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Prevalence Of Common Clinical Conditions and Outcome in Pediatric Medical Intensive Care Unit in Kerala

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Abstract

Background: The study aimed to assess the prevalence of common clinical conditions and the outcome of children admitted to the pediatric medical intensive care unit of a tertiary care centre in Kerala. **Methods:** A prospective observational study was conducted in the Pediatric medical Intensive care unit of a tertiary care centre over 3 months from January 2025 to March 2025. The data was analyzed using the Statistical Package for Social Sciences version 25. A chi-square test was used to test for the significance of the association; a p-value of less than 0.05 was considered significant. **Results:** A total of **226** of these patients met the inclusion criteria and were included in the study and analysed. Of these, children between 5-12 years (35.39%) accounted for the largest number, males overcounted females at 53.98%. Respiratory illnesses, neurological disorders, and hemato-oncologic conditions were the most common reasons for admission. Children who stayed in the intensive care unit for 2–7 days accounted for 43.36%. 12.38% of children needed invasive mechanical ventilation, and among them, 6 were undergoing tracheostomy. 13.27% of children had died, and 86.73% were transferred to the ward.
Significant associations were found between mortality and admission source, length of stay, renal replacement, and ionotrope support. **Conclusions:** The knowledge of common clinical conditions and outcomes of children admitted to the pediatric medical intensive care unit and the association between socio-demographic characteristics helped to plan certain nursing interventions to improve the outcome of the patients in the critical care area.

Keywords: Prevalence, Clinical conditions, pediatric medical intensive care unit

Introduction

The children are the backbone of any nation's future, holding the key to its progress and development. Child health may be defined as the ability to participate fully in developmentally appropriate activities both physically, psychologically, and socially[1]. As children grow and develop, they become exposed to many common illnesses. All children get ill from time to time, but many will recover on their own. The trend is continuously changing from period to period. Infectious diseases have contributed the majority of admissions in the past, especially in developing countries like India. But now non-communicable diseases are also on the rise. Mortality is proportional to the underlying nature of the disease, physiological status on arrival, and the quality of care, of course. Critical care medicine developed out of other subspecialties' need to provide care for their most critically ill patients. From the historical point of view, pediatric intensive care dates from the polio epidemic in Copenhagen in 1952. Doctors reduced the 90% mortality in patients receiving respiratory support with the cuirass ventilator to 40% by a combination of manual positive pressure ventilation provided by medical students and by caring for patients in a specific area of the hospital instead of across different wards[2]. Advanced technologies, the understanding of the pathophysiology of critical illness, and the development of the multidisciplinary team have made this care possible. In the last two decades, the ICUs have increased in number due to improvements in life-saving technologies. Approximately 15-20% of hospital budgets are now spent on the care of seriously ill children by the ICUs, so it is important to improve the safety of medical care due to this high cost. There are many indicators of mortality and frequency of complications, like nosocomial infections in ICUs, with much emphasis on quality improvement measures and outcomes. [3]

The Pediatric Intensive Care Unit (PICU) is a specialized section of the hospital dedicated to providing critically ill children with the highest level of medical care. Unlike other hospital areas, the PICU is equipped for intensive nursing care and continuous monitoring of vital signs, such as heart rate, breathing, and blood pressure.[4] Children who are seriously ill and require care beyond what the hospital's main medical floors can provide are treated in the PICU. Examples include:

- Severe breathing difficulties, such as those caused by asthma.
- Serious infections.

- Certain heart conditions.
- Complications from diabetes.

In some cases, children initially stable on medical-surgical floors may be transferred to the PICU if their condition worsens. Additionally, many children receive care in the PICU for several days following major surgery. This specialized unit ensures they receive constant attention and support during critical times.[2] Abundant conditions that were previously incurable are now treatable. The primary goal of basic paediatric treatment is not only to significantly reduce the mortality rate but also to return patients who are in distress from a deadly condition to a state of well-being, thereby minimizing suffering and complications and giving comfort and support to the family of the child.

Caring for critically ill pediatric patients is demanding, and the outcome is directly dependent on the training level, the expertise of the treating physician, the availability of facilities, and the knowledge of the prevalent diseases in the particular area. The ultimate aim of every pediatric intensive care unit is to prevent the death of children [5]. The WHO report shows that the major causes of death among children under the age of five in developing countries are preventable and curable diseases if treatment is optimized. As per the 2020 WHO data, worldwide, approximately 5 million children aged less than 5 years die in a year, 80% of which occur in the developing countries. The under-five mortality rate – probability of death between birth and the fifth birthday – also declined from 7.1 deaths per 1,000 live births to 5.2 deaths per 1,000 live births.[6]

However, the children who have survived pediatric critical care illness may develop physical, cognitive, emotional, and social problems that can last for months or years [7]. The ICU outcomes were determined by clinical condition at admission, patient age, comorbidity, level of pre-hospital and emergency trauma care, and factors reported during ICU admission, such as the use of mechanical ventilation, level of consciousness, duration of ICU stay, as well as complications during ICU stay, such as circulatory and ventilator-related respiratory complications [8]. The need for ventilation and vasoactive therapies in a paediatric intensive care unit (PICU) is an important outcome and is associated with increased hospital mortality and health care costs. In both resource-limited and resource-rich countries, respiratory and congenital heart diseases are the most common admissions and the highest mortality for respiratory, multi-organ failure, and cardiac reasons.[10]

In this study, the researcher shows that Significant associations were found between mortality and admission source, length of stay, renal replacement, and ionotrope support. Availability of resources, infrastructure, and medical manpower differs in different health care settings. Interventions to prevent the adverse outcomes of pediatric critical illness to minimize impairment are being studied, but much more is needed [9]. It is therefore necessary to assess the common clinical conditions and their outcomes in children admitted to the pediatric medical intensive care units to plan certain nursing interventions to improve the outcome of the children in the future.

Methods and materials

Study setting: This study was conducted in the pediatric medical ICU of the Institute of Maternal and Child Health, Kozhikode.

Period: A prospective observational study was conducted in the PICU of a tertiary care centre over a period of 3 months from January 2025 to March 2025.

Population: A total of 226 patients admitted to the PICU with ages 1 month to 13 years were randomly enrolled in the study after taking informed written consent in the local language from the patient's parents. A detailed proforma including detailed history, examination, and the laboratory data of the patient was recorded for each patient by the researcher. The course of illness and treatment was observed and the outcome duly noted. The researcher also reviewed the registries and clinical case sheets of pediatric patients (≤13 years) admitted to the intensive care unit.

Inclusion Criteria

- All paediatric patients who were admitted to the ICU during the study period.

Exclusion Criteria

- The children under the age of 1 month, who were discharged or expired within 24 hours of admission.
- whose parents refused to give the written consent were excluded from the study.
- Children with incomplete case sheets.

Study variables

The outcome of children admitted to the pediatric intensive care unit was the dependent variable. In contrast, the children's age, sex, admission diagnosis, admission source, disease character, nutritional status, length of PICU stay, vasopressor use, renal replacement, and use of a mechanical ventilator were the independent variables.

Operational definition

Pediatric age group: Refers to 1 month to 13 years of age.

Length of stay (LOS): Refers to the duration of stay in a number of days from the date of admission to the date of transfer out from the PICU.

Short-term outcome: the outcome of the patient until she/he leave the intensive care unit.
Discharged: transfer out alive from the ICU.

Data Collection Tools and Techniques

Data was collected by using a structured questionnaire regarding socio-demographic, clinical characteristics of the patients, and treatment given during their stay at the pediatric intensive care unit. Data was collected using a pretested checklist developed after reviewing various literature. The researcher collected the data for a three-month duration. Using a patient's inpatient number, the researcher used a checklist to trace and collect data from all consecutive charts that met the inclusion criteria.

Data Processing and Analysis

After the data collection, each set was checked for inconsistencies and completeness based on the code assigned for each set during the data collection process. The collected data were entered using SPSS version 25 for Windows. The descriptive statistical method was used to produce percentages, mean, and median. The association between the variables and clinical outcome was analysed by using the chi–square value.

Results

From January 1, 2025, to March 15, 2025, 250 patients were admitted to the pediatric medical intensive care unit; 226 of these patients met the inclusion criteria and were included in the study and analysed. Qualitative variables were correlated using a chi-square test. A $p<0.05$ was considered statistically significant. The data was entered in an MS Excel spreadsheet, and analysis was done using the statistical package for social sciences (SPSS) version 25.

Socio-demographic characteristics of patients admitted to the PICU

Out of the total admitted children in the pediatric intensive care unit, 122 (53.98%) were male, and the majority, 151 (66.8%), were from the Muslim community. Most of the children,80 (35.39%), were aged between 5 to 12 years. The detailed socio-demographic characteristics is shown in Table 1.

Table 1: socio- demographic characteristics(n=226)

characteristics		frequency	percentage
Age	1 mon – 1year	58	25.66%
	1-3years	61	26.99%
	3-5 years	25	11.06%
	5-12 years	80	35.39%
	>12 year	02	0.01%
Sex	Male	122	53.98%
	Female	104	46.01%
Religion	Hindu	68	30.08%
	Muslim	151	66.81%
	Christian	07	0.03%

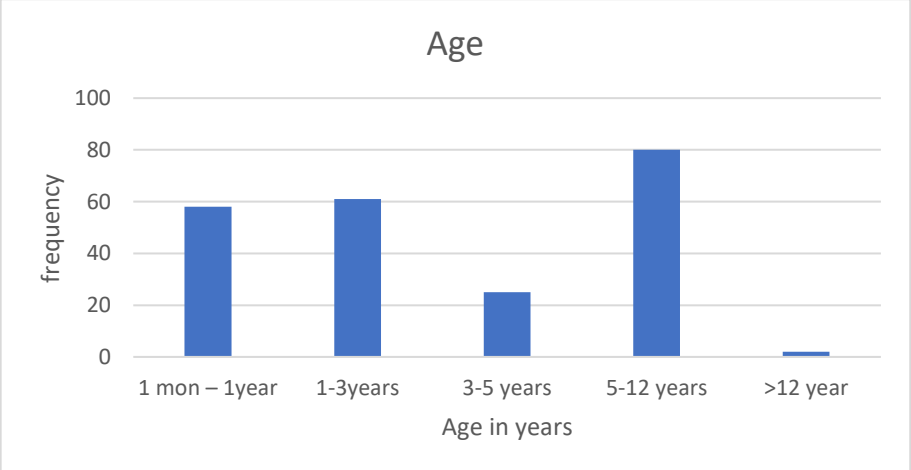

Figure 1: Age distribution of children admitted in the PICU

Figure 1 reveals that the commonest age group admitted in the pediatric medical intensive care unit was schoolers, aged between 5-12 years.

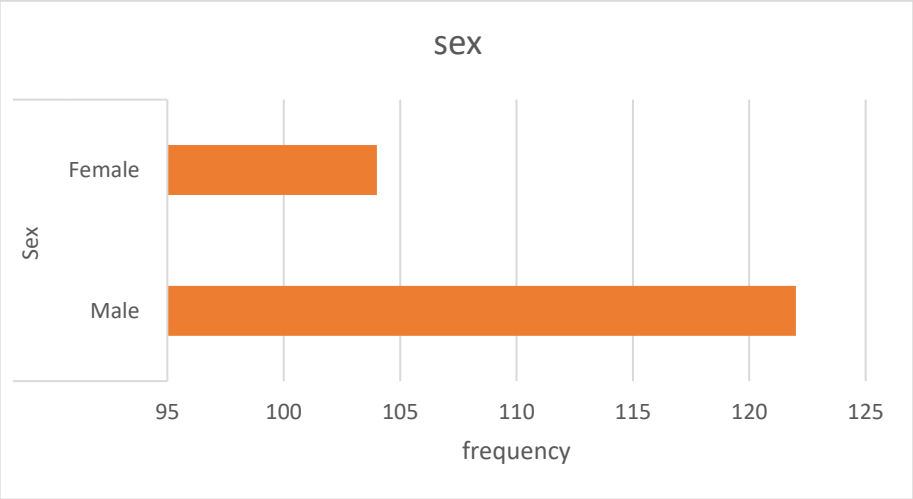

Figure 2: Sex distribution of children admitted in PICU

Figure 2 shows a male predominance in pediatric intensive care unit admissions.

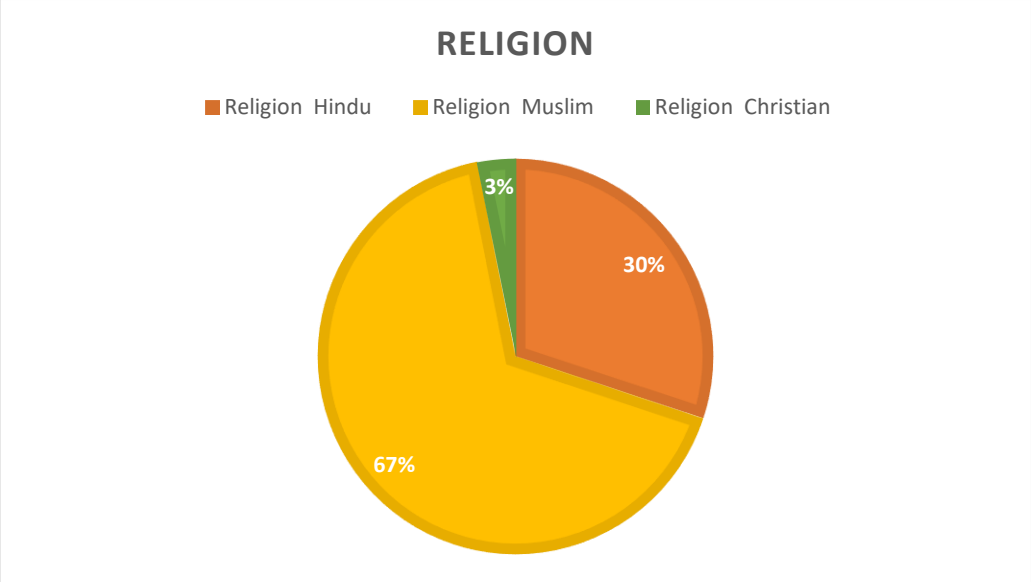

Figure 3: Distribution of children based on religion

From Figure 3, it is evident that the majority of admissions came from muslim religion.

Admission characteristics of patients admitted to the pediatric medical intensive care unit (n=226)

The majority of children admitted to the pediatric medical intensive care unit needed respiratory support (96, or 42.48%). Of the total 169 (74.78%) were direct admission from the emergency department, and 31 13.71% were transferred in from the wards. The majority of the children,94 (41.59%) was previously healthy and had no underlying health issues, and were well nourished, 121 (53.53%). The majority of the children,98 (43.36%) were stayed in the ICU for two to seven days, regardless of the outcome. Twenty-eight (12.38%) children needed invasive mechanical ventilation for respiratory support and were placed on ventilators. Out of them, 6 (0.03%) children needed temporary tracheostomy. The majority, 136(60.17%) needed continuous ionotropic infusions for hemodynamic support, and 9 (0.04%) required renal replacement therapy, especially peritoneal dialysis. The various admission characteristics encountered are presented in Table 2.

Table 2: Admission characteristics (n=226)

Admission characteristics		Frequency	Percentage
Admission source	Emergency	169	74.78%
	Transfer in from the ward	31	13.71%
	Referred case	26	11.50%
Primary indication for admission	Respiratory support	96	42.48%
	shock	36	15.92%
	Poor GCS	32	14.15%
	Raised ICP	18	07.96%
	Intensive monitoring	30	13.27%
	Post op	03	01.33%
	Post-cardiac arrest	05	02.21%
	Others	06	02.65%
Underlying health issues	Previously healthy	94	41.59%
	Respiratory	31	13.71%
	Asthma	10	04.42%
	Cardiovascular	10	04.42%
	Neurologic	70	30.97%
	Renal	11	04.87%
Nutritional status	Well nourished	121	53.53%
	Malnourished	105	46.46%
Length of stay	2-7 days	98	43.36%
	7-12 days	72	31.85%
	12-17 days	26	11.50%
	>17 days	30	13.27%
Need for mechanical ventilator	Invasive	28	12.38%
	Non invasive	02	0.01%
Need for tracheostomy	Yes	06	0.03%
	No	220	97.3%
Need for renal replacement	Yes	09	0.04%
	No	217	96.01%
Need for ionotropes	Yes	136	60.17%
	No	90	39.82%

Common clinical conditions and outcomes in the Pediatric intensive care unit

The two most common clinical conditions admitted were respiratory (33.62%) and neurological diseases. (30.97%). The most common diseases among admitted children were bronchopneumonia, seizure disorder, leukemia, acute diarrheal diseases, acute kidney injury, and severe diabetic ketoacidosis. Common clinical conditions are shown in Table 3.

Table 3 : Common clinical conditions in pediatric intensive care unit (n=226)

Clinical conditions	Frequency	%
Respiratory	76	33.62%
Infectious / Sepsis	4	0.01%
Neurological	70	30.97%
Head injury	2	0.01%
Cardiac	10	0.04%
Renal	11	0.04%
Gastro intestinal	12	0.05%
Poisoning	11	0.04%
Hemato oncologic	14	0.06%
Endocrine	7	0.03%
Burns	1	0.01%
Snake bite	2	0.01%
Drowning	5	0.02%
Spino muscular atrophy	1	0.01%

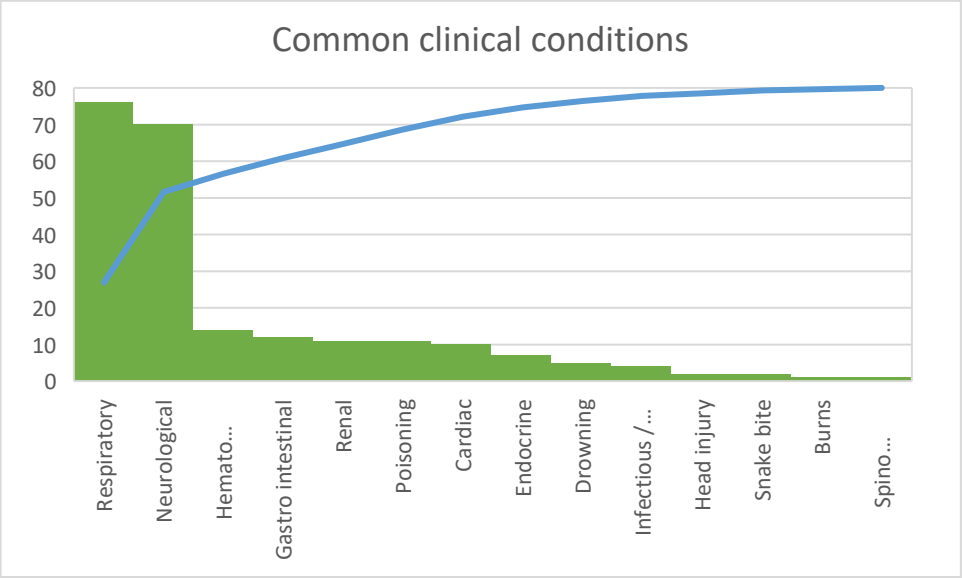

Figure 4: Common clinical conditions in pediatric intensive care unit

Figure 4 shows that the two most common clinical conditions were respiratory and neurological illnesses. The least common were spinomuscular atrophy, burns, and snake bite.

Association of socio-demographic, admission characteristics, and clinical outcome

Table 4 shows the association of socio-demographic, admission characteristics, and clinical outcome. The study showed that the source of admission and length of stay had a significant association with the outcome. Children who required renal replacement therapy were significantly more likely to have a fatal outcome compared to those who did not. And also who received ionotropes were significantly more likely to die compared to those who did not receive ionotropes.

Table 4: Association of socio-demographic, admission characteristics, and clinical outcome

variables	Outcome		Chi-square value	P value
	Survived n(%)	Died n(%)		
Socio-demographic variables				
Sex			**0.0000**	**1.0000**
Male	106	16		
Female	90	14		
Age			**8.9627**	**0.0620**
1 mon -1 year	44	14		
1 – 3 year	57	4		
3 – 5 year	22	3		
5 – 12 year	71	9		
>12 year	2	0		
Admission source			**32.2796**	**0.000000098**
Emergency	159	10		
Transfer in from ward	19	12		
Referred case	18	8		
Length of stay			**8.8763**	**0.0310**
2 – 7 days	88	10		
7 – 12 days	62	10		
12 – 17 days	18	8		
>17 days	28	2		
Mechanical ventilation			**1.0938**	**0.2956**
Invasive	10	18		
Non invasive	2	0		
Renal replacement			**23.4308**	**0.00000129**
Yes	5	4		

No	210	7		
Ionotropes			**11.2000**	**0.0008**
Yes	118	18		
No	90	0		

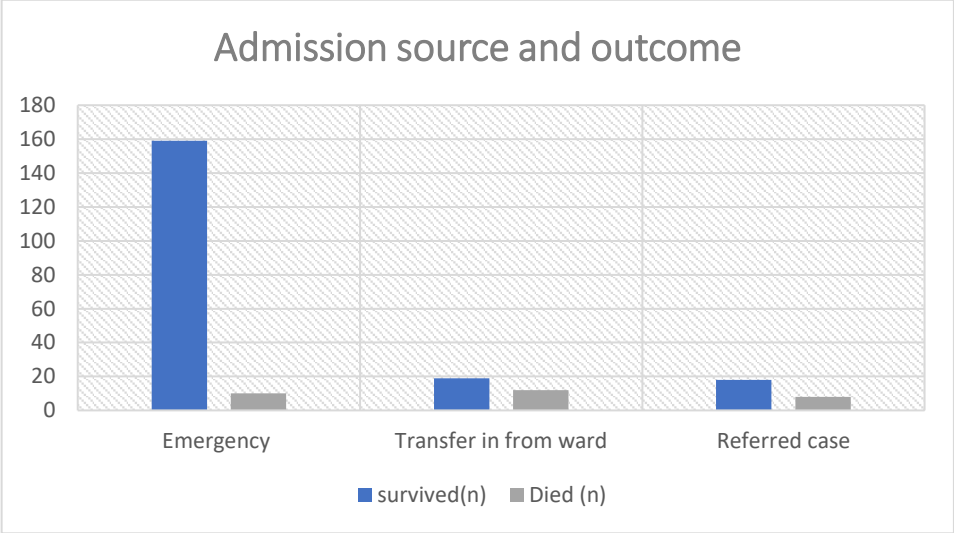

Figure 5: Outcome of children from the admission source

Figure 5 reveals that admissions and survival rates from the emergency department were most common.

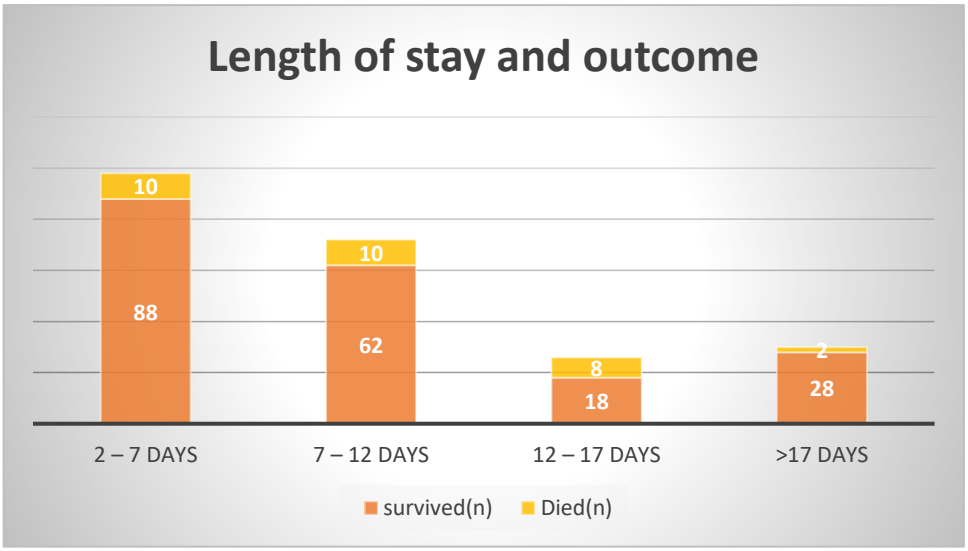

Figure 6: Outcome of children to length of stay

Figure 6 shows that the majority of children admitted to the intensive care unit for 2-7days and also had a positive outcome.

Discussion

This prospective single-center study described the sociodemographic data, admission characteristics, and outcome of children admitted to the pediatric medical intensive care unit at the Institute of Maternal and Child Health, a tertiary care center in the government sector serving most of the children from northern Kerala, from January 2025 to March 2025. In the field of critical care, intensive care unit (ICU) results can be assessed based on outcomes such as "death" or "survival" indicators, including mortality rates.[12]

A study was conducted at Tikur Anbessa Specialized Hospital to assess the admission patterns, treatment outcomes, and factors associated with mortality among children admitted to the pediatric intensive care unit (PICU) between October 2018 and October 2020. The study reviewed 361 pediatric patient records and identified the leading causes of PICU admissions as: Septic shock: 98 cases (27.14%), Meningitis: 67 cases (18.56%), Congestive heart failure (CHF): 44 cases (12.19%). Treatment

outcomes include improved: 183 patients (50.69%) Died: 158 patients (43.80%). In this study, from Table 3 it is evident that the two most common clinical conditions admitted were respiratory (33.62%) and neurological diseases (30.97%). The most common diseases among admitted children were bronchopneumonia, seizure disorder, leukemia, acute diarrheal diseases, acute kidney injury, and severe diabetic ketoacidosis. The overall mortality rate in the PICU during the study period was 13.27%.

This study included children between the age group of 1 month to 13 years, which was similar to the studies conducted by Iyoha *et al* (40.01±45.79 months), Shukla *et al* (36 months); however, Balakrishnan *et al* included even the neonatal age groups. A total of 226 children enrolled majority, 80 (33.59%), belonged to the age group 5 – 12 years. Figure 1 typically describe the age predominances, this findings are not similar to a study conducted in Haryana by Harita Kirpal & Anuradha Behl in 2024 where 15-17 Out of 500 patients enrolled, majority of the patients belonged to the age group of 1-5 years of age (29.60%) which was comparable to as found by Madaan *et al* (80.84±61.072 months) and Mukhija *et al* (96.50 months).15-19 Most patients who survived belonged to 1-10 years of age (54.50%), and maximum mortality was also seen in this age group (49.25%), both can be justified as they had the maximum number of admissions in the PICU and is comparable to Madaan *et al.*[13] In present study, from Figure 2 Out of the total admitted children in the pediatric intensive care unit, 122 (53.98%) were male, and the majority, 151 (66.8%), from the muslim community, similar to that found in most of the studies Iyoha *et al* (59.8% males and 40.2% females), Roshani *et al* (54.5% males and 45.5% females), Shukla *et al* (60.2% males and 39.8% females) and Earan *et al* (63.6% males and 36.4% females).[5,6,8,9] In this study, the two most common clinical conditions admitted were respiratory (33.62%) and neurological diseases (30.97%). This observation was similar to study carried out by Jyothi *et al* in which the cause of admission was attributed to central nervous system disorders 195 (32.5%) cases, followed by respiratory system in 122 (20.33%) cases, infections in 97 (16.16%) and cardiovascular system in 65 (10.83%) cases. This was also comparable to a study carried out by Haque *et al* However, a study analysing the epidemiological pattern of patients admitted to PICU in South India found that the respiratory system was the most common system affected (40.2%).[21,23] In this study, thirty children died, giving a mortality rate of 13.27%. Comparable findings were seen in retrospective descriptive studies done in Bangladesh and North India, with 21% and 23.5% mortality rates, respectively.[18,19] In contrast, a prospective cross-sectional study conducted in Pakistan reported an overall mortality rate of 19.07%. Other PICU studies from India, Malaysia, and Nepal indicated mortality rates ranging from 12% to 18%. [14] The disparity in the availability of diagnostic and treatment methods may account for the observed difference. In a retrospective cross-sectional study conducted in Mekelle, Ethiopia, the mortality rate was 8.5%, which was significantly lower than what was observed in our study.[23] A study in Iran revealed that children between the ages of two and twelve had the highest proportion of deaths (66.66%).[9] Similar findings were observed in studies in India and Ethiopia, where the need for inotropes was an important predictor of mortality. [21,19]

A study conducted in Pakistan shows that 468 (1.7%) were admitted to the PICU, which constituted about 41.5% of all the total PICU admissions. Sixty-three percent (n=294) were under five; males were 60.9%, and 82.3% were in the medical category. Neurological and respiratory illnesses were the common groups. Multi-organ dysfunction syndrome and co-morbidity were present in 25.2% and 23.5%, respectively. The mean length of stay was 5 hours. The case fatality rate was 20.3% as compared to the overall PICU mortality rate of 11.9%.

In 2021, a study conducted in Rajasthan, India, showed that 51.3% of children admitted to the pediatric intensive care unit were infants and 69.3% were male. The overall mortality was 2.4%.

Conclusion

In the pediatric medical intensive care unit, respiratory illnesses, neurological disorders, and hemato-oncologic conditions were the most common reasons for admission. Children stayed in the intensive care unit for 2-7 days, most of the time. Due to the dynamic and complex state of child development, it will become increasingly important to assess both short-term and long-term outcomes for an extended period, and also be necessary to plan certain age-specific nursing interventions for improving the short-term as well as long-term outcomes.

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