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Original article

Clinical profile and factors associated with mortality among children admitted to intensive care unit at Dilla University General Hospital, Southern Ethiopia: A cross-sectional study

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Abstract

Background: *The Intensive Care Unit (ICU) is a specialized hospital department designed to manage and closely monitor patients with life-threatening conditions. It is staffed by highly trained multidisciplinary teams and equipped with advanced medical technologies, typically housed in self-contained rooms to ensure optimal care. Among the most complex and demanding areas within pediatrics is the care of critically ill children.*

Methods: *Institution-based cross-sectional study was conducted from March 10, 2024, to August 08, 2025, at Dilla General Hospital on children admitted to the general intensive care unit (GICU) aged 1 month to 18 years. Data was collected by using semi-structured questionnaires. Epi data version 3.1 and SPSS version 25.0 were used for data entry and analysis, respectively. Descriptive statistics and binary logistic regression analysis were employed. Adjusted odds ratios were used to ascertain effect sizes for any association between the dependent and associated variables, while significance at a p-value of <0.05 was determined using 95% confidence intervals.*

Results: *A total of 150 children admitted to the GICU were included in this study, and 63.9% participants were male. Among the study participants, the overall death rate was 31.9%. Those patients with severe acute malnutrition (AOR= 3.97 (95% CI= 1.29, 12.19)), those with low GCS at admission (GCS <8)(AOR= 2.84(95% CI= 1.59, 5.09)), those who need inotropes (AOR= 5.20 (95% CI= 1.37, 19.75)), and children who stayed in GICU for <5days(AOR= 4.13(95% CI= 1.59, 10.74)) were significantly associated with death.*

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***Conclusions**: The overall mortality rate in this study was 32%. Key predictors of death included underlying severe acute malnutrition, low Glasgow Coma Scale (GCS) scores at admission, the need for inotropic support, and GICU stay of less than five days. These findings highlight the urgent need to strengthen client-centered care in pediatric intensive care units, with targeted interventions to reduce preventable mortality.*

***Keywords**: admission, discharge, General ICU, transfer, treatment, unfavorable outcome.*

Introduction

The pediatric intensive-care unit (PICU) is a specialized hospital unit that is equipped with advanced medical equipment and run by highly trained interdiscipilinary medical staff. It admit critically ill children who need sophisticated airway, hemodynamic, and organ supports in-order to have a better prognosis than if they were admitted to other areas of the hospital. The provision of intensive care has evolved tremendously in the past three decades leading to significant improvements in the quality of care in high income countries significantly. However, it fails to lower childhood morbidity and mortality in resource limited settings due to lack of medications, supplies, infrastructures, and skilled workers; further complicated by delayed and severe illness at presentations(1–5).

According to the World Health Organization, the main causes of death for children under five in developing countries are curable and preventable. Intensive care units that are adequately staffed and equipped can improve outcomes since these factors have been demonstrated to dramatically reduce mortality and morbidity. Many studies showed that intensive care can decrease death rates by 15% to 60%(6–9).

According to a 2015 retrospective study, the overall mortality rate for 170 children admitted to the GICU at Jimma University Specialized Hospital (JUSH), Ethiopia over a 5-year period was 40%. Trauma was the most frequent reason for admission and mortality in this study(10). Generally, the causes of PICU admission and mortality rate varies from study to study and among hospital settings and as well as regions. In a study done by *Gemechu Edae et al*, mortality rate was 21.1% and most common reason for PICU admission was infectious causes; another study done by *Dendir et al.*, death was 41.7% and infectious causes were most common reasons for PICU admission. Study done by *Seifu et al*., over all mortality was 43.8% and septic shock was most common indication to PICU admission; where as another study done by *Abebe et al*., the reported mortality was 39.3% and respiratory problem was most common indication for PICU admission(4,5,11,12)

Factors that contribute to unfavorable PICU outcome also vary among different studies.

Teshager et al.; sepsis, national income and organization of PICU study done by *Vincent JL. Et al*.; post- cardiopulmonary rescusitation and need for MV in a study done in TASH, by *Gemechu Edae et al*.; length of stay <24hrs and respiratory conditions in a study done by *Tazebew et al*.; and infectious disease and need for MV in a study done in Koirala, Nepal by *Shah GS. Et al*.(5,13–16).

The primary objective of this study was to assess the pattern of admission, treatment outcomes and assess factors associated with unfavorable outcome of pediatric patients admitted to the GICU in DUGH. The intensive care is provided by nurses, anesthetists, pediatricians and anesthesiologists. There is no similar study done in DUGH, with fewer prior studies reported nationally. The findings of this study will help to stablish isolated PICU service in the study area and help health planners and policy makers to develop strategies for the major preventable causes of deaths among pediatric emergencies based on the findings. Additionally, this study aimed to address the information gap in disease patterns, treatment outcome and factors contributing to unfavorable outcome in patients admitted to intensive care in the study area.

Methods and materials

Study area, period and design

This study was conducted from March 10, 2024, to August 8, 2025 over 18 months, at Dilla University General Hospital (DUGH), located in Dilla town, South Ethiopia, approximately 360 kilometers south of the capital, Addis Ababa. DUGH is a public hospital that serves a wide catchment area, primarily encompassing the Gedeo Zone and neighboring districts in the Oromia and Sidama regions. It provides comprehensive inpatient and outpatient services for both pediatric and adult patients. The GICU operates continuously, offering 24-hour care for critically ill individuals. In addition to its clinical role, DUGH functions as a teaching hospital for Dilla University, supporting several undergraduate and select graduate programs in basic sciences and clinical medicine for health science students.

Source population and Study population:

The source population for this study included all children aged between one month to 18 years admitted to the GICU of DUGH.

The study population comprised pediatric patients admitted during the study period and met the established inclusion criteria. These criteria ensured the selection of clinically relevant cases for assessing outcomes and determinants of mortality within the pediatric intensive care setting.

Inclusion criteria: Children with critical illness aged less than 18 years of age admitted to GICU and those children whose parents were willing to participate in this study were included.

Exclusion criteria: Patients' age less than 28 days, & greater than 18 years and those patients whose caretakers failed to give consent were excluded.

Sample size determination:

The required sample size was calculated using the single population proportion formula, based on the following assumptions: a previous study conducted at Tikur Anbessa Specialized Hospital reported a pediatric ICU mortality rate of 43.8%, with a 95% confidence level and a 5% margin of error. Using these parameters, the initial sample size was calculated as follows:

$N_o = (Z_{1-\alpha/2})^2 \cdot p \cdot q / d^2$, $(1.96)^2 \cdot 0.438 \cdot 0.562 / (0.05)^2 = 378$, Where:

$Z_{1-\alpha/2} = 1.96$ (standard normal value at 95% confidence)

p = estimated proportion of mortality (0.438)

$q = 1 - p = 0.562$

d = margin of error (0.05)

Since the source population was less than 10,000, the finite population correction formula was applied:

$Nf = No / [1 + (No - 1) / N]$

$= 378 / [1 + (377 / 250)]$

≈ 151

Thus, the final sample size was 151 critically ill children and adolescents admitted to the General Intensive Care Unit of Dilla University General Hospital.

Sampling technique and Procedure:

Based on the Health Management Information System (HMIS) report of Dilla University General Hospital (DUGH) for the 2023/24 period, the pediatric admission load to the GICU was approximately 250 cases over 18 months. Using this figure and the calculated sample size of 151, a systematic sampling approach was employed. All children under 18 years of age admitted to the GICU who met the inclusion criteria and provided consent were selected at regular interval, determined by a sampling interval (k-value) of ~1.7 (250 ÷ 151). Patients were then enrolled in every other patient during their stay in the GICU until the required sample size was achieved.

Operational definitions and Variable measurements:

Length of stay in GICU: is the time from admission to disposition (transfer to the ward or discharge to home or death).

Admission diagnosis: is the disease condition of the patient at admission of the patient to the GICU for care.

Comorbidity: chronic or long-term disease or condition is present in the same person at the same time.

Complicated meningitis: patient with confirmed or suspected meningits who show signs of increased intracranial pressure or herniation.

Death (un-favorable outcome) in GICU: patient who died after he/she was admitted to the GICU before transfer to the wards.

Favorable outcome: patient was transferred to ward with improvement or discharged to home from GICU.

Nutritional treatment: includes F-75 or F-100 in this study.

Reactive airway disease: refers wheezing in children in whom 'bronchial asthma' is not diagnosed.

Data collection tools and procedures

Data were collected by one medical intern and one general practitioner, both of whom received one day of training on the data collection process. The activities were closely supervised by the principal investigator, who had prior experience in conducting similar studies. A pre-tested, semi-structured, interviewer-administered questionnaire was used, developed by compiling items adapted from related studies and relevant literature to address the study objectives (10–12,14)**.** The questionnaire was initially prepared in English, then translated into Amharic and Gedeuffaa by language experts. To ensure consistency, it was subsequently back-translated into English by professionals with similar experience. Before data collection, participants received an orientation on the study protocol and participation details. Verbal consent was obtained from each eligible participant's caregiver. Caregivers were interviewed during the child's stay in the GICU. Data collectors visited patients 3 to 4 times during their GICU stay to gather clinical information, including diagnosis, treatment plans, intubation status, and overall GICU course, in consultation with treating physicians. Final outcomes were recorded upon discharge from the GICU. The principal investigator provided daily oversight to ensure data quality and adherence to protocol.

Data management and quality control:

One medical intern and one general practitioner were recruited as data collectors and supervised by the principal investigator. To ensure consistency in the data collection process, both were trained on the study objectives, data collection procedures, interview techniques, and the context of the questionnaire. A pre-test was conducted on 5% of eligible pediatric patients (n=8) admitted to the GICU at DUGH one week prior to actual data collection. This was done to assess the clarity, length, completeness, and consistency of the tool. Based on the findings, necessary revisions were made and reviewed by subject matter experts to ensure validity and reliability. The principal investigator reviewed all collected data daily for completeness, accuracy, and consistency. Double data entry was performed to identify and correct errors prior to analysis. The questionnaire was initially developed in English, then translated into Amharic and Geduaffaa by language experts, and subsequently back-translated into English to verify consistency.

Data processing & analysis:

The data from the questionnaire were entered into EpiData Manager version 3.1, where double-entry verification was conducted before exporting to SPSS version 25 for analysis. The data were edited and cleaned for inconsistencies and were examined for outliers, missing data, and assumptions. Descriptive statistics, including frequencies, percentages, mean values, standard deviations, and cross-tabulation, were calculated for the socio-demographic and economic status of the participants, as well as for child health-related factors (clinical and treatment profiles). Variables related to GICU outcomes were computed using variable recoding. Bivariate analysis was performed to select variables for multivariate analysis, with those having a p-value ≤ 0.25 in the bivariate analysis considered candidates for multivariable analysis. Ultimately, multivariable logistic regression analysis was conducted to identify independent predictors of unfavourable GICU outcomes (death). The final model was fitted using stepwise selection methods (backward logistic regression). Variables with a p-value < 0.05 in the multivariable logistic regression were deemed statistically significant predictors of unfavourable outcomes, and odds ratios (OR) with 95% confidence intervals (CI) were used to illustrate the degree of association between the independent and outcome variables. The goodness of fit of the model was assessed using the Hosmer and Lemeshow test. Results were reported as percentages (frequency) for categorical variables, and findings were summarized and presented in tables, graphs, and charts, interpreted in line with the study's objectives.

Results

Socio-demographic and economic characteristics of participants/caregivers

This study involved a total of 150 children and adolescents admitted to the general ICU. The majority of caregivers (149, 99.3%) were parents (mothers and/or fathers) accompanying the children. Most caregivers, 89 (59%), were aged between 18 and 35 years, and over two-thirds (116, 77.0%) of the participants came from rural areas. Approximately 139 (92.5%) of the parents were married, and 70 (46.7%) were unable to read or write. Nearly two-thirds (96, 63.9%) of the parents were farmers, and 100 (66.4%) had a monthly income of less than 3,000 ETB. Additionally, 109 (73%) had a family size of five or more. Among the study participants, nearly two-thirds (96, 63.9%) were male, with most (93, 62.3%) being young children under the age of five. Among school-aged children, 8 (10/57, 17.4%) did not attend school (Table 1).

Table 1. Socio-demographic and economic related characteristics of participants and parents/caregivers

Variables	Category	Frequency	Percentage (%)
Primary caregiver (Caregiver's identity)	Father &/or Mother	149	99.3
	Relatives	1	0.7
Age of caregiver (years)	18- 35	89	59.0
	35- 45	42	27.9
	≥ 45	19	13.1
Residence	Urban	34	23.0
	Rural	116	77.0
Current marital status of caregiver	Single	2	1.6
	Married	139	92.5
	Divorced	3	1.7
	Separated	4	2.5
	Widowed/Widower	2	1.6
Educational status of the caregiver	Can not read and write	70	46.7
	Primary school	53	35.2
	Secondary school	18	12.3
	College/University	9	5.7
Occupational status of the caregiver	Farmer	96	63.9
	Merchant	26	17.2
	Government employee	15	9.8
	Daily laborer	13	9.0
Family size	<5	41	27.0
	>5	109	73.0
Average monthly income	<3,000 ETB*	100	66.4
	3,000- 7,000 ETB	48	32.0
	>7,000 ETB	2	1.6
Age of the child (years)	1-12months	33	22.1
	1- 5 yrs	60	40.2
	6- 10 yrs	25	16.4
	11- 17 yrs	32	21.3
Sex of the child	Male	96	63.9
	Female	54	36.1
Educational status of the child	Pre-school	93	62.3
	Primary school	38	25.4
	High school	9	5.7
	Not attend school	10	6.6

Child's health related factors (clinical and treatment profiles)

Out of 150 study participants, approximately 146 (97.5%) had no prior ICU admissions. Diagnoses were made by physicians in the emergency room, inpatient units, or GICU based on clinical evaluations and available investigations and imaging. Severe pneumonia with respiratory failure (RF) or impending respiratory failure (IRF) was diagnosed in 66 participants (44.3%), followed by complicated meningitis in 37 participants (24.6%). Nearly half of the patients, 71 (47.5%), presented within five days of the onset of their current illness, and more than half (84, 55.7%) were directly admitted to GICU from the emergency room. About 34 participants (23%) had concomitant severe acute malnutrition, and 25 (16.4%) were receiving one or more inotropic drugs. Among those who were candidates for ventilator support, 67 out of 91 (73.6%) were intubated and received ventilatory support. Among non-ventilated cases, 15 out of 24 (62.5%) were not intubated due to a shortage of ventilators (Table 2).

Table 2. Health related factors (clinical profiles) of study participants

Variables	Category	Frequency	Percentage (%)
Previous ICU admission	Yes	4	2.5
	No	146	97.5
Admission diagnosis (N=150 for each variable)	Exacerbation of bronchial asthma	6	4.1
	Severe pneumonia with RF	66	44.3
	Complicated meningitis	37	24.6
	Shock	16	10.7
	Severe head injury	6	4.1
	Post- operative patient	18	12.3
	GBS	7	4.9
	Severe malaria	21	13.9
	Reactive airway disease	17	11.5
	Tuberculosis	21	13.9
	Others*	22	14.8
Duration of illness before admission	<5days	71	47.5
	5-10days	42	27.9
	>10days	37	24.6
Complications during GICU of stay	Yes **	4	2.5
	No	146	97.5
Severe acute malnutrition	Yes	34	23.0
	No	116	77.0
Admission sources	Emergency	84	55.7
	Pediatrics ward	47	31.1
	Surgery ward	13	9.0
	Operation room	6	4.1
GCS at admission	<8	56	37.7
	8-12	21	13.9
	13-15	73	48.4
Candidate for mechanical ventilator	Yes	91	60.7
	No	59	39.3
Intubated? (N=91)	Yes	67	73.6
	No	24	26.4
FOUR score after intubation (n= 21)	<8	12	57.1
	13-16	2	9.5
	8-12	7	33.3
Duration of intubated (n=67)	<7days	49	73.1
	7-10days	8	12.0
	>10days	10	14.9
Reason for un-intubation (n=24)	Scarcity of ventilators	15	62.5
	Caretaker fail to give consent	6	25.0
	Others***	3	12.5
Need for inotropes	Yes	25	16.4
	No	125	83.6

NB: *Severe croup-4, Generalized tetanus-3, ketoasidosis-3, inhalation burn-1, late onset sepsis-1, CHF- 5, Encephalopathy-1 & upper airway obstruction-4, ** hospital acquired infections, ***lack of appropriate ETT, drugs

FOUR score: Full outline of unresponsiveness, RF: Respiratory failure.

Treatment related factors

The spectrum of care in the GICU typically includes the administration of empirical antibiotics, analgesics, ventilatory support, strict monitoring of input-output and vital signs, inotropes, and anti-seizure medications, tailored to each patient's diagnosis. This care is provided by a team consisting of pediatricians, anesthesiologists, and nurses. Among 150 cases, 134 patients (89.3%) received one or more empirical antibiotics (with some cases guided by drug susceptibility testing), and 85 patients (56.6%) were treated with one or more analgesics. More than half of the participants (85, 56.6%) stayed in the GICU for less than five days. Additionally, 48 participants (32%) died in the GICU, and 7 participants (4.7%) left against medical advice (Table 3).

Table 3. Treatment related profiles of study participants

Variables	Category	Frequency	Percentage (%)
Different treatments (n=150 for each variable)	Antibiotics	134	89.3
	Analgesics	85	56.6
	Diuretics	11	7.4
	Nutritional treatment	36	23.8
	Anti-Tuberculosis	21	13.9
	Steroids	62	41.0
	Anti- seizure medications	27	17.2
	Surgical intervention	18	12.3
	Artesunate	21	13.9
	Mannitol	25	16.4
	Salbutamol	26	17.2
	Others*	13	8.2
Length of GICU stay	<5days	85	56.6
	5-10days	43	28.7
	>10days	22	14.8
GICU outcome	Favorable outcome(improved)**	95	63.3
	Unfavorable outcome(death)	48	32.0
	LAMA	7	4.7
Reason for LAMA (n=7)	Fear of complications	1	14.3
	Financial constraints	2	28.6
	Spiritual visit	4	57.1

NB: *Calcium gluconate, potassium chloride, ** discharged to home-2, transferred to wards-100

Candidate Variables Associated with GICU Outcomes

Bivariate logistic regression analysis was conducted to identify potential predictors for inclusion in the multivariable model. The following factors were found to be significantly associated with GICU discharge outcomes and were selected as candidate variables: duration of illness, presence of severe acute malnutrition, Glasgow Coma Scale (GCS) score at admission, requirement for inotropic support, and length of stay in the GICU (Table 4).

Table 4. Bivariate analyses for factors associated with unfavorable GICU outcome among study participants

Variables	Category	GICU outcome		AOR (95%CI)	P-value*
		Favorable	Un-favorable		
Duration of illness before presentation	Less than 5days	58	27	0.32 (0.12, 1.73)	0.108
	5-10 days	28	15	0.42 (0.21, 2.90)	0.201
	Greater than or equal to 10days	17	5	1	
Severe acute malnutrition	Yes	13	21	3.97 (1.29, 12.19)	0.016*
	No	89	27	1	
GCS at admission	Less than 8	30	26	2.84 (1.59, 5.09)	0.001*
	8-12	16	5	0.56(0.32, 24.91)	0.210
	13-15	56	17	1	
Need for inotropes	Yes	6	19	5.20 (1.37, 19.75)	0.015*
	No	96	29	1	
Duration of GICU stay	Less than 5 days	58	27	4.13 (1.59, 10.74)	0.004*
	5-10days	28	15	1.65(0.67, 7.87)	0.021
	Greater or equal to 10 days	17	5	1	

Predictor variables of GICU outcome among study participants

Factors such as duration of illness, severe acute malnutrition, Glasgow Coma Scale (GCS) score at admission, need for inotropic support, and length of GICU stay were found to be potential predictors of discharge outcomes (Table 4). These five variables were included in the multivariable logistic regression model to calculate adjusted odds ratios (AOR) with corresponding 95% confidence intervals (CI). Children admitted to the GICU with severe acute malnutrition were nearly four times more likely to experience an unfavorable outcome compared to their well-nourished counterparts (AOR = 3.97; 95% CI: 1.29–12.19). Similarly, those presenting with a Glasgow Coma Scale score below 8 at admission had a

significantly elevated risk of poor outcomes (AOR = 2.84; 95% CI: 1.59–5.09), indicating the prognostic importance of neurological status on arrival.

The need for inotropic support was the strongest predictor, with affected children over five times more likely to die or experience adverse outcomes (AOR = 5.20; 95% CI: 1.37–19.75), reflecting the severity of circulatory compromise. Additionally, a GICU stay of less than five days was associated with a markedly increased risk of mortality (AOR = 4.13; 95% CI: 1.59–10.74), possibly indicating early deterioration or late presentation (Table 5)

Table 5. Multiple logistic regression model predicting factors associated with unfavorable GICU outcome among study participants

Variables	Category	GICU outcome		AOR (95%CI)	P-value*
		Favorable	Un-favorable		
Duration of illness before presentation	Less than 5days	58	27	0.32 (0.12, 1.73)	0.108
	5-10 days	28	15	0.42 (0.21, 2.90)	0.201
	Greater than or equal to 10days	17	5	1	
Severe acute malnutrition	Yes	13	21	3.97 (1.29, 12.19)	0.016*
	No	89	27	1	
GCS at admission	Less than 8	30	26	2.84 (1.59, 5.09)	0.001*
	8-12	16	5	0.56(0.32, 24.91)	0.210
	13-15	56	17	1	
Need for inotropes	Yes	6	19	5.20 (1.37, 19.75)	0.015*
	No	96	29	1	
Duration of GICU stay	Less than 5 days	58	27	4.13 (1.59, 10.74)	0.004*
	5-10days	28	15	1.65(0.67, 7.87)	0.021
	Greater or equal to 10days	17	5	1	

Discussion

This study aimed to examine the admission patterns of critically ill pediatric patients to the GICU, evaluate their treatment outcomes, and identify factors associated with unfavorable outcomes. A total of 150 children were prospectively assessed during their stay in the GICU. Of these, 96 (63.9%) were male and 54 (36.1%) were female. In this study, the majority of admitted cases were aged between 1 to 5 -years, 60 (40.2%). This is almost similar with the study done in Ayder Referal Hospital and Tikur Anbessa Specialised Hospital, Ethiopia which stated that around 37.3% and 37.8% patients were between 1 and 5 years respectively (12,17). Similar study done in SPHMMC, Ethiopia showed different findings with

only 26.9% of patients age 1 to 5 years(5). Despite discrepancies, in this study as well as in previous studies, age was not statistically significant determinant of mortality.

Severe pneumonia was diagnosed in 44.3%, complicated meningitis in 24.6%, severe malaria in 13.9% and 12.3% patients were post-operative. This finding was in line with studies done in Ayder referral hospital, TASH, University of Gonder Specialized Hospital (UGSH), Wolaita sodo University Comprehensive Specialized Hospital and Hawassa University-Comprehensive Specialized Hospitals, Ethiopia and Koirala, Nepal where the most common reasons of admission were infectious diseases; this similarity might be due to comparable economic status of study participants (4,11,13,15,17). The possible causes of admission into the GICU in our study were different from a study done in general ICU of Jimma University specialized hospital (54.7%) where surgical, and trauma patients were the dominant reason for admission(10). This might be due to the long duration(2015GC) of the study done in JUSH.

Our study showed that high mortality rate among Pediatric patients admitted in the GICU was 48 (31.9%); this might be due to lack of isolated PICU in our setting as children are dependent, late presentations, low GCS, background malnutrition, lack of trained PICU staff and lack/shortage of advanced equipment. The rest 102 (68.1%) were improved (either discharged to home directly from GICU or most of them transferred to the wards in DUGH after improvement of their conditions) and 7 (4.9%) were left againist medical advice. This finding was similar with the studies done by Tazebew et al (30.9%)(14), Teshager et al (32.6%)(13) and Shah GS et al(34.1%)(15).

The mortality in our study was significantly higher than study done in India (death only 2.1%), by Abhulimhen-Iyha et al. (18), another study done by Poyekar SS in India with death of 9%(19) and study done by EI Halal et al. in Brazil, reported death was 10.3%(20); this significant disparity in death report might be due to that isolated PICU service was highly qualified interms of staff, advanced equipment and even early health seeking behavour of caregivers unlike that of our study where pediatrics patients were admitted to the GICU with adult patients, no adequately trained staff, no sufficient ICU equipment and most of our patients with death came to the hospital late (>5days of onset of illness). Even unfavorable outcome (death) in our study was higher than study done in Pakistan by Siddiqui et al. with death of 12.9%(21), another study done by Gemechu Edae et al. showed death of 21.1%(5), and also study done in Eritrea by Mohammed and Tekle death was 25.3%(22); these discrepancies might be due isolated PICU unlike that of our study.

Mortality in this study was significantly lower than studies done in Ethiopia by Abebe et al. mortality was 39.3%(12), by Dendir et al.

than study done by Riviello et al. mortality was 48.7%(23) & by Nyirasafari et al. mortality was 50%(24). These discrepancies might be due to high background malnutrition (Nyirasafari et al -reported moderate to severe malnutrition of 60%, our study- severe acute malnutrition- 23% and significantly associated with death (p- 0.016), relatively higher study participants (Sefu et al, N=361), indication to PICU admission (Tesfaye et al. trauma 34.7% of which 45.8% of them died).

More than one third (67, 44.7%) of the study participants were intubated and mechanically ventilated which was similar with study done by *Dendir et al*. (43.4% mechanically ventilated; but significantly higher than the study done by *Tazebew et al.* (10% mechanically ventilated), study done by *Teshager et al.* (only 11.8% were mechanically ventilated) and study done by *Tesfaye et al.* (37.1% mechanically ventilated). In this study the high proportion of participants needed mechanical ventilation. This might be explained by the fact that patients admitted to our hospital came late with severe illness (like Severe pneumonia with IRF/RF and complicated meningitis).

Low level of Glasgow coma scale (GCS<8/15, p<0.001) at admission was about 3 times significantly associated with unfavorable outcome in this study which was inline with studies done in Ayder referral hospital by *Haftu et al.* (p- 0.04)(17), study done by *Seifu et al.* (P-0.001)(4) and with the study done in Rwanda by *Riviello et al.* (p- 0.0001)(23).

Need for inotropes (p- 0.015) in those patients with septic or cardiogenic shock during GICU stay was another factor that was 5times more associated with death, this was similar with the study done in Ethiopia by Dendir et al. (P-0.003)(11) and study done in Rwanda by Nyirasafari et al. (p- 0.001)(24).

Length of stay in the GICU another factor that might going to affect ICU outcome. Length of stay(LOS)<5days (p-0.004) was 4times associated with un-favorable outcome (death) than LOS of >5days in our study, this might by due to late coming of patients to the hospital or late transfer to the GICU and similar with the study done by Dendir et al., length of stay in the PICU <7days (p- 0.001) (11) and done by Seifu et al., length of stay 2-7days in PICU (p- 0.0001)(4) significantly associated with death.

Limitations of the Study

This study was conducted in a single institutional setting with a relatively small sample size, and referral bias may have inflated the results. Furthermore, arterial blood gas (ABG) analysis was not available.

Conclusions and Recommendations

In this study, the rate of unfavorable outcome (death) among children admitted to the GICU was 31.9%. Significant predictors of mortality included background severe acute malnutrition, use of inotropes, Glasgow Coma Scale (GCS) score below 8 at admission, and a length of stay less than five days in the GICU.

We recommend that Dilla University General Hospital (DUGH) establish a dedicated Pediatric Intensive Care Unit (PICU) equipped with sufficient beds, trained nursing staff, an anesthesiologist, and a pediatric intensivist to improve outcome of critically ill children. Additionally, we urge the Ministry of Health–Ethiopia to support hospitals in rural areas by providing modern ICU equipment and staff training to initiate or strengthen PICU services.

Further research is needed through multi-center studies with larger sample sizes, particularly in resource-limited settings, to deepen understanding and guide evidence-based interventions.

List of Abbreviations

ARDS: Acute Respiratory Distress Syndrome; AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; DKA: Diabetic Ketoacidosis; DST: Drug Sensitivity Test; DU: Dilla University; DUGH: Dilla University General Hospital; ETB: Ethiopian Birr; GCS: Glasgow's Coma Scale; GBS: Guillain Barre Syndrome; GICU: General Intensive Care Unit; HMIS: Hospital Management Information System; IRF/RF: Inpending Respiratory Failure/ Respiratory Failure; LAMA: Leave Against Medical Advice; MV: Mechanical Ventilation; RHD: Rheumatic Heart Disease; WHO: World Health Organization.

Declarations

Ethical approval and consent to participate

Ethical approval for the study was obtained from institutional review board (IRB) of College of Medicine and Health sciences, Dilla University (Ref. No: duchm/irb/065/2024). Data was collected after informed written consent was obtained from the caregivers and/or study participants. The study was conducted in accordance with the Declaration of Helsinki and adhered to Good Clinical Practice guidelines. Confidentiality was maintained by excluding names and addresses as identification in the questionnaire & keeping their privacy during the data collection was maintained. No treatment or procedure was added or withhold on study participants for the purpose of this study.

Consent for publication: Not applicable**.**

Clinical trial number: Not applicable**.**

Availability of data and materials: All materials and data are available from the corresponding author without any restriction.

Authors' contributions: AT was involved in conceptualization and data collection, analysis and drafting the manuscript; FG was involved in conceptualization, data collection and drafting the manuscript, HM rose the concept, involved in conceptualization, did the analysis, and draft the manuscript. All the three authors reviewed the manuscript thoroughly.

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