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Adherence to Treatment Guidelines and Short-Term Outcomes of Children Under Five Years Admitted with Severe Acute Malnutrition at Mama Lucy Kibaki Hospital, Nairobi County, Kenya

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ABSTRACT

Background: Severe Acute Malnutrition (SAM) is associated with an increased risk of infections and high mortality. Nutrition-related factors contribute to nearly half of deaths among children under five years, with high mortality persisting despite the existence of guidelines. This study was conducted to assess adherence to the World Health Organization (WHO) treatment guidelines and to determine short-term outcomes among children under five years admitted to Mama Lucy Kibaki Hospital, a level five Kenyan hospital.

Method: This was a prospective cohort study conducted at Mama Lucy Kibaki Hospital between 28 October and 31 January 2025. A total of 136 children aged 6-59 months admitted with SAM were consecutively enrolled and followed up until discharge. Data were collected via an interviewer-administered questionnaire and checklist covering the 10 WHO steps. Each WHO guideline step was scored dichotomously (1=complete assessment and recommended management; 0=otherwise). Good adherence was defined a priori as a total score of ≥7 of 10 steps and complete adherence as fulfilment of all 10 steps. Descriptive statistics, logistic regression, Poisson regression and Kaplan-Meier survival analysis were used to describe short-term outcomes and their association with guideline adherence.

Results: The majority, 125 (91.9%) out of 136 children, were aged below 24 months. The most common comorbidities were pneumonia 99 (73%) and acute gastroenteritis 98 (72%). Adherence to SAM WHO guidelines were highest for treating infections step 5 (99.3%) and lowest for sensory stimulation step 9 at 5.9%. The median duration of hospitalisation was 10 days (IQR 8-13) and in-hospital mortality was 10.3% (14). Only 78 (57.4%) achieved good adherence (≥7 steps). Good adherence was associated with lower mortality (P<.001) and shorter hospital stays (median 9 vs 11 days, P<.001), but not with weight gain (P =.257). Each additional step adhered to was associated with shorter length of stay (adjusted IRR 0.91, 95% CI: 0.88–0.94) and lower odds of death (adjusted OR 0.29, 95% CI: 0.15–0.47, P<.001).

Conclusion: Adherence to the WHO SAM guidelines for the inpatient management of SAM was suboptimal and good adherence was significantly associated with improved survival and shorter hospitalisation. Strengthening implementation of these guidelines may improve clinical outcomes among children with SAM.

BACKGROUND

The global under-five mortality rate was estimated at 37 deaths per 1,000 live births in 2024.[1] In Kenya, this burden remains higher, with an under-five mortality rate of 41 deaths per 1,000 live births.[2] Nutrition-related factors are responsible for approximately 45% of deaths among children under five years of age, underscoring the critical role of malnutrition in reducing child survival.[3] Globally, the 2025 Joint Child Malnutrition Estimates indicate that 42.8 million children under five are wasted, with about 12.2 million classified as severely wasted. The burden is disproportionately concentrated in Africa and Asia, with Eastern Africa alone accounting for approximately 3.6 million affected children.[4]

Adequate nutrition is critical during childhood especially in the first five years of life when growth is most rapid and a child is largely dependent on caregiver.[5] Severe acute malnutrition (SAM) is defined by severe wasting and/or bilateral pitting oedema. Severe wasting is identified as a weight-for-length (children under two years) or weight-for-height (children over two years) measurement below −3 standard deviations of the World Health Organization (WHO) child growth standards.[6,7]

In Kenya, a multicentred study conducted across 13 hospitals reported a prevalence of severe acute

malnutrition of 10.1%, with a case fatality rate of 14.8%.[8] Similarly, a study conducted at Mbagathi Hospital in Nairobi documented a case fatality rate of 8%.[9]

Kenya introduced national guidelines for the management of severe acute malnutrition in 2009 under the Integrated Management of Acute Malnutrition (IMAM) framework adapted from WHO recommendations, in order to improve care and rehabilitation of affected children. Although these guidelines are integrated into national child health protocols and are considered feasible and sustainable, adherence remains suboptimal.[10]

The WHO protocol for the inpatient management of SAM is a 10-step approach divided into stabilisation (Steps 1–7) and rehabilitation (Steps 8–10). Stabilisation involves correcting hypoglycaemia and hypothermia, managing dehydration, correcting electrolyte imbalance, treating infection, addressing micronutrient deficiencies, and initiating feeding. Rehabilitation focuses on catch-up growth, sensory stimulation, and preparation for discharge.[6,11]

Studies in Kenya show wide variation in adherence to WHO guidelines, with generally low adherence and incomplete documentation of key management steps.[12] Reported adherence varies widely between facilities: Utilisation of SAM management guidelines were 86.4% at Busia County Referral Hospital, compared with 4.5 % at Moi Teaching and Referral Hospital. While only 5 out of 8 steps were documented at Garissa Provincial Hospital. This variation is influenced by factors such as lack of supervision, insufficient clinical skills, inadequate infrastructure, and unavailability of dedicated malnutrition units. As a result, a gap persists between recommended practice and actual implementation, with limited evidence on its impact on short-term outcomes.[13,14]

The introduction of the WHO inpatient guidelines has contributed substantially to reduction in case fatality; nevertheless, mortality among children admitted with SAM remains high. Sustainable Development Goal 3.2 targets an under-five mortality rate of no more than 25 deaths per 1000 live births by 2030. This target will not be met without inpatient management of SAM.[15,16]

To reduce mortality associated with SAM and improve its management ,there is a need for maximum utilisation of guidelines and short-term outcome recognition.[17,18] However, systematic data on adherence to SAM management guidelines remain constrained.[19] This study aimed to determine the level of adherence to the WHO guidelines for the inpatient management of SAM, to describe the short-term outcomes of children admitted with SAM, and to assess the association between adherence and these outcomes at Mama Lucy Kibaki Hospital.

METHODS

Study design, Period and Setting

This study was a prospective cohort study conducted from 28 November 2024 to 31 January 2025. The study was conducted at Mama Lucy Kibaki Hospital. A Level Five referral hospital located in the Eastern region of Nairobi County, Kenya. The paediatric ward in the hospital has a capacity of 47 beds and an average occupancy rate of 187%, reflecting a high patient burden. Hospital records indicated that approximately 400 children were admitted with severe acute malnutrition in 2023.

Study Population

We included children aged 6 to 59 months admitted with severe acute malnutrition. Children were eligible if they had a Weight for height/length (WHZ) ≤-3 standard deviations according to WHO growth standards or Mid Upper Arm Circumference (MUAC) of <11.5 cm using MUAC tape and/or bilateral pitting oedema. Children diagnosed with congenital heart disease or malignancy were excluded from the study.

Sample Size and Sampling Technique

The minimum sample size was calculated using the standard formula for estimating a single population proportion.[20,21]

$$N=\frac{P(1-p)(z1-\alpha)^2}{d2}$$

n: minimum sample size before correction; p=.155 the proportion adherent to SAM guidelines reported at Adama Hospital Medical College, Ethiopia.[22]

Z (1- α) =1.96

d=margin of error at 5% (0.05)

n=201

Clinical Information Network (CIN) data for this hospital indicate approximately 400 SAM admissions annually; a finite population correction was therefore applied.

Finite correction: $N = n_0 / (1 + (n_0 - 1) / N)$

$N = 201 / (1 + (201 - 1) / 400) \approx 134$ children

During the study period every eligible child whose caregiver provided consent was consecutively enrolled, yielding a total of 136 children. Which exceeded the minimum required sample size. All participants were followed prospectively each day until discharge from hospital or death.

Study Variables

Short term outcomes included duration of hospitalization, in-hospital mortality, and weight gain during hospitalisation, expressed in g/kg/day.

Adherence to guidelines

The degree of conformity with the WHO 10 steps protocol for the inpatient management of SAM.

Bias

To minimize selection and information biases, data collectors were trained and used a standardized checklist based on WHO guidelines. As the study was prospective, data were reviewed daily for completeness and consistency. Data collectors were not members of the clinical teams responsible for patient care. Data from hard-copy forms were independently entered into the electronic database and cross-checked for consistency and accuracy.

Data collection procedure

Data were collected by two trained data collectors using an interviewer-administered questionnaire and a structured WHO guideline checklist. The tools were reviewed by five experts comprising three consultant paediatricians, a clinical nutritionist and a biostatistician for content validity. The tools were pretested on 14 children (equivalent to 10% of the calculated sample size) at a comparable facility. These children were not part of the study population and were not included in the final analysis. The questionnaire was administered in both English and Kiswahili to ensure accurate comprehension and standardisation of responses. The questionnaire was used to collect sociodemographic data and to assess outcome of interest which were length of hospitalisation, mortality rate and weight gain during hospitalisation. At the point of discharge or death, a checklist was used to assess adherence to each of the 10 WHO steps. Data entry was checked daily for completeness and accuracy. The data were collected over a three-month period, from 28 October 2024 to 31January 2025.

Data Analysis

Data were collected using KoboCollect (Cambridge, Massachusetts, USA), Statistical analysis was performed using R version 4.4.2 (R Core Team, Vienna, Austria). Descriptive analyses were performed to summarize demographic and clinical characteristics, adherence to each WHO guideline step, and key outcomes. Categorical variables were presented as frequencies and percentages, whereas continuous variables were expressed as means with Standard Deviations (SD) or medians with Interquartile Ranges (IQR), depending on data distribution.

As no validated adherence scoring system exists for inpatient management of SAM, adherence was assessed using a study-specific score based on the 10 WHO treatment guidelines. Each of the 10 WHO steps were scored dichotomously: a step was scored 1 if the full assessment and recommended management (as per WHO protocol) were documented and delivered, and 0 otherwise. Partial implementation (assessment without correct management) was scored 0. The total adherence score ranged 0–10. Good adherence was defined a priori as a total score of ≥ 7 of the 10 steps and complete adherence as fulfilment of all 10 steps. The threshold of 7 was chosen because steps 1-7 constitute the stabilisation phase. Which addresses the life-threatening complications responsible for the majority of early deaths in SAM.[14,23,24] Because step 9 (sensory stimulation) showed uniformly low implementation. A pre-specified sensitivity analysis was conducted.

Inferential analyses examined association between adherence and outcomes. Length of hospital stay was modelled using Poisson regression. Overdispersion was formally assessed and the dispersion parameter did not indicate overdispersion, so the Poisson model was retained. In-hospital mortality was modelled using multivariable logistic regression adjusted for age, sex, oedema status and HIV exposure. Model fit was summarised using the Nagelkerke R^2. Group comparisons used student's t-tests or Mann–Whitney U tests for continuous variables and Chi-square or Fisher's exact tests for categorical variables. Kaplan-Meier survival analysis was used to describe time from admission to in-hospital death, with children discharged alive censored at the date of discharge. Survival between adherence groups was compared using the log-rank test. All tests were two sided and a P value <.05 was considered statistically significant.

Ethical Consideration and Consent to Participate

Ethical approval for the study was obtained from the Jomo Kenyatta University of Agriculture and Technology Research and Ethics Committee (Ref: JKU/214/896B; 20 March 2024), the National Commission for Science Technology and Innovation (Ref: NACOSTI/P/24/34713; 24 April 2024), Nairobi City County Government (Ref: NCCG/HWN/REC/560; 22 May 2024), and Mama Lucy Kibaki Hospital Research Committee (Ref: MLKH/ADM/RES/2; 7 August 2024). The study was conducted in accordance with the declaration of Helsinki.

Written consent was obtained from each caregiver prior to enrolment in the study. The consent process included a clear explanation of the study objectives, procedures, and the voluntary nature of participation. All enrolled caregivers were able to read and understand the consent form in either English or Kiswahili. Provision was made for non-literate caregivers, whereby the consent information would be explained in a language they understood and consent documented by fingerprint in presence of a witness; however, no non-literate caregivers were enrolled in this study. Only caregivers who provided voluntary consent were enrolled. Confidentiality was strictly observed throughout the study, and no incentives or compensation were offered.

RESULTS

Participants

A total of 136 children were enrolled in the study after screening for eligibility.

Socio-Demographic Characteristics

In our study the males were 74 (54.4%) and females were 62 (45.6%). The majority of children 125 (91.9%) were aged below 24 months. Most caregivers had secondary education 79 (58.1%), followed by primary 49 (36.0%) and tertiary education 8 (5.9%) (Table 1).

Clinical Characteristics

Anthropometry: The mean height of children was 71 cm (SD 9), the mean weight was 6.1 kg (SD1.6), the mean Mid-Upper Arm Circumference was 10.7 cm (SD 1). Oedema was present in 15 (11%) of the children. The Weight-for-Height Z-scores (WHZ) revealed that 135 (99.3%) of the children had WHZ below -3 standard deviations. The mean WHZ was -3.12 SD (SD 0.35). The remaining 1 (0.7%) had borderline Z-scores and were enrolled based on other SAM criteria (MUAC and/or oedema).

Presenting symptoms: The most common presenting symptoms were fever by 102 (75%) and diarrhoea 99 (72.8 %). Other notable symptoms included difficulty in breathing 82 (60.3%), vomiting 81 (59.55%), and cough 75 (55.1%). Dehydration status at admission was hypovolaemic shock 29 (21.3%), dehydration without shock in 39 (28.7%) and 51 (37.5%) had no signs of

TABLE 1: Socio-Demographic and Clinical Characteristics of Participants, N=136

Variables	Overall n = 136 (100%)	Non-edematous n = 121 (89%)	Edematous n = 15(11.0%)
Age (months), Median (IQR)	11.0 (8.0; 13.0)	11.0 (8.0; 13.0)	12.0 (9.0; 15.0)
Age category			
<24 months	125 (91.9)	111 (91.7)	14 (93.3)
≥24 months	11 (8.1)	10 (8.3)	1 (6.7)
Sex			
Female	62 (45.6)	54 (44.6)	8 (53,3)
Male	74 (54.4)	67 (55.4)	7 (46.7)
HIV exposed	5(3.6)	5(4.1)	0 (0)
HIV infected	1(0.73)	1(0.8)	0 (0)
Co-morbidities			
Acute gastroenteritis	98 (72)	86 (71)	12 (80)
Pneumonia	99 (73)	91 (75)	8 (53)
Meningitis	31 (23)	26 (21)	5 (33)
Pulmonary TB	14 (10)	13 (11)	1 (6.7)
Rickets	37 (27)	33 (27)	4 (27)
Presenting symptoms			
Diarrhoea	99 (73)	87 (72)	12 (80)
Fever	102 (75)	93 (77)	9 (60)
Convulsion	30 (22)	27 (22)	3 (20)
Difficulty in breathing	82 (60)	76 (63)	6 (40)
Vomiting	81 (60)	71 (59)	10 (67)
Cough	72 (53)	65 (54)	7 (47)
Inability to feed	9 (6.6)	9 (7.4)	0 (0)
Delayed milestones	30 (22)	26 (21)	4 (27)

dehydration while the remaining 17 (12.5%) dehydration status was not documented.

Admission diagnosis: The most common diagnosis on admission was severe pneumonia 99 (72.8%), followed by Acute Gastroenteritis 98 (72.01%), rickets 39 (28.67%), Meningitis 32 (23.52), pulmonary tuberculosis 15 (11%), 5 (3.67%) were HIV exposed and 1 (0.7%) infected.

Coexisting conditions: Most of the patients 108 (79.4%) presented with more than 1 comorbidity. More than one coexisting condition was present in 108 (79.4%) children. The most frequent combination was acute gastroenteritis and pneumonia at 30 (22.1%), followed by acute gastroenteritis with pneumonia and meningitis at 10 (7.4%) and acute gastroenteritis with pneumonia and rickets at 10 (7.4%).

Level of Adherence to WHO Guidelines: The highest level of adherence was observed for Step 5 (treat infections) at 135 (99.3%, 95% CI: 95.4%–100%) followed by Step 8 (achieve catch up growth) at 128 (94.1%, 88.4%–97.2%), closely followed by Step 4 (correct electrolyte imbalance) at 127 (93.4%, 87.4%–96.7%) and Step 7 (initiate feeding) at 127 (93.4%, 87.4%–96.7%). Conversely, Step 9 (Provide sensory stimulation) had the lowest adherence rates at 8 (5.9%, 2.8%–11.6%).

Adherence to Step 1 (prevent and treat hypoglycaemia) was 65 (47.8%, 39.2%-56.5%); although 135 (99.3%) children were assessed for hypoglycaemia, only 65 (47.8%) received the recommended management. Adherence to Step 2 (prevent and treat hypothermia) was 64 (47.1%, 38.5%-55.8%); all children were assessed for hypothermia but only 64 (47.1%) received the recommended management. Adherence to Step 3 (treat dehydration) was 77 (56.6%, 47.9%-65.0%); dehydration was assessed in 119 (87.5%) children and reassessed in 90 (66.2%), but only 77 (56.6%) received the recommended rehydration. Adherence to Step 6 (correct micronutrient deficiencies) was 69 (50.7%, 42.1%-59.4%). Vitamin A was administered only to children with measles; children with clinical signs of vitamin A deficiency did not receive supplementation. Adherence to Step 10 (prepare for follow-up after recovery) was 122 (89.7%, 83.0%-94.0%); all children discharged alive were referred to the nearest outpatient therapeutic programme and supplied with ready-to-use therapeutic food (RUTF).

To further assess overall adherence, an adherence score was calculated per child based on the number of WHO steps fully implemented out of 10. The mean adherence score was 6.8 of 10 steps. Overall, 78 (57.4%, 95% CI 48.6%-65.7%) children received good adherence (≥7 of 10 steps), and all 10 steps were fulfilled in only 4 (2.9%). In the pre-specified sensitivity analysis excluding Step 9 (sensory stimulation), 29 (21.3%) children fulfilled all of the remaining nine steps. Table 2 and Figure 1 presents the level of adherence to each step.

Short-Term Outcomes: The median length of hospitalisation was 10 days (IQR 8-13). Of the participants, 33 (24%) achieved weight gain above 10 g/kg/day, 39 (29%) gained 5–10 g/kg/day and 64 (47%) had weight gain below 5 g/kg/day. The overall mortality rate was 10.3% (14 deaths).

TABLE 2: Adherence to Severe Acute Malnutrition WHO guidelines, N=136

WHO Guideline Step	Adhered (%)	95% CI
Step 1 Hypoglycemia	65 (47.8%)	39.2% - 56.5%
Step 2 Hypothermia	64 (47.1%)	38.5% - 55.8%
Step 3 Dehydration	77 (56.6%)	47.9% - 65%
Step 4 Correct electrolyte imbalance	127 (93.4%)	87.4% - 96.7%
Step 5 Treat infections	135 (99.3%)	95.4% - 100%
Step 6 Correct micronutrient deficiencies	69 (50.7%)	42.1% - 59.4%
Step 7 Begin cautious feeding	127 (93.4%)	87.4% - 96.7%
Step 8 Catch up growth feeding	128 (94.1%)	88.4% - 97.2%
Step 9 Sensory stimulation	8 (5.9%)	2.8% - 11.6%
Step 10 Transfer to outpatient care	122 (89.7%)	83% - 94%

FIGURE 1: Level of Adherence to Each of the 10 Steps in a County Hospital

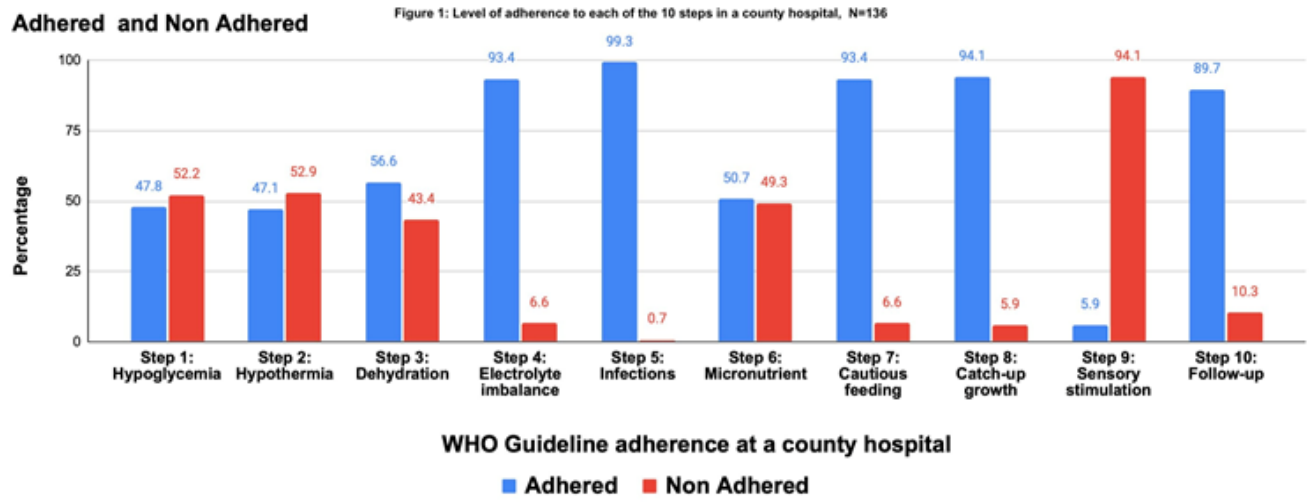


Table 3 summarises short-term outcomes and Figure 2 shows Survival probability.

Association between adherence and short-term outcomes: All 14 in-hospital deaths occurred among children with poor adherence (<7 steps), giving a mortality of 14/58 (24.1%) in this group compared with 0/78 (0%) among children with good adherence (≥7 steps). This association was statistically significant (P <.001).

Median length of stay was significantly shorter for the good adherence group (9 days, IQR 7–11) than for the poor adherence group (11 days, IQR 9–14; P < .001). Mean weight gain was higher in the good adherence group (7.77 g/kg/day, SD 9.48) than in the poor adherence group (4.75 g/kg/day, SD 10.44). Although this difference was not statistically significant (P = .257).

In unadjusted comparisons, mortality among non-oedematous children (n=121) was lower (9.1%) and weight gain higher (mean 6.89 g/kg/day) than among oedematous children (n=15), among whom mortality was 3 (20%) and weight gain lower (mean 3.16 g/kg/day). Children younger than 24 months (n=125) had higher mortality 14 (11.2%) and lower weight gain than those aged ≥24 months (n=11). All of whom survived and demonstrated greater weight recovery (mean 12.45 g/kg/day). HIV-exposed (5) and infected children (n=1) and there were no deaths and mean weight gain (mean 15.61 g/kg/day). This subgroup was too small to support any inference and the finding may reflect chance variation (Table 4).

In the Multivariable Poisson regression model, the

adherence score was the strongest predictor for hospital length of stay. Each unit increase in adherence score was associated with a 9% reduction in length of stay (IRR 0.91, 95% CI: 0.88–0.94, *P*<.001). Children who died during admission had a 22% shorter hospital stay compared to survivors (IRR 0.78, 95% CI: 0.63–0.95, *P*=.013). Age below <24 months, male sex, oedematous status, and weight gain were not significantly associated with length of stay, as all had IRRs close to 1 and non-significant p values (Table 5).

TABLE 3: Short-Term Outcomes, N = 136

Outcome / Category	Frequency (n)	Percentage (%)
Weight Gain		
Poor (<5 g/kg/day)	64	47
Moderate (5–10 g/kg/day)	39	29
Good (>10 g/kg/day)	33	24
Length of Stay		
≤7 days	40	29.4
>7 days	96	70.6
Discharge Outcome		
Alive	122	89.7
Died	14	10.3

Logistic regression analysis for inpatient mortality identified adherence score as the only significant independent predictor. Each unit increase in adherence score was associated with 71% lower odds of death (adjusted OR 0.29, 95% CI: 0.15 -- 0.47, *P*<.001). This estimate describes an association and does not establish causation. Sex, oedematous status and length of hospital stay were not statistically significant, with wide confidence intervals and *P* values above .3. Because only 14 deaths were observed, the number of events per variable was low and the intercept was imprecisely estimated; the model estimates should therefore be interpreted with caution. Table 6 demonstrate logistic regression analysis.

Overall, adherence to WHO severe acute malnutrition management guidelines was suboptimal, particularly for sensory stimulation, hypoglycaemia management, hypothermia management, and micronutrient supplementation. Good adherence was associated with lower mortality and shorter hospital stay, underlining the clinical importance of comprehensive implementation of WHO-recommended care.

TABLE 4: Short-Term Outcomes by Clinical Characteristics and Adherence Categories, N=136

Subgroup	n	Deaths (%)	Median LOS (IQR)	Weight Gain, mean (SD)	Weight Gain, median (IQR)
Edematous	15	3 (20%)	9 (8;12)	3.16 (5.35)	3.3 (0.1;5.82)
Non-edematous	121	11 (9.1%)	10 (8;13)	6.89 (10.34)	5.95 (2.3;10.04)
Age <24 months	125	14 (11.2%)	10 (8;13)	5.96 (9.08)	5.11 (1.89;9.9)
Age ≥24 months	11	0 (0%)	10 (8.5;12)	12.45 (16.66)	7.11 (5.27;7.99)
HIV exposed	5	0 (0%)	9 (9;10)	13.5 (7.56)	11.12 (8.14;16.5)
Adherence: Good (≥7)	78	0 (0%)	9 (7;11)	7.77 (9.48)	5.95 (2.31;10.46)
Adherence: Poor (<7)	58	14 (24.1%)	11 (9;14)	4.75 (10.44)	5.11 (0.44;8.45)

TABLE 5: Association Between Adherence and Hospital Length of Stay: Multivariable Poisson Regression Analysis, N=136

Variable	IRR (95% CI)	*P value*
Intercept	20.24 (15.51–26.31)	<.001
Adherence	0.91 (0.88–0.94)	<.001
Age<24 (vs ≥24 months)	1.04 (0.85–1.26)	.71
Sex: Male (vs Female)	0.92 (0.83–1.03)	.151
Edematous (vs non-edematous)	0.92 (0.77–1.09)	.339
Died (vs Alive)	0.78 (0.63–0.95)	.0132
Weight gain: Moderate (vs Good)	1.09 (0.94–1.26)	.257
Weight gain: Poor (vs Good)	0.98 (0.85–1.12)	.718

FIGURE 2: Survival Probability (Kaplan Meier) N-136

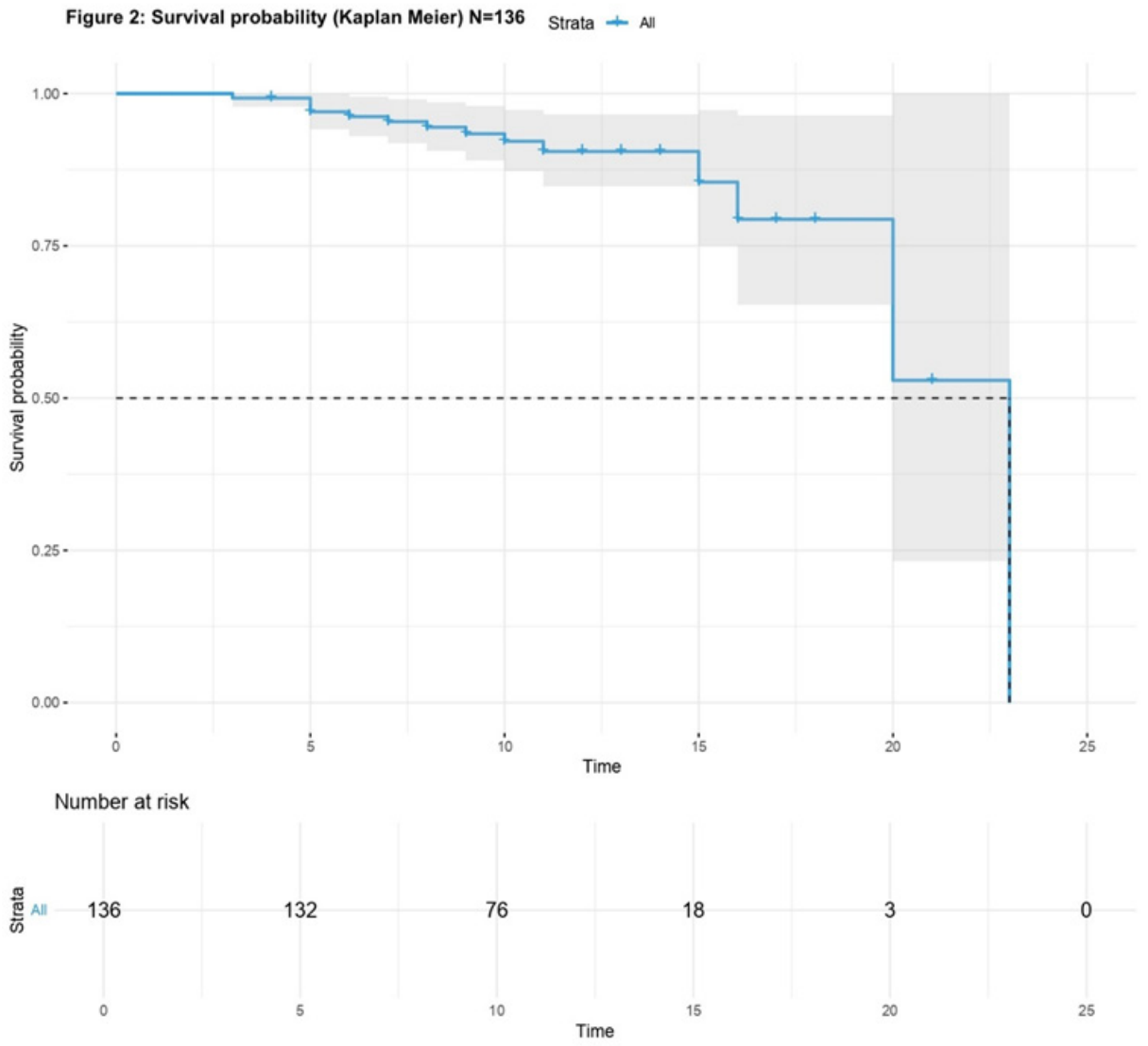


TABLE 6: Association Between Adherence and Inpatient Mortality: Multivariable Logistic Regression Analysis, N=136

Variable	OR (95% CI)	*P value*
Intercept	110.28 (1.38–9673.59)	.029
Adherence	0.29 (0.15–0.47)	<.001
Sex: Male (vs Female)	2.21 (0.45–12.46)	.335
Edematous (vs non-edematous)	0.38 (0.03–2.86)	.393
Moderate (vs Good)	1.18 (0.09–30.33)	.903
Poor (vs Good)	3.3 (0.41–72.46)	.324
Length of Hospital stay	0.91 (0.75–1.08)	.275

DISCUSSION

This prospective cohort study assessed adherence to WHO SAM guidelines and short-term outcomes among 136 children aged 6 to 59 months admitted with SAM at Mama Lucy Kibaki Hospital.

Adherence to WHO SAM management was suboptimal, with 78 (57.6%) children achieving good adherence (≥7 of 10 steps). Adherence was highest for the later steps, including treatment of infection, correction of electrolyte imbalance, cautious initiation of feeding with F-75 therapeutic milk, transition to catch-up feeding, and discharge planning with outpatient follow-up. This pattern likely reflects the strong emphasis these components receive in national guidelines[25] and World Health Organization recommendations, which clearly standardize feeding regimens, antibiotic therapy, and discharge procedures within management protocols.

In contrast, adherence to early stabilisation steps was considerably lower. Management of hypoglycaemia, hypothermia, dehydration, micronutrient supplementation, and sensory or emotional stimulation was suboptimal. Similar gaps have been reported in other low-resource settings. For example, A study done in Garissa Hospital, Kenya, found very low adherence to hypoglycaemia and hypothermia management (14.6% and 5.2%, respectively).[12] Similarly, a study in Sudan reported limited utilisation of intravenous dextrose for hypoglycaemia and suboptimal rehydration.[26] A prospective study in Pakistan also demonstrated poor adherence, noting no use of Rehydration Solution for malnutrition (ReSoMal) despite frequent dehydration cases.[27]

The suboptimal adherence observed in this study is likely to be multifactorial. The paediatric ward operated at an average occupancy of 187%, limited staffing during periods of high patient volume plausibly led clinicians to prioritize immediately lifesaving interventions over structured monitoring, documentation and developmental care. Sensory stimulation (Step 9), which requires dedicated staff time, play materials and designated space was the least frequently adhered to step 8 (5.9%). Other likely contributors include lack of supervision, absence of routine training, unfamiliarity with SAM WHO guideline, lack of clinical audit, intermittent availability of glucometers, thermometers and incomplete documentation of care that was in fact delivered.[13,14,28]

Collectively, these findings indicate persistent challenges in implementing early stabilisation and emergency care components of SAM management across similar settings. While feeding protocols and infection management appear relatively well integrated into clinical practice. There is a critical need to strengthen early life-saving interventions and child psychosocial stimulation to improve overall adherence and clinical outcomes.

The short-term outcomes assessed at Mama Lucy Kibaki Hospital included length of hospital stay, mortality rate and mean weight gain. The in-hospital mortality rate was 10.3 % (14). Which is higher than the WHO benchmark of less than 5% for inpatient SAM care. This study is comparable to reports from other Kenyan settings which demonstrated a case-fatality rate of 6 to 28.6 % across 13 county hospitals and 13.5% in Garissa Hospital. [8,9] Comparable findings have been reported elsewhere in Africa, with case fatality of 8.47 % in Northwest Ethiopia and 26.9% in Vhembe district, South Africa.[29,30] The relatively high case fatality in these studies was attributed to late presentation, comorbidities at admission and poor adherence to the WHO SAM guidelines, which is consistent with this study which showed association between adherence and mortality.[24]

Similar evidence has been reported in Malawi[31] and systemic reviews[13,32], in which failure to manage early complications was associated with increased risk of death.

Although mean weight gain was higher among children managed with good adherence, mean weight gain in the poor adherence group (4.75 g/kg/day) remained below the recommended target of at least 10 g/kg/day. This difference was not statistically significant, which may reflect variation in baseline nutritional status and comorbidity, as well as the limited power of the study to detect a difference in this outcome. Despite this, the observed trend is consistent with existing evidence indicating that strict adherence to treatment protocols improves both survival and nutritional recovery.[33]

Adherence to the WHO SAM management guidelines was associated with improved survival and a shorter median hospital stay. These findings are consistent with evidence from other African settings,[8,28,34] which report that good adherence to treatment protocols is associated with fewer fatal complications through timely and appropriate clinical interventions.

This study reinforces the need to strengthen the implementation of WHO SAM guidelines. Key areas for improvement include routine glucose monitoring, hypothermia prevention, accurate dehydration assessment with appropriate use of ReSoMal. Consistent micronutrient supplementation and structured sensory stimulation. Regular clinical audit, structured supervision and use of standardized checklists could further improve adherence to SAM guidelines.

Strengths and Limitations

The prospective design allowed real-time assessment of adherence and clinical outcomes, reducing the recall bias and incomplete documentation inherent in retrospective record review. All 136 enrolled children were followed daily until discharge or death, and a standardised WHO-based checklist was used throughout, improving consistency of data collection. However, the study had limitations. First, the study was conducted in a single hospital, which may limit generalisability to other healthcare settings. Second, the study focused primarily on quantitative assessment of adherence and did not explore healthcare worker or system-related reasons for poor implementation of specific WHO steps. Third, only short-term inpatient outcomes were evaluated, with no post-discharge follow-up to assess long-term recovery, relapse, or mortality. Fourth, adherence was ascertained from documented care, so interventions that were delivered but not recorded would have been misclassified as non-adherence. Fifth, Steps 8 and 10 can only be completed by children who survive to the rehabilitation and discharge phases, so the total adherence score is not

fully independent of survival. Finally, only 14 deaths were observed, which limited the precision of the regression analyses and precluded adjustment for a larger number of covariates. Future multicentre and qualitative studies are recommended to explore barriers to guideline adherence, assess long-term outcomes, and identify context-specific interventions to improve implementation of the WHO guidelines for the management of severe acute malnutrition.

CONCLUSION

Adherence to the WHO inpatient guidelines for the management of severe acute malnutrition remains suboptimal. Adherence to the critical early stabilisation steps ranged from 47.1% to 56.6%. Good adherence was associated with a shorter hospital stay (median 9 versus 11 days, $P<.001$) and with lower in-hospital mortality (0% versus 24.1%, $P<.001$), and each additional step adhered to was associated with 71% lower odds of death (adjusted OR 0.29, 95% CI 0.15-0.47). The study reaffirms the call for intensified implementation support through capacity-building training, checklists, and real-time audits. Multicentre and qualitative research is recommended to assess long-term outcomes and to explore the reasons for suboptimal adherence.

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