Determinants of Death in children aged 1 month and 14 years Admitted to Pediatric Intensive Care Unit at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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1. Submission Guide

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Full title of the research Project	Determinants of death among children aged 1 month to 14 years admitted to pediatric intensive care unit at TASH, Addis Ababa Ethiopia
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Name of resident **Signature** **Date**

This proposed work has been submitted with my approval as an advisor

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Acknowledgement

First, I would like to give thanks to almighty GOD! Helping me all the way. Next Addis Ababa University College of Health Sciences, Department of pediatric and child health for providing significant chance to progress this research proposal. Especially my appreciation goes to my advisor Dr. Rahel Argaw for positive guidance, constrictive comment, and continuous efforts for this proposal development.

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5. Acronym

PICU - Pediatric intensive care unit

SPSS - Statistical Package for Social Science

TASH - Tikur Anbessa Specialized Hospital

LOS- Length of Hospital Stay

ETB- Ethiopian Birr

AOR- adjusted odd ratio

COR – crude odd ratio

6. Abstract

6.1 Background

The intensive care unit (PICU) serve as a critical health care environment for children facing sever and potentially life threating conditions, the management of critically ill children requires a multidisciplinary approach and is characterized by high levels of complexity and variability. Understanding the determinants of mortality in the PICU is essential for improving patient outcomes, optimizing resource allocation and guiding future research in pediatric critical care**.**

6.2 Objectives

The purpose of this study is to assess the predictors and determinants of death among children aged 1 month - 14 years admitted to pediatric intensive care unit at Tikur Anbessa hospital specialized hospital, Addis Ababa, 2024.

6.3 Methodology

This is a prospective study of children aged less than 15 years admitted at pediatric intensive care unit Tikur Anbessa Hospital Addis Ababa from October 2024 to February 2025. Data was collected from patient's using structured questionnaires. The data was cleaned, entered and analyzed by using SPSS version 25. Descriptive results was presented in tables and figures and binary logistic regression model was used and p- value <0.05 was considered as statistically significant.

6.4 Result

A total of 145 children were studied; more than two-thirds 97 (66.9%). were under 5 years of age. The majority of the children, 77 (53.1%), were males, with 77 (53.1%) from the capital, Addis Ababa, and most, 132 (91.0%), referred from public hospitals. Regarding the caregiver's educational status, the majority, 63 (43.4%) have a primary to secondary education background, followed by university 48 (33.1%) and no education 34 (23.4%).with respiratory condition being the most common primary ICU admission diagnosis, 62 (42.8%); followed by infection and sepsis, 35 (24.1%) and 13 (9.0%), respectively. More than one-third of the children 56 (38.6%) had comorbidities. The mortality rate at the intensive care unit was 30.3% .Moreover mechanical ventilation need (AOR = 4.92, 95% CI 1.67, 14.45, p-value = 0.004) and (AOR = 8.16, 95% CI 2.81, 23.72, p-value = 0.000). Finally, the odds of death were 71% reduced among those who stayed for more than 72 hours in ICU compared to those who stayed 72 hours or less (AOR = 0.29, 95% CI 0.11–0.83; P-value = 0.022).

6.5 Conclusion

The mortality rate at the PICU was 30.3%. Patients who utilize mechanical ventilators, have comorbid conditions, require inotropes and those who stay longer in PICU has higher mortality and should be treated with extra vigilance.

Key word: **Determinants, Pediatric patient, PICU, outcome, Mortality,**

7. CHAPTER ONE: INTRODUCTION

7.1 Background

Children in developing countries are more likely to be younger and to suffer from infectious diseases, which set them apart from children in wealthier nations (1).

Referrals and lengthy travel times sometimes result in late presentations to the hospital, which raises the severity of the illness and the admittance mortality rate (1).

The intensive care unit (ICU) may be required for a patient who has hemodynamic instability that requires frequent vital sign monitoring, invasive hemodynamic monitoring, rapid intravenous medication titration with concurrent monitoring, and ICU breathing assistance. For patients who are seriously ill or injured, this could significantly improve the quality of care and outcomes, especially in high-resource settings (2).

The ICU results were determined by the patient's age, concurrent conditions, degree of pre-hospital and emergency care, clinical state at admission, and factors reported at the time of ICU admission, such as the use of mechanical ventilation, degree of mental state, the duration of stay, and problems during the ICU stay, such as ventilator-related respiratory and circulatory problems (3).

The aim of this research is to identify the determinants of PICU death and to evaluate the association between specific treatment protocols and outcomes in pediatric patients who are admitted to Tikur Anbessa Hospital.

7.2 Statement of the Problem

There are several elements that can alter and impact the course of critical illness, including the events that transpire during the process. Understanding the causes of death in the PICU is one of the primary strategies for lowering mortality, in addition to enhancements in the standard of care for children. As a result, the findings of this study will serve as baseline data for future research in this field.

7.3 Significance of the study

The number of patients being admitted to our pediatric intensive care unit is frequent, but there are no sufficient studies showing the frequency of admission and outcome of those patients.

Identifying factors affecting the patient's outcome and their impact on mortality will help the hospital in designing improvement projects.

It will support policy makers to adapt appropriate approaches to meet increased demand and health care planning to contribute to the evidence-based and improved care of patients admitted to pediatric intensive care units in Ethiopia.

8. CHAPTER TWO: LITERATURE REVIEW

In a prospective cohort study of critically ill children from 28 days to 14 years old who visited the emergency department of Muhimbili National Hospital in Tanzania, it was found that children who arrived at the ED more than 48 hours after the onset of their illness had a 1.3-fold increased risk of dying there (1)

A geographical analysis and descriptive cross-sectional study conducted in Mexico City revealed a low ICU bed capacity per person. This raises the risk of dying as a result of these health disparities, especially when paired with other elements like patients' entitlements to certain health care systems and regional access. This demonstrates the importance of planning the infrastructure for medical emergencies in a thorough and fair manner.(2)

Data on all adult (>16 years) patients admitted to intensive care units (ICUs) from 730 participating centers across 84 countries was prospectively gathered. The results show that sepsis is still a serious global health issue, with high fatality rates in every country. Our results also indicate that the risk of mortality is significantly correlated with the worldwide national income, indicating that the arrangement of intensive care units has a substantial impact on the risk of death.(3)

Pediatric patients who were admitted to the critical care unit had a high overall pooled mortality, according to a systemic review and meta-analysis carried out at Gondar Hospital. especially those who are using inotropes, have comorbidities, or have a Glasgow Coma Scale score of less than eight and are on mechanical ventilators. (4)

The PICU's mortality rate was 43.8% in a retrospective cross-sectional research conducted in TASH. Meningitis and septic shock were the leading causes of death, with the greatest fatality occurring within seven days after admission. (5)

In a retrospective analysis of 665 patients, Desy Rusmawatiningtyas found that a fluid overload percentage of greater than 10%, the requirement for mechanical ventilation support, the use of vasoactive medications, and the existence of congenital abnormalities are all linked to PICU mortality in pediatric patients with sepsis. Cerebral palsy patients hospitalized for post-operative treatment in the PICU had a higher survival rate than other septic patients. (6)

A prospective cohort-outcome research was carried out in twelve academic PICUs in the United States between 2013 and 2017. Poor outcomes during the three-month follow-up were linked to physiologically plausible factors related to organ dysfunction associated with sepsis-associated critical illness and its treatment in children experiencing septic shock.(7)

According to a retrospective cohort research of survival predictors in a pediatric intensive care unit in a low-income nation, it's imperative that children patients with heart problems have prompt diagnosis and treatment. Patients with low GCS scores need to be closely monitored. To reduce the need for endotracheal tubes and improve outcomes, other approaches should be considered. (8)

In a prospective study conducted at a hospital in Karachi, the Accuracy of Pediatric Risk of Mortality (PRISM) III Score in Predicting Mortality Outcomes in a Pediatric Intensive Care Unit revealed that the score had exceptional predictive power and accuracy in our group. In our analysis, there was no discernible difference between the expected and observed fatality rates. Prediction models help doctors determine a patient's prognosis so that appropriate actions can be made in advance and identify situations where further medical care is needed in an environment with limited resources.(9)

According to a descriptive research conducted at King Edward Medical University/Mayo Hospital in Lahore, Pakistan, septicemia and bronchopneumonia were the main reasons for admission, while septicemia in the intensive care unit was the leading cause of death.(10)

An observational study was conducted retrospectively in a PICU of a northern Indian teaching institution. The outcome of newly established PICU are comparable to those of other research projects conducted on the Indian subcontinent. PICU admissions can be actively monitored or audited to identify management errors and improve outcomes using the tools at hand.(11)

A cross-sectional research conducted in Pakistan Along with high mortality rates, this study highlights the substantial burden of sepsis, diabetic ketoacidosis, and respiratory diseases in the PICU. To improve outcomes in critically sick pediatric populations in situations with limited resources, it is imperative to establish targeted care regimens, optimize resource allocation, and improve early treatments.(12)

According to a prospective study carried out at the intensive care unit (PICU) of Sohag University Hospital in Egypt, the rate of functional deterioration was comparatively low, but the PICU mortality rate was significant. Poor outcomes were linked to factors pertaining to the therapy of organ failure brought on by sepsis. (13)

In a prospective cohort of adult patients admitted to Londrina Hospital's intensive care unit, survival rates and time to admission were significantly correlated. Positive results are more likely to occur with early ICU admission.(14)

According to a prospective multicenter cohort study from the European Childhood Life-threatening Infectious Disease Study, invasive bacterial disease continues to cause significant morbidity and mortality in critically ill children in high-income nations, even in the face of extensive vaccination campaigns. Nearly one-third of sepsis survivors who were brought to the intensive care unit ended up with some form of disability.(15)

According to a retrospective study on the prognosis of patients with acute respiratory failure and prolonged stays in intensive care units, individuals with ARF who needed prolonged stays in the intensive care unit had a poor prognosis and a high probability of dying while in the hospital. (16)

A prospective observational study of mortality predictors and the burden of respiratory diseases in pediatric intensive care units In the context of a high PRISM III score, shock (respiratory group), and age less than one year (cardiorespiratory group), respiratory infections were a major cause of PICU admissions and are linked to a significant mortality risk.(17)

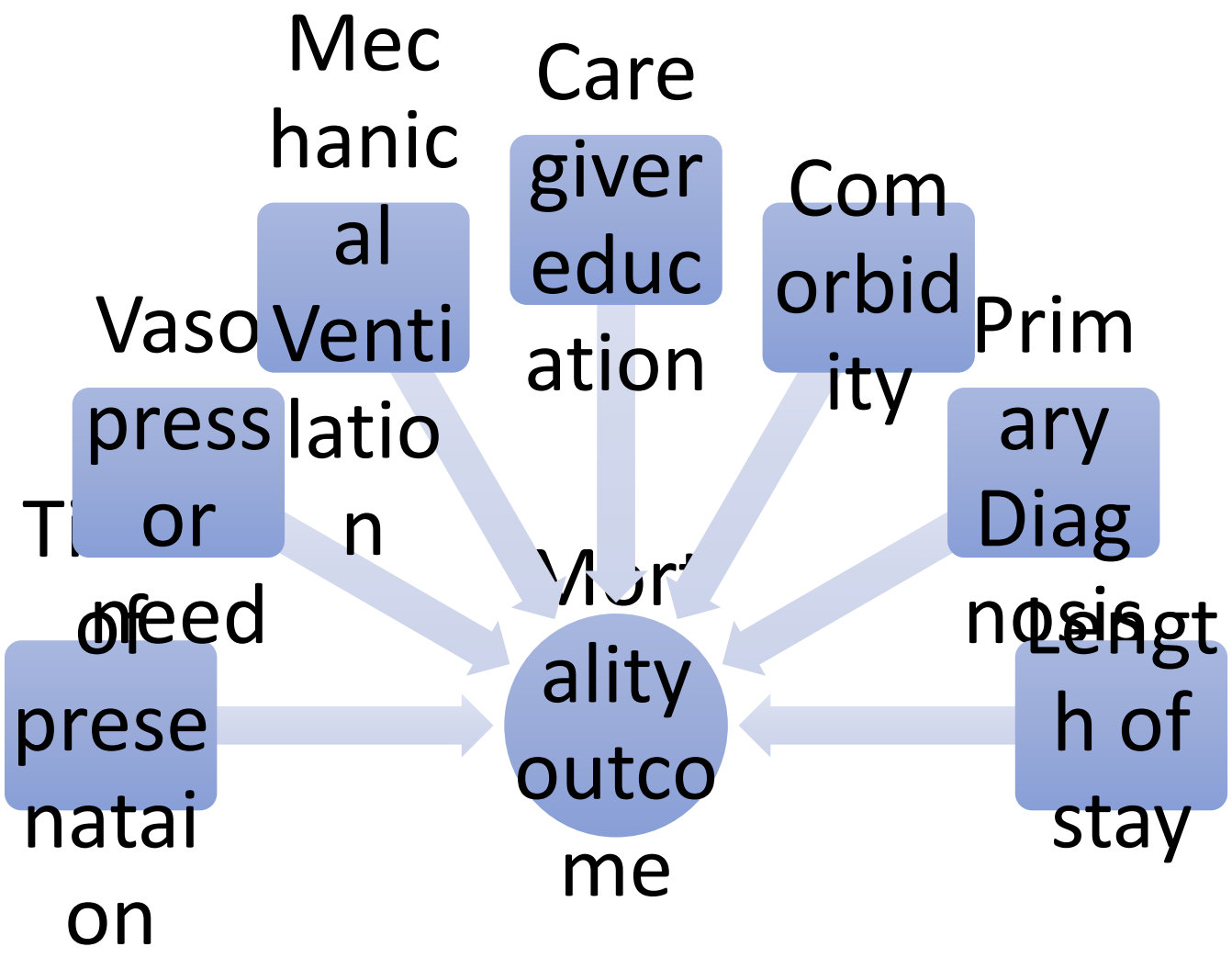
In an article reviewing children in India under the age of five Due to the emergence of newer pathogenic organisms, the resurgence of previously controlled diseases, widespread antibiotic

resistance, and inadequate vaccination coverage despite numerous creative efforts, acute respiratory infections (ARIs) were the leading cause of death for children under five. (18)

A significant rate of in-ICU mortality among admitted pediatric patients in a subset of Ethiopian tertiary care institutions was found by a prospective observational research conducted in a health facility. GCS < 8, sepsis diagnosis, in-ICU problems, and sedative medication use were all independent predictors of in-ICU death. (19)

A retrospective study conducted in Iran found that the most frequent reasons for admission and death in the PICU are respiratory failure and serious infections, and that very young infants are particularly vulnerable to a high death rate. (20)

9. Conceptual Framework



10. Objectives

10.1 General Objective

The aim of this study is to assess the determinants of death among children aged 1 month to 14 years admitted to the pediatric intensive care unit at TASH, Addis Ababa, Ethiopia.

10.2 Specific Objectives

- To determine the clinical conditions that most commonly lead to death in PICU
- To evaluate the association between specific treatment protocols and outcomes in pediatric patients.

11. CHAPTER THREE: METHODS

11.1 Methods and Materials

11.2 Study Area and Period

This study was conducted at Addis Ababa University, College of Health Science, Tikur Anbessa Specialized Teaching Hospital, Department of Pediatrics and Child Health, located in Addis Ababa, the capital city of Ethiopia. It is the largest medical school in the country with undergraduate, postgraduate, and some subspecialty trainings. It has around 600 beds and serves nearly 250,000 patients as outpatients annually. The pediatric inpatient beds account for 115 beds (excluding NICU), and the pediatric intensive care unit ward has 4-6 beds.

11.3 Study Design

A hospital-based prospective cross-sectional study design was conducted on patients admitted to the pediatric intensive care unit at Tikur Anbessa Specialized Hospital from November to February.

11.4 Population

11.4.1 Source Population

The source of populations was all infants and children aged 1 month to 14 years who were admitted to the pediatric intensive care unit at Tikur Anbessa Hospital.

11.4.2 Study Population

All infants and children were admitted to the pediatric intensive care unit at Tikur Anbessa Specialized Hospital during the study period.

11.4.3 Inclusion and Exclusion Criteria

11.4.3.1 Inclusion Criteria

- Children age 1 month to 14 years both male and female who were admitted to the pediatric intensive care unit.
- Secured consent from caregivers
- Medical cases

11.4.3.2 Exclusion Criteria

- Surgical cases
- Lost follow up

11.5 Sample Size determination

The total sample will be determined by using single population proportion formula by considering the following assumptions

95% confidence level,

Margin of error = 5%,

The following formula was used to determine the sample size.

$$N=\frac{Z^2xP(1-P)}{D^2} \qquad \frac{1.96^2 \ x0.35x0.35}{(^{0.05})^2}=349$$

N= Sample size

Z= Z score

P= population proportion

D= Margin of error

There for the total population in this study are less than 10.000 so using the reduction formula

S = n/ (1 + n/N)

n = sample size for population of size

N = number of nurses in hospital

S=349/ 1+349/440) =194 S=194 adding 10 % (19.4) for missing and incomplete data, Therefore, the required sample size of this study is 194+19 = **213**.

11.6 Sampling Technique

The entire group of medical pediatrics patients admitted to the pediatric intensive care unit were involved until the final sample size in the study period.

11.7 Data collection procedure and instrument

11.7.1 Data collection instrument

A structured questionnaire was adopted from different literature for our setup. After a 10% pretest was done on 5 patients after accommodation, the feedback from the questionnaires was used to collect data from patients admitted to the pediatric intensive care unit.

11.7.2 Instrument

A structured questionnaire was prepared in the English language and was used.

11.8 Study variables

11.8.1 Dependent variables

Mortality

11.8.2 Independent Variables

Socio-demographic characteristics, clinical presentation, type of referral, comorbidities, pre hospital interventions, use of ICU medication and MV.

11.9 Data Quality control

Three data collectors and one supervisor with the qualification of MPH were trained for one day about the objective of the study and ways of handling data. The instrument was pretested with 5 % of the respondents, which was not included in the actual study, in order to check clarity, understandability, and acceptance. Based on the result of the pretest, the unclear and confused questions were modified accordingly. Data completeness and consistency were checked daily, and the collected data was cleaned and compiled by the investigator.

11.10 Data processing and Analysis

The collected data was coded, cleaned, and checked for completeness and entered and analyzed using the Statistical Package for Social Science (SPSS) version 25. The mean with standard deviation, median with interquartile range for continuous variables, and frequency tables for categorical variables were prepared. The t-test was used to assess the associations between variables, and multivariate regression was used to determine the predictors and determinants of death. P-value significance is taken as 0.05.

11.11 Operational Definitions

- **Determinants of PICU death:** defined as variables that influence the survival outcomes of patient admitted to a PICU**.**
- **Outcome:** defined as discharge home, transferred to the ward, and died.
- **Length of stay:** The length of time the patient spent in the pediatric critical care unit, measured in hours, days, and months.

11.12 Ethical consideration

An ethical clearance and official letter were obtained from the Department of Research and Publication Committee of Addis Ababa University, Department of Pediatric and Child Health. The data collection was anonymous, which did not include names of individual participants, and any other personal identifiers were not indicated in the study.

11.13 Dissemination and utilization of results

The result of the study was disseminated to Addis Ababa University College of Health Science Department of Pediatrics and Child Health, Addis Ababa University.

For other concerned bodies through presentation, hard and soft copy. An attempt was made for publication of the research in a reputable journal.

12. CHAPTER FOUR: RESULTS

12.1 Statistical analysis

The data was collected using EpiData, cleansed, and then exported to SPSS Version 25 for analysis. Frequencies and percentages were used to display categorical variables. If more than 20% of projected cell counts were less than 5, the chi-square or Fisher exact test was performed to compare groups for categorical variables in bivariate analysis. In the bivariate analysis, variables with a p-value of less than 0.3 were used to determine independent factors related to death in order to find potentially relevant factors for the final models. Once model-fitting information was checked (Hosmer and Lemeshow test p=0.321) in the final multivariable binary logistic regression model, statistical significance was determined using the adjusted odds ratio with a 95% confidence interval and a p-value < 0.05.

Table 1: Socio-demographic characteristics

Variables		n (%)
Age	<12 month	49 (33.8)
	12-59 month	48 (33.1)
	≥60 months	48 (33.1)
Sex	Male	77 (53.1)
	Female	68 (46.9)
Care givers education status	No education	34 (23.4)
	Primary to secondary	63 (43.4)
	University	48 (33.1)
Address	Addis Ababa	77 (53.1)
	Out of Addis Ababa	68 (46.9)
Source of referral	Public hospital	132 (91.0)
	Private Hospital	6 (4.1)
	Self	7 (4.8)
Source of patient	Emergency	74 (51.0)
	OR	18 (12.4)
	Ward	53 (36.6)

The study included **145** children; more than two-thirds 97 (**66.9%**). were under 5 years of age. The majority of the children, 77 (**53.1%**), were males, with 77 (**53.1%)** from the capital, Addis Ababa, and most, 132 (**91.0%**), referred from public hospitals. More than half, 74 (**51.0%**) were admitted from the emergency unit. Regarding the caregiver's educational status, the majority, 63 (**43.4%**) have a primary to secondary education background, followed by university 48 (**33.1%**) and no education 34 (**23.4%**). (Table 1).

Table 2: Other baseline characteristics

Variables		n (%)
Onset of illness	≤ 72 hours	29 (20.0)
	> 72 hours	116 (80.0)
Pre-hospital treatment	Yes	10 (6.9)
	No	135 (93.1)
CPR done before admission	Yes	7 (4.8)
	No	138 (95.2)
Time spends in hour for ICU bed availability	< 24 hours	38 (26.2)
	24-48 hour	88 (60.7)
	>48 hour	19 (13.1)
Primary ICU admission diagnosis	Respiratory	62 (42.8)
	Infectious	35 (24.1)
	Sepsis	13 (9.0)
	CNS	12 (8.3)
	Renal	7 (4.8)
	Cardiac	5 (3.4)
	Heamato-oncology	5 (3.4)
	Gastrointestinal	4 (2.8)
	Endocrine	2 (1.4)
Comorbidity	Yes	56 (38.6)
	Malignancy	26 (46.4)
	Cardiac	21 (37.5)
	Neurologic disorder	9 (16.1)
	No	89 (61.4)

One hundred sixteen (**80.0%**) children had passed 72 hours since the onset of illness; only 10 (**6.9%**) took prehospital treatment, and CPR was done for 7 (**4.8%**) of the children. Majorities spend 24-48 hours on ICU bed availability. The respiratory condition was the most common primary ICU admission diagnosis, 62 (**42.8%);** followed by infection and sepsis, 35 (**24.1%**) and 13 (**9.0%**), respectively. More than one-third of the children 56 (**38.6%)** had comorbidities. The most common prevalent comorbidity was malignancy 26 (**46.4%**), followed by cardiac condition 21 (**37.5%**) and neurologic disorder 9 (**16.1%**). (Table 2)

During the ICU stay, 83 (**57.2%**) patients required mechanical ventilation. whereas 33 (**22.8%**) needed vasopressors. In terms of duration of stay, more than one-third of the children 110 (**75.9%)** spent more than 72 hours in the ICU, with the remaining 35 (**24.1%**) staying for 72 hours or less. Finally, 44 (**30.3%**) died; the remaining 101 (**69.4%**) improved and were transferred. (Table 3)

Table 3: ICU medication, length of stay and final outcome

Variables		n (%)
Need for MV	Yes	83 (57.2)
	No	62 (42.8)
Need for vasopressor	Yes	33 (22.8)
	No	112 (77.2)
Length of stay	≤ 72 hours	35 (24.1)
	> 72 hours	110 (75.9)
Final outcome	Improved	101 (69.4)
	Died	44 (30.3)

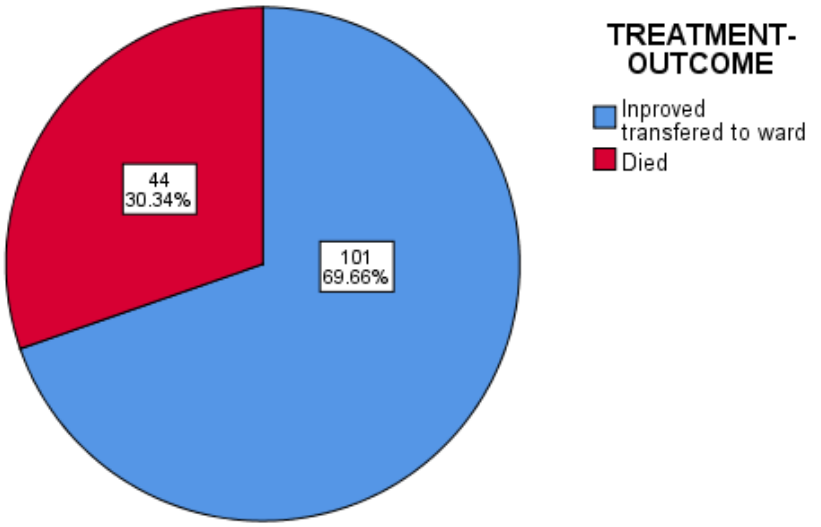


Figure 1: - Final treatment outcome of children age 1 month to 14 years

Table 4:Chi-square comparison table based on the final outcome

Variables		All	Final outcome		P-value
			Improved	Died	
			101 (69.4)	44 (30.3)	
Age	<12 month	49 (33.8)	30 (61.2)	19 (38.8)	0.281
	12-59 month	48 (33.1)	35 (72.9)	13 (27.1)	
	≥60 months	48 (33.1)	36 (75.0)	12 (25.0)	
Sex	Male	77 (53.1)	55 (71.4)	22 (28.6)	0.621
	Female	68 (46.9)	46 (67.6)	22 (32.4)	
Care givers education status	No education	34 (23.4)	19 (55.9)	15 (44.1)	**0.023***
	Primary to secondary	63 (43.4)	42 (66.7)	21 (33.3)	
	University	48 (33.1)	40 (83.3)	8 (16.7)	
Onset of illness	≤ 72 hours	29 (20.0)	21 (72.4)	8 (27.6)	0.718
	> 72 hours	116 (80.0)	80 (69.0)	36 (31.0)	
Pre-hospital treatment	Yes	10 (6.9)	4 (40.0)	6 (60.0)	0.067
	No	135 (93.1)	97 (71.9)	38 (28.1)	

CPR done before admission	Yes	7 (4.8)	2 (28.6)	5 (71.4)	**0.027***
	No	138 (95.2)	99 (71.7)	39 (28.3)	
Time spends in hour for ICU bed availability	< 24 hours	38 (26.2)	25 (65.8)	13 (34.2)	0.325
	24-48 hour	88 (60.7)	65 (73.9)	23 (26.1)	
	>48 hour	19 (13.1)	11 (57.9)	8 (42.1)	
Comorbidity	Yes	56 (38.6)	39 (69.9)	17 (30.4)	0.998
	No	89 (61.4)	62 (69.7)	27 (30.3)	
Need for MV	Yes	83 (57.2)	48 (57.8)	35 (42.2)	**0.000***
	No	62 (42.8)	53 (85.3)	9 (14.5)	
Need for vasopressor	Yes	33 (22.8)	9 (27.3)	24 (72.7)	**0.000***
	No	112 (77.2)	92 (82.1)	20 (17.9)	
Length of stay	≤ 72 hours	35 (24.1)	17 (48.6)	18 (51.4)	**0.002***
	> 72 hours	110 (75.9)	84 (76.4)	26 (23.6)	

A chi-square test result revealed a statistically significant proportion of deaths. were higher among caregivers with no education (**44.1%)** vs. primary to secondary (**33.3%**) vs. university (16.7%) (***P = 0.023***). A statistically significant proportion of patients died with CPR done before admission (71.4% vs. 28.3%, ***P = 0.027***), need for a mechanical ventilator (42.2% vs. 14.5%, ***P < 0.001***), and need for vasopressor (72.7% vs. 17.9%, ***P < 0.001***) than those without. Furthermore, a higher proportion of deaths occurred among those who stayed ≤ 72 hours compared to those who stayed more than 72 hours (51.4% vs. 23.6%, ***P <0.01***). (Table 4)

Table 5: Bivariable and multivariable results of factors associated with death.

Variable		COR (95% CI)	P-value	AOR (95% CI)	P-value
Age	<12 month	1		1	
	12-59 month	0.58 (0.24-1.38)	0.223	1.14 (0.37-3.48)	0.812
	≥60 months	0.52 (0.22-1.25)	0.148	1.42 (0.42-4.780	0.563
Sex	Male	1			
	Female	1.19 (0.58-2.42)	0.621		
Care givers education status	No education	1		1	
	Primary to secondary	0.63 (0.26-1.49)	0.296	0.62 (0.21-1.81)	0.387
	University	0.25 (0.92-0.70)	0.008	0.21 (0.06-0.77)	**0.018***
Onset of illness	≤ 72 hours	1			
	> 72 hours	1.18 (0.47-2.91)	0.718		

Pre-hospital treatment	Yes	3.82 (1.02-14.32)	0.046	2.22 (0.38-12.99)	0.374
	No	1		1	
CPR done before admission	Yes	6.34 (1.18-34.09)	0.031	3.05 (0.33-28.03)	0.324
	No	1		1	
Time spends in hour for ICU bed availability	< 24 hours	1			
	24-48 hour	0.68 (0.29-1.54)	0.359		
	>48 hour	1.39 (0.45-4.33)	0.561		
Comorbidity	Yes	1.01 (0.48-2.07)	0.998		
	No	1			
Need for MV	Yes	4.29 (1.87-9.84)	0.001	4.92 (1.67-14.45)	**0.004***
	No	1		1	
Need for vasopressor	Yes	12.26 (4.95-30.35)	0.000	8.16 (2.81-23.72)	**0.000***
	No	1		1	
Length of stay	≤ 72 hours	1		1	
	> 72 hours	0.29 (0.13-0.64)	0.002	0.29 (0.11-0.83)	**0.022***

12.2 Independent predictors of ICU death

Variables from the bivariate analysis with **a p-value < 0.3** were taken into the final model. Caregivers educational status, need for MV, need for vasopressors, and length of stay were significantly associated with death in the multivariable binary logistic regression after adjusting for covariates. The odds of death were **79%** reduced among caregivers with an educational background of university education and above compared to those with no education (AOR = 0.21, 95% CI 0.06–0.77; **P-value = 0.018**). Those who required MV and vasopressors had 4.9- and 8.1-times greater odds of death compared to those who did not require (AOR = 4.92, 95% CI 1.67, 14.45**, p-value = 0.004**) and (AOR = 8.16, 95% CI 2.81, 23.72, **p-value = 0.000**). Finally, the odds of death were 71% reduced among those who stayed for more than 72 hours in the ICU compared to those who stayed 72 hours or less (AOR = 0.29, 95% CI 0.11–0.83; **P-value = 0.022**). (Table 5).

13.Discussion

The study included 145 children; more than two-thirds 97 (66.9%) were under 5 years of age it is low comparable to different studies conducted by Jothi AK et al. El Halal HG etal which showed 78.3% and 83.33% of children in the under-five age category respectively

Seventy-seven (53.1%) of the children were males. This result is similar to one conducted by Abebe T. at Jimma University Specialized Hospital, where the male-to-female ratio was 1.2:1.

A significant proportion of deaths were higher among caregivers with no education (44.1%) which is a bit higher than that of Tanzania (32%) .

The three primary causes of admission and death in this study were respiratory conditions, accounting for 62 cases (42.8%), followed by infection and sepsis, accounting for 35 cases (24.1%) and 13 cases (9.0%), respectively. This is comparatively high when compared to recent studies conducted in China [14], India [9], and Nepal (33%), which had respective rates of 2.1 and 6.5%. This is related to the lack of resources, which is a common problem in developing nations.

There were comorbidities in 56 (38.6%) of the children, with malignancy 26 (46.4%) being the most common comorbidity, followed by cardiac condition 21 (37.5%) and neurologic disorder 9 (16.1%). This is because TASH is a referral hospital, and the majority of the patients come from outside of Addis, where there are primarily oncology or cardiac centers.

The intensive care unit (ICU), one of the most popular critical care delivery systems, is primarily responsible for providing appropriate support for respiratory and other organ dysfunctions.

83 (57.2%) of the patients in this study needed mechanical ventilation, which is higher than the study conducted in Nepal (30%), the general intensive care unit of Jimma University Specialized Hospital (37.1%), and Ayder Referral Hospital (4%). This is comparable (57.8%) to a study conducted in Ethiopia TASH by Ashenafi Seifu.

Vasopressors (22.8%) were also found to be significantly linked to a higher death rate, particularly in patients with septic shock, compared to those who did not require inotropic support. This aligns with the research conducted by Mirza S. Malik.

In contrast to a study conducted at Ayder Referral Hospital that found mortality was higher in patients who stayed longer than 28 days, a bigger percentage of deaths occurred among those who stayed ≤ 72 hours as opposed to those who stayed more than 72 hours (51.4% vs. 23.6%, P <0.01). This disparity may be explained by the fact that, in our study, mechanical breathing was used by the majority of patients who spent >72hrs in the PICU, and we found that this was a statistically significant contributing factor to PICU mortality.

The mortality rate in the current study was 30.3%, which is even higher than the rates in studies conducted in America (14.5%), India (16.7%), Taiwan (22%) by Ehsan Valaviand and Chen, but lower than those conducted by Abebe T, where the mortality rate was 40%, and Tanzania (41.4%) by Sawe HR. This could be because developed countries have developed PICU equipment at a faster rate than developing ones.

Finally, 101 patients (69.4%) recovered and were moved to the ward, which is higher than the 50.6% found in Ashenafi Seifu's Ethiopia TASH trial and the 56% found in Shah GS's study conducted in Nepal.

The incredibly high rate of ICU deaths could be caused by several factors. Conducting additional research benchmarking and intervention is highly recommended.

14.Conclusion

The pediatric critical care unit had a relatively high mortality rate (30.3%), with sepsis and respiratory disorders accounting for the majority of admissions and deaths. Mortality in the PICU was substantially correlated with the requirement for mechanical ventilation, vasopressors, and stays longer than 72 hours. Therefore, in order to enhance care and mortality, early therapy of the initial presenting illness is essential.

15.Recommendation

- We suggest that stakeholders focus on raising community knowledge about the importance of early health care seeking (admission) and improving the caliber of PICU services.
- In order to provide patients with life-threatening diseases with appropriate PICU treatment, the study setup must expand the PICU's capacity.
- It is necessary to put into practice both basic and advanced capacity-building initiatives for PICU staff.
- In order to reduce potential biases, we would like to suggest that the researchers think about doing a multi-center study.

16.Limitations of the study

Because this study was first carried out at one center and the second was added in the middle, it might not accurately represent the circumstances and patient volume in other hospitals. A multicenter option might have been preferable.

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18.ANNEXES.

18.1 Annex I: Work Plan

18.1.1 Management of the Research Project

Budget was secured based on the profile and arranged for use. Stationery was collected, arranged and was used. Training for data collectors and supervisor was given on the planned date. The data collection formats was made ready for use. Instruments were pre-tested before the actual data collection on the planned date. To collect the actual data each data collectors was prepared according to the total days required for data collection and the data collection was beings on the planned data by providing consent form for each volunteer respondents. Monitoring the whole project was done according to the work plan below.

Table 6. Work plan by Gantt chart

TOPIC SELECTION	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb
1. proposal development									
2.Proposal defense and submission									
3.Recruitment and training of data collectors and supervisors									
4. Data collection									
5. Data entry and clearance									
6. Analysis of data									
7. Report writing									
8. Thesis defense									

18.2 Annex II: Questionnaire

18.2.1 Participant Information Sheet

Questionnaire Code Number:_____

My name is _____. I am working as data collector in the research Conducted by Dr Misscuba Anibia, who is conducting this research for the partial fulfillment of her specialty in pediatrics and child health in AAU. We are trying to assess the predictors and determinants of death among children aged 1 month to 14 years admitted to pediatric intensive care unit at TASH. You will participate if you give me consent after you have understood the following information sheet:

Purpose: The purpose of this study is to assess the determinants of death among children aged 1 month to 14 years admitted to pediatric intensive care unit at TASH.

Procedure: the determinants of death among children aged 1 month to 14 years admitted to pediatric intensive care unit at TASH.. If you are willing to participate in this project, you need to understand and say "yes" on the agreement form.

Risk/ Discomfort: By participating in this research project, there are no payment and risk or discomfort you should fear as a result of participating in this study except, you may feel that it has some discomfort especially on spending time about 30 minutes. We hope you will participate in the study for the sake of the Benefit of the research result. I am sure there is no risk in participating in this research project.

Benefits: There may not be direct benefit to you but your Participation is likely to help us in assessment of predictors and outcome of time to presentation among children admitted to pediatric intensive care unit at TASH.

Confidentiality: The information collect from this research project will be kept confidential and information about you that will be collected by this study will be stored in a file, without your name, but a code number assigned to it. In addition, it will not be revealed to anyone except the principal investigator and will be kept locked with key.

Right to refuse or withdraw: You have full right to refuse from participating in this research. You can choose not to respond to some or all questions if you do not want to give your response.

If you have questions: If you have additional questions regarding this study, you can contact the principal investigator

Address of the principal investigator

NAME: Dr Misscuba Anibia

18.3 PHONE: +251977885393
Emil: misscubaanibia92@ gmail .com

18.4 Annex III: CONSENT FORM

I understand all conditions stated above. I have understood that Participation in this study is entirely voluntarily. I have been told that my answers to the questions will not be given to anyone else and no reports of this study ever identify me in any way Therefore, I am Ready and willing to participate in this study. You decided:

1. Agree to participate [ ] _____signature, continue

2. Not agree to participate (stop here); thank you very much!

If the study subject agrees to participate in the study, start the interview.

NB: No need of enforcing the respondent to be included in the study

Data collectors name _____ Signature _____Date __/__/____

QUESTIONNAIRE

SN	Variable	Descriptions of variables	Remark
1.	Age		In years with one decimal
2.	Sex	**Male** **Female**	
3.	Address		
4.	Caregivers' education	1. No education 2. Primary to secondary education 3. University /College	
5.	Source of referral	1. Self-referral 2. Public hospital 3. Private hospital	If the patient came for ER
6.	Source of patients	1. Emergency 2. Ward 3. Operation Room 4. NICU	
7.	Onset of illness		In hours if less than 72 hours In days >72 hours
8.	Pre hospital treatment /home remedies /traditional healer /religious ritual		
9.	CPR done before admission	Yes No	
10.	Primary ICU admission diagnosis	1. CNS 2. Respiratory 3. Cardiac 4. Gastrointestinal 5. Infectious 6. Kidney 7. Endocrine 8. Oncology/hematology emergency 9. Syndromic : 9.1 Down Syndrome,9.2 others specify :	
11.	Presence of Comorbidity	1. HIV 2. Cardiac : 2.1 Congenital , 2.2 Rheumatic , 2.3 Cardiomyopathy 3. Diabetes 4. Malignancy 5. Neurological disorders Others	
12.	Need for mechanical ventilator	Yes No	

13.	Need for vasopressors	Yes No	
14.	Length of ICU stay		In hours if more than 24 hours stay In days if less than 24 hours stay
16.	Outcome	1. Improved (transferred to ward) 2. Died.	

18.5 Budget: Cost breakdown of the research project

Title	**Qualification**	**Number**	**Salary**	**Duration in months**	**Total**
Data collector's salary	Nurse	2	7250	½	14500
Typist salary	Secretary	1	6000	1	6000
Duplicator salary	Duplicator	1	2000	1	2000
Multi-purpose Printing Paper	Ream	1	2000	1	2000
Telephone	Above	-	600	-	600
TOTAL					**25,100 BTB**

18.6 Assurance of Principle Investigator

The author took responsibility for the research project's scientific and ethical conduct, provided timely progress reports, sought approval, and effectively communicated with all stakeholders, including funding sources related to the subject matter or materials discussed in this manuscript.

Name of the Resident: Dr. Misscuba Anibia

Signature: _____

Date: _____

Approval of Advisors

Name of the Primary Clinical Advisor: Dr.Rahel Argaw

Signature: _____

Date: _____