

Morbidity pattern and outcome in patients admitted in a paediatric intensive care unit: Experience of a hospital attached to a medical college in rural Maharashtra, India

*Subhash Shankar Poyekar¹

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Abstract

Introduction: Critically ill children require treatment in an intensive care unit which is not easily available in rural areas and costly resulting in more deaths in rural parts of India. The knowledge of pattern of disease prevalent in the local community plays an important role in planning appropriate health care facilities. Outcome findings help in evaluation of current medical practices and carrying out changes if necessary, leading to better patient care.

Objectives: To analyse morbidity pattern and outcome in patients admitted in a Paediatric Intensive Care Unit (PICU) of a hospital in rural Maharashtra.

Method: Descriptive data were collected retrospectively from the hospital medical records from January 2017 to December 2018 and analysed for morbidity pattern and outcome in children admitted in the PICU.

Results: A total of 2386 children were admitted and treated in the PICU during the 2-year period. Mean age of the studied patients was 40.2 ± 42 months; 34% were infants and 58.9% were males. The mean length of stay (LOS) in PICU was 4.81 ± 4.89 days. Diagnoses included respiratory infection (27.3%), infectious diseases (20.5%), neurological disorders (18.2%), gastrointestinal (10.5%), haematological (5.8%), renal/endocrinal (3.2 %), cardiovascular (3.1%), and others (10.7%). Other causes included acute poisoning, snake / scorpion bite, trauma and foreign body ingestion / aspiration. The overall mortality rate was 9%.

¹Associate Professor, Department of Paediatrics, Rural Medical College, Loni, Maharashtra, India

*Correspondence: dr.subhashp18@gmail.com

 <https://orcid.org/0000-0003-4450-9960>

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Conclusions: The present study reveals that the most susceptible age group was under-five year old children. Respiratory illnesses and infectious diseases were the major causes.

(Key words: Cardiovascular, Infectious diseases, Morbidity pattern, Outcome, PICU).

Introduction

In the developing world, morbidity and mortality in under-five year old children is an important public health problem¹. Paediatric intensive care unit (PICU) is set aside for managing children with life-threatening illnesses². The aim of a PICU is early intervention and quality care to achieve a good outcome. There is increased survival of critically ill children, with advances in intensive care facilities³. Outcome depends on the underlying nature of the disease, associated co-morbidities, clinical condition of the patient at presentation, infrastructure and the quality of care provided in the unit⁴. Study of the morbidity pattern among the treated children provides information of the diseases in the community and facilitates a strategy to deal with them and make the PICU more adaptive for the population catered.

Objectives

To analyse morbidity pattern and outcome in patients admitted in a PICU of a hospital in rural Maharashtra.

Method

A retrospective record-based study was carried out to review the admissions to the PICU of a hospital attached to a post-graduate teaching institute located in a rural part of Maharashtra. The hospital has a well-equipped six-bed PICU, and a 6-bed High Dependency Unit (HDU) which admits paediatric patients <12 years of age. Data of admissions in PICU from January 2017 to December 2018 (2-year period) were collected, which included age, gender, diagnosis, duration of stay, advanced management provided in PICU and the outcome. Outcome was classified as transfers to main paediatric ward, discharge against medical advice (DAMA), referral discharge and death. All patients in PICU were treated according to a written standard protocol.

Ethical issues: Approval was obtained from the Ethical Committee of Pravara Institute of Medical Sciences-Deemed University (No. PIMS/DR/RMC/2019/305). As this was a retrospective study informed consent was not possible. Confidentiality was assured.

Statistical analysis: Data were analysed using Microsoft Office Excel version 2007 and statistical package for social science, version 17.0. Nominal data were compared using the Chi square test. $p < 0.05$ was considered significant.

Results

A total of 2386 children who received care in the PICU during the 2-year period were enrolled. Age-wise and gender-wise distribution of study subjects in the 2 year study period are shown in Figures 1 and 2. Majority of them were under-5 year old children. The proportion of infants getting admitted had increased in 2018, so also more male children required admission during 2018 as compared to the previous year. Month-wise admissions to PICU are shown in Figure-3. There were more admissions from August to October.

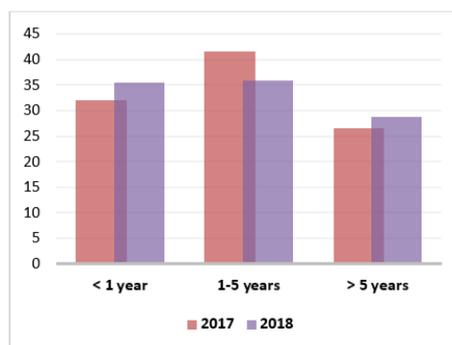


Figure 1: Age-wise distribution of study subjects

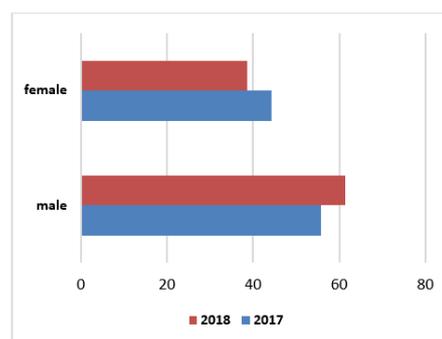


Figure 2: Gender-wise distribution of study subjects

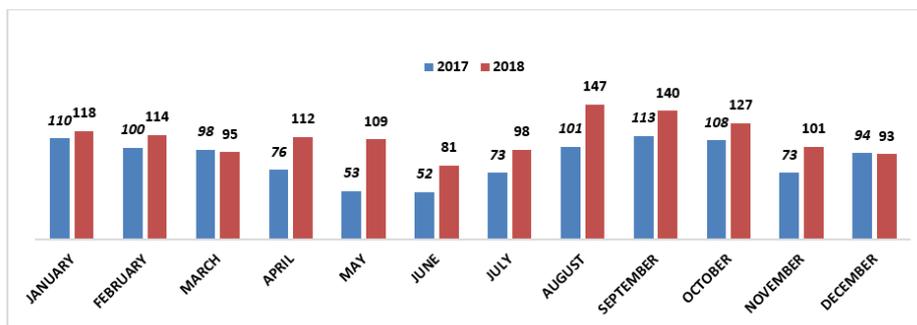


Figure 3: Month-wise admissions to paediatric intensive care unit (PICU)

Diagnoses in children admitted in PICU are shown in table 1. Respiratory system affection was the leading cause of morbidity in children, followed by infectious diseases and neurological problems. Acute poisoning (ingestion/inhalation) and snake /

scorpion bite were the major causes for severe morbidity requiring PICU admission/care. Accidental ingestion/aspiration of foreign body and trauma were other the non-infectious/non-systemic causes for admission and care in the PICU.

Table 1: Disease pattern in patients admitted to paediatric intensive care unit (PICU)

Diagnosis	2017		2018		Total	
	N=1051	%	N=1335	%	N=2386	%
Respiratory infections	260	24.7	392	30.9	652	27.3
Infectious disease	198	18.8	290	21.7	488	20.5
Neurological problems	181	17.2	254	19.0	435	18.2
Gastrointestinal diseases	136	12.9	115	8.6	251	10.5
Poisoning, bites (snake/scorpion)	99	9.42	82	6.14	181	7.6
Haematological	63	5.8	68	5.1	131	5.5
Renal and metabolic disorders	43	4.1	34	2.5	77	3.2
Cardiovascular system	31	2.9	42	3.1	73	3.1
Trauma, foreign body ingestion /aspiration	34	3.2	47	2.2	81	3.4
Others	06	0.6	11	0.8	17	0.7

Length of stay (LOS) in the PICU is shown in Figure 4. Nearly half of the children stayed in the PICU for less than 3 days, whereas the proportion

of children requiring prolonged intensive care increased during 2018.

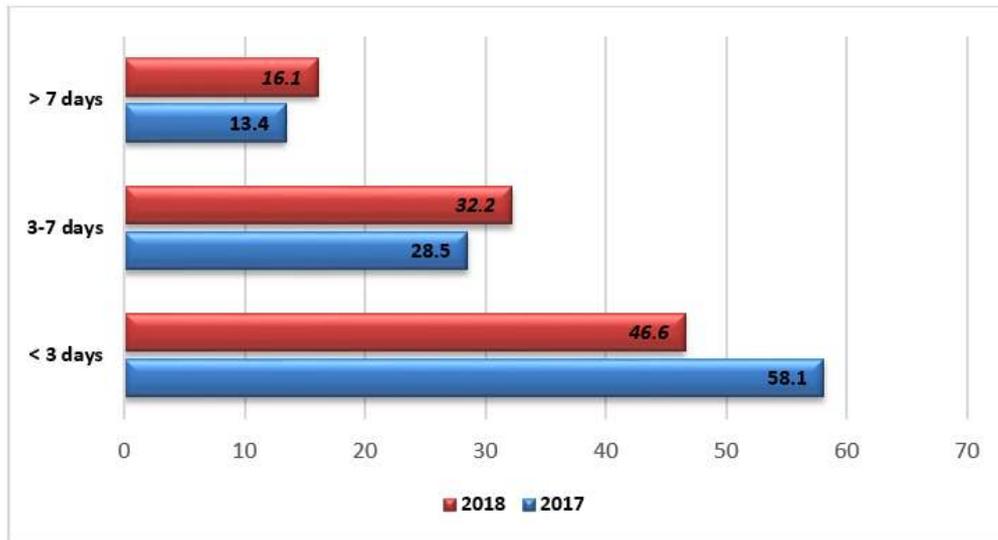


Figure 4: Length of stay of patients in the paediatric intensive care unit (PICU)

Year-wise immediate outcome of management in study subjects is shown in table 2. It showed increase in mortality during 2018, however the

proportion of children leaving against medical advice (LAMA) had shown a decline.

Table 2: Year wise outcome in study subjects

	2017		2018		Total	
	N	%	N	%	N	%
Transferred & Discharged from Wards	868	82.6	1159	86.8	2027	85
Expired	75	7.1	140	10.5	215	9.0
Discharged from PICU	102	9.7	34	2.5	136	5.7
Left against Medical Advice (LAMA)	6	0.6	2	0.1	8	0.3

Determinants of treatment outcome are shown in table 3. Overall mortality was 9% with marginally higher proportion amongst male children. The highest mortality was seen in infants. Better

survival was observed in children who showed response to the treatment on day one of admission. Major causes of death were severe respiratory tract infection/diseases and sepsis.

Table 3: Socio-demographic variables and outcome in patients admitted in PICU

Variable	Outcome n (%)			*P value
	Survival (n=2171)	Death (n=215)	Total (n=2386)	
<i>Sex</i>				
M	1295 (92.17%)	110 (7.83%)	1405	0.019
F	876 (89.3 %)	105 (10.7%)	981	
<i>Age group (months)</i>				
< 12	703 (86.8%)	107 (13.2%)	810	0.0001
12 - 59	850 (93.6%)	65 (6.4%)	915	
> 60	618 (93.5%)	43 (6.5%)	661	
<i>Length of stay (days)</i>				
< 1	252 (87.8%)	35 (12.2%)	287	<0.0001
2-7	1463 (91.84%)	130 (8.16%)	1593	
> 7	456 (90.12%)	50 (9.88%)	506	

Discussion

During the study period 2386 children in the age group of more than 28 days to 12 years were admitted into the PICU. Of them, 1405 (58.9%) were males with a M: F ratio of 1.43:1, similar to other tertiary level PICUs^{4,5}. Male preponderance in admissions may be caused by biological vulnerability of boys to infection. Tyagi BB, *et al* found that more boys than girls were admitted to hospital for varied complaints, suggestive of a gender bias⁶. In contrast, a study from South India found that more female patients were treated in the PICU⁷.

The mean age of study subjects was 40.2 ± 42 months, which is comparable to another study⁴. There were 1725 (72%) children under the age of 5 years, similar to observations in a study by Jyothi AK, *et al*⁸. Maximum numbers of patients viz. 915 (38.4%) were in the 1 - 5 year age group. This was followed by infantile age group which constituted 810 (34%) cases. Similar observations have been reported⁷. However, in another study, the maximum numbers of patients were in the infantile age group⁹ and Nirmala C, *et al* found that the most common age group of admitted children was 5 years and above¹⁰.

This study revealed that respiratory (27.3%), infectious diseases (20.5%) and neurological diseases (18.2%) were the major causes of admission. Other systemic diseases were diagnosed in 21.3% of children. Respiratory diseases being the leading cause for PICU admission is similar to some studies^{11,12}. However, cardiovascular disease (41.1%) was the most common disease reported by Blesing I, *et al*⁴. Infectious disease was the leading cause of admission in the PICU in a study conducted in Odisha³ and nervous system disorders was major cause in a study by Jain S *et al*⁹. Respiratory infections was the predominant cause for admission; which could be a reflection of disease prevalence in the community. In the present study, infectious diseases was the next common cause of admission but a specific causative agent could not be identified in all the cases due to limitation of diagnostic facilities.

Almost five percent of paediatric emergency admissions was because of acute poisoning. Similar finding had been reported in a South Indian study¹³. It chiefly comprised accidental ingestion of household products and insecticides. It could be due to children being from agrarian families and to insecticides and kerosene being stored at home with easy accessibility to them. Snake bite, scorpion sting and unknown bites were also seen in significant number of patients (3%). This finding in our study could be attributed to the fact that the majority of them reside in a rural area with poor

housing conditions, reptiles having resting places near to their houses.

Substantial numbers of children were admitted with foreign body ingestion/aspiration. Most of them were below 2 years of age. This may be because their parents were working in the field and unable to provide constant supervision. These children play in open areas and hence have access to small particles and nuts / beans. Trauma-related cases constituted a sizeable proportion of admissions into the PICU and were made up of road traffic accidents, head injuries, falls from height and other forms of trauma. This could be due to increase in number of vehicles on road as means of transportation and risky/ adventurous behaviour in growing children.

In this study we analysed seasonal trends/variations of admission rate. It was observed that the number of cases started increasing from August and remained at a high level till October in both years. Respiratory (viral) illnesses mainly contributed to the increased number. The next peak was seen in late winter. This sudden spurt in the cases may be attributed to an outbreak of viral illnesses and vector borne diseases in the surrounding areas.

The mean length of stay (LOS) in the PICU was 4.81 ± 4.89 days (range, 1–53 days). Nearly half of the patients stayed for less than 72 hours. In a study by Haftu H, *et al*¹⁴, the mean ICU stay was 4.9 ± 5.8 days (range 1–30 days) with 61% of them staying for 2–7 days. An Indian study by Khilnani P, *et al*¹⁵ reported that the mean duration of stay was 4.52 ± 2.6 days. In contrast, a study conducted by Sahoo B, *et al*³ reported that the mean duration of stay was 3.7 ± 2.5 days.

The clinical condition of 2163 (90.7%) patients improved and they were transferred to the paediatric wards for completion of treatment and were eventually discharged. There was a significant decrease in the number of patients leaving against medical advice in 2018.

The overall mortality was 9%, similar to a study by Haftu H, *et al*¹⁴. This value is higher than the mortality rate (4.1%) documented by Sahoo B, *et al*¹². It is, however, less than the mortality rate reported by Mridha D *et al*¹¹ (20.9%) and Bellad R, *et al*¹⁶ (16.7%). Lower mortality may be due to adequate manpower and availability of advanced equipment and provision of continuous medical education on paediatric critical care from time to time for the staff by the institution. Amongst those who died 51.2% were males and 48.8% were females, with their mean age being 30 months. There was an increase in percentage of patients with adverse outcome in 2018 as compared to the

previous year, which may be because of increase in number of patients brought to the PICU in a very critical state, requiring ventilator support and inotropes.

Major causes of death were respiratory infections, sepsis, meningitis/ encephalitis, cardiogenic shock and renal/metabolic disorders. In the study by Roy N, *et al*¹⁷, septicaemia was the leading cause of death, followed by meningitis and respiratory infections. Infantile age group, female gender and LOS less than 24 hours were risk factors for mortality.

Conclusions

In this study under-five year old children were the vulnerable population with male preponderance. Respiratory infections and infectious diseases were the leading causes of admission with severe respiratory infection and sepsis the leading causes for death. Acute poisoning, bites (snake/scorpion), foreign body ingestion and aspiration substantially contributed to morbidity and mortality amongst rural children. Overall mortality was 9%. Infantile age group, female gender and LOS less than 24 hours were risk factors for mortality.

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