

# Morbidity and Mortality Pattern of Patients Admitted into Paediatric Intensive Care Unit of Tertiary Level Hospital of Nepal

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## ABSTRACT

**Introduction:** The paediatric intensive care unit (PICU) takes care of critically ill paediatric patients. Regular evaluation of the outcomes of patients admitted to PICU is important to assess the effectiveness of various interventions. This study aimed to find the morbidity and mortality pattern of patients admitted to PICU of tertiary level Paediatric hospital of Nepal.

**Methods:** We conducted a retrospective, cross sectional observational study using the records of all the patients admitted to PICU of a tertiary level hospital from January 2017 to August 2017. We collected data on age, sex, geographical distribution, duration of PICU stay and the morbidity and mortality outcomes. Outcome is classified as transfer to ward, leave against medical advice (LAMA) and death. Data were analysed descriptively using SPSS version 23.

**Results:** Out of 358 patients admitted to PICU, the mean age was 1.83 years. Majority were infants (54.5%) with male:female ratio of 1.8:1. The major causes of PICU admission were respiratory disease (27.7%) followed by CNS disease (19.6%) and infections (17.3%). The average length of stay was 6.27 days. Overall mortality was 22.7%.

**Conclusion:** Respiratory infections were the primary cause of PICU admission and overall mortality rate was high at 22.7%. However, mortality rate was even worse for patients with multi-system involvement. We need prospective studies to examine the underlying reasons for mortality among patients with multi-system involvement.

**Keywords:** children; morbidity; mortality; Nepal; PICU



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## INTRODUCTION

One of the indicators for Sustainable Development Goals as defined by UN is to ensure healthy lives and promote wellbeing for all people at all ages. By 2030, target of Sustainable Development Goal is to end preventable deaths of newborns and children under-5-years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births.<sup>1</sup> Despite a rapid reduction in under-5-year mortality for some countries, the progress in sub-Saharan Africa and Southeast Asia remains insufficient to meet the goal.<sup>2</sup> The majority of childhood deaths in these settings result from preventable and reversible causes.<sup>3,4</sup> While 10–20% of sick children will be referred to a hospital, the delay in recognition, late presentation, lack of resources, and severity of illness make the first 24 hours of hospitalisation the most vulnerable period with one-third of patient deaths occurring during this time.<sup>5</sup>

In order to reduce global mortality in the under five population in less developed countries, we need adequate nutrition and preventive care, as well as effective paediatric emergency and critical care services. However, less developed countries face a daunting task in their effort to develop and sustain critical care services as most of the services are limited to basic healthcare services even during life-threatening situations.<sup>6</sup> In addition, there is inadequate research in the field to identify appropriate interventions in these less developed countries.<sup>7</sup>

In critical care medicine, intensive care unit performance can be evaluated based on mortality or survival outcomes. With proper evaluation of PICU performance, we can identify and standardise appropriate interventions that are not only effective but can also guide in the efforts to manage resources needed to deliver care in intensive units.<sup>8</sup>

This study was based on the data from the PICU of a tertiary care referral children's hospital, located in Kathmandu, Nepal. As this is the only Government's paediatric tertiary level hospital throughout the country, the burden of critically ill patients who require intensive care is also high.

This study was done to identify the morbidity and mortality pattern and the outcomes of patients admitted in the PICU.

## METHODS

This was a cross sectional observational study. The medical records of all children (aged one month to 14 years) admitted in the PICU from January 2017 to August 2017 were reviewed retrospectively. All the patients admitted to PICU during this duration were enrolled as study participants. The age, sex, geographical distribution, morbidity, duration of PICU stay and the outcomes were analysed. Outcome was classified as transfer to ward, discharges, leave against medical advice (LAMA) and death. Those patients whose clinical condition was neither improved nor deteriorated during PICU stay were considered static. Proposal for the study was submitted to IRC of our institute and ethical approval was taken prior to the start of the study.

Descriptive statistics were presented using frequency and percentage. Bivariate analysis was performed using Chi-Square test to find the association between various characteristics and outcome of PICU admitted patients. At 95% confidence interval (CI), p-value < 0.05 was considered to be significant.

## RESULTS

The total sample size for this study was 358. Majority of patients (54.5%) were infants, followed by children between the ages of one to four years (20.7%). (Fig.1) The mean age was 1.83 years and standard deviation was 0.057. A total of 269 (75.2%) were under five years children admitted to PICU.

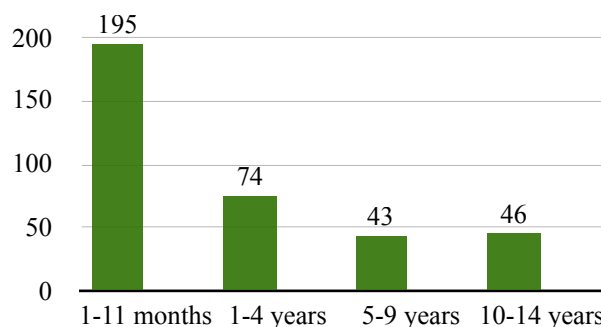


Figure 1. Age distribution of patients

**Table 1.** System involved as per age group of patients admitted in PICU

System involved	Total no. of patients (n = 358)	Age of patients			
		1-11 months (n = 195)	1- 4 years (n = 74)	5-9 years (n = 43)	10-14 years (n = 46)
		No. of patients (%)	No. of patients (%)	No. of patients (%)	No. of patients (%)
Respiratory	99 (27.7%)	64 (32.8%)	18 (24.3%)	12 (27.9%)	5 (10.8%)
CNS	70 (19.6%)	22 (11.3%)	19 (25.7%)	14 (32.5%)	15 (32.6%)
Infectious	62 (17.3%)	46 (23.6%)	4 (5.4%)	3 (7%)	9 (19.6%)
CVS	59 (16.5%)	47 (24.1%)	7 (9.5%)	4 (9.3%)	1 (2.2%)
Hemato-oncological	26 (7.3%)	6 (3%)	11 (14.9%)	6 (14%)	3 (6.5%)
GIT	16 (4.5%)	7 (3.6%)	5 (6.7%)	2 (4.6%)	2 (4.3%)
Nephrological	11 (3.1%)	0	5 (6.7%)	2 (4.6%)	4 (8.7%)
Miscellaneous	8 (2.2%)	1(0.5%)	3 (4%)	0	4 (8.7%)
Metabolic	4 (1.1%)	2 (1%)	2 (2.7%)	0	0
Rheumatic	2 (0.6%)	0	0	0	2 (4.3%)
Endocrine	1 (0.3%)	0	0	0	1(2.2%)
Total	358 (100%)	195 (54.5%)	74 (20.7%)	43 (12%)	46 (12.8%)

The male:female ratio was 1.8:1, with 230 (64.2%) males and 128 (35.8%) females. A large majority of patients (81.6%) came from outside Kathmandu valley. The patients most commonly requiring PICU admissions were due to respiratory disease (27.7%), followed by CNS, infectious, cardiovascular, haemato-oncological diseases. Miscellaneous disease included poisoning, malnutrition and allergic reactions. In infants the most common diseases which lead to PICU admission were respiratory, followed by cardiovascular, infection, CNS and GIT diseases.

Respiratory disease was the commonest problem in the majority of children (Table1).

Of the 358 patients, 235 (65.7%) improved, the condition of 43 (12%) patients were static and 80 (22.3%) patients expired. Among the patients who improved, 225 were transferred to paediatric ward for continuation of treatment and 10 patients were discharged directly. Out of 43 static patients, 10 were transferred to paediatric ward and 4 were discharged as per parent's request, and 29 left

**Table 2.** Outcome of PICU admitted patients

Outcome	No. of patients			Total
	Improved	Static	Expired	
Transferred to ward	225	10	-	235
Discharged	10	4	-	14
LAMA	0	29	-	29
Expired	0	0	80	80
Total	235 (65.7%)	43 (12%)	80 (22.3%)	358

**Table 3.** Outcome of patients as per age group

Age group	No. of patients			Total
	Improved	Static	Expired	
1-11 months	122	20	53 (27.2%)	195
1-4 years	47	10	17 (23%)	74
5-9 years	29	9	5 (11.6%)	43
10-14 years	37	4	5 (10.8%)	46
Total	235 (65.7%)	43 (12%)	80 (22.3%)	358

**Table 4.** Outcome of PICU admitted patients as per length of stay and System involved.

Character istics	Outcome			Total	P-value
	Improv ed	Static	Expired		
<b>Length of stay</b>					
1 day	16 (28.6%)	9 (16%)	31 (55.4%)	56	< 0.001
2-7 days	157 (74.4%)	19 (9%)	35 (16.6%)	211	
> 7 days	62 (68.1%)	15 (16.5%)	14 (15.4%)	91	
<b>System involved</b>					
1 (single system)	152 (74.5%)	24 (11.8%)	28 (13.7%)	204	< 0.001
> 1 (Multisystem)	83 (53.9%)	19 (12.3%)	52 (33.8%)	154	

•Chi-square test

against medical advice (LAMA) (Table 2) Mortality was higher in infants (27.2%) followed by children of one to four years (23%) (Table 3).

The mean length of stay in PICU was 6.27 days (range one to 39 days). A higher proportion of children who stayed less than one day in PICU have died (55.4%). Based on Chi-square test, the relationship between length of stay and the outcomes was statistically significant. ( $p < 0.001$ ) (Table 4). We also observed significant differences in outcomes by system involved ( $p < 0.001$ ). The mortality in children who had multi-system involvement was high at 33.8% as compared with only 13.7% for those with only one system involvement. (Table 4).

## DISCUSSION

This study included a total of 358 PICU admissions over the study period. The mean age of the patient was 1.83 years which was similar to the study done by Abhulimhen-Iyoha BI et al. and Roy SM et al.<sup>9,10</sup> Majority of the children were males. The gender distribution in our study was similar to the studies done by Abhulimhen-Iyoha BI et al., Roy SM et al., Khilnani P et al. and Volaki E et al.<sup>9-12</sup>

Our results probably show male preference in seeking medical care. As it is the only paediatric referral centre in whole country, majority of the patients were from outside the Kathmandu valley.

Top five causes of PICU admissions were in consistence with disease pattern as seen in studies done by Khilnani P et al., Volaki E et al. and Mukhija G et al.<sup>11-13</sup> In other studies done by Abhulimhen-Iyoha BI et al. CVS was the major cause of PICU admission as the study was done in the centre where a lot of cardiovascular surgeries are done.<sup>9</sup> CNS disease was found to be the major cause of PICU admission in another study done by Roy SM et al.<sup>10</sup> The difference in this pattern may be due to difference in the disease pattern of different geographical locations. The mean length of stay in PICU was 6.27 days (range 1–39 days). It was similar to the study done by Abhulimhen-Iyoha BI et al., Khilnani P et al. and Haque A et al.<sup>9,11,14</sup>

Regarding the outcome, 235 (65.7%) patients improved, 43 (12%) were static and 80 (22.3%) expired. The mortality rate of PICU was 22.3% which is similar to the study done by Roy SM et al. (24.3%) in patients admitted to PICU of a teaching hospital in Kolkata, West Bengal, in the eastern part of India, and Jyothi AK et al. (28%).<sup>10,15</sup> But this is in contrast with the various studies done, where the mortality rates are lower (2.1% to 9.7%).<sup>9,11-13</sup> The wide range of mortality may be due to varied reasons; delayed referral to an intensive care unit could be one of the many reasons.

Although some studies reveal that there is correlation between length of stay and outcome,<sup>16</sup> whereas other shows no relationship.<sup>9</sup> Among those with significant relationship, there are contradictory findings as to how length of stay affects outcome.<sup>17</sup> Our study shows that among those children who stayed in PICU for one day or less; 31 (55.4%) expired and 16 (28.6%) improved. Nine (16%) of those patients who stayed in the PICU for less than one day went on LAMA as they were suffering from chronic diseases such as haematological malignancies, Down's syndrome, congenital heart diseases, cerebral palsy etc. and their condition was static. There was significant relationship between length of stay and outcome, which was in contradiction with study done by Abhulimhen-



Iyoha BI et al.<sup>9</sup> But, the mortalities in the patients who stayed in PICU for either two to seven days or more than seven days were similar. The severity of illness before admission and the presence of co-morbid conditions are also significant factors in patient survival. The delay in recognition, late presentation, lack of resources, and illness severity make the first 24 hours of hospitalisation the most vulnerable period with one-third of patient deaths occurring during this time.<sup>5</sup> In this study, the mortality is higher in children who had multi-system involvement (33.8%) in comparison to children with single system involvement (13.7%). As the proportion of infants requiring PICU admissions was high, the mortality among this age group was also relatively high.

We do not have data to examine the severity of patients and thus, we cannot assess whether the mortality differences across different patient groups

are due to confounding factors. Future studies could conduct a prospective study and include severity scoring tools such as Paediatric Risk of Mortality (PRISM) and Paediatric Index of Mortality (PIM) to better understand the causes of differences in mortality.

## CONCLUSIONS

We found that a majority of patients admitted to PICU are under the age of one year and the primary cause of admission was the disease of respiratory system. Mortality rate were high at 22.3% but mortality rates differed by the number of systems involved with the patient with multi-system involvement having a worse mortality rate.

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