

ORIGINAL RESEARCH

A Hospital Based Prospective Study to Assess the Risk Factors Contributing to Increased Mortality in Children Admitted with Shock in PICU

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ABSTRACT

Background: Shock is one of the most dramatic, dynamic and life-threatening problems faced by the physician in critical care setting. The mortality rate of shock in pediatric patients has declined as a consequence of educational efforts (pediatric advance life support), which emphasize early recognition and intervention and rapid transfer of critically ill patients to a PICU via a transport service. To know about the risk factors in a critically ill child with shock and its association with outcome, will give us an early clue in identifying and prioritizing management strategies.

Material & Methods: A descriptive study done on 100 children in the age group of one month to 12 years presenting with shock (or) who later develop shock during PICU stay at RUHS College of Medical Sciences, Jaipur, Rajasthan, India during one year period. Children who had received inpatient treatment prior to admission in PICU, post cardiac arrest shock and traumatic shock / Burns were excluded in our study. During the PICU stay periodic vital signs and other measures like urine output and oxygen saturation were recorded. IV fluid therapy, rate and duration of inotrope and other organ support like ventilatory support were documented.

Results: In present study the frequency of shock was found to be 1.64%. Undernutrition, decompensated shock, cardiogenic shock, duration of shock more than 6 hours, leucopenia, hypocalcemia, inotrope requirement, ventilator support & MODS was present in higher proportion of children who died (36.11%, 69.44%, 27.77%, 72.22%, 22.22%, 38.88%, 94.44%, 97.23% & 69.45 respectively) when compared to those who had survived (20.32%, 14.06%, 9.37%, 26.56%, 4.68%, 10.93%, 57.82%, 47.25% & 15.62% respectively). Odds of different variables were measure among the children who died, when compared to those who had survived (2.17, 13.78, 3.56, 7.45, 5.89, 5.11, 13.87, 104.2 & 12.78 respectively).

Conclusion: We concluded that under nutrition, decompensated shock, inotrope requirement, MODS, leucopenia and ventilatory support are independently associated with poor outcome.

Keywords: Shock, PICU, Children, Risk factor, Inotrope requirement, MODS

INTRODUCTION

Shock is a clinical state characterized by inadequate tissue perfusion resulting in delivery of oxygen and metabolic substances that is insufficient to meet tissue metabolic demands. Shock accounts for more morbidity and mortality in children world wide than any other diagnosis.^{1,2} Shock is one of the most dramatic, dynamic and life-threatening problems faced by the physician in critical care setting.³ Shock occurs in approximately 2% of all hospitalized children and adults in the united state.⁴ Majority of the childhood illness have the potential to lead to shock.

High index of suspicion is needed for early identification of shock. Early institution of treatment will definitely reduce the chances of progression of shock to end up in cardio respiratory failure. Rapid and focused cardiopulmonary assessment adds in the early recognition of shock state.⁵

The mortality rate of shock in pediatric patients has declined as a consequence of educational efforts (pediatric advance life support), which emphasize early recognition and intervention and rapid transfer of critically ill patients to a PICU via a transport service.⁴

Knowledge about the morbidity pattern and etiology of shock in PICU will give us better understanding of the illness to plan the appropriate management, and also to improve the outcome. To know about the risk factors in a critically ill child with shock and its association with outcome, will give us an early clue in identifying and prioritizing management strategies.

MATERIALS & METHODS

A descriptive study done on 100 children in the age group of one month to 12 years presenting with shock (or) who later develop shock during PICU stay at RUHS College of Medical Sciences, Jaipur, Rajasthan, India during one year period. Children who had received inpatient treatment prior to admission in PICU, post cardiac arrest shock and traumatic shock / Burns were excluded in our study.

METHODS

Personal details and history were taken initially. Rapid cardio pulmonary assessment and physical examination including general and systemic examination were done and entry made in the data sheet.

All sick children were initially evaluated in the emergency room of the hospital and initial stabilization of the patient including airway, breathing followed by fluid resuscitation was carried out. Children presenting with acute watery diarrhea were admitted in the PICU only if they require some intensive care in the form of ventilation, inotrope support or dialysis. All other cases of shock were admitted in PICU.

The proforma was designed to notify the type of shock identified in the emergency room, the probable risk factors to mortality, the results of investigations and the progress of the patient. Routine investigations were taken in all the patients, specific investigations that are mentioned in the proforma were taken in required cases.

The patients were managed according to the protocol adapted from text book of the paediatric intensive care² and as per PALS guidelines.⁵

Management details and complications were recorded. During the PICU stay periodic vital signs and other measures like urine output and oxygen saturation were recorded. IV fluid therapy, rate and duration of inotrope and other organ support like ventilatory support were documented.

STATISTICAL ANALYSIS

As the variables are in qualitative form we have used chi square test in the univariate analysis to observe the association between the study variables and the outcome. To quantify the magnitude of association we have used odds ratio and its corresponding 95% confidence interval to observe the precision of the estimates.

RESULTS

In present study the frequency of shock was found to be 1.64%. The incidence of shock is higher in the younger age group and progressively reduces as the age advances. Male: Female ratio was 1.3:1 (table 1).

Table 1: Age and Sex Distribution Of Children With Shock

S. No	Age Group	Male		Female		Total	
		Nos	%	Nos	%	Nos	%
1.	1 month-12months	25	60.97%	16	39.02%	41	41%
2.	>1 year-5 years	19	51.35%	18	48.64%	37	37%
3.	>5 years-10 years	11	64.70%	6	35.29%	17	17%
4.	>10 years-12 years	3	60%	2	40%	5	5%
	Total	58	58%	42	42%	100	100%

Under nutrition, decompensated shock, cardiogenic shock, duration of shock more than 6 hours, leucopenia, hypocalcemia, inotrope requirement, ventilator support & MODS was present in higher proportion of children who died (36.11%, 69.44%, 27.77%, 72.22%, 22.22%, 38.88%, 94.44%, 97.23% & 69.45 respectively) when compared to those who had survived (20.32%, 14.06%, 9.37%, 26.56%, 4.68%, 10.93%, 57.82%, 47.25% & 15.62% respectively). Odds of different variables were measured among the children who died, when compared to those who had survived (2.17, 13.78, 3.56, 7.45, 5.89, 5.11, 13.87, 104.2 & 12.78 respectively) (table 2).

Table 2: Associated Between the Risk Factors And Outcome(Death) (Univariate Analysis)

Variables	Outcome (N=100)		P-value	OR for death	95% CI for OR
	Died (N=36)	Survival (N=64)			
Age (yrs)					
<1 yrs	18 (50%)	23 (35.94%)	>0.05	1.69	(0.992, 2.934)
>1 yrs	18 (50%)	41 (64.06%)			
Under-nutrition					
Yes	13 (36.11%)	13 (20.32%)	<0.05*	2.17	(1.23, 3.89)
No	23 (63.89%)	51 (79.68%)			
Decompensated shock					
Yes	25 (69.44%)	9 (14.06%)	<0.001*	13.78	(7.24, 27.18)
No	11 (30.56%)	55 (85.94%)			
Sepsis					
Yes	20 (55.55%)	27 (42.18%)	>0.05	1.56	(0.934, 2.67)
No	16 (44.44%)	37 (57.82%)			
Cardiogenic shock					
Yes	10 (27.77%)	6 (9.37%)	<0.001*	3.56	(1.78, 7.92)
No	26 (72.22%)	58 (90.62%)			
Duration of shock					
≥ 6 hours	26 (72.22%)	17 (26.56%)	<0.001*	7.45	(4.12, 13.23)
< 6 hours	10 (27.77%)	47 (63.73%)			

Duration of illness					
>12 hours	19 (52.77%)	38 (59.37%)	>0.05	0.76	(0.45, 1.26)
< 12 hours	17 (47.22%)	26 (40.62%)			
Leucopenia					
Yes	8 (22.22%)	3 (4.68%)	<0.001*	5.89	(2.38, 14.67)
No	28 (77.78%)	61 (95.32%)			
Hypocalcemia					
Yes	14 (38.88%)	7 (10.93%)	<0.001*	5.11	(2.58, 9.75)
No	22 (61.12%)	57 (89.06%)			
Inotrope requirement					
Yes	34 (94.44%)	37 (57.82%)	<0.001*	13.87	(5.12, 42.18)
No	2 (5.56%)	27 (42.18%)			
Ventilatory support					
Yes	35 (97.23%)	28 (43.75%)	<0.001*	104.2	(14.76, 770.23)
No	1 (2.77%)	36 (56.25%)			
MODS					
Yes	25 (69.45%)	10 (15.62%)	<0.001*	12.78	(6.56, 23.89)
No	11 (30.55%)	54 (84.38%)			

DISCUSSION

In present study the frequency of shock was found to be 1.64%. According to Western data, shock occurs in approximately 2% of all hospitalized children and adults in United States.⁴ In a study conducted by Daljit Singh et al⁶ they found frequency of shock was 4.3%.

In our study fever was the common presentation in septic and hypovolemic shock. Breathlessness was the common presentation in cardiogenic shock, in our study it was uniformly presenting all cases of cardiogenic shock convulsions were the most common presentation in distributive shock. The incidence of septic shock is increasing world over with a 10 fold increase in the past 20 years, the reason being that more patients are surviving with the disease which were fatal previously and due to increase in invasive procedures which constitute risk factors for developing sepsis⁶.

In our study inotrope was required in 71 patients (71%), which is high when compared to study done by Daljit Singh et al⁶, where inotrope was required in 46.0% of patients. This may be explained by the difference in patient population between our study (PICU cases) and other study (patients brought to emergency). Mortality was high in patients requiring inotropes (36%), mortality was very high in patients requiring more than one inotrope. It is much higher in our study when compared to previous study, by Kutko et al⁷ who concluded that mortality was more in patients requiring multiple inotropes (42.9%) than patients requiring single inotrope (0%).

In our study ventilatory support was required in 63 cases (63.0%) which is very high when compared to study done by Daljit Singh et al⁶ (22.4%). This can be explained by most cases of septic shock in our study instead of hypovolemic shock due to diarrhea which has very good prognosis, not requiring ventilatory support and inotropes.

In present study we found, undernutrition decompensated shock, need for ventilatory support, MODS, leucopenia and inotrope requirement were the independent risk factors for mortality as in previous studies.^{4,7,8-11} In a study conducted by Daljit Singh et al⁸ they found malnutrition and inotrope requirement were not associated with increased mortality.

CONCLUSION

Diagnosis and management of shock in early compensated stage carries better prognosis than in decompensated shock irrespective of the age of the patient. Under nutrition, Decompensated shock, inotrope requirement, MODS, leucopenia and ventilatory support are independently associated with poor outcome.

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