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Study of the Epidemiology of Deaths in Paediatric Intensive Care Unit at Tertiary Care Hospital in India.

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ABSTRACT

The Paediatric Intensive Care Unit (PICU) is a specialized healthcare setting that provides critical care to children who are seriously ill or injured. Despite the advances in medical technology and the availability of specialized care, mortality remains a significant concern among critically ill children admitted to the PICU. Therefore, studying the epidemiology of deaths in the PICU is of great importance. To study the epidemiology of children's death admitted to the PICU of KIMS hospital, Bangalore. Retrospective data were collected from 51 children aged 1 month to 18 years who expired while under care in PICU of the study institution during 42 months (April 2017- July 2022). The data were collected from the institution's PICU. The study variables included were age, sex, and details of diagnosis including primary disease, co-morbidities and cause of death. Master chart was prepared and analysed using IBM Statistical Package for Social Science (SPSS version 21). The summary statistics for categorical variables are reported using frequency and percentage and continuous variables as mean (SD). A total of 51 deaths were documented during the study period from the total of 1500 admissions. The Mortality rate of children admitted to PICU was 1.8 %. The mortality patterns were acute GE with severe dehydration with refractory shock, sepsis with MODS, post cardiorespiratory arrest status revived and referred from outside secondary to hepatitis, pulmonary haemorrhage secondary to ARDS, respiratory depression with status epilepticus secondary to temporomesial sclerosis with mods. The mean age of children who died in PICU for a period of 42 months was 8 years. Among the 50 deaths male ratio was high when compared to the female ratio. Sepsis was a common condition found in both sexes. In this study, the prevalence of pulmonary haemorrhage secondary to ARDS was high in males and acute GE with severe dehydration with refractory shock was high in females.

Keywords: Paediatric Intensive Care Unit, epidemiology, mortality rate

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INTRODUCTION

The Paediatric Intensive Care Unit (PICU) is a specialized healthcare setting that provides critical care to children who are seriously ill or injured. Despite the advances in medical technology and the availability of specialized care, mortality remains a significant concern among critically ill children admitted to the PICU [1-3]. Therefore, studying the epidemiology of deaths in the PICU is of great importance. Understanding the patterns and determinants of mortality in the PICU can provide valuable insights into the factors contributing to poor outcomes among critically ill children. These insights can help healthcare providers develop and implement appropriate interventions to reduce mortality and improve the overall quality of care provided to critically ill children [4, 5]. A study of the epidemiology of deaths in the PICU at a tertiary care hospital is a critical step in this process. Such a study can provide important information about the characteristics of children who die in the PICU, the conditions that lead to their death, and the factors that may influence their prognosis [6-8].

Therefore, the purpose of this study was to investigate the epidemiology of deaths in the PICU at a tertiary care hospital. Specifically, the study aimed to identify the demographic and clinical characteristics of children who died in the PICU, the primary diagnoses associated with mortality, and the factors that may have influenced mortality rates. By understanding the factors that contribute to mortality in the PICU, healthcare providers can develop appropriate interventions to reduce mortality and improve outcomes for critically ill children.

MATERIAL AND METHODS

The present retrospective study was conducted in the PICU of KIMS hospital, Bangalore, Karnataka, India.

Study design: Retrospective quantitative study

Study Setting: Tertiary PICU.

Ethical considerations: Ethical approval was obtained from the hospital's Institutional Review Board (IRB) before conducting the study.

Data source: The data was collected retrospectively by analyzing the death records from 51 children aged 1 month to 18 years who expired while under care in the PICU of the study institution during 42 months (April 2017- July 2022).

Sampling technique: Purposive random sampling

Sample size: 51

Inclusion criteria

- All patients admitted to the PICU between April 2017- July 2022 were retrospectively studied from admission to death.
- Children aged 1 month to 18 years

Exclusion criteria

- Children outside these age limit
- Children outside period limit

Variables: The study variables included were age, sex, and details of diagnosis, including primary disease, co-morbidities and cause of death.

Statistical analysis: Master chart was prepared and analysed using IBM Statistical Package for Social Science (SPSS version 21). The summary statistics for categorical variables are reported using frequency and percentage and continuous variables as mean (SD).

RESULTS

The data was collected from 1500 children aged 1 month to 18 years who expired while under care in the PICU of the study institution during 42 months (April 2017- July 2022).

In our present study, male children were 65 %, while females were 35 %.

The mean age was 8.07 years, while the maximum number of children were in the age range of 4 to 6 years.

Maximum children (48%) were from lower socioeconomic status families.

A total of 1500 children were admitted to PICU & 51 deaths were documented during the study period. The Mortality rate of children admitted to PICU was 1.8 %. The mortality patterns were acute GE with severe dehydration with refractory shock, sepsis with MODS, pulmonary haemorrhage secondary to ARDS, respiratory depression with status epilepticus secondary to temporomesial sclerosis with mods.

The mean age of children who died in PICU for a period of 42 months was 8 years.

Among the 50 deaths male ratio was high when compared to the female ratio.

Sepsis was a common condition found in both sexes.

The average length of stay of male patients at the PICU was 5 days and the average length of stay of female patients was 3 days.

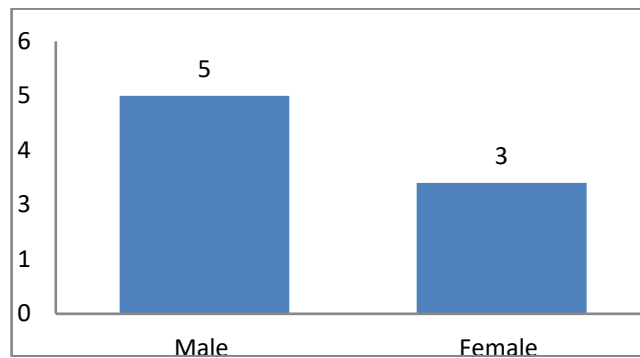
Table 1: Patients information

Number (N) (Gender wise patient distribution)	29	22
Mean (Age – in years)	8.62069	7.045455
Standard Deviation	5.888329	4.96154
p-value	0.5	0.5
Death with Septic Shock	7	4
Average Length of Stay	5	3

Table 2: Distribution of causes of death at PICU

Causes of deaths at PICU	Males	Females	Total	Male %	Female %
ACUTE GE WITH SEVERE DEHYDRATION WITH REFRACTORY SHOCK	4	2	6	33.33333333	66.66667
SEPSIS WITH MODS	6	3	9	33.33333333	66.66667
PULMONARY HEMORRHAGE SECONDARY TO ARDS	2	3	5	60	40
RESPIRATORY DEPRESSION WITH STATUS EPILEPTICUS SECONDARY TO TEMPOROMESIAL SCLEROSIS WITH MODS	2	3	5	60	40
Others	16	10	26	38.46153846	61.53846

Figure 1: Distribution of average length of stay at PICU of males and females in the study



The mortality of the PICU was 1.8% during the study period. Higher mortality was associated with more severe conditions of disease and the presence of co-morbidities. Acute respiratory distress syndrome (ARDS) continues to contribute significantly to the disease burden in today's arena of paediatric critical care medicine. It is an acute, diffuse, inflammatory lung injury caused by diverse pulmonary and non-pulmonary etiologies, through our analysis, we found it is the major reason for deaths in PICU.

There was a high occurrence rate of pulmonary haemorrhage secondary to ARDS and Sepsis secondary to hepatitis and a mortality rate of 1.8%.

DISCUSSION

Our study comprehensively investigated the epidemiology of the mortality profile in the PICU of a tertiary hospital. Our study found that the mortality in the PICU was 1.5% during the study period. A higher mortality was associated with more severe conditions of disease and the presence of co-morbidities. Acute respiratory distress syndrome (ARDS) continues to contribute significantly to the disease burden in today's arena of paediatric critical care medicine. It is an acute, diffuse, inflammatory lung injury caused by diverse pulmonary and non-pulmonary etiologies, through our analysis, we found it is the major reason for deaths at PICU [9-10].

According to the new consensus definition, sepsis is a life-threatening organ dysfunction caused by a deregulated host response to infection. Sepsis-associated liver dysfunction is traditionally viewed as a late feature of critical illness. Recent studies have revealed liver dysfunction as an early event in sepsis. Liver dysfunction, when culminates into liver failure, becomes a severe complication, it has been a major cause of death in female patients [11]. There was a high occurrence rate of pulmonary haemorrhage secondary to ARDS and Sepsis secondary to hepatitis and a mortality rate of 1.5%.

There are several limitations to this study. Our study was retrospective and relied on PICU data collection forms completed at the time of care. These forms did not have the adequate breadth of data available, nor did the study team perform an in-depth chart review of specific diagnostic and treatment-related factors associated with mortality from various illnesses. Since our focus was to identify general disease demographics for targeted teaching, we sought this approach for efficiency in an environment lacking an electronic medical record and robust medical documentation upon patient transfer to HCM. Despite these limitations, this retrospective has immensely helped us to identify and note the reasons for deaths at PICU. Additional areas for future clinical research that were identified through this study include more detailed evaluations of disease specific outcomes based on the severity at initial presentation and specific treatments, with analysis of the mechanisms of death [12].

The study identified several factors that were associated with increased mortality rates in the PICU, including younger age, male gender, higher severity of illness, and presence of comorbidities. The study also found that a longer duration of PICU stay was associated with increased mortality rates. Overall, the study provides important insights into the epidemiology of deaths in the PICU at a tertiary care hospital. The findings can help healthcare providers develop and implement appropriate interventions to reduce mortality and improve outcomes for critically ill children. For example,

interventions aimed at reducing the incidence of respiratory and cardiovascular disorders, improving early detection and treatment of sepsis, and providing appropriate supportive care to children with neurological disorders may help to reduce mortality rates in the PICU.

A study conducted in the United States by Goldstein et al [13] collected 63,285 consecutive PICU admissions from January 2004 to December 2005 in the Virtual Paediatric Intensive Care Unit Performance System database and found that patients with day 1 MODS had a higher risk of dying (10.0% vs 1.2%), a longer length of stay in PICU (3.6 vs 1.3 days) and worse performance at discharge. Our study reported acute respiratory distress syndrome (ARDS) continues to contribute significantly to the disease burden in today's arena of paediatric critical care medicine. It is an acute, diffuse, inflammatory lung injury caused by diverse pulmonary and non-pulmonary etiologies, through our analysis, we found it is the major reason for deaths in PICU.

Shukla et al [14]. reported that infectious disease was still one of the commonest causes of ICU admission and mortality [18]. While in our study, higher mortality was associated with more severe conditions of disease and the presence of co-morbidities.

Rashma RP et al [15] from Kerala (India) reported total of 100 deaths were documented during the study period from the total 945 admissions. The Mortality rate of children admitted to PICU was 10.58%. The mortality pattern was cardiopulmonary arrest 29%, sepsis 19%, Pneumonia 16%, MODS 14%, Liver disease 7%, inborn error of metabolism 6%, ARDS 6%, ARF 3%. While comparing with our study, our study found that the mortality in the PICU was 1.5% during the study period. Higher mortality was associated with more severe conditions of disease and the presence of co-morbidities. Acute respiratory distress syndrome (ARDS) continues to contribute significantly to the disease burden in today's arena of paediatric critical care medicine. It is an acute, diffuse, inflammatory lung injury caused by diverse pulmonary and non-pulmonary etiologies, through our analysis, we found it is the major reason for deaths in PICU.

The findings of this study can help healthcare providers develop appropriate interventions to reduce mortality and improve outcomes for critically ill children. For example, healthcare providers can focus on reducing the incidence of respiratory and cardiovascular disorders, improving early detection and treatment of sepsis, and providing appropriate supportive care to children with neurological disorders. Additionally, efforts can be made to reduce the duration of PICU stay, which has been associated with increased mortality rates. Thus our study provides important insights into the epidemiology of deaths in the PICU and can serve as a basis for future research and clinical practice aimed at reducing mortality rates and improving outcomes for critically ill children.

Study limitations:

- The study was conducted at a single tertiary care hospital, which may limit the generalizability of the findings.
- The study was retrospective in nature, which means that it relied on data collected from medical records and may be subject to bias or errors.
- COVID-19 pandemic might have affected the admission and the death statistics.

CONCLUSION

In conclusion, the study of the epidemiology of deaths in the Paediatric Intensive Care Unit (PICU) at a tertiary care hospital has provided valuable insights into the factors contributing to mortality among critically ill children. In this study, the prevalence of pulmonary hemorrhage secondary to ARDS was high in males and acute GE with severe dehydration with refractory shock was high in females.

Abbreviations

PICU: Paediatric Intensive Care Unit
CVD: Cardiovascular diseases
ARDS : Acute respiratory distress syndrome
SD : Standard Deviation
M: Mean
MODS:multiorgan dysfunction syndrome

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