அவ்வாறு விலகுவதானது தங்கள் குழந்தையின் சிகிச்சைக்கு எந்தவித பாதிப்பையும் உருவாக்காது.

பெற்றோரின் கையொப்பம் சாட்சியின் கையொப்பம்

நாள் :

இடம் :

Name	Age	Sex	Nutrition	System	Ventilation	O2	Vaso.agent	No.vas.used	MODS	R.R.T	Duration	CPR	Prism range	Total score	outcome
Poornima	1	2	5	3	1	2	1	1	1	2	3	2	2	10	1
Bharath kumar	3	1	6	3	1	2	1	1	1	2	3	2	2	10	1
Rakshana	1	2	5	2	1	2	1	2	1	2	2	2	2	7	1
Adhiesh	2	1	5	2	1	2	1	1	1	2	3	2	3	13	1
Santhosh	2	1	4	3	1	2	1	0	1	2	2	2	2	7	1
Sabitha	1	2	1	4	2	1	2	0	2	2	2	2	1	2	1
Prashiya	2	2	2	8	1	2	1	2	1	2	2	2	4	18	1
Ranbeer	2	1	4	2	1	2	1	1	1	2	3	2	2	7	1
Keerthana	3	2	4	8	1	2	1	2	1	2	3	2	4	20	1
Logendran	1	1	1	8	2	1	2	0	2	2	1	2	1	0	1
Vetri	2	1	3	2	1	2	1	2	1	2	3	2	2	10	1
Prithik raj	1	1	6	2	2	1	1	1	2	2	2	2	1	2	1
Dhanashri	2	2	3	3	1	2	1	2	1	2	3	2	2	9	1
Manisha	2	2	5	3	1	2	1	2	1	1	3	2	2	7	1
B/o Frila	1	1	5	2	1	2	1	1	1	2	3	2	3	15	1
Riyaz	1	1	1	2	1	2	1	1	1	2	2	2	2	7	1
B/oKumari	1	2	4	2	1	2	1	1	1	2	3	2	2	9	1
Pregin	1	1	4	2	1	2	1	1	1	2	2	1	1	5	1
Shameer	1	1	5	2	1	2	1	1	1	1	3	2	1	5	1
Jerson	2	1	6	2	1	2	1	3	1	2	3	2	2	7	1
Monesh	1	1	1	2	1	2	1	2	1	2	3	2	2	10	1
Napradha	1	2	2	2	1	2	1	2	1	2	3	2	2	7	1
Parthu	2	1	3	2	1	2	1	1	1	2	2	2	2	10	2
B/Srilakmi	1	1	4	2	1	2	1	1	1	2	2	2	2	8	1

Syed Parveen	**1**	**1**	**1**	**7**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**2**	**3**	**11**	**1**
Appu	**2**	**1**	**2**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**1**	**5**	**1**
Sharuini	**2**	**2**	**3**	**3**	**1**	**2**	**1**	**3**	**1**	**2**	**3**	**1**	**2**	**8**	**1**
Susendran	**2**	**1**	**4**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**3**	**12**	**1**
Mahesh	**2**	**1**	**5**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**5**	**1**
Swetha	**2**	**2**	**2**	**8**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**13**	**1**
Prithina	**2**	**2**	**7**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**7**	**1**
Abdul rahman	**2**	**1**	**4**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**1**	**5**	**1**
Vignesh	**1**	**1**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**2**	**9**	**1**
Kesiga	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**3**	**14**	**1**
Abish	**2**	**1**	**6**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**0**	**1**
Gangadhar	**2**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**1**	**0**	**1**
Kishore	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**9**	**1**
Buvaneshwari	**1**	**2**	**2**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**5**	**1**
Rohith	**2**	**1**	**1**	**8**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**7**	**1**
Nayonika	**2**	**2**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**2**	**2**	**7**	**1**
Logeshwaran	**1**	**1**	**5**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**2**	**7**	**1**
Jeevashree	**2**	**2**	**5**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**7**	**1**
Bhawankarthi	**1**	**1**	**2**	**4**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**1**	**4**	**19**	**1**
Abdulmuheem	**1**	**1**	**1**	**4**	**1**	**2**	**1**	**1**	**1**	**1**	**3**	**2**	**2**	**10**	**1**
Shree	**1**	**2**	**4**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**2**	**1**	**5**	**1**
Thigal	**1**	**1**	**6**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**1**	**5**	**1**
B/mageswari	**1**	**2**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**3**	**12**	**1**
Chandru	**2**	**1**	**3**	**2**	**2**	**1**	**2**	**0**	**2**	**2**	**1**	**2**	**1**	**0**	**1**
Purnima	**1**	**2**	**5**	**3**	**1**	**2**	**2**	**0**	**1**	**2**	**3**	**2**	**2**	**8**	**1**

Abish	**1**	**1**	**6**	**2**	**1**	**2**	**2**	**0**	**1**	**2**	**3**	**2**	**1**	**7**	**1**
Dhanushri	**2**	**2**	**4**	**8**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**4**	**17**	**1**
Mohd Ajmal	**1**	**1**	**5**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**7**	**1**
Dharani	**3**	**2**	**2**	**3**	**2**	**1**	**2**	**0**	**2**	**2**	**2**	**2**	**1**	**0**	**1**
Subash	**3**	**1**	**8**	**3**	**2**	**1**	**2**	**0**	**2**	**2**	**2**	**2**	**1**	**4**	**1**
Karupasamy	**2**	**1**	**2**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**1**	**8**	**2**
Shashank	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**3**	**1**	**3**	**15**	**2**
Keerthana	**1**	**2**	**4**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**1**	**5**	**2**
Shravan	**1**	**1**	**3**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**2**	**7**	**2**
Vishwa	**2**	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**2**	**7**	**2**
Thumesh	**1**	**1**	**3**	**8**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**1**	**2**	**7**	**2**
Rhithish	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**1**	**5**	**1**
Bagyalaksmi	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**1**	**2**	**2**	**4**	**19**	**2**
Sivakumar	**3**	**1**	**4**	**7**	**1**	**2**	**2**	**0**	**2**	**1**	**3**	**1**	**3**	**15**	**2**
Kishore	**2**	**1**	**3**	**2**	**2**	**1**	**2**	**0**	**2**	**2**	**2**	**2**	**1**	**0**	**1**
Yogesh	**2**	**1**	**4**	**3**	**1**	**2**	**1**	**1**	**2**	**2**	**3**	**1**	**1**	**5**	**2**
Dhargan	**2**	**1**	**8**	**2**	**2**	**1**	**2**	**0**	**2**	**2**	**1**	**2**	**1**	**0**	**1**
Kaviya	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**3**	**2**	**5**	**22**	**2**
Monish	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**6**	**26**	**2**
Ramsri	**1**	**1**	**2**	**4**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**1**	**3**	**12**	**2**
Harish	**2**	**1**	**1**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**1**	**2**	**8**	**2**
Vishwa	**1**	**1**	**6**	**3**	**1**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**3**	**15**	**2**
Sasikumar	**1**	**1**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**2**	**7**	**1**
Pothumani	**3**	**2**	**1**	**5**	**1**	**2**	**1**	**3**	**1**	**2**	**1**	**1**	**4**	**17**	**2**
Ammu	**3**	**2**	**1**	**4**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**3**	**13**	**2**
Anitha	**1**	**2**	**6**	**4**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**1**	**4**	**19**	**2**
Jeshwanth	**1**	**1**	**1**	**4**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**1**	**4**	**18**	**2**

Monishwar	**2**	**1**	**6**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**2**	**7**	**2**
B/Sidhakumari	**1**	**1**	**3**	**2**	**1**	**2**	**1**	**3**	**1**	**2**	**3**	**1**	**2**	**7**	**2**
Jeeva	**2**	**1**	**5**	**2**	**1**	**2**	**1**	**3**	**1**	**2**	**3**	**1**	**3**	**12**	**2**
Lithin	**1**	**1**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**2**	**8**	**2**
Shalini	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**1**	**2**	**10**	**2**
Md Yahoop	**1**	**1**	**6**	**2**	**1**	**2**	**1**	**3**	**1**	**2**	**2**	**1**	**2**	**7**	**2**
Ritheeswaran	**1**	**1**	**1**	**4**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**1**	**2**	**7**	**2**
Ibrahim	**2**	**1**	**4**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**3**	**15**	**2**
Saranya	**2**	**2**	**3**	**8**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**4**	**18**	**2**
B/Laksmidevi	**1**	**1**	**5**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**1**	**5**	**1**
Madhusika	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**3**	**12**	**2**
Kavinkumr	**1**	**1**	**1**	**4**	**1**	**2**	**2**	**0**	**1**	**1**	**3**	**2**	**3**	**13**	**2**
Rashiya	**2**	**2**	**4**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**2**	**2**	**8**	**2**
Nandhila	**3**	**2**	**1**	**5**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**1**	**3**	**15**	**2**
Saranya	**2**	**2**	**4**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**4**	**18**	**2**
Sandeep	**3**	**1**	**5**	**3**	**1**	**2**	**2**	**0**	**2**	**2**	**2**	**2**	**2**	**7**	**1**
Varadhan	**3**	**1**	**4**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**8**	**1**
Vishal	**2**	**1**	**1**	**3**	**1**	**2**	**2**	**0**	**1**	**2**	**2**	**2**	**2**	**8**	**1**
Meenatchi	**3**	**2**	**6**	**8**	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**3**	**14**	**1**
Yogesh	**3**	**1**	**4**	**3**	**1**	**2**	**2**	**0**	**1**	**2**	**2**	**2**	**2**	**7**	**1**
Arunkumar	**3**	**1**	**1**	**3**	**2**	**1**	**2**	**0**	**2**	**2**	**2**	**2**	**1**	**0**	**1**
Vimal raj	**3**	**1**	**1**	**8**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**7**	**1**
Logesh	**3**	**1**	**6**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**1**	**3**	**12**	**2**
Joshna	**3**	**2**	**4**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**1**	**3**	**11**	**2**

EXCEL KEY

AGE	
< 1 year	1
1 – 5 years	2
6 – 12 years	3
SEX	
Male	1
Female	2
NUTRITION	
Weight for Length/Height	
< -3 S.D	1
< -2 to -3 S.D	2
< -1 to -2 S.D	3
0 to -1 S.D	4
0 to +1 S.D	5
+1 to +2 S.D	6
+2 to +3 S.D	7
> +3 S.D	8
SYSTEMS AFFECTED	
CVS	1
RS	2
CNS	3
INFECTIOUS	4

HEPATOBILIARY	5
HEMATOLOGICAL	6
RENAL	7
OTHERS	8

MECHANICAL VENTILATION

YES	1
NO	2

Oxygen therapy

YES	1
NO	2

Vasoactive Agents

YES	1
NO	2

No Of Vasoactive agents used

Nil	0
One	1
Two	2
Three	3

MODS

YES	1
NO	2

RENAL REPLACEMENT THERAPY

YES	1
NO	2

DURATION OF STAY

< 3 days	1
3– 7 days	2
>7 days	3

CPR

YES	1
NO	2

OUTCOME

Discharge	1
Death	2