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Original Research Article

EARLY DEATH IN A PEDIATRIC INTENSIVE CARE UNIT OF PAKISTAN: A DESCRIPTIVE ANALYSIS

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ABSTRACT

Background: *Mortality statistics from pediatric intensive care units (PICU) are widely available. Early Death (ED) is defined as death occurring within 24 hours of ICU admission. Few clinical reports on ED are available from the adult ICU. There is a paucity of data on ED available from the PICU.* ***Objective:*** *The objective of the study is to assess the frequency of Early Deaths and describe the patient's clinical-demographic characteristics who died within the first 24 hours of PICU admission.* ***Study Design:*** *A descriptive, cross-sectional study.* ***Setting:*** *A closed multidisciplinary Pediatric Intensive Care Unit of a public-sector Children's Hospital.* ***Duration:*** *One year; From January 1 to December 31, 2024.* ***Methods:*** *A total of 225 children (age 1 month to 15 years) who expired within 24 hours of admission to the PICU of the Children's Hospital of Korangi, Karachi, were eligible. Data were extracted from electronic medical records and chart reviews, including patients' demographic characteristics, pertinent clinical variables, selected labs and imaging, pediatric sequential organ dysfunction (p-SOFA) score, and received ICU-specific intervention. Descriptive statistics were applied.* ***Results:*** *The overall mortality rate was 8.72% (666) of all admissions (n=5814), and 33.78% (225) of all deaths were ED. The median age was 12 months (IQR 6-24 months), and 55% were male. Almost half of the patients (48.5%) were in a terminally ill state. The most common abnormal critical clinical parameters were hypoxia (88%, n=198), hypotension (88%, n=198), and decreased level of consciousness (89.8%, n=202). The mean p-SOFA was 10.6±4. Septic shock, cardiac diseases, and multi-organ failure were the most common diagnoses at the time of death. Vasoactive drugs and mechanical ventilation were used in 99.6% (n=224) and 82.7% (n=186), respectively. The mean time from PICU admission to death was 10.5±9.8 hours.* ***Conclusion****: We found the frequency of early deaths was more than one-third of all deaths in the PICU (33.78%). Nearly half of them were futile. Septic shock, cardiac illnesses, and multiorgan failure were the common diagnoses. More comprehensive studies are needed on early deaths from PICUs for critical analysis.*

Keywords: Critically ill, Death, Children, PICU, Multi-Organ Dysfunction

INTRODUCTION

Pediatric Intensive Care Units (PICUs) are a geographical, dedicated area of a hospital for the care of critically ill or injured children. PICUs are well established in developed countries, and the growth of ICUs, including PICUs, has exponentially increased in the arena of the COVID-19 pandemic. Most children die in PICUs(1).

Extensive literature is available on mortality from pediatric intensive care units (PICUs)(2,3). Studies on mortality in PICUs have been evaluated from a wide range of different aspects. There have been enormous epidemiological studies published on mortality rates and risk factors for mortality from PICUs worldwide. The mortality rates still serve as a key indicator of healthcare quality and resource utilization in both adult and pediatric intensive care units. Currently, the mortality rate in the Pediatric Intensive Care Units (PICUs) of low-income and high-income countries is 10%-20% and 2%-6% respectively.(4, 5)Numerous studies are available on prediction models like PRISM III/IV, PIM 3, PELODS, and recently, P-SOFA for prognosis in children admitted to PICUs(6). Many studies analyzed single variables like lactic acidosis as a predictor of mortality in PICUs(7). Several studies reported mortality related to admission source and disease-specific diagnosis. Children admitted from the emergency room, as well as those with septic shock, have higher odds of death as compared to others.(8, 9). Few studies have described the modes of death in their PICUs(10). Time of admission to PICUs as a predictor of mortality was also compared with mixed results.(11).

More recently, the temporal pattern of mortality from adult ICUs has been reported. The distribution of the temporal pattern of death in the ICU is bimodal: Early deaths (ED) are defined as deaths that occur within 24 hours of admission to the ICU, and Late deaths (LD) are defined as deaths that occur after day 1 of ICU admission.(12, 13). ED from the ICU did not gain importance in medical literature for several reasons. Most of the scoring system of the prediction model requires a 24-hour stay in the ICU. It has also not been discussed in the morbidity and mortality conference of the academic session, most likely due to incomplete evaluation.(14). Few clinical reports from adult ICUs revealed that early deaths contribute from 15-50% of all deaths.(11, 15, 16). There is a gap in the literature on ED from PICUs. This study aims to describe the frequency, clinical-demographic characteristics, and management patterns of children who died within 24 hours of PICU admission at the public-sector Children's Hospital.

METHODOLOGY

This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies. (17). A descriptive cross-sectional study was conducted on children (1 month – 15 years) who expired within 24 hours of admission to the PICU of the Children's Hospital of Korangi, Karachi, from January 1, 2023, to May 31, 2025. This study was approved by the local institutional review board (SICHN/EX 001/25) dated April 04, 2025. Early death (ED) was defined as patient death occurring within 24 hours of PICU admission (13).

The estimated sample size was 207, calculated using the WHO calculator, with an anticipated proportion of 15.7% and a 95% Confidence Interval, and a 5% absolute margin of precision (2). The study population included children aged 1 month to 15 years who fulfilled the criteria of ED during the study period. All patients who

stayed more than 24 hours were excluded from the study.

Patients' medical records were reviewed to extract demographic data (age, gender), pertinent clinical parameters (hypotension, hypoxia, metabolic acidosis, decreased level of consciousness), primary admission diagnostic category, selected diagnostic aids, pediatric-Sequential Organ Failure Assessment(p-SOFA)(18) And ICU interventions (vasoactive drugs, mechanical ventilation). The time from PICU admission to death was also recorded on a structured data collection sheet. Data were entered into SPSS v27 Statistics Software (IBM Corp., Armonk, NY, USA), and descriptive statistics were applied. Data were analyzed using Statistical Package for the Social Sciences software version 29.0. Descriptive statistics summarized demographic and clinical characteristics.

RESULTS

During the study period, 5814 patients were admitted to the PICU. The overall mortality rate was 8.72% (n=666), with 3.86% (n=225) of these patients dying within 24 hours of admission. Of total deaths, 225 (33.78%) patients were in the ED category. Patients' characteristics were described in Table 1.

Table 1: Patients' Characteristics (N=225)

Demographic Features		
Age (months)	median (IQR)	12 (6 – 24)
Gender – Male	n (%)	124 (55.1)
Duration of preceding illness (days),	median (IQR)	4 (2 – 7)
Co-morbidity conditions – Yes	n (%)	38 (16.9)
Malnutrition – Yes,	n (%)	89 (39.6)
Presenting complaints		
Desaturation – Yes	n (%)	198 (88)
Hypotension – Yes	n (%)	198 (88)
Altered conscious level – Yes	n (%)	202 (89.8)
Seizures – Yes	n (%)	71 (31.6)
Respiratory distress/failure – Yes	n (%)	220 (97.8)
Bleeding – Yes	n (%)	44 (19.6)
Examination and Laboratory Findings		
Low perfusion index – Yes	n (%)	205 (91.1)
Pseudo-platelet electrical activity –	Yes n (%)	42 (18.7)
Organ System Involved		
Central nervous system – Yes	n (%)	186 (82.7)
Cardiovascular system – Yes	n (%)	220 (97.8)
Respiratory system – Yes	n (%)	221 (98.2)
Acute Kidney Injury – Yes	n (%)	116 (51.6)
Coagulopathy – Yes	n (%)	48 (21.3)
Stay in PICU		
PICU stay before death (hrs),	median (IQR)	9 (4 – 16)
Admission Diagnosis		
Acute Myocarditis	n (%)	44 (20.1)
Measles ± complications	n (%)	37 (16.9)
Sepsis / Septic shock	n (%)	67 (30.6)
Others	n (%)	71 (32.4)

The median age was 12 months (IQR: 6-24 months); male gender was 55.1% (n=124). The most common diagnostic categories were shock-like states 48.9% (n=110), respiratory disorders 31.2% (n=70), and neurological disorders 12.3% (n=28). Median duration from admission to death was 9 hours (range: 4-16 hours). Focused and pertinent diagnostic and ICU interventions are shown in Figure 1.

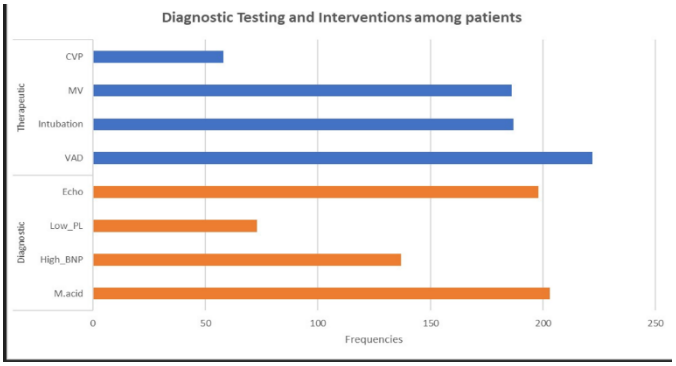

Figure 1: Diagnostic Investigations and therapeutic interventions (N=225)

An interesting observation in this study was that 18.7% of patients (n=42) had no pulses on admission with an organized cardiac rhythm on the monitor and focused echo revealed cardiac contractility, which is described as Pseudo Pulseless Electrical Activity (P-PEA). Almost 100% of patients had multi-organ dysfunction, with a mean (±SD) pediatric sequential organ function assessment (p-SOFA) score of 10±6. The most common organ system involved was the respiratory system, 98.2% (n=221), followed by the cardiovascular system, 97.8% (n=220), and the central nervous system, 82.7% (n=186).

DISCUSSION

We observed that one-third (33.78%) of all deaths occurred within 24 hours of admission to the PICU. Few mortality reports were published on the mode of deaths in PICUs. Numerous studies are available on the predictor models of mortality as the outcome of PICU. (6). There is a paucity of data on early deaths in PICUs (2). Our results of ED in PICU were similar to adult published reports on ED from ICUs, ranging from 18.9% to 34%(19, 20). Andersen *et al* reported that 1/3rd of overall ICU deaths (29.8%) occurred in the first 24 hours of ICU admission. (13). Similarly, Kakerra *et al. and Medeirosa et al. observed 18.9% and 23.8% EDs in their cohorts*, respectively.(19, 21). Botan *et al*, in their retrospective 5-year pediatric mortality reports, showed 15.7% (40/254) ED in their PICU. (2). Similarly, Johnson *et al* observed a 15% mortality rate in the first 24 hours of admission to the PICU among a cohort of children admitted with suspected primary bloodstream infection. (22). Schlapbach *et al* reported 36.8% (53/144 pediatric septic shock) of death within 24 hours of admission to the PICU.(23). Similarly, Miura et al reported 31.6% (77/244) of children with community-acquired septic shock died on the first day of admission in a PICU in Japan.(24).

The demographic profile showed that most of our patients were less than 2 years of age, as compared to the median age of children in the ED group, which was 81.8 months from the PICU of Korea. (2). However, the existing literature revealed that most children dying in PICUs were under five years of age. (25).

Most of the patients were in a terminally ill condition and had Do Not Resuscitate (DNR) orders in both the adult and pediatric cohorts of the ED.(16, 19). Similarly, there was a high severity of illness, as indicated by the PRISM-III score (mean 37 points) in the Korean study and the p-SOFA score (10 points) in this study. Co-morbidity was significantly more common in the Korean PICU study as well as adult reports.(2, 19). The frequencies of critical pertinent clinical parameters like desaturation, hypotension, and depressed level of consciousness, and selected labs like metabolic acidosis were similar in most of the relevant studies. (12, 15, 20).

The Pseudo PEA is extensively described in adult literature owing to the use of Point of Care Ultrasound (POCUS) in resuscitation; reported from 15-35%(26). The prevalence of pseudo-PEA in children remains unknown (27). We found almost one-fifth of children (18.7%)

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admitted with pseudo-PEA in this study. The POCUS is increasingly used in pediatric resuscitation (28).

Several studies have discussed the high utilization of resources in PICUs. The cost of care in PICUs is high due to significant resource utilization.(28, 29). Studies on ED and short stay in ICUs have raised concerns about the utilization of expensive ICU resources on futile cases. (30). All these studies suggest alternative strategies for better utilization of ICU resources, especially in limited resource settings.

The strength of our study is that it is the first from our region to include all possible characteristics of early death. We have several limitations, including retrospective, single-center, and with a small sample size. This was only observational for descriptive description of demographic and clinical characteristics of children who died within 24 hours of admission to the PICU. We did not assess any predictive factor for early deaths. This study included medical patients only.

Future directions: We require comprehensive evaluations of larger, multicenter studies on early ICU mortality. These evaluations should include predictor models and cost analyses to guide physicians, patients, and their families in managing acute deterioration in such cases.

CONCLUSION

We found that about one-third of all deaths of critically ill children occurred in the first 24 hours of admission to the PICU in resource-limited settings. Septic shock, cardiac catastrophes, and multiorgan failures were the common diagnoses of early deaths in the PICU.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (SICHN/EX 001/25)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

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Critical manuscript writing and review
ANWARUL HAQUE (Consultant Pediatric Intensivist)
Concept of idea, study protocol, and guarantor of manuscript.

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