

Mortality and morbidity pattern and outcome of children admitted in paediatric intensive care unit

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Abstract

Background: In developing countries, there is scarce data on paediatric critical care. This makes modification of practices to improve outcome, difficult. The above study was done to highlight the lack of facilities and concept of pediatric critical care so that modification of management can lead to better outcome of critically ill children. **Methods:** A retrospective study of the demography, clinical profile, diagnosis, treatment and outcome of children admitted to the PICU of NKP SALVE Institute of Medical Sciences from: October 2011–September 2013 was done. **Results:** A total of 320 children were admitted to the PICU with male and female children being 58.1% and 41.9% respectively. In critically ill category with respect of the primary diagnosis, almost 60% cases admitted were for either neurologic or respiratory problems. In critically ill category, 20.4% required cardio-respiratory support. Amongst the 20 death that occurred, almost 35% deaths was due to sepsis, 47% deaths occurred due to CNS disorders, and 11% death were due to respiratory disorders. **Conclusions:** The leading cause of admission was infectious and respiratory diseases. Infections have a higher predilection for higher mortality rate in PICU. So the source of infection either hospital acquired or community acquired should be identified and managed aggressively.

Key Word: Clinical profile, Mortality, PICU

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field of pediatrics. The main purpose of the PICU is to prevent mortality by intensively monitoring and treating critically ill children who are considered at high risk of mortality. Pediatric intensive care unit (PICU) aims at promoting early intervention and quality care with an objective of achieving good results and better prognosis. This can be achieved by well-equipped and well-staffed intensive care units.^{2,3} Pediatric intensive care is an emerging concept. Therefore, PICU data were analysed to find out the pattern of diseases and outcome at our centre which would help in modifying practices if necessary, leading to better management and outcome of critically ill children.

INTRODUCTION

Intensive care has become very important in the management of critically ill children. The pediatric intensive care unit (PICU) is a part of the hospital where critically ill pediatric patients who require advanced airway, respiratory, and hemodynamic supports are usually admitted with the aim of achieving an outcome better than if the patients were admitted into other parts of the hospital.¹ The care of critically ill children remains one of the most demanding and challenging aspects of the

AIM

To evaluate the mortality, morbidity pattern and outcome of admissions into the PICU of a tertiary care centre in India.

Study Design: Hospital based retrospective Study.

Study Period: October 2011–September 2013.

Study Setting: Pediatric Intensive Care Unit.

Study Population: All patients admitted in PICU.

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Sampling Method: Non probability sampling.

Statistical Analysis: SPSS ver 11.0.

Inclusion Criteria: All patients admitted in PICU during the study period.

METHODOLOGY

The hospital based retrospective study was carried out in a 10bedded PICU with approximate admission of 190 annually. The patients were between the ages 1 month to 18 years. Demographic data, primary diagnosis, primary reason for admission, any need for respiratory support or cardiac support, length of hospital stay and outcome of the patients (Death, Discharge) was recorded. Written and informed consent was obtained from the parents. Patients who satisfied the inclusion criteria were then categorized into following groups⁴:

Category A: Critically ill children were defined as those who were admitted in PICU and stayed for more than 48hours or died in the 1st 48 hours of admission.

Category B: Non critically ill children were defined as those children who were admitted in PICU and stayed less than 48 hours then transferred to the ward or discharged

OBSERVATIONS AND RESULTS

A total of 355 cases were admitted during the study period out of which 35cases did not consent to participate in the study; thereby leaving 320 cases for the study. The study included 2 groups of children admitted in Pediatric Intensive Care Unit, critically ill (Category A) and non-critically children (Category B).

Table 1: Distribution of subjects according to categories

Categories	No. of Subjects	(%)
Category A	201	62.81
Category B	119	37.19
Total	320	100

Table 2: Distribution of subjects according to age (Category A)

Age category ⁷²	Total (%)
Infant (< 2 yrs)	60 (29.8)
Young child (2-6 yrs)	49 (24.4)
Child (6-12 years)	57 (28.4)
Adolescent (12-18 yrs)	35 (17.4)
Total	201

Table 2 provides the distribution of subjects according to age. Maximum, i.e. 60 (29.8%) subjects were observed in the infant age group. There were 49 (24.4%) subjects in the age range of 2-6 yrs. In the age range of 6-12 yrs, there were 57 (28.4%) cases. In the adolescent i.e. 12-18 yrs age group, there were 35 (17.4%) subjects.

Table 3: Mean duration of hospital stay of patients in days according to age and gender (Category A)

Age Category	Duration of hospital stay in days		Overall
	(Mean ± SD)		
	Gender		
	Male (n=75)	Female (n=39)	
Infant (< 2 yrs)	6.20 ± 2.82	4.14 ± 3.48	5.80 ± 4.29
Young child (2-6 yrs)	7.52 ± 5.14	5.25 ± 3.39	6.35 ± 4.53
Child (6-12 years)	7.00 ± 5.02	6.20 ± 3.79	5.25 ± 3.75
Adolescent (12-18 yrs)	8.80 ± 7.24	5.90 ± 3.03	6.11 ± 4.68
Overall	7.21 ± 4.91	5.46 ± 3.51	6.61 ± 4.54

Table 3 provides the analysis of means for the duration of hospital stay of patients according to age and gender. For male category of patients, the mean duration of hospital stay was highest in the age group of 12-18 years (Adolescent) (8.80 ± 7.24 days) and lowest in the age group of < 2 years (infant) (6.20 ± 2.82 days). In female category, the mean duration of hospital stay was highest for 6-12 years (Child) (6.20 ± 3.79 days) and lowest in the age group of < 2 years (infants) (4.14 ± 3.48). It was found that the overall mean duration of hospital stay was highest in the age group of 2-6 years (young child) (6.35 ± 4.53 days) and lowest in the age group of 6-12 years (child) (5.25 ± 3.75 days).

Table 4: Distribution of patients as per clinical diagnosis and system (category A)

System	Total
Cardio Vascular System (CVS)	15(7.46)
<i>Rheumatic heart disease</i>	4
<i>Congenital heart disease</i>	11
Respiratory System (RS)	37(18.40)
<i>Pneumonia</i>	16
<i>Brochiolitis</i>	4
<i>Pleural effusion</i>	3
<i>Brochopneumonia</i>	6
<i>Asthmatic bronchitis</i>	3
<i>Miscellaneous (Pneumothorax, FBand subglottic obstruction, Sinusitis)</i>	5
Central Nervous System (CNS)	67(33.33)
<i>Encephalitis</i>	30
<i>Meningitis</i>	10
<i>Guillian Barre Syndrome</i>	5
<i>Seizure disorder</i>	14
<i>Miscellaneous(hydrocephalus,stroke,encephalocele,head injury)</i>	8
Gastrointestinal Track (GIT)	10 (4.98)
<i>Pancreatitis</i>	3
<i>Acute gastroenteritis</i>	4
<i>Chronic gastroenteritis</i>	1
<i>Surgical causes</i>	2
Hematology	9 (4.48)
<i>Sickle cell anemia</i>	4
<i>Miscellaneous(hemolyticanaemia,leukemia,severe anaemia)</i>	5
Renal	8(3.98)
<i>Acute renal failure</i>	4
<i>Nephrotic syndrome</i>	2
<i>Miscellaneous(hydronephrosis,renal stones)</i>	0
Infectious	32 (15.92)
<i>Dengue</i>	25
<i>Malaria</i>	2
<i>Enteric fever</i>	2
<i>Septicemia</i>	3
Hepatobiliary	10 (4.98)
<i>Hepatitis</i>	4
<i>Chronic liver disease</i>	4
<i>Cholestatic jaundice</i>	2
Others	13 (6.47)
<i>Poisoning</i>	2
<i>Malnutrition</i>	4
<i>Snake bite</i>	1
<i>DB ketoacidosis</i>	3
<i>Miscellaneous(drowning,endocrine,reye's syndrome)</i>	3
Total	201

Table 4 gives the distribution of patients according to disease status and system involved. Overall, in category A, maximum number of cases [67 (33.33%)] admitted in our PICU were due to neurological causes. Viral encephalitis comprised maximum cases (30). This was followed by seizure disorder which. Respiratory disorders were the second most common reason for admission to PICU [37 (18.40%)]. Out of these cases, Pneumonia occurred in 17 (43.24%) of cases. There were 3 (18.75%) cases of septicaemia grouped under infectious cause, but septicaemia was also seen in 2 cases of diseases due to GIT illnesses and one case of diabetic ketoacidosis. Other common illnesses for which the patients were admitted was due to congenital heart disease, pancreatitis, acute renal failure, chronic liver disease and hematological causes. Cases of poisoning², snake bite¹, diabetes ketoacidosis³ and miscellaneous⁷ also showed hypocalcemia

Table 5: Distribution of patients as per the cardiorespiratory support required (category A)

Cardio-respiratory support	TOTAL
Yes	41(20.4)
No	160(79.6)

Table 5 gives the distribution of patients according to the cardio-respiratory support required in PICU patients.

Table 6: Number of patients as per the disease category and the outcome(Category A)

Outcome	Total (%)
Discharged	181 (90.04)
Died	20 (09.96)
Total	201

Table 6. provides the distribution of patients according to the disease category and the outcome.

Table 7: Distribution of subjects according to age and disease status (Category B)

Age category	Total (%)
Infant (< 2 yrs) (n=37)	37 (31.1)
Young child (2-6 yrs) (n=43)	43 (36.1)
Child (6-12 years) (n=23)	23 (19.4)
Adolescent (12-18 yrs) (n=16)	16 (13.4)
Total (%)	119

Table 7 provides the distribution of subjects as per age and disease status in category B.

Table 8: Distribution of patients as per clinical diagnosis and system

System	Overall Total
Cardio Vascular System (CVS)	3 (2.52)
<i>Rheumatic heart disease</i>	1
<i>Congenital heart disease</i>	2
Respiratory System (RS)	27 (22.69)
<i>Pneumonia</i>	12
<i>Pleural effusion</i>	3
<i>Asthmatic bronchitis</i>	6
<i>Bronchiolitis</i>	2
<i>Bronchopneumonia</i>	4
Central Nervous System (CNS)	30 (25.21)
<i>Febrile convulsions</i>	7
<i>Encephalitis</i>	4
<i>Seizure disorder</i>	10
<i>Miscellaneous(developmental delay,icso, headinjury,cerebral malaria)</i>	9
Gastrointestinal Track (GIT)	7 (5.88)
<i>Acute gastroenteritis</i>	7
Hematology	6 (5.04)
<i>Sickle cell anemia</i>	1
<i>Thalessemia</i>	1
<i>Severe anaemia</i>	4
Renal	2 (1.68)
<i>Nephrotic syndrome</i>	1
<i>Wilm's tumor</i>	1
Infectious	21 (17.65)
<i>Dengue fever</i>	16
<i>Enteric fever</i>	3
<i>Malaria</i>	2
Hepatobiliary	5 (4.20)
<i>Hepatitis</i>	2
<i>Cholestatic jaundice</i>	2
<i>Hepatoblastoma</i>	1
Others(Poison,DKA,malnutrition,Misc)	18 (15.13)
Total	119

Table 16 gives the distribution of patients according to disease status and system involved. The primary diagnosis at the time of admission maximally included febrile convulsions and seizure disorders. Next common cause of admission was due to respiratory problems which included cases of Pneumonia or Asthmatic Bronchitis. Other common illnesses for which the patient was admitted included congenital heart disease, acute gastroenteritis, hematological diseases, Dengue fever and cholestatic jaundices.

DISCUSSION

The PICU is a special unit primarily concerned with the care of patients with critical illness and demands a broad-based knowledge to achieve good outcome⁵. Advances in pediatric sub-specialties including the critical care medicine have improved the survival of sick children. During the 24 months study period, 432 children were admitted to the 10 bedded PICU which is comparable to other tertiary level PICUs in the country.⁶ Majority of the patients were males 186 (58.1%) a finding similar to that of S. Shah and K. Shah and 30.3% were infants as recorded by Haque and Bano.^{7,8} This study revealed that infectious diseases, respiratory diseases and central nervous system diseases were the major causes of admission into the PICU. S. Shah and K. Shah reported respiratory illness (33%) as the commonest indication for admission, Blessing I reported cardiovascular disease (41.1%), as the commonest indication for admission in their series while a study from Pakistan found post cardiac surgery (34%) to be the most common condition.^{8,9} This shows that paediatric intensive care admissions vary in different countries and one should be aware of the prevalent conditions to develop the facilities and prepare treatment protocols accordingly. Overall mortality in this study was 9.96%, giving an ICU survival rate of 90.04%. This value is higher than documented by Shah *et al* with the mortality rate (2.1%) and Choi *et al* with the mortality rate (2.6%) for a fivebed PICU in a general hospital in Hong Kong.¹¹ It is, however, less than an overall mortality of 16.7% recorded in India by Bellad *et al*.¹⁰ The reported mortality varied from 9.8-35% in different series by other authors.¹¹⁻¹³ The average LOS (6.024±4.35 days) in PICU of the present study is in contrast to mean duration of 4.52±2.6 days reported by Khilnani *et al*. The absence of a high-dependency unit at our centre led to the admission of some patients who were not ill enough to remain in PICU. To enhance cost-effective management of patients and avoid unnecessary stretch of the ICU stay this situation needs to be addressed. This was one of the limitations of our study. The other limitation was inability to assess the severity scoring. Based on our observation, it appears that care of

patients in our PICU is somewhat similar to other tertiary level PICUs in the country. The low mortality rate in our PICU could be due to medical college affiliation with better resources availability, 24-hour physician coverage, highly trained-nurses, good nurse-patient ratio and presence of 4 trained paediatric intensivists. Pearson *et al* have suggested that the availability of full-time trained paediatric intensivists can deliver care of high quality and with much higher efficiency than without them in PICUs.¹⁴

CONCLUSIONS

It was concluded that the demographic profile of patients including age, sex, source of admission and co morbidities follow a varied pattern in different PICU patients worldwide. Our study had comprehensively investigated the mortality profile in PICU of a tertiary hospital. Our study found that the mortality of the PICU was 9.96% during study period. A higher mortality was associated with more severe conditions of disease and presence of co morbidities. So better care and management should be given for those children admitted to PICU with severe co morbidities. Infections have a higher predilection for higher mortality rate in PICU. So the source of infection either hospital acquired or community acquired should be identified and managed aggressively.

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