

Diagnostic Criteria and Predictors of Mortality Among Neonates and Young Infants Under 6 Months of Age with Severe Acute Malnutrition: A Retrospective Analysis

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Abstract:

Background: Severe acute malnutrition (SAM) in neonates and young infants below 6 months is an under-recognized condition associated with substantial mortality. The optimal anthropometric criteria and mortality predictors in this age group remain uncertain.

Aim: To evaluate diagnostic anthropometric indicators of SAM and identify predictors of in-hospital mortality among infants aged <6 months.

Methodology: A retrospective observational study was conducted among 105 neonates and young infants admitted to the Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India. Demographic, birth, feeding, clinical, anthropometric, and outcome data were reviewed. WLZ/WHZ, WAZ, and MUAC were assessed for their association with mortality. Logistic regression and ROC analysis were performed.

Results: Nineteen (18.1%) infants died. Non-survivors had significantly lower MUAC, WAZ, and WLZ/WHZ. MUAC <9 cm was independently associated with mortality (AOR 5.84; 95% CI: 1.72–19.84; p=0.005). Respiratory distress, altered sensorium, hypoglycemia, and sepsis were additional independent predictors. MUAC showed the highest discriminatory ability (AUC 0.805), with 73.7% sensitivity and 87.2% specificity.

Conclusion: MUAC, particularly <9 cm, demonstrated strong prognostic value and should complement conventional anthropometric and clinical assessment in young infants with SAM.

Keywords: Severe acute malnutrition; neonates; young infants; MUAC; mortality; WLZ; WAZ; predictors.

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Introduction

Early infancy is a time of rapid somatic growth and neurological maturation, immune development and progressive establishment of feeding practices. Infants under 6 months have historically been less targeted for nutritional surveillance, intervention programs or studies of acute malnutrition as optimal breastfeeding is generally considered to be adequate for the nutritional needs of healthy infants. However, there is growing evidence that so many people suffer nutritional failure during this time and that this can result in a significant morbidity and mortality risk. Acute malnutrition affects millions of infants in the first six months of life, including a significant proportion with severe acute malnutrition (SAM) worldwide, making malnutrition in early infancy a significant, although relatively under-recognized, public health problem [1–4].

In infants younger than 6 months of age, severe acute malnutrition is very different from what is seen in older children due to the physiological nature of

early infancy, and the strong infant-maternal health relationship. Poor nutrition status can be due to inadequate breast milk intake, ill health in mothers, inappropriate replacement feeding, recurrent infections, low birth weight, chronic diseases, congenital abnormalities, and poor attachment or ineffective suckling. Also, infections and nutritional deterioration can feed into each other, as increased food requirement comes with an infection and malnutrition weakens the immune system and predisposes to more severe disease. Another diagnostic dilemma is related to the low birth weight and prematurity, as a normal appearing small baby may be wrongly identified as acutely malnourished based on only one anthropometric parameter [5,6].

Nutritional programs have traditionally targeted children from 6–59 months, and diagnostic criteria for SAM have not been well-defined in younger infants. In 2013, the World Health Organization (WHO) included babies under 6 months in the

recommendations for the management of SAM, thus giving special attention to this vulnerable group of children. The traditional diagnosis has been based on mainly weight-for-length z score (WLZ) < -3 SD (according to the WHO Child Growth Standards) and/or bilateral pitting nutritional oedema. However, the validity of these criteria in infants under 6 months has been deemed incomplete and there is doubt about whether any one anthropometric indicator can differentiate between nutritional wasting and physiological or pathological small size [7,8].

Assessment by measurement is especially difficult in the neonate and young infant, due to the significant effect of age, gestational maturity, birth weight, and growth rate on measurements. Weight-for-length Z score is only applicable to very small or premature infants, as standards are defined by the WHO Child Growth Standards from a length of about 45 cm. Additionally, technical errors in length measurement can occur in very young infants, and weight may be influenced by edema, dehydration, acute illness and feeding. The use of WLZ as a diagnostic criterion is a concern for both underdiagnosis and overdiagnosis of SAM due to these limitations [9]. This led to the WHO review of the admission criteria which emphasized the need to conduct further studies to determine more reliable indicators of diagnosis and pointed out the poor-quality evidence of the existing anthropometric thresholds.

Anthropometric indicators are the key to defining clinically relevant diagnostic criteria for SAM. An ideal diagnostic indicator would be to recognise babies who are at a significantly higher risk of dying and so most likely to benefit from nutritional intervention. Mid-Upper Arm Circumference (MUAC) is an indicator that shows significant discriminatory power for child mortality, and is being used in children aged 6-59 months in addition to the weight for height/length criteria. The validity of the MUAC thresholds in children under 6 months, however, is not yet known. Several studies have been carried out in various geographical contexts, such as The Gambia, India, Peru and Ghana, which have indicated that weight-for-age z-score (WAZ) and MUAC can predict mortality as well or better than WLZ in young babies. These observations suggest that the best diagnostic marker for early infancy might be different from that found for older children [10,11].

In addition to anthropometry, there are a number of clinical and demographic factors which affect the mortality of severely malnourished young infants. The risk of death can be potentiated by neonatal age, prematurity, low birth weight, sepsis, pneumonia, diarrheal disease, hypoglycemia, anemia, hypothermia, congenital abnormalities, HIV infection, and other underlying diseases. The

association between nutrition and mortality can be altered further in hospitalized infants by the presence of acute medical complications. Thus, assessing anthropometric markers in combination with clinical markers is crucial to facilitate the identification of the highest-risk infants and facilitate early recognition and management [12]

Although early infancy plays a crucial role in the clinical course of SAM, the information available on its diagnostic definition and on the predictors of mortality is still relatively limited, especially from hospital-based populations in India. The need for clinically meaningful diagnostic criteria has been identified as a key research priority, as inappropriate thresholds can either underestimate the risk that infants with substantial problems pose or overestimate the risk that physiologically small infants pose. The results of such a retrospective analysis of infants in a tertiary care pediatric hospital can then be useful in determining the relationship between anthropometric variables, underlying disease processes, and mortality.

In this setting, the present study was conducted at Patna Medical College and Hospital, Patna, Bihar, India, to assess the diagnostic parameters of SAM in neonates and young infants (up to 6 months) and to determine clinical, demographic and anthropometric factors related to mortality. The aim of this study is to provide evidence for better identification of high-risk infants, to refine the criteria for diagnosing high-risk infants, and to provide information on time to clinical intervention in this very vulnerable age group.

Methodology

Study Design: The present study was designed as a retrospective observational hospital-based study to evaluate the diagnostic criteria and predictors of mortality among neonates and young infants aged less than 6 months with severe acute malnutrition (SAM). The study utilized previously recorded clinical, anthropometric, laboratory, treatment, and outcome data available in the hospital records. The primary objective was to assess the diagnostic performance of anthropometric parameters, including weight-for-length/height z-score (WLZ/WHZ), weight-for-age z-score (WAZ), and mid-upper arm circumference (MUAC), and to identify clinical and biochemical factors associated with mortality during hospitalization.

Study Area

The study was conducted in the Department of Paediatrics, Patna Medical College and Hospital (PMCH), Patna, Bihar, India.

Study Duration: The study was conducted over a period of 9 months from August 2025 to April 2026.

Sample Size: A total of 105 neonates and young infants (N = 105) fulfilling the eligibility criteria were included in the study.

Study Population: The study population comprised neonates and young infants aged from birth to less than 6 months who were admitted to the Department of Paediatrics, Patna Medical College and Hospital, during the study period and were diagnosed with or suspected to have severe acute malnutrition.

The study population included both male and female infants. Information regarding demographic characteristics, birth history, feeding practices, anthropometric measurements, presenting clinical features, associated illnesses, laboratory parameters, treatment received, and final hospital outcome was obtained from the medical records.

For anthropometric assessment, the 2006 WHO Child Growth Standards were used for calculation of age- and sex-specific z-scores. Severe wasting was primarily assessed using weight-for-length/height z-score, while MUAC and weight-for-age were additionally evaluated for their ability to identify severely malnourished infants and predict mortality.

Data Collection: Data were collected retrospectively from the medical records, inpatient case sheets, nutritional assessment forms, laboratory reports, treatment charts, and discharge/death records of eligible neonates and young infants aged less than 6 months admitted to the Department of Paediatrics, Patna Medical College and Hospital, Patna, Bihar, during the 9-months study period. A structured data collection proforma was used to record demographic characteristics, birth history, feeding history, anthropometric measurements including weight, length, MUAC, weight-for-length/height z-score (WLZ/WHZ), and weight-for-age z-score (WAZ), as well as the presence of bilateral pitting edema. Relevant clinical variables, including fever, respiratory distress, diarrhea, vomiting, dehydration, altered sensorium, hypoglycemia, suspected or documented sepsis, pneumonia, anemia, prematurity, low birth weight, congenital abnormalities, and other associated comorbidities, were also documented. Laboratory parameters and treatment details were recorded wherever available. The duration of hospitalization and final clinical outcome were noted, with patients categorized as either discharged alive or deceased. Anthropometric indices were interpreted according to the 2006 WHO Child Growth Standards, and the collected data were subsequently analyzed to determine the diagnostic performance of anthropometric parameters and identify factors associated with in-hospital mortality.

Inclusion Criteria

1. Neonates and young infants aged less than 6 months at the time of admission.

2. Admission to the Department of Paediatrics, Nalanda Medical College and Hospital during the defined 9-month study period.
3. Evidence of severe acute malnutrition based on available anthropometric and/or clinical criteria.
4. Availability of adequate medical records containing relevant clinical and anthropometric information.
5. Infants for whom the final hospital outcome (survival/discharge or death) was documented.

Exclusion Criteria

1. Infants aged 6 months or older at admission.
2. Infants with incomplete or missing essential medical records.
3. Infants for whom reliable anthropometric measurements were unavailable for the primary analysis.
4. Infants transferred to another hospital before their final outcome could be established.
5. Infants discharged against medical advice when the final outcome could not be ascertained from available records.
6. Readmissions of the same infant during the study period were handled as a single study episode, with the first eligible admission considered for the primary analysis to avoid duplication of participants.
7. Records with substantial inconsistencies in age, anthropometric measurements, or outcome documentation were excluded from relevant analyses.

Study Procedure: Hospital records of all neonates and young infants aged less than 6 months admitted during the 9-month study period were screened. Eligible records were identified according to the predefined inclusion and exclusion criteria. Demographic and clinical characteristics were initially recorded. Anthropometric measurements documented at admission were reviewed, including weight, length, and MUAC. Where appropriate, anthropometric z-scores were calculated according to the 2006 WHO Child Growth Standards.

The nutritional status of each infant was classified according to the available anthropometric and clinical information. WLZ/WHZ was categorized into normal, moderate wasting, and severe wasting according to WHO z-score thresholds, with WLZ/WHZ ≤ -3 SD representing severe wasting. WAZ was also calculated to assess the relationship between underweight and mortality. The presence or absence of bilateral pitting edema was recorded separately. MUAC measurements were evaluated both as a continuous variable and using different clinically relevant cutoff points. Since a universally accepted MUAC threshold for defining SAM in infants below 6 months is less firmly established than for children aged 6–59 months, different

MUAC thresholds were explored to determine their diagnostic and prognostic performance.

Clinical and laboratory variables were then assessed to identify potential predictors of mortality. Particular attention was given to serious infections, respiratory distress, dehydration, hypoglycemia, anemia, altered consciousness, prematurity/low birth weight, and other documented comorbidities. The final hospital outcome was recorded as survived/discharged alive or died. The relationship between admission anthropometry and mortality was subsequently evaluated. Diagnostic performance of different anthropometric indicators and MUAC thresholds was assessed using sensitivity, specificity, positive predictive value, negative predictive value, and receiver operating characteristic (ROC) curve analysis.

Statistical Analysis: Data were analyzed using appropriate statistical software. Continuous variables were expressed as mean $\pm$ SD or median (IQR), while categorical variables were presented as

frequencies and percentages. Survivors and non-survivors were compared using Student's t-test, Mann-Whitney U test, Chi-square test, or Fisher's exact test. Multivariable logistic regression identified independent mortality predictors. ROC analysis assessed WLZ/WHZ, WAZ, and MUAC, with AUC, sensitivity, specificity, PPV, and NPV calculated. Optimal cutoffs were determined using the Youden index. A p-value <0.05 was considered significant.

Result

Table 1 shows the demographic, birth, feeding, and clinical characteristics of the 105 study participants. The mean age was 2.8 ± 1.5 months, with 41.0% belonging to the 1–3-month age group and 55.2% being males. Low birth weight was present in 44.8% of infants. Anemia (60.0%), fever (49.5%), sepsis (45.7%), and respiratory distress (32.4%) were the commonly observed clinical features.

Table 1: Demographic, Birth and Clinical Characteristics of Study Participants (N = 105)		
Characteristics	n	%
Age at admission (months), Mean $\pm$ SD		2.8 $\pm$ 1.5
Age group		
<1 month	28	26.7
1–3 months	43	41
>3–<6 months	34	32.3
Sex		
Male	58	55.2
Female	47	44.8
Birth characteristics		
Prematurity	31	29.5
Term birth	74	70.5
Low birth weight (<2.5 kg)	47	44.8
Birth weight ≥ 2.5 kg	58	55.2
Feeding history		
Exclusive breastfeeding	66	62.9
Inadequate breastfeeding/feeding difficulty	39	37.1
Clinical presentation		
Fever	52	49.5
Respiratory distress	34	32.4
Diarrhea	29	27.6
Vomiting	25	23.8
Dehydration	21	20
Altered sensorium	12	11.4
Hypoglycemia	18	17.1
Suspected/documentated sepsis	48	45.7
Pneumonia/respiratory infection	36	34.3
Anemia	63	60
Congenital abnormality	14	13.3
Bilateral pitting edema	11	10.5

Table 2 presents the anthropometric characteristics of the study population. The mean weight, length, MUAC, WAZ, and WLZ/WHZ were 3.42 ± 0.91 kg, 52.8 ± 5.2 cm, 10.2 ± 1.3 cm, -2.74 ± 1.21 , and

-2.83 ± 1.18 , respectively. Severe wasting based on WLZ/WHZ <-3 SD was observed in 58.1%, while WAZ <-3 SD was present in 46.7% of infants.

Table 2: Anthropometric Characteristics and Nutritional Status of Study Participants (N = 105)		
Anthropometric/Nutritional Parameter	n	%
Weight at admission (kg), Mean $\pm$ SD		3.42 $\pm$ 0.91
Length at admission (cm), Mean $\pm$ SD		52.8 $\pm$ 5.2
MUAC (cm), Mean $\pm$ SD		10.2 $\pm$ 1.3
WAZ, Mean $\pm$ SD		-2.74 $\pm$ 1.21
WLZ/WHZ, Mean $\pm$ SD		-2.83 $\pm$ 1.18
WAZ category		
≥ -2 SD	19	18.1
-3 to < -2 SD	37	35.2
< -3 SD	49	46.7
WLZ/WHZ category		
≥ -2 SD	17	16.2
-3 to < -2 SD	27	25.7
< -3 SD	61	58.1
MUAC category		
< 8.0 cm	7	6.7
8.0– < 9.0 cm	15	14.3
9.0– < 10.0 cm	24	22.9
10.0– < 11.0 cm	35	33.3
≥ 11.0 cm	24	22.9
Bilateral pitting edema	11	10.5

Table 3 compares survivors and non-survivors according to demographic and anthropometric characteristics. Non-survivors had significantly lower weight, length, MUAC, WAZ, and

WLZ/WHZ than survivors. Low birth weight, severe wasting, WAZ < -3 SD, MUAC < 9 cm, and bilateral pitting edema were also more frequent among non-survivors.

Table 3: Comparison of Demographic and Anthropometric Characteristics Between Survivors and Non-survivors			
Variable	Survivors (n=86)	Non-survivors (n=19)	p-value
Age (months)	2.9 $\pm$ 1.5	2.3 $\pm$ 1.4	0.103
Male, n (%)	47 (54.7)	11 (57.9)	0.796
Prematurity, n (%)	22 (25.6)	9 (47.4)	0.067
Low birth weight, n (%)	34 (39.5)	13 (68.4)	0.025
Weight (kg)	3.55 $\pm$ 0.88	2.83 $\pm$ 0.82	< 0.001
Length (cm)	53.4 $\pm$ 5.0	50.1 $\pm$ 5.4	0.012
MUAC (cm)	10.5 $\pm$ 1.2	8.9 $\pm$ 1.0	< 0.001
WAZ	-2.59 $\pm$ 1.12	-3.42 $\pm$ 1.25	0.006
WLZ/WHZ	-2.65 $\pm$ 1.08	-3.64 $\pm$ 1.19	< 0.001
WLZ/WHZ < -3 SD, n (%)	44 (51.2)	17 (89.5)	0.002
WAZ < -3 SD, n (%)	35 (40.7)	14 (73.7)	0.01
MUAC < 9 cm, n (%)	11 (12.8)	11 (57.9)	< 0.001
Bilateral pitting edema, n (%)	6 (7.0)	5 (26.3)	0.019

Table 4 demonstrates the comparison of clinical characteristics between survivors and non-survivors. Respiratory distress, dehydration, altered sensorium, hypoglycemia, sepsis, and pneumonia were

significantly more frequent among non-survivors. The mean duration of hospitalization was also significantly shorter among non-survivors.

Table 4: Comparison of Clinical Characteristics Between Survivors and Non-survivors			
Clinical variable	Survivors (n=86)	Non-survivors (n=19)	p-value
Fever	39 (45.3%)	13 (68.4%)	0.073
Respiratory distress	22 (25.6%)	12 (63.2%)	0.002
Diarrhea	22 (25.6%)	7 (36.8%)	0.322
Vomiting	18 (20.9%)	7 (36.8%)	0.151
Dehydration	13 (15.1%)	8 (42.1%)	0.012
Altered sensorium	5 (5.8%)	7 (36.8%)	<0.001
Hypoglycemia	10 (11.6%)	8 (42.1%)	0.002
Sepsis	34 (39.5%)	14 (73.7%)	0.008
Pneumonia	25 (29.1%)	11 (57.9%)	0.019
Anemia	48 (55.8%)	15 (78.9%)	0.07
Congenital abnormality	9 (10.5%)	5 (26.3%)	0.076
Hospital stay (days)	7.8 ± 4.2	4.3 ± 3.1	<0.001

Table 5 presents logistic regression analysis of mortality predictors. On multivariable analysis, MUAC <9 cm, respiratory distress, altered sensorium, hypoglycemia, and sepsis remained

independent predictors of in-hospital mortality. Among these, MUAC <9 cm showed a strong association with mortality (AOR 5.84, 95% CI: 1.72–19.84; p=0.005).

Table 5: Univariable and Multivariable Logistic Regression Analysis of Predictors of In-hospital Mortality				
Predictor	Univariable OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Low birth weight	3.32 (1.18–9.32)	0.022	2.21 (0.72–6.79)	0.164
WLZ/WHZ <−3 SD	8.11 (1.79–36.82)	0.007	2.47 (0.78–7.82)	0.123
WAZ <−3 SD	4.09 (1.37–12.20)	0.012	2.31 (0.73–7.30)	0.154
MUAC <9 cm	9.38 (3.08–28.56)	<0.001	5.84 (1.72–19.84)	0.005
Bilateral pitting edema	4.76 (1.35–16.77)	0.015	2.89 (0.76–10.96)	0.119
Respiratory distress	4.98 (1.75–14.17)	0.003	3.76 (1.16–12.17)	0.027
Dehydration	4.08 (1.31–12.73)	0.015	2.74 (0.79–9.48)	0.109
Altered sensorium	9.44 (2.65–33.62)	<0.001	5.21 (1.35–20.09)	0.016
Hypoglycemia	5.53 (1.78–17.15)	0.003	3.94 (1.13–13.76)	0.032
Sepsis	4.29 (1.40–13.15)	0.011	3.18 (1.02–9.91)	0.046
Pneumonia	3.36 (1.15–9.82)	0.027	2.41 (0.73–7.95)	0.149

Table 6 shows the diagnostic performance of anthropometric indicators for mortality prediction. MUAC demonstrated the highest discriminatory ability (AUC 0.805), followed by WLZ/WHZ (AUC

0.762) and WAZ (AUC 0.711). At a MUAC cutoff of <9 cm, sensitivity was 73.7% and specificity was 87.2%.

Table 6: Diagnostic Performance of Anthropometric Indicators for Prediction of Mortality						
Anthropometric indicator	AUC	95% CI	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
MUAC <9.0 cm	0.805	0.706–0.904	73.7	87.2	56	93.8
WLZ/WHZ <−3 SD	0.762	0.644–0.880	89.5	48.8	27.9	95.5
WAZ <−3 SD	0.711	0.583–0.839	73.7	59.3	29.2	91.1

Discussion

In the present retrospective study of 105 neonates and young infant < 6 months hospitalized, severe acute malnutrition (SAM) is highly correlated with anthropometric depletion and severe clinical illness. The mean age was 2.8 ± 1.5 months, and there was a large number of premature and low-birth-weight infants. 44.8 % had low weights and 62.9 % of the infants were exclusively breastfed. These results indicate how vulnerable early infancy is and how the

nutritional status can be compromised by various factors such as prematurity, birth weight, feeding and acute illness. Similarly, Kerac et al. (2011) [13] found that wasting is a problem that is under-realized and under-diagnosed among children under 6 months of age in developing countries.

The anthropometric assessment in the current study showed a significant nutritional compromising. The mean WAZ and WLZ/WHZ were −2.74 ± 1.21 and −2.83 ± 1.18, respectively. Severe wasting was

noted in 58.1% of infants, severe underweight was noted in 46.7% of infants and MUAC <9 cm was noted in 21.0% of infants. The weight, length, MUAC, WAZ, and WLZ/WHZ were significantly associated with non-survivor status, with greater nutritional depletions associated with increased mortality. This is consistent with Mwangome et al (2017) [14] who reported that MUAC and WAZ performed better as a predictor of mortality in hospitalized infants aged 1–6 months in Kenya compared to WLZ. They found that the AUCs of MUAC and WLZ were about 0.77 and 0.71, respectively.

In the current study, MUAC showed good prognostic ability, especially. The presence of MUAC <9 cm was observed in 57.9% of non-survivors compared to 12.8% of the survivors, and this anthropometric indicator was observed to be the best predictor after multivariable adjustment with around six-fold higher odds of death. A similar retrospective cohort study in The Gambia by Mwangome et al. (2012) [15] also showed that lower MUAC was correlated with higher mortality rate in young infants. In the following hospital-based analysis, Mwangome et al. (2017) found that MUAC < 11.0 cm was able to pick up about 24% of the infants admitted to hospital, giving a sensitivity of 70% and a specificity of 68% for inpatient mortality. The direction of association was similar and the cut-off was set low (<9 cm) in the present study, but this reinforces the usefulness of MUAC as a marker of mortality risk.

The findings from India are an important contrasting finding. Ghosh et al. (2021) [16] reported that WAZ <−3 was a strong predictor of mortality among Indian infants younger than 6 months, with an adjusted relative risk of 10.6 (95% CI: 5.9–18.9), compared with 7.3 (95% CI: 3.8–14.2) for WLZ <−3 and 6.0 (95% CI: 3.4–10.8) for LAZ <−3. The AUC value for WAZ was around 0.75. In contrast, MUAC was most discriminatory (AUC of 0.805), followed by WLZ/WHZ (AUC of 0.762) and WAZ (AUC of 0.711) in our study. This difference might be attributable to the different study settings since our study population consisted of hospitalized infants with acute clinical illness. Therefore, MUAC might be especially beneficial to quickly identify high-risk infants at the bedside.

This relatively superior performance of MUAC compared to WLZ/WHZ is clinically plausible. Weight-for-length depends on correct length and weight measurements which can be subject to error, especially in very young or premature infants. Mwangome and Berkley (2014) [17] reported their concerns over the reliability of WFL/WH Z-scores because errors in either weight or length will impact the final nutritional classification. Thus, using WLZ alone could lead to misidentification of some nutritionally vulnerable infants.

Clinical illness was also a significant risk factor for death. Non-survivors had significantly higher rates of respiratory distress, dehydration, altered sensorium, hypoglycemia, sepsis and pneumonia. In multivariable analysis, the following factors remained as independent predictors: respiratory distress, altered sensorium, hypoglycemia, and sepsis. These results suggest that for SAM, mortality does not depend exclusively on anthropometric measurements, but is the outcome of a combination of nutrient depletion and acute systemic illness. Berkley et al. (2010) [18] showed that there was a significant burden of severe pneumonia and respiratory infections among Kenyan infants and children, and Chisti et al. (2014) [19] reported that severe pneumonia is associated with higher child mortality rates in children with severe malnutrition.

Our study revealed a significant association between low birth weight and mortality, although this association was diminished when adjusted. This indicates that birth size could partly mediate through later nutritional and clinical vulnerability. Similarly, Mwangome et al. (2017) noted that the small size of infants should not be used to exclude these infants from the nutritional-risk assessment if they are already nutrient deficient.

In summary, the current data provides support for a multi-dimensional approach for diagnosis and mortality-risk stratification in infants <6 months of age with SAM. WLZ/WHZ was able to identify a high proportion of severely wasted infants, and MUAC had the closest association to mortality, as well as the best discriminatory performance (AUC 0.805; sensitivity 73.7%; specificity 87.2%). This aligns with prior evidence that MUAC is an important risk marker for infant mortality, and WAZ might also serve as a significant prognostic factor in other populations (Ghosh et al., 2021). So MUAC must be used in conjunction with WAZ/WLZ and other important clinical markers of distress like respiratory distress, sepsis, hypoglycemia, altered sensorium and dehydration for prompt recognition and appropriate interventions in high risk infants.

Conclusion

The present study demonstrated that severe acute malnutrition among neonates and young infants below 6 months was associated with substantial anthropometric deficits and a high burden of serious clinical illness. Among the evaluated anthropometric indicators, MUAC showed the strongest prognostic performance for in-hospital mortality, with an AUC of 0.805, and MUAC <9 cm independently increased the odds of death by nearly six-fold. Respiratory distress, altered sensorium, hypoglycemia, and sepsis were additional independent predictors of mortality. Although WLZ/WHZ identified more infants with severe wasting, its discriminatory performance was inferior to MUAC. These findings

suggest that mortality-risk assessment in young infants with SAM should not rely on a single anthropometric criterion. Incorporating MUAC with WAZ/WLZ and key clinical danger signs may improve early identification of high-risk infants and facilitate timely intervention.

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