Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

Study of clinico-etiological profile and outcome of children admitted in pediatric intensive care unit (PICU)

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Received Date: 25/04/2023 Acceptance Date: 23/06/2023

Abstract

Background: Pediatric intensive care unit (PICU) has a specific location for management of children with serious and severe diseases. The mortality in a PICU can reflect a hospital's health care quality and efficiency on handling with critical ill patients, and reduce the mortality in PICU will be the key to reduce the overall mortality in a children's hospital. Present study was aimed to characterize the profile of children admitted to a tertiary PICU in western rural India. **Material and Methods:** Present study was prospective, observational study, conducted in children of age >28 days to 12 years, either gender, requiring admission in PICU. **Results:** In present study 477 children admitted to PICU were studied. Majority were from 1 year to <5 years (36.48 %) & were male (53.24%). Maximum number of death was found in cardiovascular system(48.3%) then respiratory system (42.3%), infectious(41.4%), neurological (32.7%), hematological (29.2%), gastrointestinal system (12.5). Out of 477 of children admitted 276 (57%) patients survived, 177 (37%) patients died, 20 (4.1%) patients taken discharge against medical advice (AMA) and 4 (0.83%) patients was referred to higher centre. 182 patients had needed mechanical ventilation (38.1 %) and among those patients 164 patients were died (90.1 %). Majority patients were stayed for 1 day to < 3 days (205 patients). Maximum number of mortality rate was noted in patients admitted for < 1 day (58 %). There was 100% mortality of patients with prism score >30 and 92% mortality when prism score is >25 & difference was highly statistically significant ($p<0.001$). **Conclusion:** Higher mortality was noted in mechanical ventilated patients, PICU stay less than 24 hours, Prism score >30.

Keywords: PICU admission, sepsis, ARDS, PRISM III score

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Introduction

Pediatric intensive care unit (PICU) has a specific location for management of children with serious and severe diseases. Under five mortality according to the data provided by UNICEF is 41 deaths per 1000 live birth in 2016.[1,2] The number of children dying before the age of five is 5 – 6 million in 2016. 15000 under five children die every day.[1] With progresses in medical knowledge of paediatric anaesthesia, medicine and surgery, understanding of life-threatening pathophysiology processes, and development of scientific and technical methods to monitor, the paediatric critical care medicine developed rapidly.[2,3]

The acquisition of technologies, training of human resources, and re- evaluation of care processes should be employed according to the demographic characteristics and morbidity of the population. By providing basic pediatric intensive care services such as intravenous access

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

and fluid resuscitation, basic antibiotic support, oxygen and non-invasive ventilator support (continuous positive airway pressure) one can save the lives of million children every year in rural areas of developing countries.[4,5]

The mortality in a PICU can reflect a hospital's health care quality and efficiency on handling with critical ill patients, and reduce the mortality in PICU will be the key to reduce the overall mortality in a children's hospital.[6] With the advancement in intensive care facilities, there is a dramatic increase in survival of critically ill children.[4,5] Present study was aimed to characterize the profile of children admitted to a tertiary PICU in western rural India.

Material And Methods

Present study was single-center, prospective, observational study, conducted in Department of Pediatrics, Government Medical College and Hospital, Latur India. Study duration was of 2 years. Study design and methodology was approved by institutional ethical committee.

Inclusion criteria

- Patients of age >28 days to 12 years, either gender, requiring admission in PICU, parents willing to participate in present study

Exclusion criteria

- Parents not willing to participate in present study

Study was explained to patients in local language & written consent was taken from parents of children admitted in PICU for participation & study. Detailed history of presenting complaints with duration was elicited. The demographic and clinical data were recorded as age, gender, diagnosis at PICU transfer, type of admission(self, referred, treatment received), anthropometric parameters were obtained and physical examination was done and findings were recorded in proforma at the time of admission.

Laboratory parameters like compete blood count, liver function test, kidney function test, urine culture, routine microscopy, blood culture, sputum culture, CSF routine microscopy and culture and sensitivity pattern, PT/APTT/INR, serum electrolytes, HIV ELISA, HBV, HAV, CHEST X-rays, CT scan, MRI and other investigations were done when required.

The data were entered in Microsoft excel sheet and data was analysed by using descriptive statistics, test of significance i.e., chi square test. Software used for analysis is IBM SPSS 21.0 version.

Results

In present study 477 children admitted to PICU were studied. Majority were from 1 year to <5 years (36.48 %), 5 years to 12 years (33.33 %) & >28 days to < 1 year (30.19 %). Out of total 477 children, 254 (53.24%) were male and 223 (46.75%)were females. Male to female ratio was 1.13:1.

Table 1: General characteristics

	No. of patients	**Percentage**
Age groups		
>28 days to < 1 year	144	30.19 %
1 year to <5 years	174	36.48 %
5 years to 12 years	159	33.33 %
Gender		
Male	254	53.24 %
Female	223	46.75 %

Common major system involved were infectious (280), respiratory(204), neurological (168), hematological (164) , CVS (62), gastrointestinal (48), and renal (18) out of 477 patients. But maximum number of death was found in cardiovascular system(48.3%) then respiratory

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

system (42.3%), infectious(41.4%), neurological (32.7%), hematological (29.2%), gastrointestinal system (12.5).

Table 2: Major system involvement

System involved	Total admissions	death	Percentage
Infectious	280	116	41.4
Respiratory system	204	86	42.21
Neurological system	168	55	32.7
Hematological	164	48	29.2
CVS	62	30	48.3
Gastrointestinal	48	6	12.5
Renal	18	-	0

In present study, out of 477 of children admitted 276 (57%) patients survived, 177 (37%) patients died, 20 (4.1%) patients taken discharge against medical advice (AMA) and 4 (0.83%) patients was referred to higher centre.

Table 3: Gross outcome of admissions in PICU.

	Number of patients	Percentage
No. of pts. admitted	477	100
Discharge	276	57.86%
Death	177	37.10%
Discharge against medical advice (AMA)	20	4.1%
Referred to higher centre	4	0.83%

In age group of >28 days to <1-year, major cause of admission were pneumonia, ARDS & sepsis. While mortality was common in children admitted due to CHD (100 %), ARDS (66.7 %) & sepsis (55 %). In age group of 1 year to <5year year, major cause of admission were pneumonia, status epilepticus & MRCP. While mortality was common in children admitted due to thalassemia major and sepsis (100 % each) & meningitis/encephalitis (45.4 %). In age group of 5-12 years, major cause of admission were meningitis/encephalitis pneumonia & status epilepticus & MRCP. While mortality was common in children admitted due sepsis (100 %), ARDS (55.5 %) & meningitis/encephalitis (51.4 %).

Table 4: Major causes /etiology of admissions and death in PICU

	>28days to <1 year.		1 year and <5 year		5 years to 12 years	
Causes	**Admissions**	**Death (%)**	**Admissions**	**Death (%)**	**Admissions**	**Death (%)**
Pneumonia	95	43 (45.2 %)	51	17 (33.3 %)	28	13 (46.4 %)
ARDS	30	20 (66.7 %)	23	8 (34.7 %)	9	5 (55.5 %)
Sepsis	20	11 (55 %)	2	2 (100 %)	1	1 (100 %)
CHD	13	13 (100 %)	15	2 (13.3 %)	3	1 (33.3 %)
Status epilepticus	4	1 (25 %)	31	13 (41.9 %)	28	13 (46.4 %)
Dengue fever	4	1 (25 %)	12	4 (33.3 %)	11	1 (9 %)
Meningitis/encephalitis	2	1 (50 %)	22	10 (45.4 %)	35	18 (51.4 %)
MRCP	-	-	24	9 (37.5 %)	8	4 (50 %)
Thalassemia major	-	-	4	4 (100 %)	8	3 (37.5 %)

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Out of 477 PICU admissions 182 patients had needed mechanical ventilation (38.1 %) and among those patients 164 patients were died (90.1 %).

Table 5: Patients required mechanical ventilated

Total admissions in PICU	477
Number of patients mechanical ventilated (%)	182 (38.1 %)
Total death in mechanical ventilated patients.	164 (90.1 %)

Most common microorganism grown on culture of various body fluids like blood culture, urine culture, CSF culture were E. coli (10.27 %), Klebsiella (5.87 %) and Pseudomonas (1.89 %).

Table 5: Most common organisms found in culture of various body fluids.

Microorganisms	Number of patients	Percentage
E.coli	49	10.27 %
Klebsiella	28	5.87 %
Pseudomonas	9	1.89 %

Majority patients were stayed for 1 day to < 3 days (205 patients). Maximum number of mortality rate was noted in patients admitted for < 1 day (58 %) as compared to >7 days (42.8 %), 3 days to < 7 days (41.6 %) &
1 day to <3 days (24.8 %) & difference was highly statistically significant (p<0.001).

Table 6: Relationship of stay in PICU & mortality.

Days in PICU	Number of patients	Death (%).
<1 day	81	47 (58 %)
1 day to <3 days	205	51 (24.8 %)
3 days to < 7 days	156	65 (41.6 %)
>7 days	35	15 (42.8 %)

Maximum number of patients 227 were had prism score up to 5. There were high percentage of mortality when PRISM SCORE increased. There was 100% mortality of patients with prism score >30 and 92% mortality when prism score is >25 & difference was highly statistically significant (p<0.001).

Table 7: Outcome predictability using Pediatric Risk of Mortality-3 (PRISM- III) score.

PRISM score	Number of patients	Death (%)
Up to 5	227	52 (22.9 %)
>5 to 10	165	65 (39.3 %)
>10 to 15	38	24 (63.1 %)
>15 to 20	16	11 (68.7 %)
>20 to 25	7	5 (71.4 %)
>25 to 30	13	12 (92.3 %)
>30	1	1 (100 %)

Discussion

The principal 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 of pain, anxiety, and complications and to provide comfort and guidance to the child's family.[6] The knowledge of the clinical profile and outcome of critically ill children helps in planning health policies.

In this study, incidence of total number of children admitted in PICU was 477. In 477 patients 276 were discharged which is around 57% , 177 patients were registered death which is around

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

31%, 20 patients were discharged against medical advice (DAMA) which is around 4% and 4 patients were referred to higher centre which is around 0.83% of total admissions.
Similar mortality was noted by Indira das et al,.[7] (27.34%) & Sarbani et al,.[8] (24.32%) while lower mortality was noted by Suresh Goyal et al,.[9] (14.8%). Differences in survived patients in different studies, are due to type of case admitted in different geographic areas where as some epidemic of particular diseases.
In present study, male to female ratio was 1.13, means slightly more males were admitted in PICU. Similar findings were noted by Indira et al,.[7] & Suresh et al,.[9]
In study by Sarbani et al,.[8] death percentage in PICU entire age group was 43.59 % , 20.92 % and 26.5 % in age group of >28days to <1year, 1year to <5 year and 5year to 12year age respectively and similar survival of 56.4%,78.4% and 73.5 in age group of >28days to <1year,1 year to <5year and 5year to 12 year respectively. Maximal percentage of survival was observed in 1 year to <5year age group, similar findings were noted in present study.

In present study, the most common disease/system categories admitted were infectious diseases (58%), respiratory diseases(40%), neurological diseases (29%), hematological diseases (20%), cardiovascular diseases (9%), gastrointestinal diseases (5%) and renal diseases (2%) and rest others. Similar findings were noted by Bandya Sahoo et al,.[10]
Nilofer et al,.[11] noted that out of 72 patients needed mechanical ventilation 28 died (38 %). Ayesha begum at. al.(117) noted 63 (43.8%) patients died out of 144 ventilated cases in PICU, similar findings were noted in present study.
In present study, maximum number of patients stayed between 1 days to 3 days around 205 patients of 477 admission in which proportion of death is also lowest than other which is 24.8%. Maximum proportion of death is within first day of PICU admission. After 3 days of stay number of patients stays decreased but proportion of death was increased. As between >3days to <7 days total patients stayed was 156 with 65 (41.6%) mortality and 35 patients was stayed >7 days and 15 (42.8%) was died. This study shows p value <0.001, which is highly significant. Similar study done by Nilofer et al,.[11] shown that proportion of patient's death maximum in first 3 days of PICU stay. but as number of days increases patients cure rate increased. In another similar study by Blessing et al,.[12] shown that maximum number of patients stayed for less than 1 day and a smaller number of patients stayed after 7 days of period. But maximum pro portion of death after 7 days of PICU stay.
In present study we isolated microorganisms from culture from 86 patients, most common microorganisms from various body fluids during first 24-hour admissions of PICU patients. Most common organisms were E. coli, klebsiella and pseudomonas in 49, 28 and 9 patients respectively. Ayes Betil Ergil et al,.[13] Found that most common organisms isolated from blood culture were staphylococcus species 46% and klebsiella 49% species and pseudomonas 14% species and candida species. These differences in result may be due to differences in various fluid collections and contamination in our PICU care or different prevalence of various diseases.
In our study, the probability of death increases significantly as prism score increases.in my study maximum number of patients is under 5 score which is 227 out of 447 patients. That and mortality in this score was 52(22.9%). And 100% death registered in >30 prism III score. This study shows p value <0.001 which is highly significant.
Ashish Verma et al,.[14] shown similar predictions of mortality as prism III scoring increase and there was also 100% mortality as scoring increased by 30. Similar findings were noted by Roopa et al,.[15] and Suresh et al,.[9] which suggests that PRISM III score is sensitive predictor of outcome.
The outcome measures of PICU include mortality, length of stay (LOS), long-term result such as health status, disability and morbidity. PRISM III score is most acceptable widely used scoring system.[16] Regular use of scoring systems in PICU provides an opportunity not only to

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

predict the outcome but also helps an improvement of quality of care within the limited resources available.

The main goal of pediatric intensive care unit (PICU) is to significantly decrease the mortality. By providing basic pediatric intensive care services such as intravenous access and fluid resuscitation, basic antibiotic support, oxygen and non-invasive ventilator support (continuous positive airway pressure) one can save the lives of million children every year in rural areas of developing countries. These interventions are low cost and easy to implement in developing countries on a large scale to decrease mortality.

The studies that investigate mortality and risk factors for death can give information to improve the clinical practices and provide public health strategies to improve the outcomes of ICU care.

Conclusion

Overall female mortality was higher than male in all age group of children admissions. Common indications for PICU admission were involved diseases or disorders of respiratory system followed by neurological system and sepsis. Maximum deaths occurred in patients admitted with cardiovascular system disorders followed by respiratory system and sepsis. Higher mortality was noted in mechanical ventilated patients, PICU stay less than 24 hours, Prism score >30.

Conflict of Interest: None to declare
Source of funding: Nil

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