



Wolkite University

We Strive for Wisdom!

**COLLEGE OF MEDICINE AND HEALTH SCIENCE, SCHOOL OF
MEDICINE ,DEPARTMENT OF PEDIATRICS AND CHILD HEALTH**

**TIME TO DISCHARGE AND ITS PREDICTORS AMONG CHILDREN
AGED 6 - 59 MONTHS WITH SEVERE ACUTE MALNUTRITION
ADMITTED TO THE THERAPEUTIC FEEDING CENTER AT
WOLKITE UNIVERSITY SPECIALIZED HOSPITAL INSTITUTION
BASED RETROSPECTIVE FOLLOW-UP STUDY, 2026**

BY

SHEMSU WORKU (PEDIATRICS and CHILD HEALTH , RESIDENT, MD)

FEBRUARY , 2026

WOLKITE, CENTRAL ETHIOPIA

THESIS WAS SUBMITTED TO DEPARTEMENT OF PEDIATRICS AND CHILD HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCE, SCHOOL OF MEDICINE IN PARTIAL FULFILMENT FOR THE REQUIREMENT OF THE SPECIALITY IN PEDIATRICS AND CHILD HEALTH

Name of the investigator	Shemsu Worku (Pediatrics and Child Health Resident, MD) Phone : +251913607988 Email shemsgold4@gmail.com
Name of advisors	1. Dr. Agize A. (PhD in Human Nutrition) Phone:+251911542030 2. Dr. Daniel T.(MD, Assistant Professor in Pediatrics and Child Health) Phone:+251928403745
Title	Time to discharge and its predictors among children aged 6 - 59 months with severe acute malnutrition admitted to the Therapeutic Feeding Center at Wolkite University Specialized Hospital, Institution Based Retrospective follow-up study, 2026
Study period	January 1, 2026 to January 30 , 2026
Study area	Wolkite University Specialized Hospital
Proposed budget	29,700 .00 ETB

APPROVAL SHEET

Submitted by:

Pediatrics and Child Health Candidate

Dr. Shemsu Worku



Feb 20, 2026

Approved by

1. Major advisor

1. Dr. Agize A. (PhD in Human Nutrition)



Date Feb 20, 2026

Co-advisor

1. Dr. Daniel Tulu (MD, Ass. Professor in Pediatrics and Child Health)

Sign



Date Feb 20, 2026

Examiners

1. Dr. Teshome Gensa (BSc, PhD in RH)



Date Feb 20, 2026

2. Dr. Numeri (MD, Ass. Professor in Pediatrics and Child Health)

Sign



Date Feb 20, 2026

Head, Department

Dr. Numeri (MD, Ass. Professor in Pediatrics and Child Health)

Sign



Date Feb 20, 2026

College/Institute Dean

1. Name _____ Sign _____ Date _____

Director, School of Graduate studies

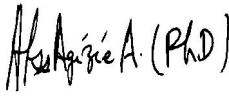
1. Name _____ Sign _____ Date _____

February, 2026

CERTIFICATION SHEET


We hereby certify that we have read and evaluated this Thesis titled "Time to discharge and its predictors among children aged 6 - 59 months with severe acute malnutrition admitted to the Therapeutic Feeding Center at Wolkite University Specialized Hospital, Institution Based Retrospective follow-up study" prepared under our guidance prepared by Dr. Shemsu Worku We recommend that the Thesis shall be submitted as fulfilling the requirements for the award of Certificate of Specialty in Pediatrics and Child Health.

Advisors:

1. Dr. Agize A. (PhD in Human Nutrition)  Date Feb 20, 2026
2. Dr. Daniel Tulu (MD, Ass. Professor in Pediatrics and Child Health)

Sign  Date Feb 20, 2026

As members of the Board of Examiners of the Certificate of Specialty in Pediatrics and Child Health Thesis open defence examination, we have read and evaluated this thesis prepared by Dr. Shemsu Worku , and examined the candidate. We hereby certify that; the thesis is accepted for fulfilling the requirements for the award of the Certificate of Specialty in Pediatrics and Child Health.

1. Dr. Teshome Gensa (BSc, PhD in RH)  Feb 20, 2026
Name Signature Date

2. Dr. Numeri(MD, Ass. Professor in Pediatrics and Child Health)

Name Sign  Date Feb 20, 2026

3. Chairperson Signature Date

DECLARATION

By my signature below, I declare and affirm that this specialty thesis entitled “Time to discharge and its predictors among children aged 6 - 59 months with severe acute malnutrition admitted to the Therapeutic Feeding Center at Wolkite University Specialized Hospital, Institution Based Retrospective follow-up study” is my own work and I declare that this thesis has not been submitted to any other university anywhere for the award of any academic degree and I have cited and referenced all sources and material used in this document.

Name of Investigator

Signature:

Date

Dr. Shemsu Worku



Feb 20,2026

Advisors:

1. Dr. Agize A. (PhD in Human Nutrition)

Sign.



Date Feb 20, 2026

2. Dr. Daniel Tulu (MD, Ass. Professor in Pediatrics and Child Health)

Sign



Date Feb 20, 2026

ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest gratitude to our Almighty creator. My deepest gratitude and heartfelt thanks goes to my advisors **Dr. Agize A. (PhD in Human Nutrition)** and **Dr. Daniel (MD, Assistant Professor in Pediatrics and Child Health)** for their unreserved professional support, technical guidance and advises throughout the process of this thesis development without any reservation. Finally,I would like to acknowledge Wolkite University, CMHS for providing me this golden opportunity to carry out this thesis development task as part of research methodology training and Hospital Administrator and Staffs for their support.

ACRONYMS

AHR	Adjusted Hazard Ratio
CMHS	College of Medicine and Health Science
EDHS	Ethiopia Demographic Health survey
FMOH	Federal Ministry of Health
MUAC	Mid Upper Arm Circumference
OTP	Outpatient Therapeutic Program
ReSoMal	Rehydration Solution for Malnutrition
RUTF	Ready to Use Therapeutic Food
SAM	Severe Acute Malnutrition
SC	Stablization Centers
SPHERE	Social and Public Health Economic Research growth
TFC/TFU	Therapeutic Feeding Center /Unit
WFP	World Food Program
WHO	World Health Organization
WUSH	Wolkite University Specialized Hospital

TABLE OF CONTENTS

APPROVAL SHEET	II
CERTIFICATION SHEET	III
DECLARATION	IV
ACKNOWLEDGEMENT	V
ACRONYMS	VI
LIST OF TABLES	IX
LIST OF FIGURES	X
ABSTRACT	XI
1. INTRODUCTION	1
1.1. Background	1
1.2. Statement of the problem	3
1.3. Significance of the study	5
2. LITERATURE REVIEW	6
2.1 Global burden of severe acute malnutrition	6
2.2 Ethiopian situation	6
2.3 Recovery time from SAM and Predictors in therapeutic programs (TFU)	6
3. OBJECTIVES	10
3.1. General objective	10
3.2. Specific objectives	10
4. METHODS	11
4.1. Study area	11
4.2. Study design	11
4.3. Study period	11
4.4. Source and study population	11
4.4.1. Source population	11
4.4.2. Study population	11
4.5. Eligibility criteria	12
4.5.1. Inclusion criteria	12
4.5.2. Exclusion criteria	12
4.6. Sample size and sampling procedure	12

4.6.1. Sample size determination	12
4.6.2 Sampling procedure	14
4.7. Variables of study	14
4.7.1. Independent variables	14
4.7.2. Dependent variable	14
4.8. Operational definitions	15
4.9. Data collection	15
4.9.1. Instrument and Data collectors	15
4.9.2. Data quality control	15
4.10. Data processing and analysis	16
4.11. Ethical consideration	16
4.12. Dissemination of the result	16
5.RESULTS	17
5.1 Socio-demographic and anthropometric characteristics of children with SAM	17
5.2 Medical complications and comorbidities	18
5.3 Treatment details and outcomes	19
5.4 Comparison of time to discharge from inpatient treatment facility among different groups (the KM survival curve)	22
5.5 Predictors of time to discharge from stabilization centers	25
6. DISCUSSION	27
7. LIMITATION OF THE STUDY	30
8. CONCLUSION	31
8.1 Recommendations	31
9. REFFERENCES	32
10. ANEXE-1	37

LIST OF TABLES

Table 1 Sample size determination for the assessment of time to discharge and its predictors among children aged 6 - 59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital ,Wolkite, Central Ethiopia, 2025.	13
Table 2 Socio-demographic and anthropometric characteristics of children with severe acute malnutrition aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	17
Table 3 Medical Complications and Comorbidities of children with severe acute malnutrition aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	18
Table 4 Treatment - related and follow up characteristics of children with SAM aged6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	20
Table 5 Life table analysis children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	22
Table 6 Multivariable cox-regression analysis predictors of time to discharge from SC among children with SAM aged 6–59 months old admitted at WUSH from June 1, 2020 - May 31,2025.	26

LIST OF FIGURES

Figure 1 Conceptual frame work of predictors for time to discharge from Stablization center associated with patient’s outcome among children aged 6 - 59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital ,Wolkite, Central Ethiopia, 2025.	9
Figure 2 Treatment outcomes of SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	21
Figure 3 Distribution of length of hospital stay of children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	21
Figure 4 Kaplan-Meier survival function estimates children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	23
Figure 5 Log-Rank estimates with and without hospital acquired infections among children with SAM aged 6–59 months old admitted at WUSH from June 1, 2020 - May 31,2025.	23
Figure 6 Log-Rank estimates with vaccination status among children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	24
Figure 7 Log-Rank estimates with and without dehydration among children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.	24

ABSTRACT

BACKGROUND: Under nutrition is a major public health concern, especially in low-income settings. It includes wasting and nutritional edema, stunting and underweight and micronutrient deficiency. Undernourished children, particularly those with severe acute malnutrition, have a higher risk of death from common childhood illness. Children with severe acute malnutrition have a nine-fold risk of mortality compared to well-nourished children hence the need for appropriate management. While the treatment of severe acute malnutrition is well established, achieving desired outcomes has proven to be challenging.

OBJECTIVES: To assess the time to discharge and its predictors among children aged 6 - 59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital (WUSH) ,Wolkite, Central Ethiopia from June 1, 2020 - May 31,2025.

METHOD: Institution-based retrospective follow-up study was conducted in Wolkite University Specialized Hospital among children aged 6 - 59 months admitted to inpatient Therapeutic Feeding Center from June 1, 2020 - May 31, 2025. Participants were selected using computer generated random numbers. Time to discharge from inpatient treatment was estimated using Kaplan-Meier procedure and Log rank test was used to test observed difference between covariates. Multivariate Cox proportional hazard regression analysis model was used to identify predictor of time to discharge.

RESULTS: The discharge rate was 75.8% and the median time to discharge from stabilization center was 14.00 days with 95%: CI (13.35,14.65). Children who were transferred-in from other health facilities and return from default, Hospital acquired infections, presence of dehydration and who had vaccinated fully were predictors of time to discharge from stabilization center.

CONCLUSIONS: The median time to discharge and the discharge rate from stabilization center were within the SPHERE of standards. Transferred-in from other facilities ,return from default , Hospital acquired infections , dehydration were significant predictors of time to discharge.

Key words: Time to discharge, severe acute malnutrition, recovery

1. INTRODUCTION

1.1. Background

Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. It encompasses over nutrition, which manifests as overweight or obesity; under nutrition and micronutrient deficiencies (1). Under nutrition is a major public health concern, especially in low-income settings. It includes wasting (low weight-for-height) and nutritional edema, stunting (low height-for-age) and underweight (low weight-for-age) and micronutrient deficiency (2). Severe acute malnutrition is defined as severe wasting and/or bilateral edema. Severe wasting is extreme thinness diagnosed by a weight-for-length (or height) < -3 SD of the WHO Child Growth Standards. In children ages 6-59 months, a mid-upper arm circumference < 115 mm also denotes severe acute malnutrition (3).

Globally in 2022, an estimated 148 million children under 5 years of age were affected by stunting and 45 million were affected by wasting; an estimated 13.7 million infants and children under 5 years had severe wasting and the remainder had moderate wasting, revealing the vast extent of undernutrition among the youngest population (4). Undernourished children, particularly those with severe acute malnutrition, have a higher risk of death from common childhood illness such as diarrhea, pneumonia and malaria. Nutrition-related factors contribute to about 45% of deaths in children under 5 years of age (5).

Based on the 2024-25 Ethiopia Demographic Health survey (EDHS), 5% of children under five are wasted and 1% of these severely wasted (6). Children with severe acute malnutrition (SAM) have a nine-fold risk of mortality compared to well-nourished children hence the need for appropriate management (7). The pooled mortality rate among under-five children with SAM admitted to TFUs in Ethiopia was 8.32 per 1000 person-days of observation (8).

As per the international sphere standard recommendation, the recovery time of children admitted to stabilization center should be less than one month but there is a significant difference in recovery time from stabilization center among the studies (9). The study conducted in Kamba District, Karat and Fasha stabilization Centers, public Hospitals in Addis Ababa and Debre Tabor Comprehensive Specialized Hospital reported that 50, 26, 16 and 15 days respectively

(10-13). Similar studies conducted at Felegehiwot Referral Hospital, Dubti Referral Hospital, Yekatit 12 Hospital, and Hiwot Fana Hospital showed the average recovery time estimated 16, 21, 15 and 17 days respectively (14-17).

While the treatment of severe acute malnutrition (SAM) is well established, achieving desired outcomes has proven to be challenging. As far as the investigator's knowledge is concerned, there is no study had been conducted in study area regarding time to discharge from inpatient therapeutic feeding center. Therefore, this study aimed to determine the time to discharge from stabilization centers and its predictors among children aged 6–59 months with severe acute malnutrition.

1.2. Statement of the problem

Severe Acute Malnutrition (SAM) remains a significant global health challenge, particularly among children aged 6 to 59 months, contributing substantially to morbidity, mortality, and long-term developmental impairment particularly in low-income settings, like Ethiopia (18). While standardized protocols for SAM management exist and are expected to lead to timely recovery, the actual duration of recovery often varies significantly. This unpredictability can lead to prolonged hospital stays, which in turns significantly impacts both the children and their families, affecting development, mental health, family dynamics , and economic stability (7).

Severely acute malnourished patients are admitted for a period of weeks or longer and caregivers are required to stay with their malnourished children for that period in the centers. Hospital stays lasting for weeks are disruptive for both child and mother and for families as well, especially when the mother is essential for economic survival of the household (20-22). Furthermore, in a hospital setting where SAM patients are managed alongside children with infectious disease, a longer stay increases the risk of hospital-acquired infections and in-hospital mortality (19-24).

Another devastating outcome of a longer duration of SAM is the long-term impact of SAM on nervous system development. Studies have revealed that prolonged starvation in infants and children results in clinical neurological deficits, including learning deficits and behavioral problems (25,26). The impact of long-term hospitalization of under-5 children extends beyond the children themselves. A cohort study in Italy found that hospitalization of children for over 16 days produced a significant increase in stress among mothers or caregivers compared to shorter hospitalizations (27). A cohort study in Malawi examined found significant correlations between markers of infection and length of hospitalization (28). Another longitudinal study conducted at tertiary hospital in Ethiopia found that hospital-acquired infection was associated with prolonged hospitalization and a higher risk of in-hospital mortality (29).

Several retrospective cohort studies have been conducted in different regions of Ethiopia to investigate recovery time of under-5 children from SAM. The estimated average recovery rate ranged from 43.6% at Ayder Referral Hospital to 83.0% at Wolisso St. Luke Catholic Hospital with a median recovery time ranging from 10.00 days at Dilchora Referral Hospital to 21.56 days at Ayder Referral Hospital (30-33). Moreover an institutional based retrospective cohort

study conducted on 650 inpatient children admitted with SAM at Dubti Referral Hospital, Eastern Ethiopia indicated that the average recovery time from SAM was 21 days (15). Similar study conducted among 423 under-five children with SAM admitted to Yekatit 12 Hospital, in Addis Ababa had shown 81.3% nutritional recovery rate and 15.00 days median recovery time (16).

Specifically, at Wolkite University Specialized Hospital, there is a lack of localized data on the precise time to discharge from inpatient treatment facility and the specific clinical and demographic factors influencing this duration. Therefore, the purpose of this study was to assess the time to discharge and its predictors among children aged 6 - 59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital (WUSH), Wolkite, Central Ethiopia from June 1, 2020 - May 31, 2025.

1.3. Significance of the study

For Patient Care - The results of this study will help to optimizing patient management, and enhancing the quality of care and survival outcomes for children suffering from SAM.

For the Hospital - The study can provide Hospital-specific length of stay data for benchmarking and identify modifiable predictors and it will help to improve resource utilization effectively and efficiently.

For researcher - Furthermore, it will be used as a source of baseline information for future researchers and scholars.

2. LITERATURE REVIEW

2.1 Global burden of severe acute malnutrition

Severe malnutrition is one of the common causes of morbidity and mortality among children under the age of 5 years worldwide. Combating malnutrition in all its forms is one of the greatest global health challenges. More than half of the world's undernourished were found in Asia, and more than one third were found in Africa (5). Even though severe acute malnutrition is preventable cause of under-five children mortality and morbidity, children with SAM were nine times more likely to die compared to their counterparts (34).

2.2 Ethiopian situation

Ethiopia has made substantial progress in reducing the prevalence of malnutrition in the past two decades . However childhood under nutrition remains a major challenge. Based on the 2024-25 Ethiopian Demographic Health Survey (EDHS) report, Ethiopia has the region's highest rate of acute malnutrition, with 5% of under-5 children identified as wasted. Additionally, Ethiopia has one of the highest under-5 child mortality rates in the region, with malnutrition underlying 28% of all child deaths (35).

Severe acute malnutrition still contributes significantly to inpatient morbidity and mortality in Ethiopian hospitals. In a systematic review and meta-analysis of 15 studies done to estimate the mortality rate and identify its predictors among under-five children with severe acute malnutrition (SAM) admitted to therapeutic feeding units (TFUs) in Ethiopia, the pooled mortality rate was 8.32 per 1000 person-days of observation without changed over time. HIV infection , tuberculosis , intravenous fluid use , altered body temperature , impaired consciousness , not receiving F-100 supplementation , shock , and nasogastric tube feeding were predictors of mortality (8).

2.3 Recovery time from SAM and Predictors in therapeutic programs (TFU)

Severe acute malnutrition is a considerable contributor to child mortality and morbidity so understanding the factors that influence recovery time is essential for improving the efficiency and effectiveness of therapeutic feeding programs (36).

Multiple institution- based studies have been conducted in sub-saharan Africa to identify predictors time to recover from severe acute malnutrition. A retrospective cross sectional quantitative review of data recorded in six CMAM stabilization centres registers in four Local Government Areas, Katsina state, Nigeria were reviewed. The study showed that marasmus was the most common form of severe acute malnutrition (86%). Overall, the outcomes met the minimum sphere standards for inpatient management of SAM. Children with edematous SAM (13.9%) had the lowest survival rate on Kaplan–Meier graph. The mortality rate was significantly higher during the ‘lean season’- May to August. MUAC at Exit , marasmus , transfers from OTP and average weight gain were found to be significant predictors of time-to-recovery (37). Similar study conducted on 317 patients’ records at Lacor Hospital and Gulu Regional Referral Hospital (GRRH) in Uganda indicated the average length of stay (LOS) was 14 days in (GRRH) and (Lacor). Human Immunodeficiency Virus (HIV) status, blood transfusion, type of SAM, treatment provision at admission, antibiotics, mid-upper arm circumference (MUAC), and the time of treatment initiation from admission were factors significantly associated with case fatality rate (38). Another retrospective chart review was performed on 348 patients who were enrolled in the outpatient care of the Tamale Teaching Hospital in Tamale, Ghana , Controlling for other factors, patients who completed the treatment plan had 3.2 times higher probability of recovery from severe acute malnutrition (SAM) as compared to patients who defaulted. The children aged 24–59 months had 5.8 times higher probability of recovery from SAM as compared to children aged 6–11 months . Children who were diagnosed as having marasmus on admission stayed longer before recovery than their kwashiorkor counterparts (39).

Moreover hospital based retrospective follow up study which was conducted on 282 children aged 1-60 months in Gondar University Hospital indicated the median time to discharge was 13 days and the incidence of discharge was found to be 6.4 per 100 person- day observations. Kwash-dermatosis , Anemia , pneumonia at admission and Hospital acquired infection were predictors of time to discharge (40). Furthermore a five years retrospective follow-up study design was employed among 454 children admitted with SAM in Asosa general hospital, Northwest Ethiopia , 65.4% of them were recovered at the end of the follow-up with a median recovery time of 15 days. The incidence rate of recovery was 5.28 per 100 child days’

observations. Being HIV Negative , Marasmic , and marasmic-kwashiorkor child independently predicted recovery time (41).

Additionally an institutional-based retrospective cohort study was conducted on 420 randomly selected children aged 6-59 months diagnosed SAM admitted to a stabilizing center in Hawassa University Comprehensive Specialized Hospital , Southern Ethiopia. The study had shown 69.3% of the children recovered and 10.8% died after 59 days treatment . The overall incidence density rate of recovery was 3.8 per 100 person-days and the overall median time of recovery was 17 days. F-100 intake , Tuberculosis infection and provision of special medication (IV fluid, IV antibiotic and blood transfusion) at admission were found to be significant predictors of time-to-recovery from SAM. (42).

In general, the recommended length of stay at inpatient therapeutic feeding centers is 7–10 days, and for some children who can't tolerate ready-to-use therapeutic feeding, they will continue their treatment in the inpatient feeding center with the maximum recommended stay of 60 days (7). As per the international sphere standard recommendation, the recovery time of children admitted to stabilization center should be less than one month (9).

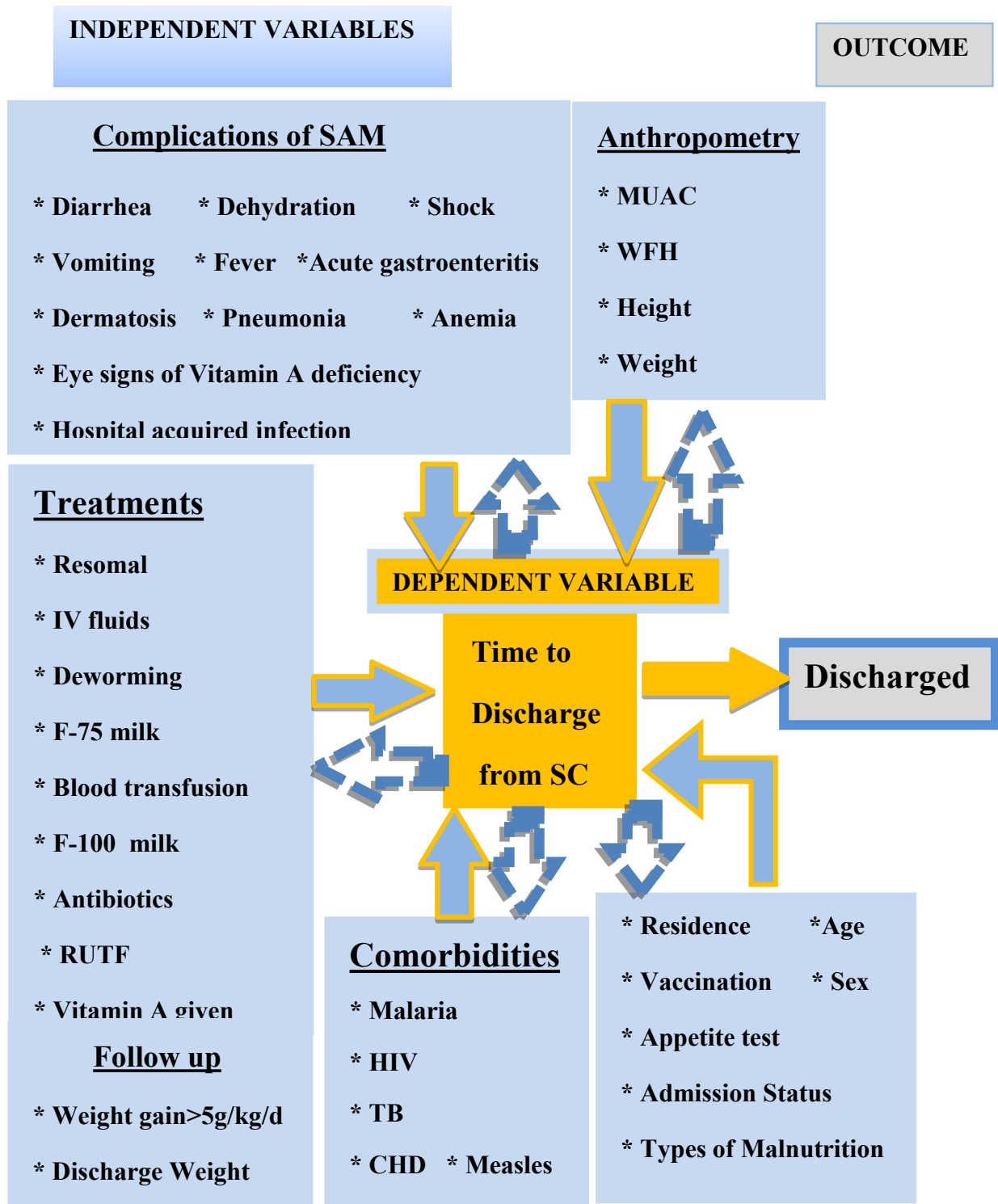


Figure 1 Conceptual frame work of predictors for time to discharge from Stablization center associated with patient’s outcome among children aged 6 - 59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital ,Wolkite, Central Ethiopia, 2025.

3. OBJECTIVES

3.1. General objective

To assess the time to discharge and its predictors among children aged 6 - 59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital (WUSH) ,Wolkite, Central Ethiopia from June 1, 2020 - May 31,2025.

3.2. Specific objectives

- ✓ To determine the discharge rate among children aged 6-59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital.
- ✓ To determine the average time to discharge among children aged 6-59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital.
- ✓ To identify factors associated with discharge time among children aged 6-59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital.

4. METHODS

4.1. Study area

The study was conducted in Wolkite University Specialized Hospital pediatric and child health department. Which is located in Gubre sub-city in wolkite town, Guraghe Zone , Central Ethiopia Region.It is found at a distance of 170 km from Addis Ababa, capital of Ethiopia and 12 km from wolkite town along the road to Butajira .The hospital delivers health service for about 4 million catchment population living in Guraghe Zone and neighbouring Yem Zone and Kebena special Woreda both in inpatient and outpatient departments.The hospital has four major wards; internal medicine, pediatrics, obstetrics and gynecology, surgery and also orthopedics, ophthalmology, psychiatry and dentistry units. There is a separate ward for children with SAM having 12 beds. Admission, treatment and discharge of patients with SAM is practiced according to the National Guideline for treatment of SAM 2019 (7).

4.2. Study design

Institution-based retrospective follow-up study was conducted among children aged 6 - 59 months with severe acute malnutrition admitted to the therapeutic feeding center at Wolkite University Specialized Hospital for the last five years (June 1, 2020 and May 31,2025).

4.3. Study period

The study was conducted from January, 1 to January 30, 2026.

4.4. Source and study population

4.4.1. Source population

All pediatric patients aged 6 to 59 months who had been admitted and treated at therapeutic feeding unit of Wolkite University Specialized Hospital was the source population.

4.4.2. Study population

All pediatric patients aged 6 to 59 months who had been admitted and treated at therapeutic feeding unit of Wolkite University Specialized Hospital between June 1,2020 and May 31,2025 were the study populations.

4.5. Eligibility criteria

4.5.1. Inclusion criteria

All records of children aged 6-59 months with severe acute malnutrition (SAM) documented in the therapeutic feeding unit logbook at WUSH from June 1, 2020 - May 31, 2025 were included in this study.

4.5.2. Exclusion criteria

Records with incomplete baseline information such as treatment outcomes, unknown admission dates, or discharge dates and lost charts were excluded from this study.

4.6. Sample size and sampling procedure

4.6.1. Sample size determination

- The sample size in this study was determined using a single population proportion formula to assess the first objective:

$$n = (Z_{\alpha/2})^2 p (1-p) / d^2$$

n = the desired sample size

Z = Standard normal variable at 95% confidence level (1.96)

d = Margin of error (0.05)

p = is an estimate of the recovery rate (assumed to be 69.3%). This value was obtained from a retrospective study in Hawassa, since that study took place near Wolkite and was conducted recently (2019), and since the choice of this value resulted in a larger sample size (42).

$$n = (1.96)^2 (0.693)(0.307) / (0.05)^2$$

n = 327 (The largest sample size was calculated and selected). After addition of 10% to the sample size to account for missing and incomplete data, the final sample size was 360 children aged 6-59 months with SAM.

- Single population proportion formula was used to determine sample size to assess the second objective.

$$n = (Z_{\alpha/2})^2 p (1-p) / d^2$$

n = the desired sample size

Z = Standard normal variable at 95% confidence level (1.96)

d = Margin of error (0.05)

p = is the proportion of children discharged before the average time assumed to be (71%).

This value was obtained from a retrospective study in Hawassa, since that study took place near Wolkite and was conducted recently (2019), and since the choice of this value resulted in a larger sample size (42).

$$n = (1.96)^2 (0.71)(0.29) / (0.05)^2$$

n = 317. After addition of 10% to the sample size to account for missing and incomplete data, the final sample size was 349.

- Sample size was calculated based on sample size estimation for survival analysis under cox to assess the third objective using Statistical software STATA version 14.0 taking the following assumptions with addition of 10% to account for incomplete and missing data (Table 1). These values were obtained from a retrospective study in Yekatit12 Hospital , since the study was done near Wolkite and was conducted recently (2020), and these values resulted in a larger sample size (16).

Table 1 Sample size determination for the assessment of time to discharge and its predictors among children aged 6 - 59 months with SAM admitted to the therapeutic feeding center at Wolkite University Specialized Hospital ,Wolkite, Central Ethiopia, 2025.

Objective	Assumptions	Predictors	AHR	Sample size
	Power 90%	Vaccination status	1.64	119
	$\alpha = 0.05$			
Third	P event = 0.81	Daily wt. gain > 5g/kg/day	2.16	60
	10% Withdrawal			

4.6.2 Sampling procedure

A computer generated random numbers (OpenEpi version 3) was used to recruit SAM cases, which were identified using the TFU register book and client cards for individuals enrolled in study period.

4.7. Variables of study

4.7.1. Independent variables

* Age	* Shock	* F-75 milk
* Sex	* Vomiting	* Blood transfusion
* Residence	* Fever	* F-100 milk
* Admission Status	* Anemia	* Antibiotics
* Height	* Dermatitis	* RUTF
* Weight	* Pneumonia	* Vitamin A given
* Vaccination	* Acute gastroenteritis	* Weight gain > 5g/kg/d
* WFH	* Hospital acquired infection	* Discharge Weight
* MUAC	* Eye signs of Vitamin A deficiency	* Malaria
* Types of Malnutrition	* Resomal	* HIV
* Appetite test	* IV fluids	* TB
* Diarrhea	* Deworming	* CHD
* Dehydration		* Measles

4.7.2. Dependent variable

The dependent variable of this study was the time to discharge from stabilization center. The time was defined as the duration between the time children were diagnosed with SAM to the time the child discharged from stabilization center and it was estimated in days.

4.8. Operational definitions

Died: Dies while receiving treatment in SC (7).

Defaulted: Absent for two consecutive days (7).

Discharge (Recovery): Patients receiving treatment in SC and the complications treated and patients stabilized with no medical complication and able to continue treatment on OTP.

Transfer out: Moved to another facility for further medical care or moved out to receive care in another SC (7).

Censored : Refers to those who were defaulted from treatment, transferred out, and those who were died while on treatment.

Survival: is being alive and not experiencing SAM related death during hospitalization period.

Length of stay: The number of days the child stayed in the hospital from the admission until an event of interest occurred

Comorbidity: A medical condition apart from SAM and its complication which was detected at admission or during hospital stay.

4.9. Data collection

4.9.1. Instrument and Data collectors

Data were collected from medical records by using a structured data abstraction form .The data abstraction form was adopted from the Ethiopian SAM management protocol (7).The data were collected by two BSC Nurses and two days of training were given for the data collectors.

4.9.2. Data quality control

Prior to the actual data collection, two days of training was given to the data collectors on the purpose and methods of data collection.The pre-test was conducted at Atat Primary Hospital on 5% of sample population prior to the actual data collection in order to see the clarity of the data collection tool.

The completeness of the data was reviewed daily throughout the process. Additionally, daily meetings and supervision sessions were arranged to address any challenges encountered during data collection.

4.10. Data processing and analysis

The data were cleaned, coded and entered using Epidata version 4.1 and were exported to SPSS version 27 for statistical analysis. Descriptive analysis was reported using graphs and frequency tables. Time to discharge from inpatient TFC was estimated using Kaplan-Meier procedure and then Log rank test was used to test whether the observed difference between different groups of predictor variables were significant or not. Multivariate Cox proportional hazard regression analysis was carried out to identify predictor variables. Variables having a P-value < 0.2 during binary variable Cox proportional hazard regression analysis was entered into multivariate analysis. P value < 0.05 was considered as statistically significant. Adjusted Hazard Ratio (AHR) with 95% confidence interval (CI) was used to show the strength of association.

4.11. Ethical consideration

Ethical clearance and official letter of cooperation was taken from Wolkite University College of medicine and health science. The confidentiality of all the data were assured.

4.12. Dissemination of the result

The finding of the study will be provided to Wolkite University College of medicine and health science department of pediatrics and child health, to update the information's and make use for intervention and further study.

5.RESULTS

5.1 Socio-demographic and anthropometric characteristics of children with SAM

Of 401 children with severe acute malnutrition aged 6–59 months old charts were reviewed admitted to TFU of WUSH from June 1, 2020 - May 31,2025 360 of the charts were included in this study. In the cohort, there were 236 (65.6 %) males, and more than two-thirds (n=244 ;67.8 %) were within the age range of 6 to 12 months. Similarly,157 (43.6 %) of children were vaccinated partially and 131 (36.4%) were vaccinated fully for their age .Among children enrolled in the study, 283 (78.6 %) and 319 (88.6%) were new admissions and diagnosed with non edematous severe acute malnutrition respectively. Regarding residential areas 232 (64.4%) were from rural areas (Table 2).

Table 2 Socio-demographic and anthropometric characteristics of children with severe acute malnutrition aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.

Variables	Categories	Frequency	Percent (%)
Age	6 -12 months	244	67.8
	24 - 59 months	74	20.6
	13 - 23 months	42	11.7
Sex	Male	236	65.6
	Female	124	34.4
Residence	Rural	232	64.4
	urban	128	35.6
Admission status	New	283	78.6
	Transfer in	40	11.1
	Return from default	19	5.3
	Readmission	18	5.0
Types of Malnutrition	Non edematous	319	88.6
	Edematous	41	11.4
Vaccination status	Partially vaccinated	157	43.6
	Fully vaccinated	131	36.4
	Not vaccinated	72	20.0

5.2 Medical complications and comorbidities

Among children included in this study 61 (16.9%) had at least one comorbidity (CHD, malaria, TB or measles) and the most common complications were acute gastroenteritis (18.4%), Diarrhea (15.9%), Dehydration (15.7%), Vomiting (13.2%) and Anemia (11.5%) (Table 3).

Table 3 Medical Complications and Comorbidities of children with severe acute malnutrition aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31, 2025.

Variables	Categories	Frequency	Percent (%)
Acute Gastroenteritis	Yes	307	85.3
	No	53	14.7
Diarrhea	Yes	266	73.9
	No	94	26.1
Vomiting	Yes	220	61.1
	No	140	38.9
Dehydration	Yes	262	72.8
	No	98	27.2
Shock	No	340	94.4
	Yes	20	5.6
Fever	No	230	63.9
	Yes	130	36.1
Pneumonia	No	216	60.0
	Yes	144	40.0
Hospital Acquired Infections	No	319	88.6
	Yes	41	11.4
HIV	Not documented	232	64.4
	Negative	128	35.6
	Yes	2	0.5
TB	No	186	51.7
	Not documented	172	47.8
Congenital heart disease	No	350	97.2
	Yes	10	2.8

Continued ...			
Malaria	No	316	87.8
	Yes	44	12.2
Measels	No	355	98.6
	Yes	5	1.4
Anemia	Yes	192	53.3
	No	168	46.7
Dermatosis	No	336	93.3
	grade 2	13	3.6
	grade 3	8	2.2
	grade 1	3	0.8
Eye signs of Vit A deficiency	No	358	99.4
	Yes	2	0.6
Appetite test	Not Done	337	93.6
	Failed	23	6.4

5.3 Treatment details and outcomes

Regarding administration of routine medications , the most commonly prescribed medications and therapeutic feeding were IV Antibiotics (22.8%), F-75 formula milk (22.6%), ReSoMal (20.3%) and RUTF (19.9%) respectively. Regarding deworming 60 (16.7%) of eligible children age (>2yrs) were treated but 292 (81.1%) were not eligible (Table 4). Among 360 records of children with the diagnosis of severe acute malnutrition included in the study 273 (75.8 %) were discharged from inpatient treatment facility and 87 (24.2%) were censored (defaulted, transfer out or died) (Figure 2). The average duration of stay in the therapeutic feeding centers was 14.46 SD (± 8.45) days (Figure 3).

Table 4 Treatment - related and follow up characteristics of children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31, 2025.

Variables	Category	Frequency	Percent (%)
Vitamin A given	No	349	96.9
	Yes	11	3.1
	Not applicable	292	81.1
Deworming	Yes	60	16.7
	No	8	2.2
IV Antibiotics given	Yes	358	99.4
	No	2	0.6
F-75 formula milk given	Yes	356	98.9
	No	4	1.1
F-100 formula milk given	No	330	91.7
	Yes	30	8.3
Resomal given	Yes	320	88.9
	No	40	11.1
IV fluids administered	No	345	95.8
	Yes	15	4.2
Blood transfused	No	345	95.8
	Yes	15	4.2
RUTF provision	Yes	313	86.9
	No	47	13.1
Fail to gain $\geq 5\text{g/kg/day}$ for 03 successive days while on F100/RUTF	No	265	73.6
	Yes	95	26.4

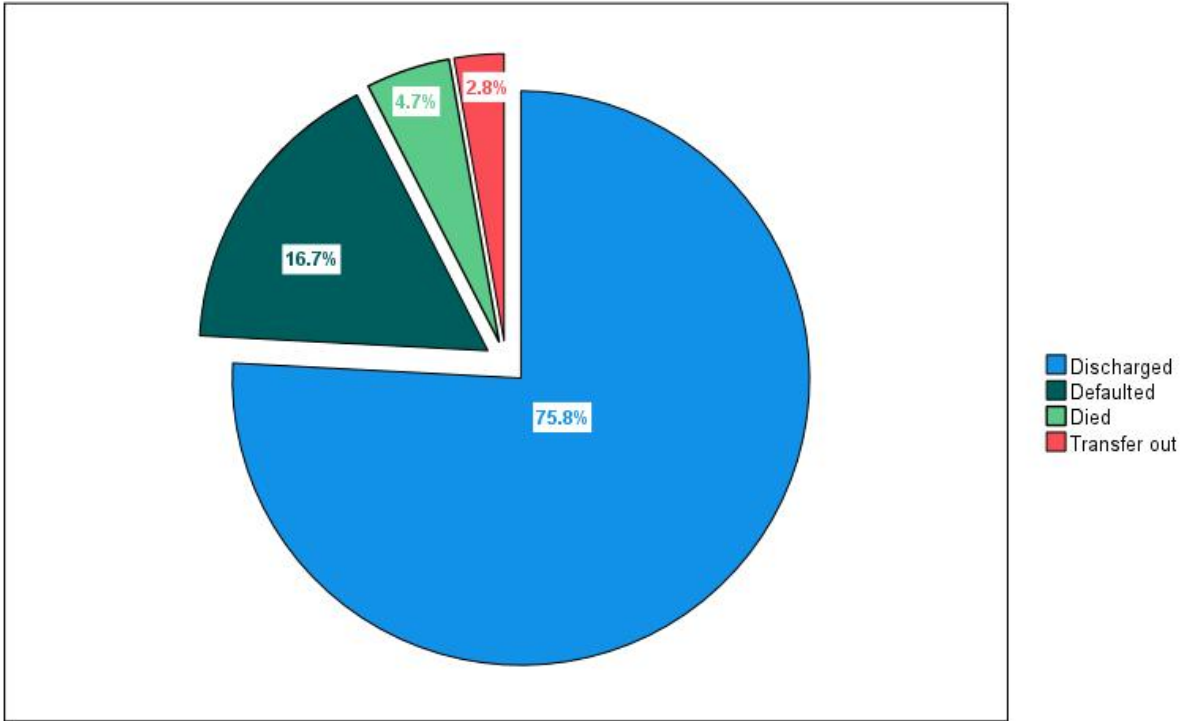


Figure 2 Treatment outcomes of SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.

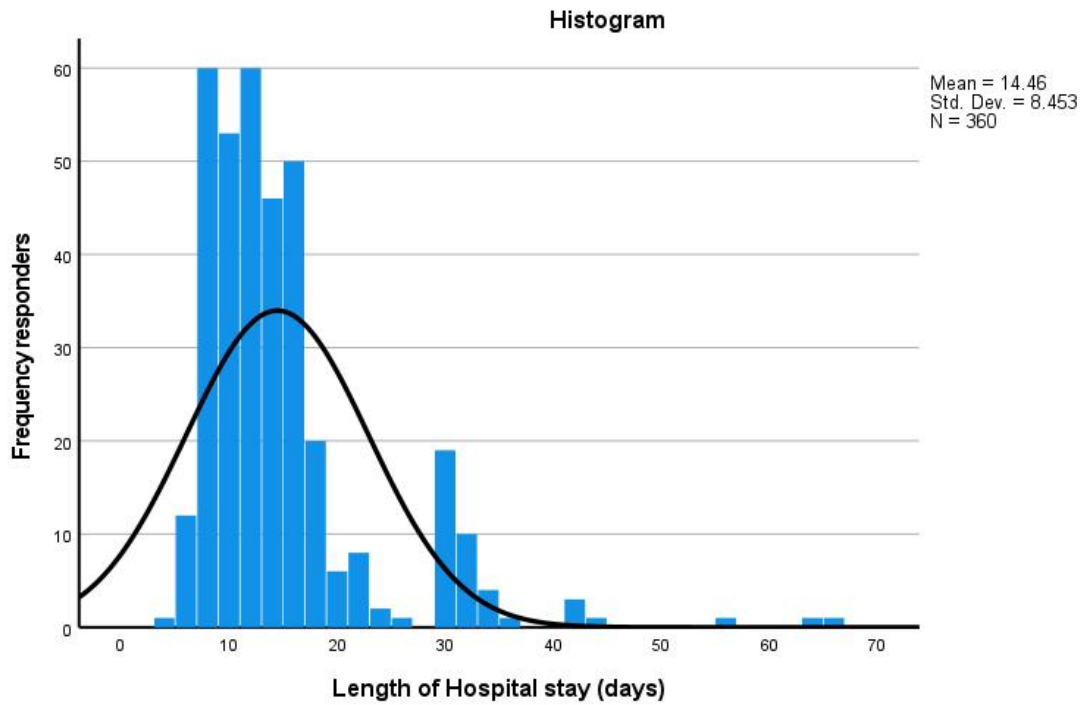


Figure 3 Distribution of length of hospital stay of children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.

5.4 Comparison of time to discharge from inpatient treatment facility among different groups (the KM survival curve)

The survival table showed that approximately 72% ,82% and 97% of children were discharged from inpatient treatment facility by the end of 12th , 18th and 30th days respectively(Table 5). The overall Kaplan-Meier curve illustrates that the median time to discharge from stabilization center for children admitted to TFU of WUSH was 14.00 days with 95%: CI (13.35,14.65). The overall mean discharge time from stabilization center for this study was 14.58 days with 95%:CI (1.58,16.40) (Figure 4). The study also revealed that children who had hospital acquired infections, dehydration, those who return from default and transfer -in from other health facilities were found to be discharged later than their counterparts. However, children who were vaccinated fully for their age were discharged faster compared to their counterparts (Figures 5-7).

Table 5 Life table analysis children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.

Interval Start Time	Number Entering Interval	Number Withdrawing during Interval	Number Exposed to Risk	Number of Terminal Events	Proportion Terminating	Proportion Surviving	Cumulative Proportion Surviving at End of Interval
0	360	10	355.000	0	0.00	1.00	1.00
6	350	56	322.000	93	0.29	0.71	0.71
12	201	16	193.000	117	0.61	0.39	0.28
18	68	0	68.000	25	0.37	0.63	0.18
24	43	1	42.500	14	0.33	0.67	0.12
30	28	1	27.500	20	0.73	0.27	0.03
36	7	0	7.000	1	0.14	0.86	0.03
42	6	1	5.500	2	0.36	0.64	0.02
48	3	0	3.000	0	0.00	1.00	0.02
54	3	0	3.000	1	0.33	0.67	0.01
60	2	1	1.500	0	0.00	1.00	0.01
66	1	1	.500	0	0.00	1.00	0.01

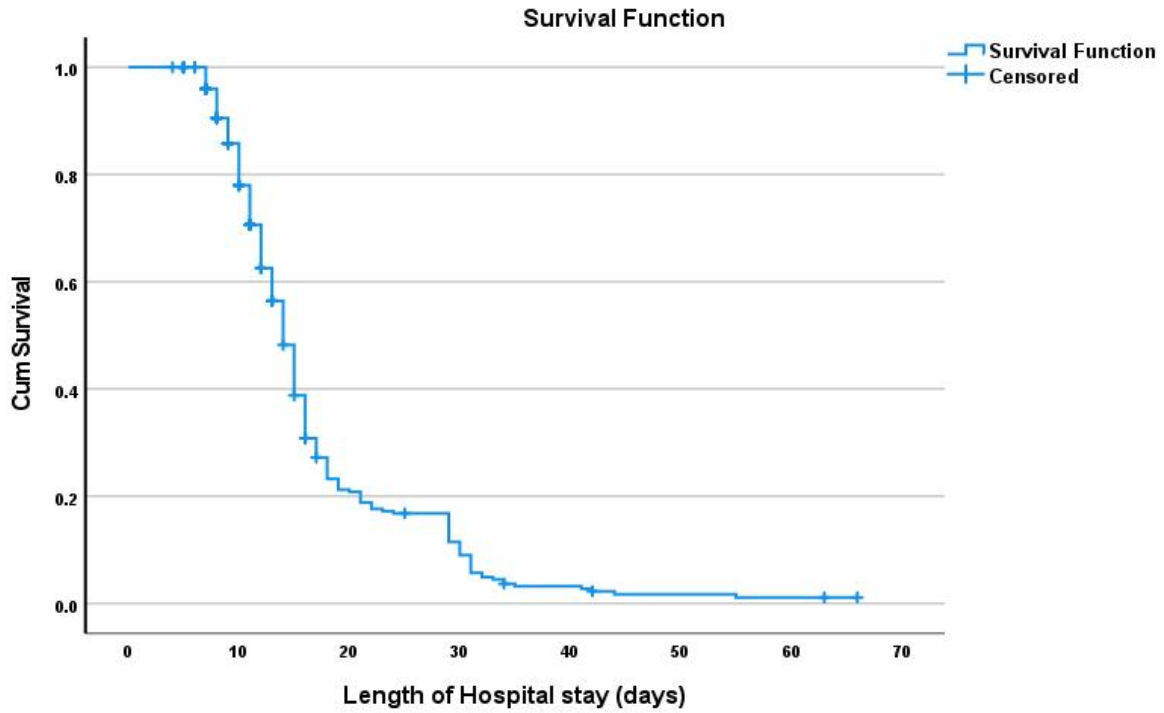


Figure 4 Kaplan-Meier survival function estimates children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.

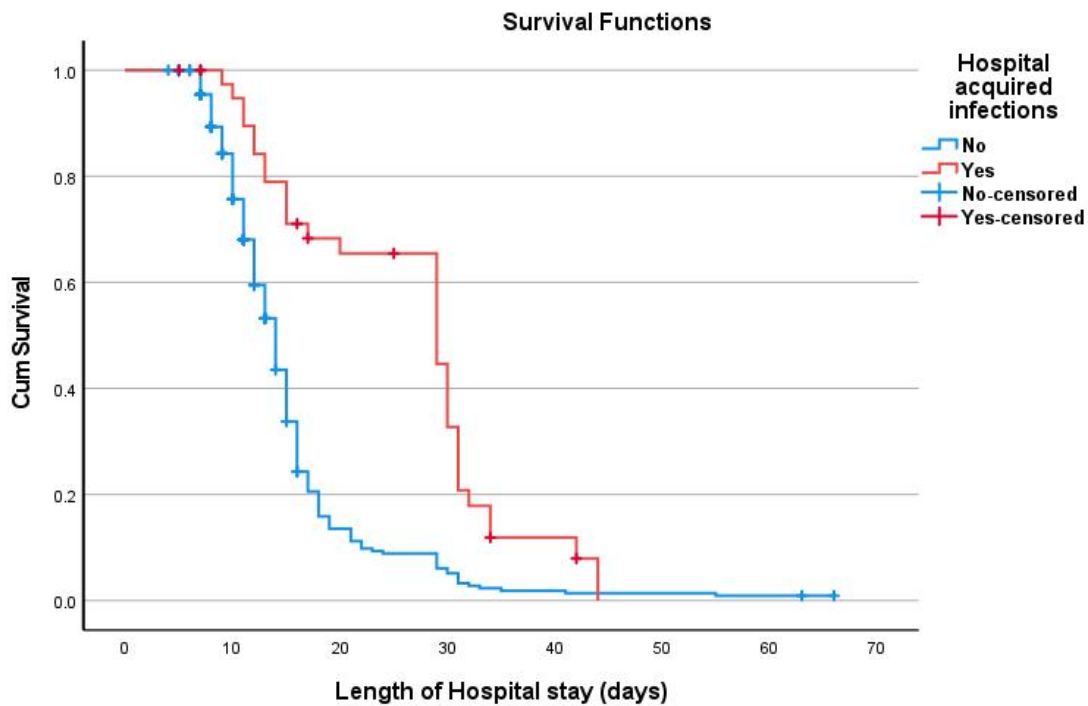


Figure 5 Log-Rank estimates with and without hospital acquired infections among children with SAM aged 6–59 months old admitted at WUSH from June 1, 2020 - May 31,2025.

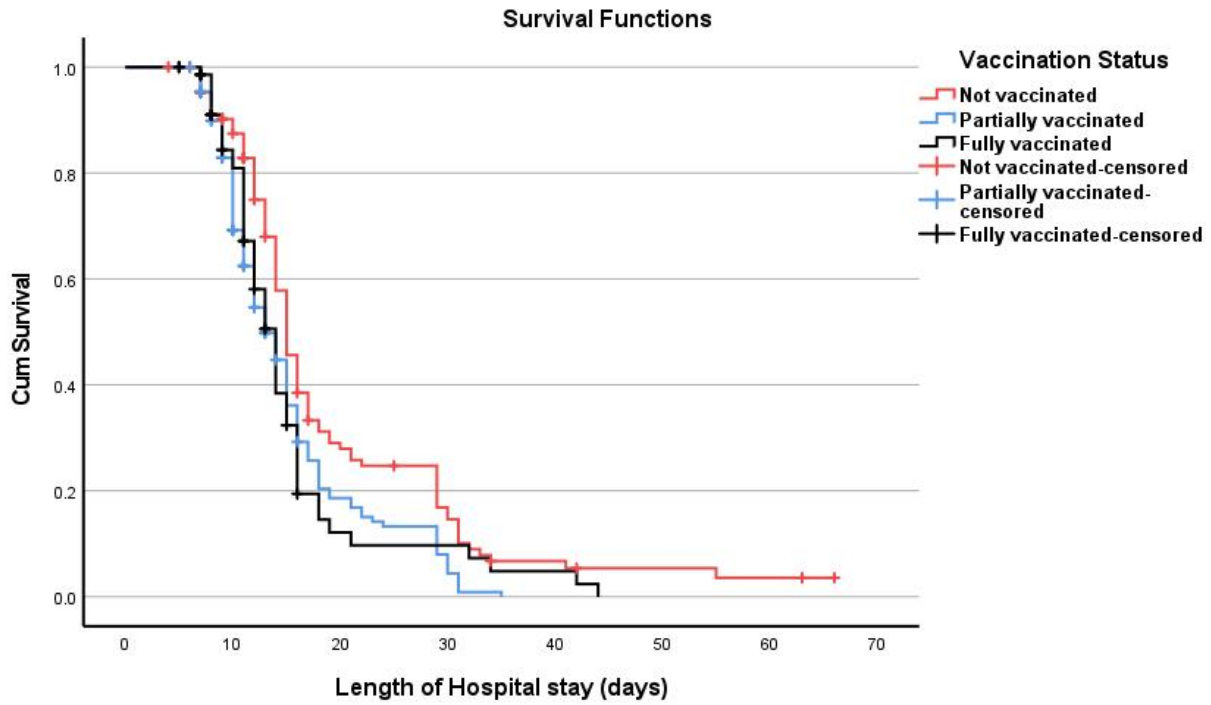


Figure 6 Log-Rank estimates with vaccination status among children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.

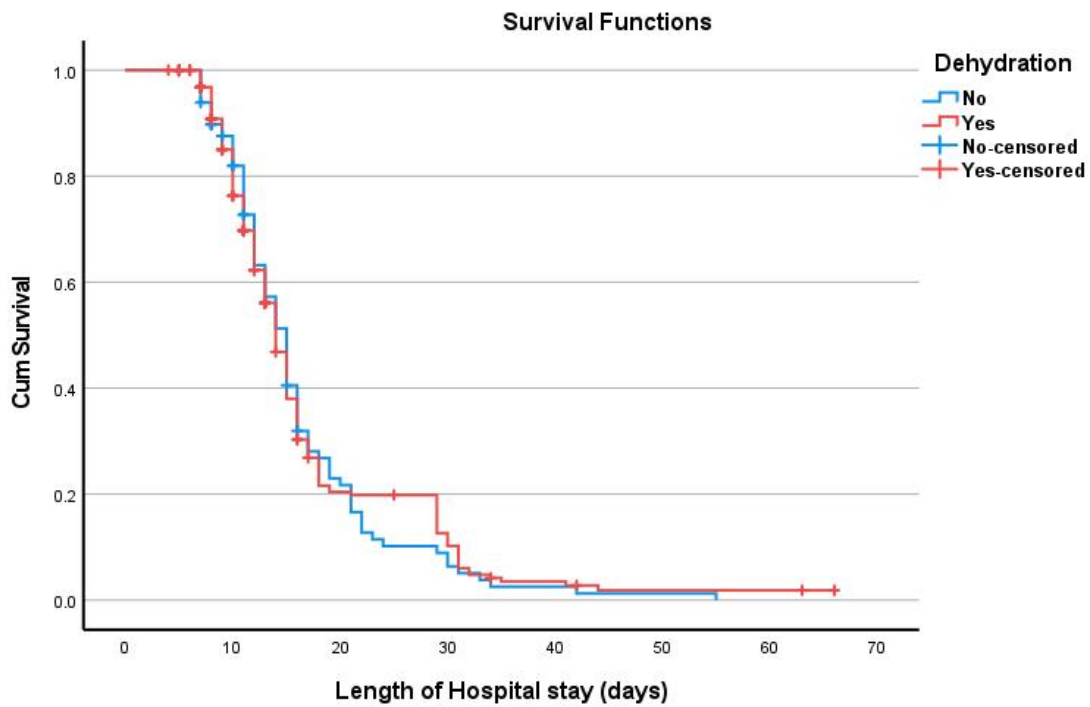


Figure 7 Log-Rank estimates with and without dehydration among children with SAM aged 6–59 months old admitted at Wolkite University Specialized Hospital from June 1, 2020 - May 31,2025.

5. 5 Predictors of time to discharge from stabilization centers

Thirty-Eight independent variables were analyzed in the cox proportional hazard analysis along with dependent variable. Twelve variables with p- value <0.2 in the bi-variate cox analysis were entered in to multivariate cox proportional hazard regression analysis. However only four variables (admission status, Hospital acquired infections, vaccination status and presence of dehydration) were found to be independent predictors. The study found that the hazard of time to discharge from inpatient treatment facility was decreased by 51.0% (AHR=0.49;95% CI:0.31,0.78) and 51.0% (AHR=0.49;95%CI: 0.25,0.96) among children who were transferred-in from other health facilities and return from default compared to new admissions respectively. Similarly, the hazard of time to discharge from inpatient treatment facility was reduced by 61.0% (AHR=0.39;95%CI:0.25,0.62) and 40.0% (AHR=0.60;95%CI: 0.38,0.95) among children who had hospital acquired infections and those who had dehydration compared to their counterparts respectively. However,children who had vaccinated fully were 1.6 times (AHR=1.63;95%CI: 1.07,2.47) more likely to discharge faster than those who were not vaccinated at all for their age (Table 6).

Table 6 Multivariable cox-regression analysis predictors of time to discharge from SC among children with SAM aged 6–59 months old admitted at WUSH from June 1, 2020 - May 31,2025.

Covariate	Category	CHR(95% CI)	AHR (95%CI)	P-Value
Residence	Urban	1	1	0.782
	Rural	1.289 (1.002,1.657)	1.0342(0.779,1.394)	
Admission status	New	1	1	
	Readmission	1.419 (0.809,2.488)	1.226 (0.620,2.425)	0.558
	Return from default	0.609 (0.353,1.050)	0.490 (0.249,0.964)	0.039**
	Transfer in	0.452 (0.300,0.681)	0.489 (0.305,0.782)	0.003**
Vaccination status	Fully vaccinated	1.330(1.017,1.740)	1.627 (1.072,2.468)	0.022**
	Partially vaccinated	1.301(0.924,1.832)	1.278(0.929,1.760)	0.132
	Not vaccinated	1	1	
Dehydration	Yes	0.907 (0.700,1.175)	0.599 (0.378,0.948)	0.029**
	No	1	1	
Fever	Yes	1.229 (0.953,1.585)	1.077 (0.786,1.476)	0.643
	No	1	1	
Hospital Acquired Infections	Yes	0.400(0.274,0.583)	0.393(0.250,0.620)	<0.001**
	No	1	1	
Malaria	Yes	1.405 (0.981,2.012)	1.312 (0.846,2.036)	0.225
	No	1	1	
Measles	Yes	0.691 (0.390,1.225)	0.730 (0.133,3.989)	0.716
	No	1	1	
Eye signs of Vit A deficiency	Yes	1.689 (0.825,3.457)	3.229 (0.429,24.311)	0.255
	No	1	1	
Deworming	Yes	1.213(0.379,3.879)	0.847 (0.606,1.182)	0.328
	No	1	1	
F-75 formula milk	Yes	0.761 (0.464,1.248)	0.422(0.115,1.542)	0.192
	No	1	1	
Intavenous fluids	Yes	0.534 (0.265,1.074)	0.503 (0.043,5.832)	0.583
	No	1	1	

CHR=Crude Hazard Ratio AHR=Adjusted Hazard Ratio CI=Confidence Interval

** indicates statistically significant (p-value < 0.05)

6. DISCUSSION

This study was conducted to assess the overall time to discharge and its predictors between different independent variables from inpatient treatment facility at WUSH.

Of 360 children included in this study, the discharge rate was 75.8 %. The observed discharge rate was within the acceptable ranges with the international SPHERE of standards set at (>75%) (9). However, there were a significant variation of discharge rate among different region of the country ranging from 43.6% ,65.5%,69.3% and 83% at Ayder referral Hospital, Asosa General Hospital, Hawassa University Comprehensive Specialized Hospital and Wolisso St. Luke Catholic Hospital respectively(32,41,42,31). These variations could be attributed to differences in the socio-demographic status, elevated rates of defaulters, and patient overload, as well as variations in adherence to the standard protocol for managing SAM.

The median time to discharge from inpatient treatment facility was 14.00 days with 95%: CI (13.35,14.65) and it was within the acceptable ranges with the international SPHERE of standards set at <28 days (9). However , approximately 13.6 % of children with SAM stayed in the Hospital beyond 28 days.This finding was consistent with other institution-based studies in Yekatit 12 Hospital, Uganda, Gondar Tertiary Hospital and Asosa General Hospital (16,38,40,41). However it was longer than reported in studies conducted at Dilchora Referral Hospital, Eastern Ethiopia and Nigeria (30 ,37) ;and it was lower compared to the study reports from Dubti Referral Hospital, Shebedino District and Ayder Referral Hospital (15,18,32). The variations in time to discharge may be related to differences in treatment and caring practices, health care settings and other socioeconomic factors among the study areas.

Concerning predictors of time to discharge from inpatient treatment facility ; presence of hospital acquired infections, those who fully vaccinated , presence of dehydration, transfer-in from other health facility and those who return from default had significant association with the dependent variable.

The presence of Hospital acquired infection significantly affected the time to discharge from inpatient treatment facility. Children with SAM who had Hospital acquired infections were discharged later than their counterparts. This is due to notorious organisms acquired at Hospitals result in need for potent antibiotics and prolonged duration of treatment. This finding was

supported by study conducted at Gondar tertiary Hospital indicated that children who had no Hospital acquired infections were discharged about 4 times sooner than their counterparts(40). Higher rates of Hospital acquired infections among children with SAM could be explained by the depressed immune status in malnourished children which predisposes them to infections.

Vaccination status of the children was also significantly associated with time to discharge from inpatient treatment facility; specifically the fully vaccinated children were approximately 1.6 times as likely to discharge earlier compared to who were not vaccinated at all for their age. This may be due to the fact that the immune system of the unvaccinated children can not defend against major childhood diseases, such as pneumonia , diarrhea, measles, and other vaccine-preventable diseases. A compromised immune system becomes more pronounced among severely malnourished children . As a result , a child experiencing alterations in nutritional status is more likely to have other comorbidities , which in turn, prolong the discharge time. The present study is consistent with the findings of the studies conducted in Yekatit 12 Hospital and Hiwot Fana comprehensive specialized Hospital (16,17). However , the studies conducted in Debre Tabor Comprehensive Specialized Hospital and Shebedino District had no association between vaccination status and time to discharge from inpatient treatment facility (13,18). The reason for this variation could be differences in the sample size .The smaller sample size studies may lack power to detect a significant effect.

According to the current study children with dehydration is independently associated with time to discharge from inpatient treatment facility. Children with dehydration had approximately 40% lower likelihood of timely discharge from inpatient treatment facility compared to those without dehydration.This finding was consistent with the study conducted in Addis Ababa (12). The possible explanation could be that dehydration exacerbates the already compromised physiological state in SAM. Malnourished children have diminished electrolyte balance , reduced renal concentrating ability, and impaired cardiovascular compensatory mechanisms. Dehydration adds further stress , prolonging stabilization and recovery. WHO guidelines for rehydration in SAM emphasize cautious , oral or nasogastric rehydration with ReSoMal to avoid fluid overload and electrolyte imbalances.This careful, slower approach -while life-saving can extend inpatient stay compared to uncomplicated cases. Dehydration in SAM often co-occurs with diarrhea , sepsis or severe infections - conditions that themselves prolong hospitalization.

However , the studies conducted in Kamba District , Shebedino District and Asosa General Hospital had no association between presence of dehydration and time to discharge from inpatient treatment facility (10,18,41). The reason for this variation may be that in those Health Institutions, Dehydration might be more likely to be detected and treated early than in the present study setting.

Regarding admission status ,children who were transferred-in from other health facilities and those return from default were 51.0% lower likelihood of timely discharge from inpatient treatment facility compared to new admissions. The reason could be due to those referred patients likely present more complex case requiring higher-level care. Potential delays in care continuity ,documentation transfer, and treatment plan adaptation. They may have experienced prior treatment failure or complications at referring facilities. Those return from default had treatment interruptions suggests social, economic , or health care barriers. These children may return with worsened clinical status or new complications. However , the studies conducted in Southern Africa and Nigeria had no association between presence of dehydration and time to discharge from inpatient treatment facility (36,37). The reason for this variation may be related to differences in treatment and caring practices and socioeconomic factors among the study areas .

7. LIMITATION OF THE STUDY

The study has some important limitations that should be considered cautiously while interpreting the results. The data were retrospectively extracted from patient's medical records and registration logbooks, some relevant variables such as the regaining of appetite at day-4, presence or absence of edema at day-4 and day-10 for edematous malnutrition were not recorded and not included in the analysis. Potential bias related with those who did measurements. A total of 16.7% of patients were left against medical advise before completion of treatment. The cause of premature leave from inpatient treatment facility could not be revealed from hospital records as the cause were not recorded.

8. CONCLUSION

The median time to discharge and the discharge rate from inpatient treatment facility were within the acceptable ranges with the international SPHERE of standards set for management of SAM. There were significant differences in time to discharge from inpatient treatment facility between different groups of predictor variables. From the cox-regression proportional hazard analysis, it was proved that children had prolonged time to discharge from inpatient treatment facility when they had hospital acquired infections, dehydration ,transferred from other facility and those who return from default. However, children who were vaccinated fully for their age had shorter time to discharge from inpatient treatment facility.

8.1 Recommendations

To complement the limitations of the study , further study using prospective study design should be conducted for better information.

Health care providers (TFU care staff) are strongly advised in early diagnosis and treatment of dehydration and hospital acquired infection.

To reduce the time to discharge from inpatient treatment facility the Federal Ministry of Health should strengthen immunization.

To reduce in Hospital morbidity and health care cost of children with SAM , strategies in the reduction of Hospital stay should be identified.

9. REFERENCES

1. World Health Organization Guideline on the prevention and management of wasting and nutritional edema (acute malnutrition) in infants and children under 5 years ; 2023 [cited 2025 June 21]. Available from: <https://iris.who.int/handle/10665/376075>.
2. Wagnew, F., Tesgera, D., Mekonnen, M. & Abajobir, A. A. Predictors of mortality among under-five children with severe acute malnutrition, Northwest Ethiopia: An institution based retrospective cohort study. *Arch. Public Health* 76, 64 (2018).
3. Robert K, Geme JW, Blum N, Tasker R, Wilson K, Schuh A, Mack C. Nelson textbook of pediatrics. 22nd ed. Philadelphia: Elsevier; 2024, p.421-426.
4. World health statistics 2024: monitoring health for the SDGs, Sustainable Development Goals. Geneva: worldhealthorganization; 2024. licence: ccby-nc-sa3.0igo; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo>.
5. WHO Guideline Malnutrition. 2021.
6. Ethiopian Statistical Service (ESS) and ICF. 2025. *Ethiopia Demographic and Health Survey 2024–25: Key Indicators*. Addis Ababa and Rockville, Maryland, USA: ESS and ICF.
7. Government of Ethiopia FMOH. National Guideline for the Management of Acute Malnutrition. Addis Ababa: FMOH; 2019.
8. Adugna A, Abebe GF, Alie MS, et al. Incidence and predictors of mortality among children with severe acute malnutrition admitted to therapeutic feeding units in Ethiopia: a systematic review and meta-analysis. *BMJ Open* 2025;15:e090902. doi:10.1136/bmjopen-2024-090902
9. Australian Agency for International Development. SPHERE project in humanitarian charter and minimum standard in humanitarian responses. Guideline. 2011; Third edition (ISBN 978-1-908176-00- 4):402.
10. Shanka NA, Lemma S, Abyu DM. Recovery rate and determinants in treatment of children with severe acute malnutrition using outpatient therapeutic feeding program in Kamba District, South West Ethiopia. *J Nutr Disord Ther.* 2015;5:155. <https://doi.org/10.4172/2161-0509.1000155>.

11. Gebremichael DY. Predictors of nutritional recovery time and survival status among children with severe acute malnutrition who have been managed in therapeutic feeding centers, southern Ethiopia: retrospective cohort study. *BMC Public Health*. 2015;15(1):1.
12. Samuel D, Milkiyas S, Rediet A, The recovery time and its predictors among under five years old children admitted with severe acute malnutrition at public hospitals in Addis Ababa, Ethiopia, *Pediatrics & Neonatology*, 2025, <https://doi.org/10.1016/j.pedneo.2024.07.013>.
13. Mekonnen G.B., Wondie, W.T., Legesse, B.T. et al. Recovery rate of severe acute malnutrition and its predictors among children admitted to therapeutic feeding unit in Northcentral Ethiopia. *Sci Rep* 15, 14767 (2025). <https://doi.org/10.1038/s41598-025-98582-z>
14. Asres DT, Prasad RP, Ayele TA. Recovery time and associated factors of severe acute malnutrition among children in Bahir Dar city, Northwest Ethiopia: an institution based retrospective cohort study. *BMC Nutr* 2018;4:17.
15. Tegegne A. Belay D. Predictors for time to recovery from severe acute malnutrition among under-five children admitted to therapeutic feeding unit at Dubti referral hospital, Afar region, Ethiopia *BMC Pediatrics* (2021) 21:562 <https://doi.org/10.1186/s12887-021-03043>
16. Mekonen A. , Girum S. , Fikrtemariam A. , Getaneh B., Kerebih A. Recovery time from severe acute malnutrition and associated factors among under-5 children in Yekatit 12 Hospital, Addis Ababa, Ethiopia: *Epidemiol Health*. 2020;2(11):<https://doi.org/10.4178/epih.e2020003> PMID 32023778
17. Meseret F, Keneni M, Alemu A, Tizazu D, Alemayehu TA, Mossie Y, Teshager T and Wondimneh F (2024) Recovery time and its predictors of severe acute malnutrition among under five children admitted at the therapeutic feeding center of Hiwot Fana comprehensive specialized hospital, eastern Ethiopia, 2024: a semi parametric model. *Front. Nutr*. 11:1450496. doi: 10.3389/fnut.2024.1450496
18. Teshome G, Boshu T, Gebremedhin S. Time-to-recovery from severe acute malnutrition in children 6 – 59 months of age enrolled in the outpatient treatment program in Shebedino, Southern Ethiopia: a prospective cohort study. *BMC pediatrics*. 2019; 19(1):33. <https://doi.org/10.1186/s12887-019-1407-9> PMID: 30691437

19. Tekeste A, Wondafrash M, Azene G, Deribe K. Cost effectiveness of community-based and in-patient therapeutic feeding programs to treat severe acute malnutrition in Ethiopia. *Cost Eff Resour Alloc*. 2012;10(1):1–10.
20. Usoro A, Aiwonodagbon B, Strong J, Kivlehan S, Akodu BA, Olufadeji A. Perspectives on the current state of Nigeria’s emergency care system among participants of an emergency medicine symposium: a qualitative appraisal. *BMJ Open*. 2021;11(8): e043869.
21. Nmadu AG, Boka S, Gobir AA, Usman NO, Adiri F, Ahmad IA. Knowledge of and the utilization pattern of referral systems among primary health care workers in a community in North-west Nigeria. *J Res Basic Clin Sci*. 2021;2(2):61–9.
22. Adedini SA, Odimegwu C, Bamiwuye O, Fadeyibi O, Wet ND. Barriers to accessing health care in Nigeria: implications for child survival. *Glob Health Action*. 2014. <https://doi.org/10.3402/gha.v7.23499>.
23. Cotton MF, Berkowitz FE, Berkowitz Z, Becker PJ, Heney C. Nosocomial infections in black South African children. *The Pediatric infectious disease journal*. 1989; 8(10):676-83.
24. Shahunja KM, Ahmed T, Faruque A, Shahid A, Das S, Shahrin L, et al. Experience With Nosocomial Infection in Children Under 5 Treated in an Urban Diarrheal Treatment Center in Bangladesh. *Global Public Health*. 2016; 3.1:1-8.
25. Spencer PS, Palmer VS. Interrelationships of undernutrition and neurotoxicity: food for thought and research attention. *Neurotoxicology* 2012;33:605-616.
26. Haggerty AD. The effects of long-term hospitalization or institutionalization upon the language development of children. *J Genet Psychol* 1959;94:205-209.
27. Commodari E. Children staying in hospital: a research on psychological stress of caregivers. *Ital J Pediatr* 2010;36:40.
28. Attia S, Versloot CJ, Voskuil W, van Vliet SJ, Di Giovanni V, Zhang L, et al. Mortality in children with complicated severe acute malnutrition is related to intestinal and systemic inflammation: an observational cohort study. *Am J Clin Nutr* 2016;104:1441-1449.

29. Ali S, Birhane M, Bekele S, Kibru G, Teshager L, Yilma Y, et al. Healthcare associated infection and its risk factors among patients admitted to a tertiary hospital in Ethiopia: longitudinal study. *Antimicrob Resist Infect Control* 2018;7:2
30. Oumer A, Mesfin F, Demena M. Survival status and predictors of mortality among children aged 0-59 months admitted with severe acute malnutrition in Dilchora Referral Hospital, Eastern Ethiopia. *East Afr J Health Biomed Sci* 2016;1:13-22.
31. Derseh B, Mruts K, Demie T, Gebremariam T. Co-morbidity, treatment outcomes and factors affecting the recovery rate of under -five children with severe acute malnutrition admitted in selected hospitals from Ethiopia: retrospective follow up study. *Nutr J* 2018;17:116.
32. Tirore MG, Atey TM, Mezgebe HB. Survival status and factors associated with treatment outcome of severely malnourished children admitted to Ayder referral hospital: a cross-sectional study. *BMC Nutr* 2017;3:66.
33. Banbeta A, Seyoum D, Belachew T, Birlie B, Getachew Y. Modeling time-to-cure from severe acute malnutrition: application of various parametric frailty models. *Arch Public Health* 2015;73:6.
34. World Health Organization; Nutrition in universal health coverage, Geneva, (2019).
35. Chisti MJ, Shahid AS, Shahunja KM, Das SK, Faruque AS, Ahmed T. Mortality rates from severe acute malnutrition requiring hospitalisation is higher in the children of working mothers in Bangladesh. *Acta Paediatr* 2018;107:2214-2215.
36. Mkhize M, Sibanda M. A Review of Selected Studies on the Factors Associated with the Nutrition Status of Children Under the Age of Five Years in South Africa. *Int J Environ Res Public Health*. 2020 Oct 30;17(21):7973. doi: 10.3390/ijerph17217973. PMID: 33142965; PMCID: PMC7662515.
37. Joseph F.I., Falade, A. & Earland, J. Time to recovery and its predictors among children 6–59 months with acute malnutrition admitted to community inpatient therapeutic feeding centers in Katsina State, Northwest Nigeria: a retrospective review of health records (2010–2016). *J Health Popul Nutr* 42, 10 (2023). <https://doi.org/10.1186/s41043-023-00352-y>

38. Muwanguzi E, Oboi JE, Nabbamba A, Wanyama R. Treatment outcome and associated factors for severely malnourished children (1–5 years) admitted to Lacor Hospital and Gulu Regional Referral Hospital in Uganda. *J Nutr Sci.* 2021;10: e33.
39. Saaka M, Osman SM, Amponsem A, Ziem JB, Abdul-Mumin A, Akanbong P, et al. Treatment outcome of severe acute malnutrition cases at the tamale teaching hospital. *J Nutr Metab.* 2015;2015:1–8.
40. Kokeb M, Mariyo A. Time to Discharge and its Predictors among Children Aged 1-60 Months with Severe Acute Malnutrition Admitted to the Therapeutic Feeding Center in A Tertiary Hospital, North West Ethiopia. *Ethiop J Health Sci.* 2022 Nov;32(6):1107-1116. doi: 10.4314/ejhs.v32i6.7. PMID: 36475254; PMCID: PMC9692151.
41. Bizuneh FK, Tolossa T, Bekonjo NE, Wakuma B. Time to recovery from severe acute malnutrition and its predictors among children aged 6-59 months at Asosa general hospital, Northwest Ethiopia. A retrospective follow up study. *PLoS One.* 2022 Aug 12;17(8):e0272930. doi: 10.1371/journal.pone.0272930. PMID: 35960715; PMCID: PMC9374216.
42. Fikrie A, Alemayehu A, Gebremedhin S. Treatment outcomes and factors affecting time-to-recovery from severe acute malnutrition in 6-59 months old children admitted to a stabilization center in Southern Ethiopia: A retrospective cohort study. *Ital J Pediatr.* 2019 Apr 11;45(1):46. doi: 10.1186/s13052-019-0642-x. PMID: 30971316; PMCID: PMC6458656.

10. ANEXE-1

WOLKITE UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE DEPARTEMENT OF PEDIATRICS AND CHILD HEALTH

Structured (data extraction tool) check list developed on the time to discharge and its predictors among children 6–59 months with severe acute malnutrition admitted to therapeutic feeding units at Wolkite University Specialized Hospital from June 1,2020 - May 31,2025.

1. Identification

- A. Card no.....
- B. Age (1. 6 -12 months 2. 13 - 23 months 3. 24 - 59 months).
- C. Sex
- D. Residence (1. urban 2. – Rural)

2. Admission characteristics

- A.Date of admission
- B. Admission status (1. New 2.Return from default 3.Readmission 4.Transfer in)
- C. Diagnosis at admission (1.Edematous 2.Non edematous)
- D. Vaccination status (1. Fully vaccinated 2. Partially vaccinated 3. Not vaccinated)
- E. Weigh (kg)....
- F. Length/Height (cm).....
- G. MUAC (cm)....
- H. WFH (Z-score)....

3. Medical complications and Comorbidities

- A. AGE (Y/N)
- B. Diarrhea (Y/N)
- C.Vomiting (Y/N)
- D. Dehydration (Y/N)
- E. Shock (Y/N)
- F. Fever (Y/N)
- G. Hypothermia (Y/N)
- H.Pneumonia (Y/N)
- I. HAI (Y/N)
- J. HIV (Positive /Negative/ Not documented)
- K.TB (Y/N/Not Documented)
- L. Malaria (Y/N)
- M. Measles
- N. Heart failure(Y/N)
- O. Anemia
- P. Dematosis (Y/N)
- Q. Eye signs of VitA deficiency
- R. Appetite test (Failed/ Not done)

4. Treatment Details

- A. Vitamin A given (Y/N)
- B. Zinc supplementation given (Y/N)
- C. Folic acid given (Y/N)
- D. Deworming (Y/N/not applicable)
- E. Antibiotics given by IV (Y/N)
- F. F-75 formula milk(Y/N)
- G. F-100 formula milk(Y/N)
- H. Resomal (Y/N)
- I. Intravenous fluids (Y/N)
- J. Blood transfusion (Y/N)
- K. RUTF (Y/N)

5. Follow up characteristics (B & C only for edematous SAM)

- A. Failure to regain appetite at day 4(Y/N)

B. Fail to start to lose edema on day 4 (Y/N/NA)

C . Edema still present on day 10(Y/N/NA)

D. Fail to gain ≥ 5 g/kg/d for 03 successive days while on F100/RUTF(Y/N)

E. Discharge weight(kg)

F. Length of stay(days).....

6. Treatment outcomes of SAM

A. Discharged

B. Defaulted

C. Died

D. Transfer out