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Clinical profile and outcome of children admitted with shock in pediatric intensive care unit of a tertiary care hospital in Coimbatore - A Prospective cohort study

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Abstract

Shock is an acute process characterized by body's inability to meet the metabolic needs of vital organs and tissues. Shock is a very important clinical state in PICU. There is limited data regarding the epidemiology of shock. This study aims to study the epidemiology of shock there by making management and allocation of resources easier.

Keywords: Shock, Sepsis, Dyselectrolytemia, Malnutrition, Hypo Tension.

Introduction

Shock is a acute process characterized by body's inability to deliver adequate oxygen to meet the metabolic demands of vital organs and tissues[1]. Early recognition of shock helps in successful resuscitation of critically ill children. Shock may be categorized as: cardiogenic, obstructive, distributive and hypovolemic. Shock is a clinical diagnosis[12].

The history and the clinical evaluations will facilitate early etiologic classification of shock and in directing appropriate treatment[13].This analysis aims to address these gaps in understanding by exploring the prevalence of shock, its clinically determined etiology, fluid management practices and outcomes among hospitalized children aged under 12 years.

Hypovolemic shock

Preload abnormality, characterized by inadequate intra vascular Volume relative to the intra vascular space. It is perhaps the most common shock occurring in infants and children.

Cardiogenic shock

Cardio genic shock is the state in which the abnormality of cardiac function is responsible for the failure to meet the metabolic needs of the tissues.

Obstructive shock

This is due to ab normalities of the afterload. Obstructive shock is caused by the inability to produce adequate cardiac output despite normal cardiac function and intra vascular volume.

Causes

- Tension Pneumothorax
- Acute pericarp dial tamponade

Distributive shock

Abnormalities in vascular tone cause maldistribution of circulatory volume, may lead to shock. Consequent peripheral pooling lead to a state of relative

Hypovolemia. Inaddition loss of arterial tone may lead on to hypo tension.

Etiology

- Sepsis
- Anaphylaxis
- Disruption of the spinal cord
- Spinal or Epidural Anaesthesia

Septic shock

Shock in sepsis contains many elements: Hypovolemic, distributive and cardio genic. Septic shock can be caused by bacteria, virus, protozoa or fungus [7]. Respiratory (37%) and primary bacteremia (25%) are the most common infections[8].

Study design

Prospective Cohort study

Place

Department of Paediatrics, Coimbatore Medical College and Hospital

Period of study

One year (March 2018-Feburary 2019)

Study population

All paediatric patients in the age group of 1 month to 12 years who will present to us with or develop features of shock on admission or anytime during hospitalization will be included in the study.

Inclusion criteria

Children between the age group of 1month to 12 years who will present to us with or develop features of shock on admission or any time during hospitalization will be included in the study.

Exclusion criteria

Documented evidence of shock treated elsewhere

Age less than 1 month and more than 12 yrs

Methodology

- All children aged 2months to 12 yrs meeting the inclusion criteria during the study period were enrolled, their history, clinical findings, treatment provided were recorded in preformed proforma.
- The shock was classified and its severity assessed
- Duration of hospital stay and Associated complications were studied.

Data management and statistical analysis

The data are reported as the mean+/-SD or the median, depending on their distribution. Frequencies are expressed in percentages.

Comparison between groups was made by the Non parametric Mann - Whitney test. The chi square test and Fishers "exact test were used assess differences in categoric variables between groups.

A p value of <0.05 was taken as being of significance for all statistical tests. All data were analysed with a statistical software package. (SPSS, version 16.0 for windows)

Results and discussion

A total of 302 children were enrolled in the study,

Children admitted with shock were analysed based on their age, gender, etiology leading to shock,

complications arising from shock, whether preexisting comorbidity was present[1],if present its relation with the severity of shock, need for inotropic support[11], and outcome were analysed.

Most of the study population were in the age group of <12months [4] (44%) and shock was more common in this age group. Female children contributed 45% and male children were 55% Gender wise distribution of shock was not significant with p value > 0.05.

The etiology of shock showed sepsis as the leading cause [12] (60%), followed by Hypo volemic shock (15%) and the least being obstructive (2%). Septic shock is the most common type of shock in all age group which is statistically significant with the p value of <0.001

Among the children admitted with shock 48% were hypo tensive. 96 (66%) children had Hypo tension on admission.

Among the children admitted 201(67%) needed inotropic support.

171 children had complications of shock. Dyselectrolytemia in the form of hyponatremia was the most common complication followed by MODS, acute kidney injury, hospital acquired infections and pulmonary edema.

Out of 302 children with shock 186 survived (62%) and 116 died (38%)

Out of 145 children in the hypotensive shock 68%died and 32% survived. Two thirds of children who died were brought to the pediatric intensive care unit in the state of hypotensive shock, those who developed hypotension during the course of hospital stay had favorable out come[10].

Association of various factors with shock was studied. Septic shock was more common in the age group of <12 months which was statistically significant with p value < 0.001.

Associated co-morbidity increases the severity of shock p value <0.001 Associated comorbidity affects the outcome of shock with p value<0.001.

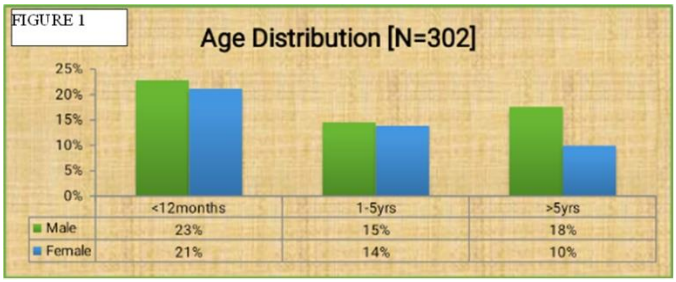


Figure 1: Age and gender wise distribution of children admitted with shock

Table 1: descriptive analysis of common etiologies of shock

Etiology	n	(%)
Septic	180	60%
Cardiogenic	43	14%
Hypovolemic	46	15%
Distributive	26	9%
Obstructive	7	2%
Total	302	100%

The etiology of shock was studied which showed sepsis as the leading cause, followed by Hypo volemic shock and the least being obstructive

Figure 2: Comparision between the etiology of shock and age

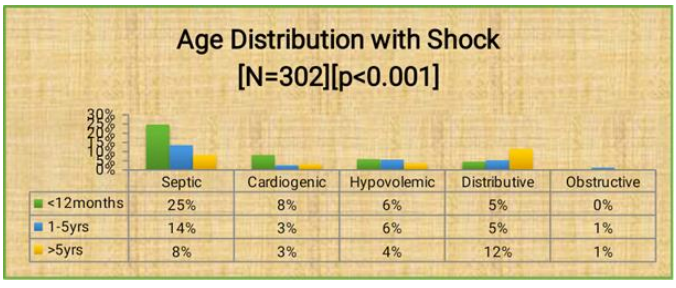


Table 2: severity of shock

Shock	n	(%)
Compensated	157	52%
Decompensated	145	48%
Total	302	100%

Among the children admitted with shock 48% were hypotensive. Out of 145 children with decompensated shock 96(66%) children had hypo tension at the time of admission Among the children admitted with 201 (67%) needed ino tropic support

Table 3: Analysis of severity of shock by the number of inotropes used

Inotropes	N	(%)
Single	76	38%
Mulitple	97	48%
Steroids	28	14%
Total	201	100%

Among 201 children (67%) who needed inotropes, 38% (n=76) required single inotropic support, 48% (n=97) required 2 or more and 14% (n=28) needed steroids as the shock was refractory.

Figure 3: Pie chart showing need for inotropes among the children with shock

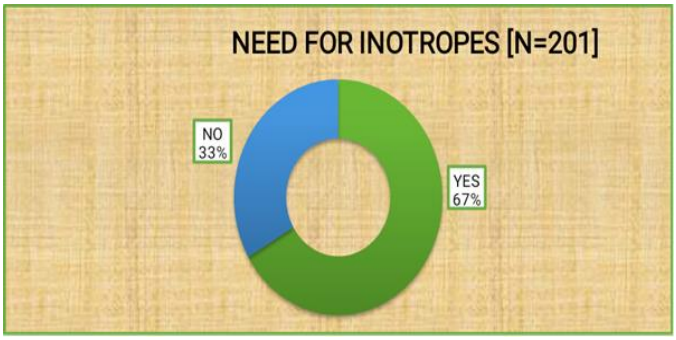


Figure 4: Presence of comorbidity in children with shock.

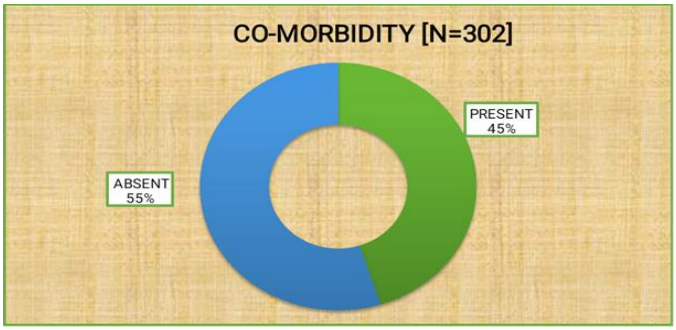


Table 4: Analysis of type of comorbidity among children with shock.

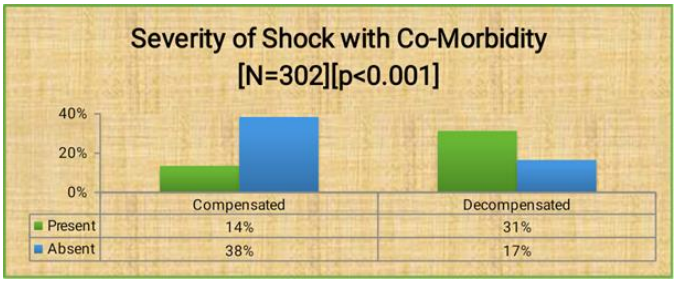
Type of comorbidity	N (136)	%
Cardiac	20	7%
Cns/seizures	10	3%
Lungs	6	2%
Kidney	5	2%
Blood disorder	14	5%
Liver disorder	11	4%
Allergy	3	1%
Nutrition	60	20%
Metabolic	3	1%
Skin disorder	1	0.3%
Syndromic	3	1.0%

Among the 136 children who had shock and comorbidity had malnutrition as the most common comorbidity.

Table 5: Association of shock with comorbidity.

Etiology Of Shock	Co-Morbidity	
	Present	Absent
Septic	48	93
Cardiogenic	32	11
Hypovolemic	16	30
Distributive	38	27
Obstructive	2	5
Total	136	166

Figure 5: Comparison between the associated co morbidity and shock's severity.



Associated comorbidity increases the severity of shock, which is statistically significant with a p value of <0.001

Table 6: Complications due to shock.

Complication	N=171	(%)
Pulmonary edema	22	13%
Hospital acquired infection	25	15%
AKI	26	15%
Dyselectrolytemia	68	40%
MODS	30	18%

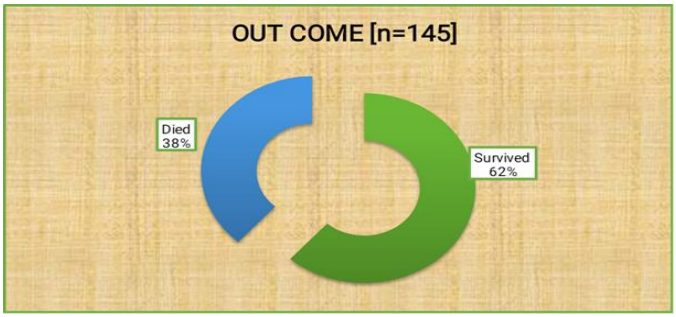
171 children had complications of shock.

Dyselectrolytemia in the form of hypo natremia was the most common complication followed by MODS, acute kidney injury, hospital acquired infections and pulmonary edema.

Table 7: outcome of children admitted with shock

Outcome	n	(%)
Survived	186	62%
Died	116	38%
Total	302	100%

Figure 6: Outcome of children with hypo tensive shock



Out of 145 children in the hypo tensive shock 68% died and32% survived. Two thirds of children who died were brought to the pediatric intensive care unit in the state of hypotensive shock, those who developed hypotension during the course of hospital stay had favorable outcome.

Conclusions

A total of 302 children were enrolled in the study, Children admitted with shock were analysed based on their age, gender, etiology leading to shock, complications arising from shock, whether preexisting co-morbidity was present[1], if present its relation with the severity of shock, need for inotropic support[11], and outcome were analysed.

Most of the study population were in the age group of <12months [4](44%) and shock was more common in this age group. Female children contributed 45% and male children were 55% Gender wise distribution of shock was not significant with p value > 0.05.

The etiology of shock showed sepsis as the leading cause [12](60%), followed by Hypo volemic shock (15%) and the least being obstructive (2%). Septic shock is the most common type of shock in all age group which is statistically significant with the p value of < 0.001

Among the children admitted with shock 48% were hypotensive. 96 (66%) children had Hypotension on admission.

Among the children admitted with 201 (67%) needed inotropic support.

171 children had complications of shock. Dyselectorlytemia in the form of hyponatremia was the most common complication followed by MODS, acute kidney injury, hospital acquired infections and pulmonary edema.

Out of 302 children with shock 186 survived (62%) and116 died (38%)

Out of 145 children in the hypotensive shock 68% died and 32% survived. Two thirds of children who died were brought to the pediatric intensive care unit in the state of hypotensive shock, those who developed hypotension during the course of hospital stay had favorable out come[10].

Association of various factors with shock was studied. Septic shock was more common in the age group of<12 months which was statistically significant with p value <0.001.

Associated co-morbidity increases the severity of shock p value <0.001 Associated comorbidity affects the outcome of shock with p value<0.001.

Sepsis is the leading cause of shock, infants are more prone for sepsis and hence the septic shock this Result correlate with the study by Swati M. Gadappa[14], Manas Kumar Behera on the clinical profile and outcome of shock in mechanically ventilated patients of critically ill children between 1month-12 years in 2018at Smt. Kashibai Navale Medical College and General Hospital, Pune, Maharashtra, India. Out of 145 children in the hypo tensive shock 68% died and32% survived.

Two thirds of children who died were brought to the pediatric intensive care unit in the state of hypotensive shock, those who developed hypotension during the course of hospital stay had favorable outcome this correlates with the study by Daljit singh 15, Atul Chopra in 2006, prospective study to determine the frequency, etiology, type and outcome of shock in children from 1month to 15 years in Ludhiana, Punjab" Septic shock presenting in the de compensated stage is associated with high mortality, Diagnosis and management of shock in compensated stage carried better prognosis than in uncompensated shock irrespective of age the patient"

Associated co-morbidity, hypotension during admission, dyselectorlytemia, need for multiple inotropes increases the severity and outcome of shock.

Among the 136 children who had associated comorbidity, malnutrition as the most common comorbidity and those children had critical course during the stay than other children.

Early recognition of shock by meticulous assessment of physio logical status and treatment improves the outcome and decreases the complications of shock and thus the duration of hospital stay, resources utilized

Ethics approval and consent to participate

The Institutional Ethics committee of Coimbatore Medical College

Consent to participate in the study was obtained from the parents of those children involved in the study at the time of admission

List of abbreviations

PICU- Pediatric Intensive Care Unit

MODS- Multi Organ Dysfunction Syndrome

AKI- Acute Kidney Injury

CNS-Central Nervous system

FTT- Failure To Thrive

SIRS -Systemic Inflammatory Response Syndrome

Authors' contributions

"Dr. TVKK performed the identification, categorization and assessment of children admitted with shock. Dr. L K performed the management, investigations and follow up of cases.

All authors read and approved the final manuscript.

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