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Original Research

Study Of Risk Factors Associated With Mortality In Peadiatrics Intensive Care Unit In A Tertiary Care Center

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Abstract

Background and objective: The investigation of "why" and "when" deaths are occurring in the PICU will give us insight into the disease types and functioning efficacy of our PICU.

Comparison of these deaths with patients who survive and Analysis of the risk factors that may be associated with death can give information that can be utilized to improve clinical practices by anticipating the outcome and provide public health strategies to improve the outcomes of ICU care.

Method: This was an analytical observational study, done in PICU, Department of Pediatrics, M.Y and CNBC Hospital, Indore (M.P) over a period of 18 months

Included patients admitted to PICU who have stayed for at least 2 hrs. (Case: patients who died, control: patients who survived with no exclusion criteria

All appropriate data was collected from admission register of PICU, MY hospital Indore and processed using a SPSS.

Result: hundred cases and hundred controls were included in study, maximum deaths were seen in 3months to 3 year of age group, other causes were low socioeconomic status, farther distance, had delayed development or malnourished, with maximum mortality due to respiratory causes followed by CNS followed by CVS than GIT and other system involvement.

Conclusion: Lower socioeconomic status, underlying chronic illness, developmental and nutritional status, farther distance from hospital, specific parameters (respiratory, circulatory, central nervous system, haematology) are significant factors influencing probability of death among critically ill children. Whereas age, gender, time to reach PICU, gastroenterology parameters show no significant differences.

Key Words: PICU (Paediatric intensive care unit), SES (Socioeconomic status), DIC (Disseminated intravascular coagulation).

Introduction

The management of severely ill children has increasingly recognized the significance of intensive care. The paediatric intensive care unit (PICU) is a specialized section of the hospital that provides advanced medical care for critically ill paediatric patients who require advanced assistance with their airway, breathing, and circulation. The goal of admitting these patients to the PICU is to achieve a better outcome compared to if they were admitted to other areas of the hospital.[1] Caring for severely ill children is a highly demanding and tough component of the discipline of paediatrics. The primary objective of the paediatric Intensive Care Unit (PICU) is to mitigate mortality rates by closely monitoring and providing intensive treatment to severely ill children who are deemed to be at a heightened risk of death. However, this incurs a substantial expense for all parties concerned, including the hospital, the staff, and the caregivers of patients.[2] Typically, this treatment is only provided to patients whose illness has the ability to be reversed and who have a high likelihood of survival with intensive care assistance. Due to the poor condition of these patients, it is often challenging to accurately forecast the result of the intervention. In the field of critical care medicine, the

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effectiveness of intensive care units (ICUs) can be evaluated by examining outcomes such as "death" or "survival" using indicators like mortality rates. Assessing the effectiveness of medical interventions through outcome evaluation allows for informed decision-making, improved quality of care, standardized practices, and efficient management of resources required for intensive care services, ultimately optimizing resource utilization.[3] Mortality in patients is influenced by various factors, including demographic and clinical characteristics of the population, infrastructural and non-medical factors (such as management and organization), case mix, admission practice, and ICU performance.[4] The ultimate objective is to minimize patient death. Several medical centresare now investigating the factors that influence the mortality rate in an Intensive Care Unit (ICU). This data can be classified based on the patient's health state and utilized to reduce mortality. [5] The research has indicated varying levels of mortality based on the different ICU facilities and circumstances of the patients being referred. The mortality rate has been seen ranging from 14.5% to 44.7% in different studies [6-8].

Material and methods:

Study period and study centre

1st Jan 2022 to 30th June 2024

PICU, Department of Pediatrics, M.Y. Hospital and CNBC, Indore (M.P).

Sample size: 100

The adequate required sample size was estimated using following formula–

$$n = z^2pq / d^2$$

Inclusion criteria- All the patients admitted to PICU who have stayed for at least 2 hours (Case: patients who died, Control: patients who were shifted out of PICU)

Exclusion criteria: None

Methodology

- Data was drawn from the medical records of a Pediatric patients who were treated in the PICU room at MYH Indore.
- The data of this study included baseline data during treatment at the PICU. Organ involvement that causes patients to require PICU treatment and cause of death for children admitted to PICU This research was an observational study that analyzed risk factors associated with mortality among critically ill children admitted to the PICU over a period of 18 months. Data of all the selected patients was drawn from the medical records.
- Once a patient is admitted we follow our standard protocol that is proper clinical and systemic examination, running relevant investigations and specific management
- For our study whenever any patient was admitted we enrolled that patient as our case and equal number of randomly selected patients who were shifted out of PICU were enrolled as controls.

Data collection and statistical analysis:

Medical record of a paediatric patient was treated and died in PICU at MYH Indore in a preformed proforma.All appropriate data was collected from the death register of the PICU, MY hospital Indore and was processed using SPSS.

➢ The categorical variables were described in terms of number(N) and percentage (%). Processed data was presented in the form of tables, diagrams, and narration.

Results:

Table: 1 –Showing distribution of case and controls according to age and sex

SN.NO.	AGE	CASE	CONTROL	TOTAL
1.	1-3 months (Para newborn)	10 (10. %)	5 (5%)	15 (7.5%)
2.	3-12months(infants)	33 (33. %)	38 (38%)	71 (35.5%)
3.	1-3 years (toddlers)	34 (34%)	33 (33%)	67 (33.5%)
4.	3-4 years(preschool)	5 (5%)	6 (6%)	11 (5.5%)
5.	4-5years (school age)	5 (5%)	5 (5%)	10 (5.0%)
6.	>5 years	13 (13%)	13 (13%)	26 (13.0%)
SO.NO.	SEX			
1.	Male	48(48%)	52 (52%)	100 (50 %)
2.	Female	42(42 %)	58 (58 %)	100 (50 %)

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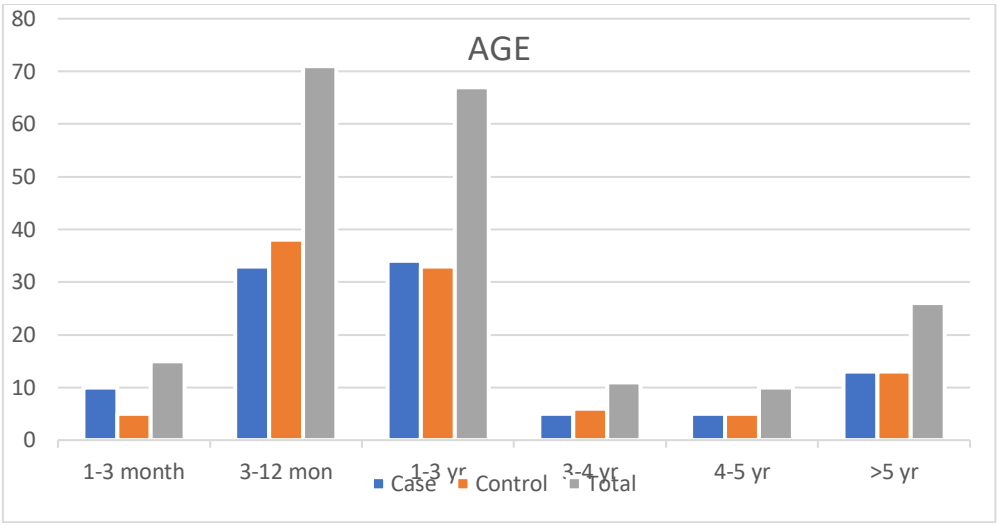
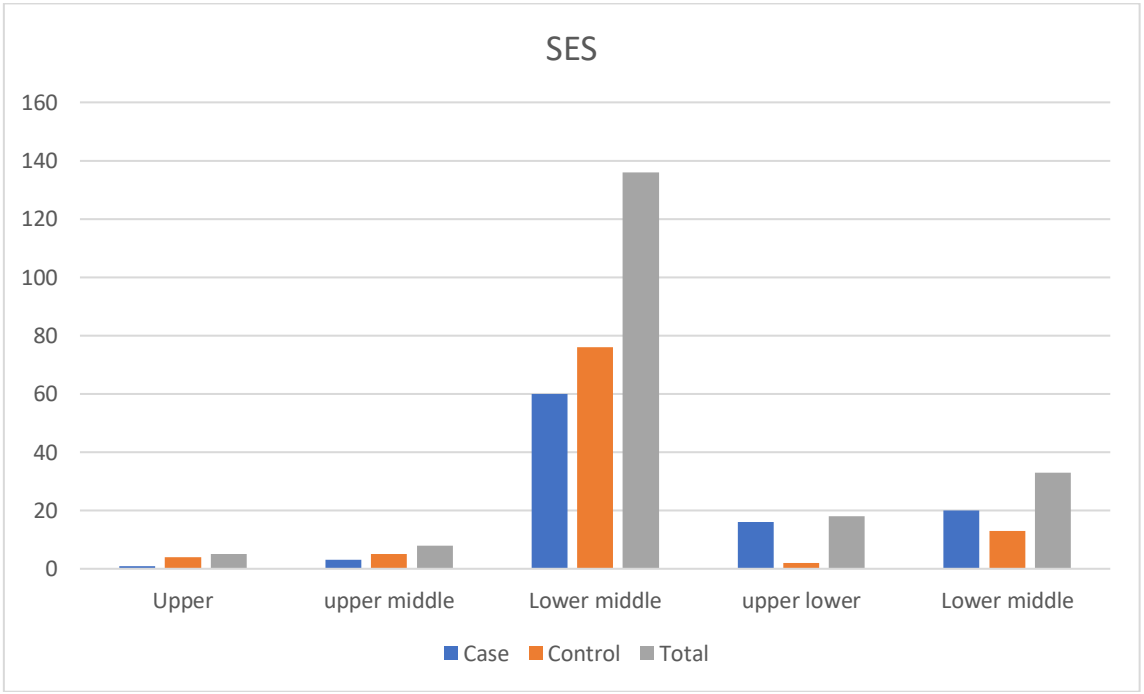


TABLE: 2- Distribution of cases and controls according to socioeconomic status and distance from hospital

SO.NO.	SOCIOECONOMIC STATUS			
1.	Upper	1 (1%)	4 (4%)	5 (2.5%)
2.	Upper middle	3 (3%)	5 (5%)	8 (4%)
3.	Lower middle	60 (60%)	76 (76 %)	136 (68%)
4.	Upper lower	16 (16%)	2 (2%)	18 (9.2%)
5.	Lower	20 (20 %)	13(13%)	33 (16.5%)
SN.NO.	DISTANCE			
1.	<50 km	26 (26 %)	40 (40 %)	66 (33 %)
2.	50-150km	33 (33 %)	29 (29 %)	62 (31 %)
3.	150-250km	34 (34 %)	27 (27 %)	61 (30.5%)
4.	>250km	7 (7 %)	4 (4 %)	11 (5.5 %)
	Total	100 (100.0%)	100 (100.0%)	200 (100.0%)



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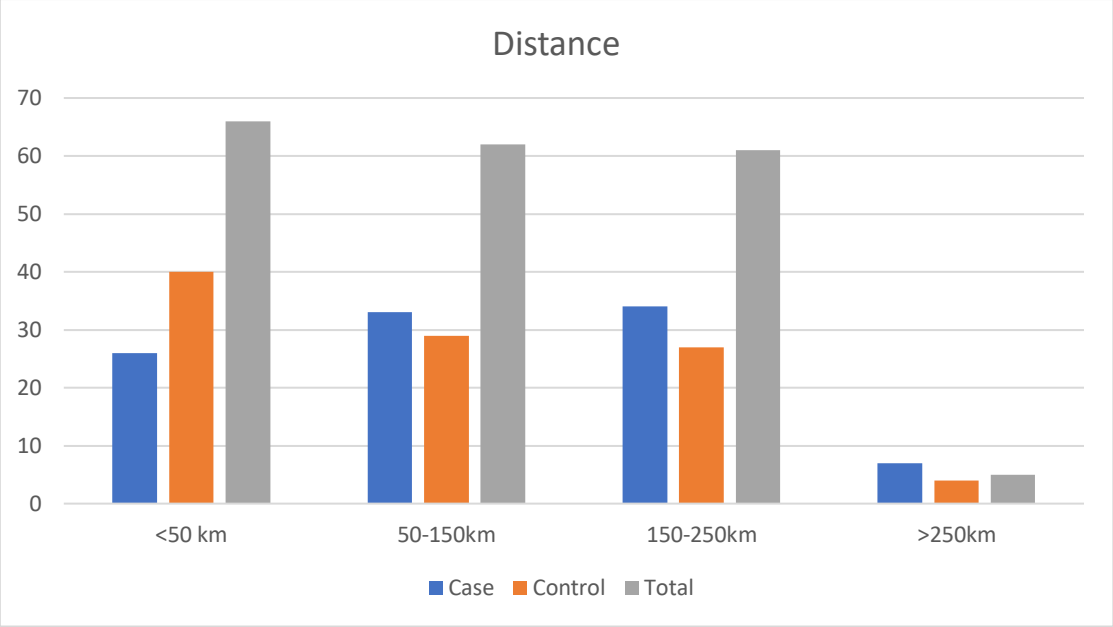
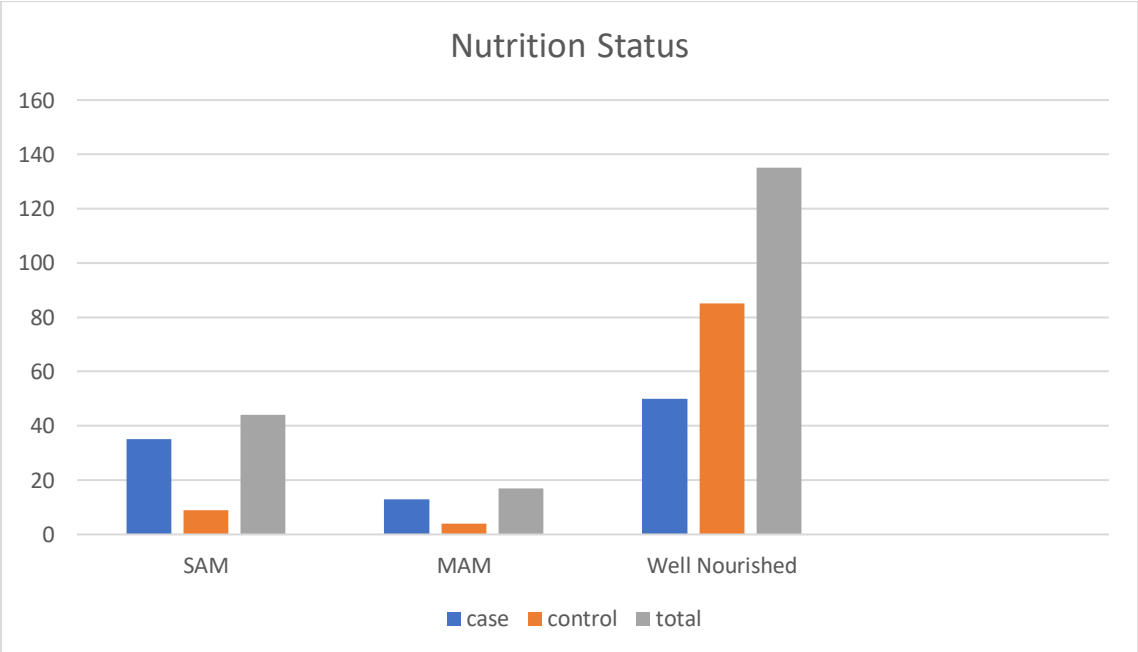


TABLE 3 - Distribution of cases and controls according to nutritional and developmental status

SL.NO.	NUTRITIONAL STATUS	CASE	CONTROL	TOTAL
1.	SAM	35 35 %)	9 (9 %)	44 (22.4%)
2.	MAM	13 (13 %)	4 (4 %)	17 (7 %)
3.	Well nourished	50 (50 %)	85 (85 %)	135 (67. 5 %)
	Total	100 (100.0%)	100 (100.0%)	200 (100.0%)
SN.NO.	DEVELOPMENTAL STATUS	CASE	CONTROL	TOTAL
1.	Delayed	25 (25 %)	7 (7 %)	32 (16 %)
2.	Appropriate	75 (75 %)	93 (93 %)	168 (84 %)
	Total	100 (100.0%)	100 (100.0%)	200 (100.0%)

Chi-square value- 29.202, p-value- <0.0001, Chi-square value- 12.054, p-value- 0.0005; OR=4.428



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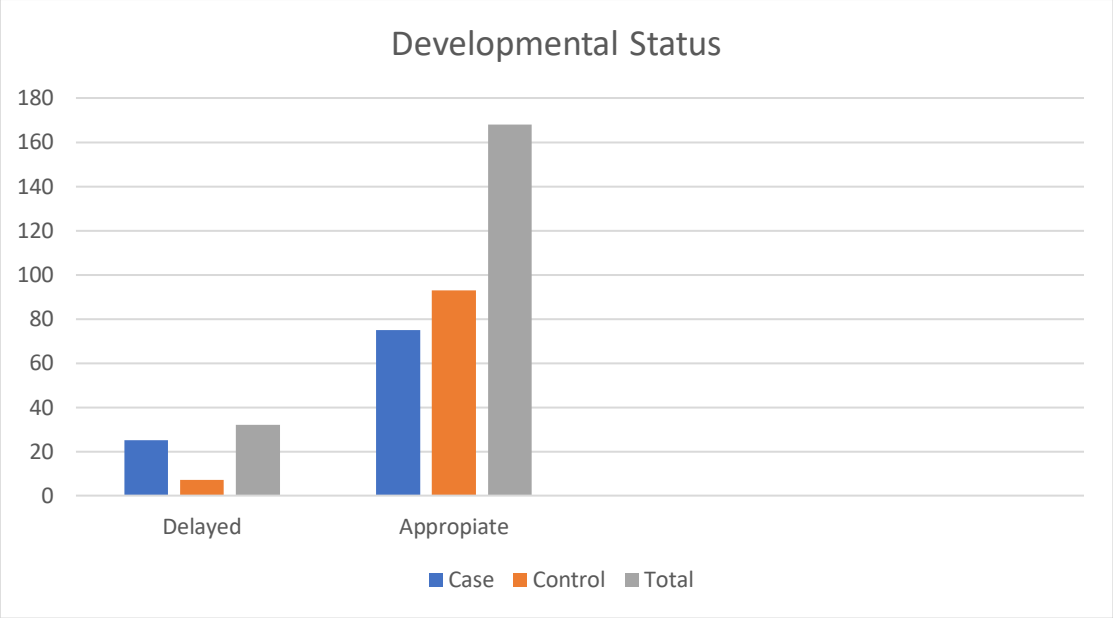
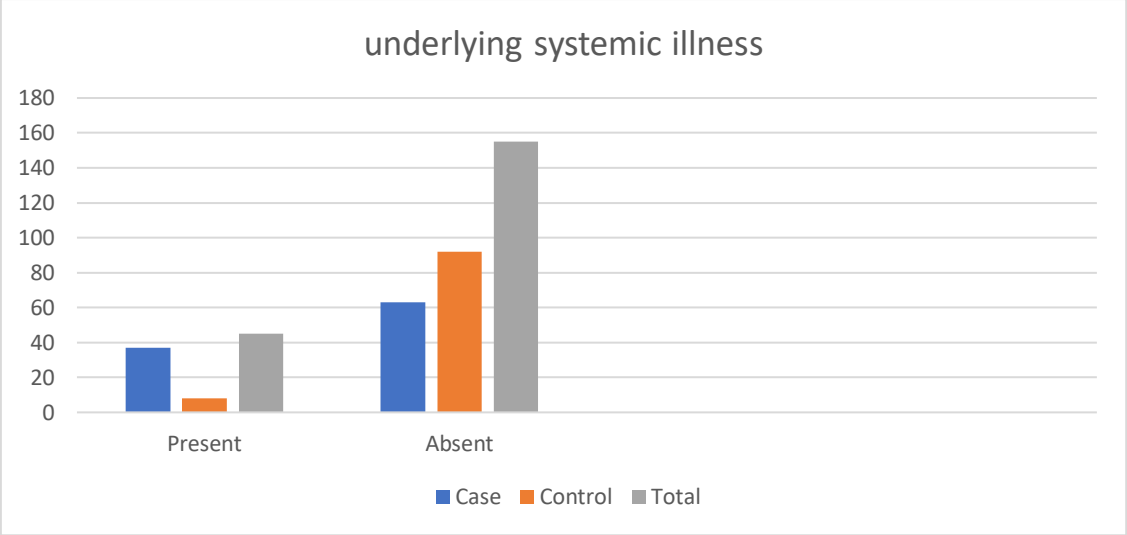


TABLE 4- Distribution of cases and controls according to underlying systemic illness

SL.NO.	UNDERLYING SYSTEMIC ILLNESS	CASES	CONTROL	TOTAL
1.	Present	37 (37 %)	8 (8 %)	45 (22.5 %)
2.	Absent	63 (63 %)	92 (92 %)	155(77.5 %)
	Total	100 (100.0%)	100 (100.0%)	200 (100.0%)

Chi-square value- 24.115, p-value- <0.0001; OR=6.754



Discussion:

The present study was conducted to analyse the risk factors associated with childhood mortality at our centre Ours is a tertiary care centre which not only caters to a large population but also functions as a referral unit for many districts in Madhya Pradesh. Most of the patients admitted in our PICU (Paediatric Intensive Care Unit) are critically ill with respiratory or hemodynamic compromise or affected consciousness.

A total of 373 deaths were recorded in our PICU over a period of 18 months during which this study was conducted (over the same period). The total number of admissions were approximately 3500, resulting in 10.6 % of mortality. Out of the total deaths during this period, we registered 100 cases that fulfilled the inclusion criteria. Equal number of age matched control were identified who were shifted out of PICU and their medical records were obtained while selecting the control group besides age group we tried to match the major system affected also.

Out of the 100 deaths included in our study, the male: female ratio was 1:1.4 Highest mortality was recorded among patients admitted with Circulatory

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involvement (18.6%), followed by those admitted with infectious diseases (17.8%), GI involvement (12%), CNS involvement (8.9%), respiratory involvement (8.2%), genitourinary involvement (6.9%), haematological disorders (5.2%) and malnutrition (3.3%).

The maximum mortality was recorded in infants (1month-1year of age) and toddlers (1-3 year), with 38% and 33% mortality respectively. Similar findings were reported in other studies conducted across India. **Bhavari VL et al. [9]** recorded 417 paediatric mortalities and reported 180 (43.2%) had age below 1 year, 58 (13.9%) had age between 1-2 years, 59 (14.1%) had age between 2-5 years and 120 (28.8%) had age above 5 years. Highest percentage mortality was also found in patients under 1 year of age in studies conducted by **Sahoo et al [10].**

60% of all cases of paediatric mortality recorded by us belonged to a lower middle class socioeconomic background. 20% belonged to lower class and 16% were from upper lower class. Similarly, majority of controls also belonged to the lower middle class (76%). Since ours is a government setup catering mostly to lower socioeconomic backgrounds, very few patients admitted with us belong to upper middle class and upper class, hence such mortalities were rarely recorded.

These findings are supported by various other studies, including a study by **Kumar et al[11]**rural-urban gap in under-five mortality has reduced from 44 per thousand in 1992–1993 to 30 per thousand in 2004–2005 which further decreased to 14 per thousand in 2019–2021. Despite reducing rural under-five

A majority of patients in both the groups (cases and controls) came from other districts travelling long distances before reaching us. Out of the 93 children who came to us from distant healthcare setups, 67 eventually succumbed to their diseases. Similar significant findings were also observed in a study done by **Praveen K, Nallasamy K, Jayashree M et al [12]** which indicates that delay in reaching the tertiary healthcare centres and inadequate primary management at primary and secondary care centres often leads to mismanagement during the golden hour. This leads to an irreversible decompensated state and subsequently increases the risk of mortality.

Out of the total cases in the study group, 25% children had history of developmental delay, while only 7% had history of developmental delay in the control group, suggesting that children with developmental delay are at a higher risk of severe illness and death. A US based study C A Boyle et al concluded that based on underlying cause only, it was found that developmental disabilities were the fifth leading cause of nontraumatic death for children between 1 and 14 years of age and the third leading cause of non-traumatic death for children between 15 and 19 years.

Low- and middle-income countries including India face many challenges in identifying and managing developmental delays. This occurs as a result of limited health care resources and poor follow up due to socio-cultural factors. These challenges can delay the diagnosis and treatment of developmental issues, potentially worsening outcomes for children admitted in critical care units.

Out of 44 children in our study who were severely malnourished along with being critically ill 35 children died and only 9 children could survive. This highlights the major role malnutrition plays in majority of all paediatric mortalities. This finding is supported in a study by **Dendir et al. [13]** which found that paediatric patients in underdeveloped nations had a significantly lower nutritional status and poorer eating habits compared to middle- and high-income countries. This places them at a higher risk for illness and complications associated with insufficient nutrition.

Out of the total 200 children's, 43 (21.5%) had a known chronic illness, with 37 cases (37%) and 8 controls (8%). The remaining 153 (76.5%) did not have a chronic illness, comprising 63 cases (63%) and 92 controls (92%).

Dendir et al. **[13].** found that children with comorbidity had a 9.4 times higher mortality risk than children without comorbidity. The chance of mortality among patients with co-morbidities ranges between 8.38 and 10%, according to studies done by ***Haftu et al.*.[14],*Seifu et al*[15]** respectively.

Conclusion:

Lower socioeconomic status, underlying chronic illness, developmental and nutritional status, farther distance specific parameters (respiratory,circulatory, central nervous system,haematology) are significant factors influencing probability of death among critically ill children.

Whereas age,gender, time to reach PICU, and gastroenterology parameters show no significant differences.

Mortality factors highlight direct and indirect causes reflecting health system and socio-economic influences.

Conflict of interest: There is no conflict of interest in this study

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References:

1. Downes JJ. Development of paediatric critical care medicine—how did we get here and why? In: Wheeler D, Wong H, Shanely T, eds. *Paediatric Critical Care Medicine: Basic Science and Clinical Evidence*. London: Springer; 2007:3–32.
2. Moerer O, Plock E, Mgbor U, et al. A German national prevalence study on the cost of intensive care: an evaluation from 51 intensive care units. *Crit Care*. 2007;11(3): R69.
3. Fiser DH. Outcome evaluations as measures of quality in paediatric intensive care. *Podiatry Clin North Am.* 1994; 41:1423–1438.

DOI: 10.69605/ijlbpr_14.5.2025.61

4. Bertolini G, Donata RAC, Apolone G. PRISM—an assessment of its performance in a sample of 26 Italian ICU'S. *Crit Care Med*. 1988; 26:1427–1432.
5. Jacobs S, Arnold A, Clyburn PA, Willis BA. The Riyadh Intensive Care Program applied to a mortality analysis of a teaching hospital intensive care unit. *Anaesthesia*. 1992;**47**(9):775–80. [PubMed: 1415974].
6. Morales IJ, Peters SG, Afessa B. Hospital mortality rate and length of stay in patients admitted at night to the intensive care unit. *Crit CareMed*. 2003;**31**(3):858–63. doi: 10.1097/01.CCM.0000055378.31408.26. [PubMed: 12626997].
7. Bellad R, Rao S, Patil VD, Mahantshetti NS. Outcome of intensive care unit patients using Pediatric Risk of Mortality (PRISM) score. *IndianPediatr*. 2009;**46**(12):1091–2. [PubMed: 19430067].
8. Colpan A, Akinci E, Erbay A, Balaban N, Bodur H. Evaluation of risk factors for mortality in intensive care units: a prospective study from a referral hospital in Turkey. *Am J Infect Control*. 2005;**33**(1):42–7. doi: 10.1016/j.ajic.2004.09.005. [PubMed: 15685134].
9. Bhavari VL, Ambike DA, Pawar ND. Study of morbidity pattern and outcome of patients admitted in paediatric intensive care unit in a tertiary care rural teaching hospital. Int J Contemp Pediatr 2019; 6:2064-7
10. Sahoo B, Patnaik S, Mishra R, Jain MK. Morbidity pattern and outcome of children admitted to a paediatric intensive care unit of Eastern India. Int J Contemp Pediatr. 2017 Mar; 4:486-9
11. Kumar, C., Piyasa, & Saikia, N. (2022). An update on explaining the rural-urban gap in under-five mortality in India. BMC Public Health, 22. doi: https://doi.org/10.1186/s12889-022-14436-
12. Praveen K., Singh, R., Gupta, N., & Sharma, D. (2020). "Analysis of Brought-in-Dead and Dead-on-Arrival Cases in a Tertiary Care Center." *Indian Journal of Critical Care Medicine*, 24(3), 153-159. doi:10.5005/jp-journals-10071-23453
13. Dendir, G., Awoke, N., Alemu, A., Sintayhu, A., Eanga, S., Teshome, M., Zerfu, M., Tila, M., Dessu, B. K., Efa, A. G., & Gashaw, A. (2023). Factors Associated with the Outcome of a Pediatric Patients Admitted to Intensive Care Unit in Resource-Limited Setup: Cross-Sectional Study. *Pediatric health, medicine and therapeutics*, *14*, 71–79. https://doi.org/10.2147/PHMT.S389404
14. Haftu H, Hailu T, Medhaniye A. Assessment of pattern and treatment outcome of patients admitted to pediatric intensive care unit, Ayder Referral Hospital, Tigray, Ethiopia, 2015. *BMC Res Notes*. 2018;11(1).
15. Seifu A, Eshetu O, Tafesse D, Hailu S. Admission pattern, treatment outcomes, and associated factors for children admitted to pediatric intensive care unit of Tikur