

DEMOGRAPHIC, CLINICAL PROFILE & OUTCOME OF PATIENTS ADMITTED TO PAEDIATRIC INTENSIVE CARE UNIT OF A TERTIARY CARE TEACHING HOSPITAL IN EASTERN INDIA: A HOSPITAL BASED RETROSPECTIVE STUDY

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ABSTRACT

Background: This study was carried out with the objectives to study the clinical profile and to find the outcome of children admitted to paediatrics intensive care unit (PICU) of IMS & SUM Hospital, BBSR.

Methods: A retrospective study was carried in children aged more than 28 days to 14 years admitted in PICU from January 2020 to June 2021 (18 months).

Results: Total 199 patients were admitted. Out of them 136 (68.3%) were males, whereas 63 (31.7%) were females. 88(44%). The mean length of stay was 4.2±4.6 days (range 1- 29 days, median 3 days). 47 patients were intubated and mechanically ventilated during this period. The mean day of mechanical ventilation was 4.1±4.6 days. Of the 15 patients died 7 patients (47%) had malignancies. Other causes of death included 2 septic shock (13.3%), 2(13.3%) ARDS. The mean duration of the PICU stay of the patients who died was 4.2±3.6 days (range 1-11 days).

Conclusions: The mortality rate at the PICU was 7.5%. Malignancies, septic shock, ARDS were the common cause of death and the maximum deaths has happened in less than 2 days of admission.

Keywords: Respiratory, ventilators, PICU, malignancies

INTRODUCTION

Pediatric ICU is a part of a hospital that deals with critically ill children who require respiratory, hemodynamic support or meticulous vital monitoring. Apart from Pediatric medicine, other surgical & medical super-specialty departments dealing with children also sometimes require pediatric ICU care for their patients. Under five mortality according to the data provided by UNICEF is 41 deaths per 1000 live birth in 2016. The number of children dying before the age of five is 5-6 million in 2016. Fifteen hundred were under five children die every day. The knowledge of the clinical profile and outcome of critically ill children helps in planning health policies. The clinical profile and outcome of PICU differ in different studies. The primary focus of PICU care has shifted from saving lives to preventing secondary injuries & preservation of function.⁽¹⁾ According to WHO, majority of under-5 mortality in developing countries is due to preventable & curable diseases if care is optimized. In intensive care units outcomes can be assessed on the basis of measures like survival or death.

The pediatric intensive care (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.⁶ Care of critically ill children remains one of the most demanding and challenging aspects in the field of pediatrics.² 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.³ 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.⁴

With the advancement of intensive care facilities, there is a dramatic increase in survival of critically ill children. In resource-limited developing countries like India, where scarcity of PICU beds is profound, it becomes important to audit admissions in & their outcomes in PICU for rational utilization of the available resources. But due to dearth of data on the clinical & etiological spectrum of PICU patients in this part of India makes it difficult to protocolize PICU admissions and hence this study is undertaken. Collection, analysis & interpretation of relevant data on utilization of ICU beds will help in planning for reducing the length of ICU stay & facilitate covering of more patients needing critical care.

This study was carried out with the objectives to study the clinical profile and to find the outcome of children admitted to paediatrics intensive care unit (PICU) of IMS & SUM Hospital, BBSR.

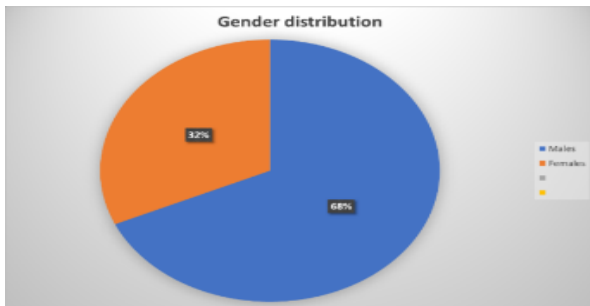
MATERIALS & METHODS

In this retrospective record-based study all admissions in PICU of IMS & SUM Hospital, Bhubaneswar, from January 2020 to June 2021 (18 months) were reviewed. During that period the Hospital had a well-equipped 5 bedded PICU, which admitted pediatric patients aged 1 month to 14 years both for medical & surgical subspecialties. After clearance from IEC data were collected about age, sex, diagnosis, duration of stay, procedures performed on the patients, & outcome. Quantitative variable was clinical profile and outcome pattern. Statistical analysis used was simple proportion test. 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.

The outcome was classified as transfer towards, discharges, discharge against medical advice & death. Management as per standard protocols including investigation & treatment given were also reviewed. Data were analyzed using Microsoft excel.

RESULTS

During the study period total 199 patients were admitted. Out of them 136 (68.3%) were males, whereas 63 (31.7%) were females. 88(44%) patients were of the age group 1month- 1 year, 68(34%) were >1year- 5 years, 20(10%) were >5years- 10 years, 23(12%) were> 10years-14 years. The mean length of stay was 4.2±4.6 days (range 1- 29 days, median 3 days). 47 patients were intubated and mechanically ventilated during this period. The mean day of mechanical ventilation was 4.1±4.6 days, the median being 3 days (range 1-28 days).The most common disease categories included neurological diseases (22.1%), respiratory diseases (17.1%), and pediatric surgical cases (12.1%). Table 1 contains the distribution pattern of different diseases. During the study period 166 (83.4%) patients improved & were shifted to ward, 2 patients (1%) were directly discharged from PICU, 15 (7.5%) died & 16 (8.1%) left against medical advice. Of the 15 patients died 7 patients (47%) had malignancies (3 leukaemia's, 1 Burkitt Lymphoma, 1 NHL, 1 medulloblastoma, 1 malignant teratoma). Other causes of death included 1 severe pneumonia (6.7%), 1(6.7%) acute intestinal obstruction, 1 (6.7%) Road traffic accidents with IVC rupture, 2(13.3%) septic shock, 1 (6.7%) cardio vascular diseases,2(13.3%) ARDS. The mean duration of the PICU stay of the patients who died was 4.2±3.6 days (range 1-11 days). 5 (33.3%) deaths occurred in >5years-10years age group. 4 (26.7%) death were each in >1year- 5 years &>10years- 14 years age group. 2(13.3%) deaths occurred in 1month-1 year age group. Table 2 shows the mortality statistics.



Gender distribution

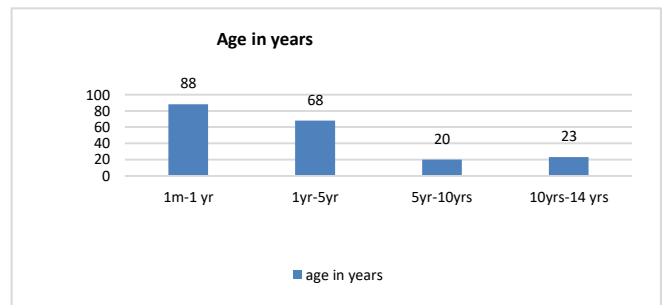


Figure 1:

Figure 2:

Age distribution of patients

Disease Conditions	Frequency & Percentage(n=199)
Respiratory	34(17.1%)
Cardiovascular	5(2.5%)
Neurological	44(22.1%)
Gastrointestinal	9(4.5%)
Endocrinal	2(1%)
Haematological(Non-malignant)	16(8%)
Sepsis	16(8%)
Trauma	18(9%)
Toxicological	2(1%)

MISC	15(7.6%)
Pediatric surgery	24(12.1%)
Malignancy	14(7.1%)

Table 1: Disease conditions

Table 2: Mortality statistics

Diagnosis	No. of deaths (n= 15)
Leukemia	3
Severe pneumonia	1
Burkitt Lymphoma	1
NHL	1
Malignant teratoma	1
Neuroblastoma	1
Acute intestinal obstruction	1
Road traffic accident	1
CVD	1
Septic shock	2
ARDS	2

Table 3: Socio-demographic profile and clinical outcomes of paediatric patients admitted to the PICU during the study period (n = 199)

Variable	Admission N%	Survive N%	Death N%	p-value
Age				
1 Month-1 year	88(44.2)	86(43.2)	2(1)	0.190
1 Year-5 years	68(34.1)	64(32.1)	4(2)	
5 Year-10 years	20(10)	15(7.5)	5(2.5)	
10 Year-14 years	23(11.5)	19(9.5)	4(2)	
Total	199(100)	184(92.4)	15(7.6)	
Gender				
Males	136(68.3)	127(63.8)	09(4.5)	0.320
Females	63(31.6)	57(28.6)	06(3)	
Total	199(100)	184(92.4)	15(7.6)	
Length of ICU stay				
< 2 days	54(27.1)	46(23.1)	08(4)	0.006
2–7 days	102(51.2)	99(49.7)	03(1.5)	0.004
7–14 days	32(16.1)	30(15.1)	02(1)	< 0.001
>14 days	11(5.5)	9(4.5)	02(1)	< 0.001
Total	199(100)	184(92.4)	15(7.6)	

Foot note- N = frequency, % = Percentage

Table 4: Association of Prism Score with Mortality

PRISM SCORE	RECOVERY n (%)	DEATH n (%)	TOTAL n (%)	P-value
<15	160	0	160	0.585
16-30	28	1	29	0.043
31-45	10	3	13	0.399
>45	1	12	13	0.012

($\chi^2 = 172.9$, $df = 3$)

Table 5 Factors associated with paediatric patients mortality at the PICU during the study period (n = 199)

Variable	Outcome				
	Survived (%)	Dead (%)	COR	AOR (95% CI)	P-value
Comorbidity					
Yes(27)	15(7.5)	12(6)	1.89	2.1	0.105
No(172)	169(84.9)	3(1.5)	1	1	
Need for MV					
Yes(47)	33(16.6)	14(7)	15.9	2.1	0.006
No(152)	151(75.9)	1(0.5)	1	1	
Inotropic/ Vasopressor need					
Yes(67)	56(28.1)	11(5.5)	42.12	3.1	0.591
No(132)	128(64.4)	4(2)	1	1	
Transfusion need					
Yes(24)	14(7)	10(5)	2.1	3.1	0.001
No(175)	170(85.5)	5(2.5)	1	1	

Table 6 Factors associated with paediatric patients mortality at the PICU during the study period (n = 199)

Variable	Outcome		COR	AOR (95% CI)	P-value
	Survived (%)	Dead (%)			
Level of GCS at admission					
12–15(122)	121(60.8)	1(0.5)	1	1	1.000
9–12 (40)	37(18.5)	3(1.5)	2.195(1.23-4.97)	1.96(0.89-3.87)	0.006
< 8 (37)	26(13.1)	11(5.5)	22(12.46-41.02)	7.9(2.19-21.76)	0.001
Admission diagnosis					

Septic shock (16)	14(7)	2(0.5)	2.1(0.9-5.9)	6.2(1.9-17.5)	0.842
Severe Pneumonia (22)	21(10.5)	10(5)	3.3(1.6-9.1)	4.1(1.2-11.5)	0.62
Meningitis/Encephalitis (44)	44(22.1)	0	1.98(0.85-5.3)	7.9(2.9-20.5)	-
Malignancy (14)	7(3.56)	7(3.5)	1.98(0.85-5.7)	10.6(3.1-29.7)	0.36
ARDS(9)	7(3.56)	21(10.5)	1.98(0.85-5.3)	7.9(2.9-20.5)	0.096
Post-operative (24)	23(11.55)	1(0.5)	4.1(1.9-11.9)	3.1(1.1-8.9)	0.43
Trauma (18)	17(8.5)	1(0.5)	3.1(1.5-8.9)	2.7(0.89-4.9)	0.56
CVD(5)	4(2)	1(0.5)	1.1(0.5-3.1)	0.7(0.1-2.1)	0.51
Airway foreign body(3)	3(1.5)	0	4.1(1.9-11.9)	3.1(1.1-8.9)	0.44
Haematological (Non malignant) (16)	16(8)	0	1.1(0.5-3.1)	0.7(0.1-2.1)	0.46
Endocrinal (2)	2(1)	0	3.3(1.6-9.1)	4.1(1.2-11.5)	0.60
MIS-C (15)	15(7.56)	0	3.1(1.5-8.9)	2.7(0.89-4.9)	0.65
Gastrointestinal (9)	9(4.5)	0	2.1(0.9-5.9)	6.2(1.9-17.5)	0.44
Toxicological (2)	2(1)	0	1.1(0.5-3.1)	0.7(0.1-2.1)	0.36

During the study period a total of 209 (132 blood, 47 tracheal, 23 urine, 7 wound swab) culture samples were sent of which out of which 21(10%) were positive. Out of the 47 mechanically ventilated patients, 4(8.5 %) patients had tracheal aspirate culture positive. 2 of them grew *Acinetobacter baumannii*, 1 *Pseudomonas aeruginosa*, 1 *Klebsiella* spp.

DISCUSSION

Critically ill infants and children's up to age 14 years receive constant care, sophisticated monitoring, and specialized treatment in our PICU at IMS SUM Hospital, SOA university, Bhubaneswar. Our PICU is a 5 bed well equipped set up with all advanced medical facilities apart from other basic hospital equipment. During 18 months of study period 199 patients were admitted to 8 bedded PICU which is which is comparable to other tertiary level PICU in the country. Out of them 136 (68.3%) were males, whereas 63 (31.7%) were females. Haque A et al, also found that majority (60.9%) of patients were male⁽⁵⁾. Abhulimhen-Iyoha BI et al, found male: female ratio of 1.49:1⁽⁶⁾. Another study from Nepal by Shah GS et al, found the male to female ratio to be 1.7:1⁽⁷⁾. In our study 88(44%) patients were of the age group 1month- 1 year, 68(34%) were >1year this is comparable to a study published Jyothi AK et al from India where majority of cases was under 5 years of age⁽⁸⁾. Our study also in accordance with 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.⁽⁹⁾ A study conducted by Abhulimhen-Iyoha BI et al, revealed that 72.4% patients were aged less than 5 years. In the same study, 50.7% constituted infants which are comparable to this study where 52.53% constituted children aged between 29 days to 1 year⁽⁶⁾In this study, most of the cases admitted in PICU belonged to central nervous system disorders which constituted (22.1%) cases, followed by respiratory system (17.1%) 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%.⁽⁵⁾ 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%)⁷ and also another study Bhavari VL et al where LRTI (14.7%) is maximum number of all cases, followed by febrile convulsions (14.1%) cases.⁽¹⁰⁾

The mean length of stay was 4.2±4.6 days (range 1- 29 days, median 3 days) compared to another study from west Bengal where the overall median PICU stay was five days (range 1-31 days), with a majority (78.4%) of them staying for 1 to 7 days.⁽¹¹⁾ In a study conducted in South Africa⁽¹²⁾, LOS in PICU was 13.8 days (mortality rate 35.44%), whereas in a study conducted in Birmingham LOS was 4.2 days (103 h).⁽¹³⁾

Overall mortality in this study was 7.5%, giving an ICU survival rate of 92.5%. 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 five-bed PICU in a general hospital in Hong Kong⁽¹⁴⁾. However, in other previous studies, we found that the mortality rates varied from 17 to 24.3% .^(13,15) Our study deaths are mostly due to malignancies (47%) followed by septic shock (13.3%) compared to AIIMS new Delhi study where overall mortality of 23.5% in these (18.6%) deaths were due to septicemia, 103 (14.2%) due to congenital heart disease. In a study from Brazil, El Halal MG et al, found the mortality in their centre to be 10.3%.⁽⁹⁾ Abhulimhen-Iyoha BI et al, found that mortality in their centre was as low as 2.1%.⁽⁶⁾ In a study from Pakistan by Haque A et al, it was found that the mortality of their PICU cases was 11.9%.⁽⁵⁾ Shah GS et al⁷, found that in their centre the mortality was 12.6%.

The high mortality in our PICU may be contributed by several factors. Main contributory factor might be that in our study malignancies were responsible for 7.1% of admissions in PICU and many of these cases were associated with several poor prognostic factors. . Another cause of high mortality is that lot of patients requiring PICU admissions have to be treated in the wards for considerable amount of time due to the paucity of beds in PICU. Our PICU gives preference to seriously ill podiatric patients from other departments also, including paediatric surgery, haematology, neurosurgery, paediatric oncology.

An inverse but non-significant correlation was observed between PRISM score with PICU and hospital stay. This contradictory finding can be attributed to higher mortality among cases with high PRISM score. At cut-off of 15, hospital stay decreased significantly i.e. higher mortality (i.e. lower hospital stay) was associated with PRISM score > 15. Madaan et al¹⁶ did not observe any difference in the mean duration of ICU stay among the survivor and non-survivors. Bellad et al¹⁷ reported that the mean ICU stay among non-survivor was shorter when compared to those survivors. As the inverse of the correlation between PRISM and mean ICU stay is considered to be an indicator of the quality of PICU services¹⁸, a difference in the quality of care available at various centers may explain the observed variability in the ICU stay being reported in different studies. Brindha et al¹⁹ attributed the median length of PICU stay with the type of primary disease condition affecting the patients and not to the PRISM score of the patients.

The mortality rate compared to developing countries somewhat less, thanks to the advanced ventilators and protocols available here. People working in PICU in developing countries face many problems like lack of resources, knowledge and the support system. A trained paediatric intensivist may help by working closely with general paediatricians, training residents and nurses in advanced procedures, developing and updating unit protocols taking into consideration the existing human, logistic and financial resources.

CONCLUSION

It can be concluded that PICU is an integral part of any paediatric department. The demographic profile of children admitted in PICU in our study and the outcome is comparable to other studies in Asia. In India, a PICU unit in every medical facility is essential for initial stabilisation and

management of sick patients. Integration of paediatric subspecialty services is required for enabling comprehensive health care under the same roof. Active surveillance or audit of PICU admissions help capture lapses in management and bring a better outcome with available resources.

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