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Original Research Article

Assessment of clinical parameters and immediate outcome of children with shock in a tertiary care hospital ASRAM, Eluru, Andhra Pradesh, India

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ABSTRACT

Background: Shock is a state of impaired tissue perfusion resulting in an imbalance between oxygen demand and supply. This widespread reduction in effective tissue perfusion causes insufficient or improper delivery and distribution of oxygen and nutrients, the end result of which is an altered cellular and sub cellular function leading to anaerobic metabolism and accumulation of lactic acid, and consequently cellular damage, multiple organ dysfunction and finally cardiovascular collapse.
Methods: The present study was conducted in the department of Pediatrics at Alluri Sitarama Raju Academy of Medical Sciences hospital, Eluru, between December 2014 and June 2016. It is a prospective study. Children aged 1 month to 12 years with a clinical diagnosis of shock were included after written consent from parents.
Results: Out of 75 children admitted with shock, 69.33% had septic shock, 25.33% had hypovolemic shock, 2.66% had distributive shock, 2.66% cardiogenic shock. Most common age group admitted with shock was 1 month-1 year 38.666%. Among 75 children with shock, 74.66% children survived and 25.33% children died. Mortality rate in cardiogenic shock was 100%, in septic shock 28.84%, in hypovolemic shock 10.52%.
Conclusions: Septic shock was the most common type of shock. Most common cause for septic shock was pneumonia. Septic shock has got highest mortality in the present study.Need for inotropes and mechanical ventilaton indicates poor prognosis in shock.

Keywords: Cardiogenic shock, Hypovolemic shock, Mortality, Septic shock

INTRODUCTION

Shock is a state of impaired tissue perfusion resulting in an imbalance between oxygen demand and supply. This widespread reduction in effective tissue perfusion causes insufficient or improper delivery and distribution of oxygen and nutrients, the end result of which is an altered cellular and sub cellular function leading to anaerobic metabolism and accumulation of lactic acid, and consequently cellular damage, multiple organ dysfunction and finally cardiovascular collapse.[1]

Shock occurs in approximately 2% of all hospitalized infants, children and adults in developed countries, and the mortality rate varies substantially depending on the etiology and clinical circumstances. Most patients who do not survive, do not die in the acute hypotensive phase of shock, but rather as a result of associated complications and multiple organ dysfunction syndrome (MODS).[2]

Shock is one of the most common pediatric emergencies with significant mortality if not recognized and treated early. Early recognition and treatment of shock with

continuous clinical and laboratory parameters will improve the outcome.

METHODS

The present study was conducted in the department of Pediatrics at Alluri Sitarama Raju Academy of Medical Sciences hospital, Eluru, between December 2014 and June 2016. It is a prospective study. Children aged 1 month to 12 years with a clinical diagnosis of shock were included after written consent from parents and clinical parameters were compared between survivors and non-survivors. Various factors like age, sex, Systolic BP and heart rate at admission, at 12 hours, at 24 hours, urine output at 24 hours, GCS at admission, requirement of inotrpes (single/multiple), requirement of mechanical ventilator were studied between survivors and non-survivers.

RESULTS

Out of 75 cases studied, 41 (54.66%) were male and 34 (45.33%) were female.

Most common age group was 1month-1year (38.66%), 1-5 years (34.66%), 5-12 years (26.66%). Among the types of shock septic shock was the most common (69.33%), followed by hypovolemic shock 25.33%, distributive shock 2.66% and cardiogenic shock 2.66%. Out of 75 cases 74.66% survived and 25.33% died. Out of different types of shock mortality was highest (100%) in cardiogenic shock, 28.84% in septic shock and10.52% in hypovolemic shock. In distributive shock 100% survival was observed in the present study. In the present study, most common infection causing septic shock was pneumonia 17/52 (32.69%), followed by sepsis 13/52 (25%), dengue fever 10/52 (19.23%) and CNS infections 9/52 (17.3%).

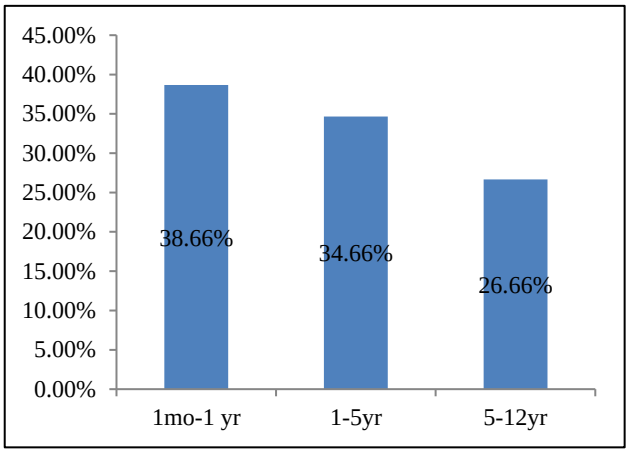

Figure 1: Age wise distribution of patients studied.

Table 1: Systolic BP changes in survivors and non-survivors 1month-1 year.

SBP (mm of Hg)	Survivors		Non-survivors		P value
	Mean	SD	Mean	SD	(t-test for independent samples)
0 hour	67.25	11.045	56.25	10.223	0.025
12	75.71	10.827	62.00	7.483	0.002

Table 2: Systolic BP changes in survivors and non-survivors 1-12 years.

SBP (mm of Hg)	Survivors		Non-survivors		P value
	Mean	SD	Mean	SD	(t-test for independent samples)
0 hour	77.59	14.666	75.33	15.395	0.700
12 hours	85.29	14.380	79.50	13.512	0.304
24 hours	92.09	12.676	76.00	13.216	0.017*

Table 3: Heart rate changes in survivors and non-survivors 1month-1 years.

Heart rate (bpm)	Survivors		Non-survivors		P value
	Mean	SD	Mean	SD	(t-test for independent samples)
0 hour	178.57	12.359	183.56	0 hour	178.57
12 hours	154.62	9.610	167.43	12 hours	154.62
24 hours	144.90	11.730	160.14	24 hours	144.90

In the present study, most common cause for hypovolemic shock was acute gastroenteritis (78.94%), diabetic ketoacidosis (15.78%), burns (5.26%).

Systolic blood pressure at admission, at 12 hours and 24 hours after admission is significantly lower in non-survivors than in survivors with shock.

In the age group 1 month-1 year, heart rate at admission was not significantly different between both groups but at 12 and 24 hours it was significantly low in survivors than in non-survivors.

Among non-survivors 84.2% required Inotropic agents of which 52.63% required multiple inotropes and among survivors only 32.14% required inotropes; which was statistically very significant with a p value of <0.001. Hence requirement of multiple inotropes was associated with poor outcome. In the present study ventilator requirement was more in non-survivors (73.68%) than in survivors (16.07) with a p value of <0.001.

Table 4: Heart rate changes in survivors and non-survivors 1-12 years.

Heart rate (bpm)	Survivors		Non-survivors		P value
	Mean	SD	Mean	SD	(t-test for independent samples)
0 hour	131.06	17.317	132.80	18.390	0.793
12 hours	119.40	18.160	122.25	20.776	0.728
24 hours	103.49	15.357	118.14	17.883	0.030*

Table 5: Comparison of clinical parameters between survivors and non-survivor.

Parameters	Survivors		Non-survivors		P value
	Mean	SD	Mean	SD	
Capillary refilling time at admission(CRT)	5.30	1.159	5.68	1.204	0.239
Capillary refilling time at 24 hours (CRT 24)	2.16	0.532	3.50	0.760	<0.001**
GCS at admission	12.21	1.979	10.21	1.548	<0.001**
SpO_2 at admission	94.52	4.760	88.68	7.056	0.003**
Urine output at 24 hours (UO)	1.66	0.701	1.05	0.433	<0.001**

Table 6: Inotrope requirement.

Inotrope	Survivors (n = 56)		Non-survivors (n = 19)		P value (Chi-Square)
	No	%	No.	%	
No inotrope	38	67.85	3	15.78	<0.001**
Single inotrope	9	16.07	6	31.57	
Multiple inotropes	9	16.07	10	52.63	
Total	**56**	**100%**	**19**	**100%**	

DISCUSSION

In the present study shock constitutes 7.96% (75/942) of total admissions in the PICU. Similar results were observed in other Indian study from Bangalore.[3]

Incidence of septic shock in the PICU in the present study was 5.5% (52/942). Incidence of severe sepsis was relatively higher in Indian pediatric ICU (40-60%) compared to those admitted in western pediatric intensive care unit (2-4%).[4]

Since the present study was conducted in a tertiary level hospital, complicated cases were referred to this PICU which explains more incidence of septic shock in this PICU. Incidence of septic shock appears to have increased from 3.7% to 4.4% between 2004-2012 [5]. Incidence of septic shock was in increasing trend, mostly because more patients are surviving with the diseases which were fatal previously and also due to increase in invasive procedures.[6]

In the present study most common age group affected with shock was 1month- 1 year (38.666%), followed by 1-5 years (34.666%), followed by 5-12 years (26.666%).

Most common cause of shock is septic shock 69.33% of cases, followed by hypovolemic shock 25.33% of cases, followed by distributive and cardiogenic shock each constituting for 2.66% cases. In the study done by Ravikanth septic shock is the most common cause of shock constituting 48% of total cases, followed by hypovolemic shock constituting for 28% of all cases; cardiogenic shock accounted for 23%, and anaphylactic shock for 1% of total cases.[3]

In the present study out of 75 cases, survivors are 56 (74.66%) and non-survivors are 19 (25.33%) which was

in concordance with that found in the literature (30-60%).[7,8]

In the present study, mortality rate for septic shock was 28.84%. Mortality rate in septic shock ranged from 10-82% in the children.[9,10] Low mortality rate for septic shock in the present study was due to early recognition of shock and its aggressive management following protocols along with constant monitoring.

In the present study cardiogenic shock was present only in 2 cases both of which died, thus making mortality rate in the cardiogenic shock 100%. In a study by Chang P et al mortality was found to be 75% in cases of cardiogenic shock.[8]

Acute gastroenteritis was the most common cause of hypovolemic shock as in other studies.[3,8] The most common infection causing septic shock in the present study was pneumonia 32.69%, followed by sepsis 25%.

In the age group 1month-1-year systolic blood pressure at admission, 12 and 24 hours is significantly lower in non-survivors than in survivors. In the age group of 1-12 years Systolic blood pressure at admission and at 12 hours of admission were not significantly different between survivors and non-survivors but at 24 hours it was significantly lower in non-survivors than in survivors.

GCS at admission was significantly low in non-survivors than in survivors. In the present study, though there is no significant difference in capillary refill time at admission between survivors and non-survivors, at 24 hours after admission capillary refill time is significantly lower in survivors than in non-survivors. The urine output (mean±ml/kg/hr) at 24 hours after admission was significantly low in non-survivors than in survivors. Similar result also occurred in a study done by Ravikanth.[3]

SpO_2 (mean±SD%) was significantly low in non-survivors at admission than in survivors. In trauma and high-risk surgical cases in adults SpO_2 by pulse oxymetry was found to be significantly higher in survivors than in non-survivors.[11]

There was more need for mechanical ventilation in the non-survivors (73.68%) than in survivors (16.07%). Need for mechanical ventilation predicted mortality in shock cases because of two reasons 1) the need for mechanical ventilation per se indicated the severity of shock 2) the multiple complications associated with ventilation which contribute to the mortality. The need for mechanical ventilation is found to be independent risk factor for mortality in this study. Requirement of mechanical ventilation was an independent risk factor for mortality in two studies.[12,13]

Requirement of multiple inotropes was associated with poor outcome. In a study done by Delgado, et al requirement of inotropes especially multiple inotropes was associated with poor outcome.[14]

CONCLUSION

Shock is one of the most common emergencies in pediatrics. Majority of cases are in the age group of >1-month-5 years. Most common cause of shock is septic shock followed by hypovolemic shock. Most common cause of septic shock is pneumonia and acute gastroenteritis is for hypovolemic shock. Septic shock has got highest mortality in this study.

The clinical variables at admission, which were significantly different between survivors and non-survivors, were GCS and saturation of oxygen by pulse oximetry. The clinical variables at 24 hours after admission, which were significantly different between survivors and non-survivors, were heart rate, capillary refilling time and urine output. There was increased need for inotropes and mechanical ventilation in non-survivors as compared to survivors.

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