

## Original research article

## A study to evaluate the clinical characteristics and outcome of patients admitted in PICU at tertiary care facility

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### Abstract

**Aim:** The aim of the present study was to identify the clinical profile and outcome of children admitted in PICU.

**Methods:** A retrospective, descriptive study was conducted in the Department of Pediatrics, Darbhanga Medical College & Hospital, Laheriasarai, Bihar, India for 1 year.. 210 children less than 14 years admitted to PICU with complete patient information along with the investigation reports in the medical records were included in the study. Outcome was noted as discharge/against medical advice/referred. History, examination details, investigations done was noted.

**Results:** Out of 210 patients, 158 (75.24%) were males and remaining 52(24.76%) were females. Male to female ratio was 3.03:1. Maximum numbers of patients were in the age group of below 1 year which constituted 115 (54.76%) cases. Central nervous system was the commonest system involved (n=72, 34.29%). Next infections involved was (n=42, 20%). Other common causes were respiratory system (n=34, 16.19%), cardiovascular (n= 22, 10.48%), gastro intestinal (n=9, 4.28%), haematological (n=10,4.76%) and renal (n=8, 3.81%) system causes. This was followed by metabolic causes (n=6, 2.86%), Down syndrome (n = 3, 1.43%) and poisoning in 4 (1.90%) cases. Out of the 210 patients admitted to PICU, 51 (24.28%) patients' died.

**Conclusion:** The present study highlights neurological, respiratory and gastrointestinal disorders to be the leading cause of admissions in PICU, catering to the needs of critical care of the in-patients from Pediatric Medicine and in-patients of pediatric age from other specialities and super specialties. This study is therefore conducted to audit the pattern of cases being admitted into the PICU of this tertiary care teaching hospital and their outcome.

**Keywords:** Cardiovascular, Metabolic, PICU, Respiratory

### Introduction

Since the first intensive care units (ICUs) were established in the United States in the 1960s, intensive care gradually has become very important in the management of critically ill patients. Paediatric patients who are critically ill and need advanced airway, respiratory and hemodynamic support are admitted in Pediatric intensive care unit (PICU) to improve outcome. Intensive care is offered to the patients whose condition is potentially reversible and have a good chance of survival with intensive care support. The objective of pediatric critical care is to decrease the mortality and to restore the child, who is suffering from a life-threatening condition, to health with a minimum pain, anxiety and complications.<sup>1,2</sup>

The quality of paediatric medical care is reflected by the presence of functioning Paediatric Intensive Care Units in a country.<sup>2</sup> The principle objective of Pediatric critical care is not only to decrease the mortality, but also to restore the child who is suffering from a life threatening condition to health with a minimum pain anxiety and complications and to provide comfort and guidance to the child's family.<sup>3</sup> According to World Health Organisation (WHO), the major causes of death in under - five children in developing countries are preventable and curable diseases, if the care is optimized.<sup>4</sup> But despite all the measures, ICU is one of the sites where medical errors are most likely to occur because of the complexity of the diseases, and multiple interventions. With advancement in intensive care facilities, there is a dramatic increase in survival of critically ill children. In critical care medicine, intensive care unit (ICU) results can be accessed on the basis of outcome such as mortality rate or survival.<sup>5</sup> In PICU it becomes important to audit admissions and their outcome, which may help to modify practices if necessary following thorough introspection, leading to better patient outcomes.<sup>6</sup> The primary focus of critical care has evolved from saving lives by monitoring and maintaining physiological status to placing greater emphasis on the prevention of secondary injuries and preservation of function.<sup>7</sup> Collection, analysis, and interpretation of relevant objective data on the utilization of ICU beds will help plan for reducing the length of ICU stay and facilitate covering more patients who require this care.<sup>8</sup> The aim of the present study was to identify the clinical profile and outcome of children admitted in PICU.

### Materials and methods

A retrospective, observational study was conducted in the Department of Pediatrics, Darbhanga Medical College & Hospital, Laheriasarai, Bihar, India for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

### Methodology

Total 210 Children less than 14 years admitted to PICU with complete patient information along with the investigation reports in the medical records were included in the study. Children with medical records with incomplete information were excluded. The patients needed for this study were identified by reviewing our PICU nominal register. 210 patients were included in this study. The following data was collected from the medical records department (MRD) about the patients included in this study-gender, age, address, provisional and final diagnosis of the patient, date of admission. Outcome was noted as discharge/against medical advice/referred. History, examination details, investigations done were noted (CBC, CRP, serum bilirubin, chest x ray, USG abdomen, neuroimaging, EEG, ABG, CSF analysis, urine routine, microscopy, stool for occult blood, LFT, RFT), course in the hospital and treatment given were recorded.

### Results

Total of 210 patients were admitted in PICU. Out of these 210 patients, 158 (75.24%) were males and remaining 52(24.76%) were females. Male to female ratio was 3.03:1.

**Table 1: Age distribution of children admitted in PICU**

Sex	Number of cases	(Percentage
Male	158	75.24
Female	52	24.76
Age		
Below 1 year	115	54.76

1-5 years	51	24.28
5-10 years	29	13.81
10-14 years	15	7.14

Table 1 shows maximum numbers of patients were in the age group of below 1 year which constituted 115 (54.76%) cases. This was followed by 1 year to less than 5 years age group which constituted 51(24.28%) cases. Under 5 years aged children constituted 166 79.05%) cases. Next most common age group admitted was 5 years to 10 years with 29 (13.81%) cases and 10 to 14 years age group constituted 15 (7.14%) cases.

**Table 2: Distribution in relation to the system involved.**

System involved/causes	Number of cases	(Percentage
Central nervous system	72	34.29
Infection/sepsis	42	20
Respiratory system	34	16.19
Cardio vascular system	22	10.48
Gastro intestinal system	9	4.28
Haematological system	10	4.76
Renal system	8	3.81
Metabolic	6	2.86
Down syndrome	3	1.43
Poisoning	4	1.90

Table 2 shows the system wise cause of admission of patients to PICU. Central nervous system was the commonest system involved (n=72, 34.29%). Next infections involved was (n=42, 20%). Other common causes were respiratory system (n=34, 16.19%), cardiovascular (n= 22, 10.48%), gastro intestinal (n=9, 4.28%), haematological (n=10,4.76%) and renal (n=8, 3.81%) system causes. This was followed by metabolic causes (n=6, 2.86%), Down syndrome (n = 3, 1.43%) and poisoning in 4 (1.90%) cases.

**Table 3: Outcome of patients in PICU**

Outcome	No of cases	(Percentage
Expired	51	24.28
Survived	120	57.14
Others	39	18.57

Out of the 210 patients admitted to PICU, 51 (24.28%) patients' died. 120(57.14%) cases improved and were shifted to general ward and later discharged. 39(18.57%) cases constituted of those who were shifted to higher centre or another department or were taken against medical advice.

## Discussion

The PICU is a special unit of health care delivery service for patients who are critical with potentially recoverable diseases. PICU requires a vast use of up to date equipment and highly skilled staff and demands a tremendous amount of time and effort on behalf of the medical and nursing staff to treat and improve survival of the critically ill patients. Protocol based management, rational antibiotic policy, early referral to PICU to be implemented to have a low mortality. Maximum numbers of patients were in the age group of below 1 year which constituted 115 (54.76%) cases. This was followed by 1 year to less than 5 years age group which constituted 51(24.28%) cases. Under 5 years aged children constituted 166 79.05%) cases. Next most common age group admitted was 5 years to 10 years with 29 (13.81%) cases and 10 to 14 years age group constituted 15 (7.14%) cases. This is comparable to a

study published by El Halal MG et al, from Brazil where it was reported that majority of patients (78.3%) was under 5 years of age.<sup>9</sup> A study conducted by Abhulimhen-Iyoha BI et al,<sup>10</sup> revealed that 72.4% patients were aged less than 5 years. In the same study, 50.7% constituted infants which is comparable to this study where 52.53% constituted children aged between 29 days to 1 year. In a study published in journal of college of physicians and surgeons Pakistan by Haque A et al, most children (62.5%) were under 5 years of age.<sup>11</sup>

Out of these 210 patients, 158 (75.24%) were males and remaining 52(24.76%) were females. Male to female ratio was 3.03:1. Abhulimhen-Iyoha BI et al, found male: female ratio of 1.49:1.<sup>10</sup> Haque A et al, also found that majority (60.9%) of patients were male.<sup>11</sup> Another study from Nepal by Shah GS et al, found the male to female ratio to be 1.7:1.<sup>12</sup> In this study, most of the cases admitted in PICU belonged to Central nervous system was the commonest system involved (n=72, 34.29%). Next infections involved was (n=42, 20%). Other common causes were respiratory system (n=34, 16.19%), cardiovascular (n= 22, 10.48%), gastro intestinal (n=9, 4.28%), haematological (n=10, 4.76%) and renal (n=8, 3.81%) system causes. This was followed by metabolic causes (n=6, 2.86%), Down syndrome (n = 3, 1.43%) and poisoning in 4 (1.90%) cases.

This was comparable to a study carried out by Haque A et al, which showed that the most common cause was neurological (28%) followed by respiratory in 24.4%, sepsis in 13.7% and cardiovascular in 10.9% cases.<sup>11</sup> This was in contrast to a study published in British journal of medical research by Shah GS et al, which found that respiratory diseases contributed to the maximum number of cases i.e. 33%, followed central nervous system diseases (18.6%), infectious diseases (11.3%), surgical causes (7.8%), gastrointestinal diseases (7.4%), cardiovascular diseases (6.5%) and poisoning (4.8%).<sup>12</sup> A study done in south india by Earan SK et al, found that respiratory system was the commonest system (40.2%) affected in their study.<sup>13</sup> A study by I. Abhulimhen-Iyoha BI et al, found that in their centre, the commonest cause was cardiovascular (41.1%) followed by neurological (12%), respiratory (10%), infectious (8.5%) and hematological causes (5-6%).<sup>10</sup>

In our study, Out of the 210 patients admitted to PICU, 51 (24.28%) patients' died. In a study from Brazil, El Halal MG et al, found the mortality in their centre to be 10.3%.<sup>9</sup> Abhulimhen-Iyoha BI et al, found that mortality in their centre was as low as 2.1%.<sup>10</sup> In a study from Pakistan by Haque A et al, it was found that the mortality of their PICU cases was 11.9%.<sup>11</sup> Shah GS et al, found that in their centre the mortality was 12.6%.<sup>12</sup> Some other studies have reported mortality similar to our study. Kapil D et al and Bagga A et al, found a mortality of 23.5% in their centre in 1993.<sup>14</sup> Another study from Pakistan by Haque A et al and Bano S et al, reported a mortality of 35% in their institute.<sup>15</sup> A study from Africa by Jeena PM et al reported an overall mortality of 35.44%.<sup>16-19</sup> The high mortality in our PICU may be contributed by several factors. Firstly, it is the only government run PICU in the tribal areas of Bihar. Another contributory factor might be that in our study central nervous system was responsible for 34.29% of admissions in PICU and many of these cases were cases of acute encephalitic syndrome. Again, viral Meningo encephalitis constituted most of the AES cases which included Japanese encephalitis. Japanese encephalitis is common in this part of the country which has high mortality. Another cause of high mortality is that lot of patients requiring PICU admissions have to be treated in the ward due to paucity of beds in PICU.<sup>20,21</sup> Our PICU caters to seriously ill pediatric patients from other departments also, including paediatric surgery, hematology, neurology, neurosurgery etc.

Mortality in patients depends on many factors such as demographic and clinical characteristic of population, infrastructure, non-medical factors (management and organization, time taken to reach health care), admission practice, and also affected by ICU performance.<sup>22</sup> The high mortality in our study may be contributed by several factors. Important contributory factor might be that, central nervous system was responsible for 34.29% of admissions in our PICU.

Another cause of high mortality is that, lot of patients requiring PICU admissions have to be managed in the ward due to paucity of beds in PICU and thereafter shifted to PICU in the late stage of the disease process.

### Conclusion

The present study highlights neurological, respiratory and gastrointestinal disorders to be the leading cause of admissions in PICU, catering to the needs of critical care of the in-patients from Pediatric Medicine and in-patients of pediatric age from other specialities and super specialities. This study is therefore conducted to audit the pattern of cases being admitted into the PICU of this tertiary care teaching hospital and their outcome. Further well planned, systematic and large-scale studies in this field is needed by using standardized methodologies, to estimate the leading causes of admission, morbidity and mortality in the PICU with the representation from different regions of India, to provide an effective PICU care in reducing the mortality and morbidity of critically ill patients, giving the desirable outcome.

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