TIME TO RECOVERY FROM SEVERE ACUTE MALNUTRITION AND ITS PREDICTORS AMONG 0-59 MONTH'S OLD CHILDREN ADMITTED TO STABILIZATION CENTERS: A PUBLIC HOSPITALS RETROSPECTIVE FOLLOW-UP STUDY IN WEST HARERGHE ZONE, OROMIA REGION, ETHIOPIA

MPH THESIS

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Time to Recovery from Severe Acute Malnutrition and its Predictors Among 0-59 Month's Old Children Admitted to Stabilization Centers: A Public Hospitals Retrospective Follow-Up Study in West Harerghe Zone, Oromia Region, Ethiopia

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APPROVAL SHEET
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I hereby certify that I have read and evaluated this Thesis entitled "Time to recovery from severe acute malnutrition and its predictors among 0-59 month's old children admitted to stabilization centers: a public Hospitals retrospective cohort study in West Harerghe, Oromia region, Ethiopia." prepared under my guidance by **Usman Abdela.** I recommend that it be submitted as fulfilling the thesis requirement for the degree of master of public health Nutrition.

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BIOGRAPHICAL SKETCH OF THE AUTHOR

I was born in 1995 in Doba woreda, West Harerghe Zone, Oromia, Ethiopia. I attended my elementary school in Doba town, Doba woreda and I also attended my secondary and preparatory school in Doba town at the same woreda. After completing preparatory school, I enrolled in the Nurse program at Woldia University in 2013, and I received my BSc degree in Nurse profession in 2017. I found work in the West Hararghe zone's Doba woreda after graduating. Moreover, I have 7 years clinical work experience in Biyo Health Center and Doba Woreda health office respectively. In October 2022, I enrolled at Haramaya University to go toward my master's degree in public health nutrition.

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ACRONYMS /ABBREVIATIONS

BSc	Bachelor of science
CI	Confidence Interval
DC	Data Collection
DEC	Data entry Clerk
EDHS	Ethiopian Demographic and Health Survey
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
FMOH	Federal Minister of health
GC	Gregorian calendar
HAZ	Height-for-age Z-score
HR	Hazard ratio
HU	Haramaya University
IHRERC	Institutional Health Research Ethics Review Committee
MAM	Moderate acute malnutrition
MUAC	Mid-upper arm circumference
NG	Nasogastric tube
SAM	Severe acute malnutrition
TB	Tuberculosis
UNICEF	United Nation International Children Education Fund
WAZ	Weight-for age Z-score
WFH	Weight for height
WHO	World Health Organization

ABSTRACT

Background: - Severe Acute Malnutrition is a major public health concern that causes sickness, and mortality in developing countries like Ethiopia, particularly among the poor communities. It continues to be a major issue, especially 2.2 and 8.3 million children under the age of five are affected by severe acute malnutrition in sub-Saharan Africa and south Asia respectively. In Ethiopia, the overall length of stay in therapeutic feeding centers ranges from 8 to 47 days. A lengthy hospital stay raises the risk of hospital-acquired infections. Despite a large body of evidences on the magnitude of acute malnutrition among Ethiopian children under the age of five, there is inadequate evidence on the time to recovery from Severe Acute Malnutrition and its related factors among children aged 0-59 months, in the study area.

Objective: -To assess the time to recovery from severe acute malnutrition and its predictors among children aged 0 to 59 months admitted to stabilization centers in a public Hospitals in West Harerghe Zone, Oromia region from March 30, 2025 to April 30, 2025.

Method: A hospital-based retrospective cohort study was conducted in the West Harerghe zone, eastern Ethiopia. The study population consisted of 264 children aged 0 to 59 months admitted to stabilization centers for Severe Acute Malnutrition (SAM) between September 1, 2019, and September 30, 2023. Three hospitals were randomly selected from the seven public hospitals in the zone using a lottery method. Data were collected using a standardized data extraction form developed based on the SAM registry and children's medical charts. Kaplan-Meier curves, the log-rank test, and Cox proportional hazards models were used for data analysis.

Result: The median recovery time was 15 days (95% CI: 13.6-16.4), and the nutritional recovery rate was 97%. Children who received amoxicillin (AHR =3.3, 95 % CI: 2.4-4.5) were more likely to recover. However, those who received folic acid supplements (AHR =0.29, 95 % CI: 0.105-0.79), and admitted with anemia at admission (AHR=0.189, 95% CI: 0.044-0.816) were less likely to recover.

Conclusion and recommendation: The overall recovery rate, death rate, and nutritional recovery time were within the acceptable range of the SPHERE project reference values. This study demonstrated that the administration of amoxicillin was associated with a shorter nutritional recovery time. Conversely, children who receive folic acid supplements, and admitted with anemia was associated with a longer nutritional recovery time.

Keywords: Severe Acute Malnutrition, Survival Status, Recovery time, predictors, Ethiopia.

1. INTRODUCTION

1.1. Background

The most severe and obvious form of under nutrition is known as severe acute malnutrition (SAM) (WHO, 2023). At least one of the following clinical criteria must be present in order for this nutritional condition to be considered present: severe wasting (weight for height <-3 z score), mid-upper arm circumference (MUAC) <11.5 cm, and bilateral oedema of nutritional origin(WHO, 2013a).The likelihood of survival for a child with SAM must be increased while limiting additional injury. Asia and Africa together account for more than seventy percent of all children with severe wasting (WHO, 2023).Thirty five percent of deaths in children under the age of five are caused, directly or indirectly, by malnutrition. One of the countries that are severely affected by severe malnutrition, a burden that is not evenly distributed, is Ethiopia. 57% of deaths in children under 5 are caused by malnutrition, either on its own or as co-morbidity (Kabalo & Seifu, 2017; Shanka, Lemma, & Abyu, 2015). The negative effects of starvation persist throughout the child's entire life. In addition to the immediate affects it has on a kid, chronic consequences of childhood malnutrition cost Ethiopia about 16.5% of its gross domestic product each year (WFP, 2013). The annual direct cost of SAM is projected to be between $20 and $30 billion worldwide (IFPRI, 2016)Similarly, Ethiopia is predicted to cost 55.5 billion Ethiopian Birr (ETB), which is equal to 16.5% of Gross Domestic Product (Tirore et al., 2017).

The minimum international standard set to evaluate the quality of management of SAM according to Sphere is a recovery time< 4weeks cure rate >75% and death rate <10% (Sphere, 2018; Quak, 2021). Similarly, studies conducted in Ethiopia on the time to recovery from SAM have found it to be in the range of 14–28.8 days (Meseret et al., 2024). A shorter recovery time indicates an acceptable level of performance in the treatment and care process. A variety of factors that predict recovery time have been documented.

1.2 .Statement of the problem

According to the recommended international sphere norm, children admitted to stabilization centers should recover in less than one month. A cross-sectional study done in India among under-5 children with SAM reveals that a length of stay was 11.71±7.59 days with a recovery rate of 84.1% (Singh et al., 2016) . A cohort study done in African continent, Zambia reported that the median length of stay of was 12 days (IQR 8 to 16 days) with a recovery rate of 47.9% (Munthali et al., 2015) .

But research has revealed that Ethiopian patients need a longer recuperation period, varying from 11 days to 8.7 weeks (Teferi et al., 2010). Furthermore, according to the recommendation, a higher than 75% recovery rates for SAM-affected children should be expected. In this regard, it is clear from the facts at hand that Ethiopia has not met this condition. For instance, between 43.6% and 87% of children recovered from SAM (Tirore et al., 2017). According to retrospective longitudinal study conducted at Oromia region revealed that the median time to recovery were 16 days with a recovery rate of 77.8% (Jarso et al., 2015). A retrospective cohort study conducted in the Eastern part of Ethiopia, Dilchora Referral Hospital children with SAM showed that the median survival time for the cohort of SAM children were 80 days with a lower recovery rate of 69.9 % (Oumer et al., 2016).

According to Sphere standards, the minimum acceptable recovery rate from severe acute malnutritionis greaterthan75%(Sphere, 2018). Furthermore, the recovery rate was 92.6% in Pakistan(Dale et al., 2018) .In sub-Saharan Africa, the overall rate of recovery from severe acute mal nutrition in children under the age of 5 years was 71.2% (Desyibelew et al., 2020) .SAM is known to cause up to 29% of mortality in Ethiopian children who received a treatment at stabilization centers (SC) (Girum, Kote, Tariku, & Bekele, 2017; UN, 2014). After therapy, 75% of children with SAM should be at least somewhat recovered. However, the rates of recovery in Ethiopia varied from 51.9% to 88.4 % (Jarso, Workicho, & Alemseged, 2015) falling short of the necessary standard. Less than a month is the advised amount of time for children receiving therapeutic feeding to recover additionally, many outcomes in this region have been discovered. A child that is severely underweight is eleven times more likely to die (Shanka et al., 2015).Similar data indicate that children with SAM have a 520-fold higher risk of dying than children who are properly fed (UNICEF, 2012). SAM causes growth retardation, decreased emotional and cognitive

development, and raises the risk of death and disease (Collins et al., 2006) SAM has negative effects on the economy that jeopardise advancement. Age, retroviral infection, type of malnutrition, and inpatient complications are a few variables that may affect the child's recovery rate and time from SAM (Hussen Kabthymer, Gizaw, & Belachew, 2020).

Even though enormous problems determine time to recovery from severe acute malnutrition, no study was done in the study area with hospital environment. In addition, most of the studies conducted so far did not include children of under- 6 months of age.

The purpose of this study is therefore, to assess the length of stay to recover from SAM and identify predictors among 0-59 month's old children admitted to stabilization centers admitted to stabilization centers of a public Hospitals retrospective cohort study in West Harerghe, Oromia region, Ethiopia.

1.3. Significance of the study

The finding of this study will help several population segments and administrative level to improve the health of the society. It will help Hospitals to plan on targeted interventions to address the issue, thereby improving the overall health of the community and was help to identify risk factors and allowing to implement preventive measures and promote healthy childhood development and optimize treatment strategies, monitor outcomes, and develop effective interventions tailored to the specific needs of malnourished children and allocating resources effectively.

The findings of this study were important to increase existing knowledge and skill of health professional, especially child health nurses, about appropriate management of SAM to shorten recovery time of children with SAM in selected hospital. For hospital managers, to design an interventional project towards improving SAM management to shorten recovery time of children with SAM in selected hospital.

The finding can also help policy makers, funders and program managers to focus on the time to recovery from sever acute malnutrition among under five children as a public health problem and to plan and implement their programs and policy accordingly.

Furthermore, the study result can help the care giver and Health care provider about time to recovery from severe acute malnutrition and its predictors among 0-59 month's old children admitted to stabilization centers by identifying the factors that extend the time to recovery. The finding of the study was an input for health bureau of Oromia at different level for evidence-based intervention design and implementation. In addition, the finding can serve as base line for future research and as well as base for policy development for the country

1.4. Objectives

1.4.1. General objective

To assess time to recovery from severe acute malnutrition and its predictors among 0-59 month's old children admitted to stabilization centers of a public Hospitals retrospective follow-up study in West Harerghe, Oromia region, Ethiopia, from March 30, 2025 to April 30, 2025.

1.4.2. Specific objectives

- To assess time to recovery from SAM among children aged 0-59 months admitted to Stabilization center in West Harerghe, Oromia region, Ethiopia.
- To identify factors affecting the time of recovery of SAM among children aged 0-59 Months admitted to Stabilization center in West Harerghe, Oromia region, Ethiopia.

2. LITERATURE REVIEW

2.1. Overview of Global burden of severe acute malnutrition

SAM continues to pose a serious threat to global public health and is still directly responsible for more than a million deaths of young children each year(Girum et al., 2017). The Joint Child Malnutrition Estimate study states that SAM puts 6.8% of children under 5 in danger worldwide More than 75% of children with severe wasting reside in Asia, while 22% do the same in Africa(UNICEF, 2023) .Additionally, SAM was responsible for more than 7% of all deaths in this age range. Despite greater progress in lowering the prevalence of stunting, there has been inadequate progress in lowering worldwide wasting rates. In addition, wasting prevalence has decreased globally over the past three decades, from 58 million cases in 1990 to 45 million cases in 2023, There has been a clear regional difference in the prevalence of wasting, with minimal prevalence (0.2%) in northern America and significantly higher prevalence (14.8%) in South Asia, 6.9% in west and central Africa, and 6% in sub-Saharan Africa. Additionally, nearly 72% of the world's wasted children reside in lower-middle income countries, whereas only 0.4% do so in high-income nations(UNICEF, 2023). SAM has been widely prevalent in the continent of Africa. 2.9 million of the almost 12.2 million wasted children under the age of five are seriously wasted in sub-Saharan Africa, Ethiopia has one of the worst rates of malnutrition. Moreover, the prevalence is not uniformly distributed across the nation, with Addis Abeba and Dire Dawa having the lowest prevalence rates and Tigray and Amhara areas having the highest rates

The prevalence of wasted and seriously wasted children is 7% and 1%, respectively, according to the EDHS 2019 study. Afar (14%) and Gambela (13%) had the greatest rates of wasting, followed by Somali (21%) and Afar (EDHS, 2019).

2.2. Time of recovery from SAM

Different researchers in different parts of the world struggle to determine the recovery time and the treatment outcomes of children admitted due to SAM. For instance, a cross-sectional study done in India among under-5 children with SAM reveals that a length of stay was 11.71±7.59 days with a recovery rate of 84.1% (Singh et al., 2016) . A cohort study done in African continent, Zambia reported that the median length of stay of was 12 days (IQR 8 to 16 days) with a recovery

rate of 47.9% (Munthali et al., 2015) . In the same way, a retrospective health facility-based study done among 969 children with SAM in Ghana showed that almost half of all the children (45.7%) were discharged after 7 days of hospitalization; about one-third of children (31.2%) were stayed 8 to 14 days; and 11.4% of children were stayed 15 to 21 days with the overall recovery rate of 82.3% (Walana et al., 2016) . Another retrospective study in rural Gambia reported the median length of stay of 18 days with a very low recovery rate of 45.6% (Burrell et al., 2017) . Another study carried out in Northern Uganda's St. Marys hospital revealed that only 66.9% of 251 SAM children were cured, while 21.2% of them had possible unsatisfactory outcomes and 11.9% were reported as deceased (Desyibelew HD, 2017) .Similar findings were also observed by a prospective cohort study carried out in Northwestern Nigeria, with an unacceptable cure rate of 58% and a defaulter rate of 40%, but a lower death rate of 2% (Farouk ZL, 2016).

According to the Ethiopian FMOH National SAM standards and the SPHERE international project, malnourished kids admitted to feeding programmes should be released with: MUAC 11.0 cm AND 15% weight increase from admission weight with no edoema for 2 consecutive visits (at hospital level WFH ≥85 %.) and a >75% cure rate is anticipated. The fatality and defaulter rates ought to be, respectively, fewer than 10% and 15%. The average daily weight increase should be higher than 8g/kg (Health F. M., 2014). A study on the treatment outcomes of SAM-affected children hospitalised to stabilisation centres in Southern Ethiopia 87% (Singh et al., 2014) Whereas 3.6 %(468) had died, were cured. For children with severe wasting and edematous malnutrition, the average length of stay was 25 and 1 days, with average weight gains of 14 and 13.4 g/kg/d, respectively (Teferi et al., 2010). According to a government study in Ethiopia, of the 322,336 SAM children treated, 85.2%, 4.1%, and 0.4% were cured, defaulted on their payments, and died, respectively. Indicating that the report complies with the minimal SPHERE project guideline.

A prospective cohort study in Northern Ethiopia found that the recovery rate was 76.8%, with a median recovery period of 49 days (Abdu O et al., 2016) days and the mean rate of weight gain was 8.3 (±3.7) g/ kg/ day and 17.5% of defaulter rate (Desalegn, Kifle, Birtukan, & Amanuel, 2016).Similarly another hospital based retrospective cohort conducted in Sekota hospital , North Eastern part of Ethiopia from January1/2011 to December 30/2013 on records of 415 children aged 0-59 months admitted for complicated SAM showed the median survival time of 10 days (95% CI = 9.23, 10.77 days) with a lower recovery rate of 46% (Desta, 2015). A retrospective cohort study

conducted in two hospitals of Wolaita Zone, Southern Ethiopia , 2016 on available records of 340 under-five children admitted for treatment of complicated severe acute malnutrition showed that the median (IQR) duration of 11 days with a recovery rate of 75.6% (Admasu et al., 2017). In the same way, a hospital based retrospective study conducted in other southern part of Ethiopia , Yirgalem Hospital from January 2013 to January 2015 revealed that the mean length to recovery was 18.16 days with a recovery rate of 78%(Kabeta and Bekele, 2017).Moreover, a retrospective hospital-based cross-sectional study done in western part of Ethiopia ,Nekemte referral hospital from November 2015 to April 2017 on records of 205 admitted children with severe acute malnutrition revealed that the mean and median time to recovery were 8-14 days (p=0.048) and 15-22 days (p=0.004) respectively with a recovery rate of 66.8%(Mena et al., 2018). Another, institutional-based retrospective cohort study conducted in Southern Ethiopia by Hawassa University Comprehensive Specialized Hospital (HU-CSH), on 420 randomly selected children aged 6–59 months from July, 2015 to June, 2017 showed that the overall median (IQR) time of recovery was 17(10, 24)days with cured recovery rate of 69.3% (Fikrie et al., 2019). Similarly , the study conducted in public hospitals of East Amhara region revealed that the median nutritional recovery time was 11 days (IQR of 6days) with a recovery rate of 74.5%(Tefera et al., 2020). Furthermore study done recently in western part of Ethiopia, Benishan gul gumuz region in Asosa General Hospital showed that the median time to recovery from SAM was 15 days with a lower recovery rate of 65.4% (Bizuneh et al., 2022). Lastly, a recent Facility-based retrospective cohort study conducted in Dubti zonal referral Hospital, Awssiresu zone, Afar regional state among 331 severely acutely malnourished children showed that the overall mean survival time of 18.39 days (95% CI=17.196-19.514) with a recovery rate of 77% (Bekele et al., 2022).

According to a study from the Sidama Zone in Ethiopia, the recovery rates for Marasmus and Kwashiorkor were 69.4% and 89.1%, respectively (Mengesha, Deyessa, Tegegne, & Dessie, 2016)According to a comprehensive review from Southern Ethiopia, children with marasmus and kwashiorkor had average lengths of stay of 25 and 21 days and weight gains of 14 and 13.4 g/kg/d, respectively (Teferi et al., 2010). In Southern Ethiopia, Gedeo Zone Health facility stabilisation centre admitted children under the age of five with complex SAM. According to a study, throughout the complete follow-up period, 51 (9.3%) children died, while 414 (76%) and 26 (4.8%) children recovered and defaulted (missed follow-up for 2 consecutive days),

respectively(Adal, Kote, & Tariku, 2016).An analysis of 340 children under the age of five who were treated for complicated severe acute malnutrition in two hospitals in the Wolaita Zone revealed a 257 (75.6%) cure rate, 30 (8.8%) death rate, 13 (43%) of which occurred within 72 hours of admission, 34 (10%) absconders (self-discharged), and 6 (1.8%) non-responders (Admasu et al., 2017) Out of 253 children with SAM, 197 (77.9%) recovered, 14 (5.5%) died during treatment, 31 (12.3%) defaulted, and 11 (4.3%) were transferred from treatment centres, according to a retrospective cohort study carried out in Debre Markos and Finote Selam Hospitals. The average length of stay in the hospitals was 11.1 days (Mekuria G et al., 2017). Another retrospective cohort research from Woldia Hospital in Northern Ethiopia found that of the 324 kids admitted to the therapeutic feeding unit, 85% with 95% CI (81%-88.7%), 6%, 5%, and 4% of the kids were, respectively, cured, dead, defaulters, and moved out (Oumer et al., 2016). On the other hand, a study on 415 children treated for complicated SAM at Sekota Hospital SC revealed a distant outcome compared to SPHERE standard, with 191 (46%) recovering, 119 (28.7%) dying, and 89 (21.4%) defaulting, and 16 (3.9%) children being discharged as none recovered (Mekuria, Derese, & Hailu, 2017). In a same vein, a retrospective cohort analysis of 469 children with complex SAM, aged 6 to 59 months, admitted to nutritional rehabilitation units in Mekelle City facilities, revealed unacceptable low recovery and unacceptable high and frightening death rates, respectively, of 69.4% and 17.6%. Reports, however, indicate that the defaulter rate was 9.4%, below the acceptable SPHERE level of 15%, and that the weight gain was 17.4 g/kg/day, equivalent to SPHERE (>8 g/Kg/day), with a total length of stay of 16 days (Gebremichael, Bezabih, & Tsadik, 2014).

According to a different study done in the therapeutic feeding programme at Yirgalem Hospital in Southern Ethiopia, of 191 children, 78% had recovered. Death rate was 16%, defaulter rate was 2.6%, and daily weight increase averaged 9.5 g/kg. Meaning that the study's compliance with suitable SC management led to a noticeably faster rate of recovery and an acceptable weight gain (Daba & Ersado, 2015). Among the 220 kids sent to Mulago Hospital in Uganda, a research found an alarmingly high cure rate of 49%, a death rate of 24%, and a defaulter rate of 27%. The average time till death was 4 days (Bachou, Tumwine, Mwadime, & Tylleskär, 2006) One basic measure of programme performance is the average length of stay for children who are very acutely malnourished in therapeutic feeding programmes or units. A lower average duration of stay

indicates that the team, programme, or unit is performing satisfactorily during the treatment and care process.

2.3. Predictors with time of recovery

2.3.1. Socio-demographic factors

Some evidences showed us the association between socio-demographic variables and the time to recover from SAM. For instance, a randomized, double-blind, placebo-controlled trial, in Malawi among under-5 children with SAM was done to determine the association between socio-demographic variables and time to recover. According to the report, age was the only socio-demographic factors for prolonged hospitalization, increased risk of treatment failure and increased risk of death. More clearly, a one-month increase in children's age with SAM is 0.7% more likely to recover faster and they are 1.1% less likely to die (Trehan I et al.,2016). However, a cross sectional research in Indonesia reveal no association between the recovery time of children with SAM and all the socio-demographic variables (Viramitha et al.,2018)) .

A cohort study in the Tigray region's Enderta district revealed that male children recovered from SAM at a rate that was 1.30 times greater than that of female children. According to further cohort studies, children under 24 months had a higher chance of dying in hospitals (Girum et al., 2017; Shanka et al., 2015; Singh et al., 2014).Similarly, a Sidama Zone study found that children older than 3 years old had a 33% lower chance of achieving nutritional recovery than those under 3 years old (Mengesha et al., 2016).On the other hand, a retrospective cohort research carried out in Woldia Hospital found no correlation between a child's age and the length of time it took to recover from SAM (Oumer et al., 2016).

According to a systematic review in SNNPR, as people aged, the death rate fell and the cure rate rose (Teferi, 2010). Another study indicated that the risks of death are five times higher for children between the ages of 6 and 11 months and for male newborns, respectively. Additionally, children who received full or partial vaccinations for their age had recovery rates that were, respectively, 12% and 16% higher than those of their counterparts (Mekuria et al., 2017)

2.3.2. Management of severe acute malnutrition

Children with SAM should be evaluated with a thorough clinical examination in order to determine whether they have medical issues and a good appetite, according to the 2013 WHO Severe Acute Malnutrition Management Guideline. Children who pass the appetite test, are clinically healthy, and are alert should therefore get treatment as outpatients. While youngsters with medical issues, severe edoema (+++), or weak appetite should be handled as inpatients (WHO, 2013a). When their medical issues, including edoema, are clearing up and they have a decent appetite, as well as when they are clinically well and aware, children with SAM who are admitted to a stabilisation centre can be stabilised to outpatient care. Stabilised children's transition from inpatient to outpatient treatment should be based on their clinical condition, not on the basis of particular anthropometric results like a specific mid-upper arm circumference or weight-for-height/length.

The case fatality rate (CFR) in hospital settings will be cut in half by using WHO recommendations for managing SAM(WHO, 2013a).The lead time before presentation has a significant impact on the CFR of SAM, its prognosis, and the factors that determine successful therapy. Meaning that success rates are high if malnourished children receive nutritional assistance early in the course of their condition and adhere to treatment until they have recovered. On the other hand, success rates are low if clients seek care tardily and/or if they are skipping out on the programme. The WHO standards for the treatment of SAM are typically unable to follow effectively and sustainably due to a lack of qualified health personnel, according to scientific research. A severely malnourished child that has been admitted to hospital, regrettably agonize a death rate is as high as 30-50% during hospitals stay. Nevertheless, with proper treatment, in accordance with WHO guidelines, this unacceptably high death rate can be declined to less than 5%(WHO, 2013a).

The WHO's recommendations for SAM treatment are based on 10 general management principles that focus on correcting specific nutrient deficiencies, managing complications, and treating severe infections. Phase I, the transition phase, and Phase II make up the management structure. Treatment of infections as well as other consequences such dehydration, hypoglycemia, hypothermia, and other electrolyte abnormalities takes up the majority of Phase I. Restoration of the lost tissue and the encouragement of catch-up growth are the main goals of phase II and the transition phase. While the goal of treatment for infants younger than six months is to promote

breastfeeding and provide supplements until breast milk is adequate for the kid to grow normally, it is crucial to place the child on breast for the most of the time (WHO, 2013a).

2.4. Medical co-morbidity

Several studies stated that children with co morbidities 95(34.1%) have less likely of recovery 12 than those without medical co morbidities 293(84.0%). Likewise, the children with at least one medical complication have a 2mg/kg/day reduced rate of weight gain (Yebyo, Kendall, Nigusse, & Lemma, 2013).Most studies revealed that children who suffered concomitantly from SAM and HIV infection has a higher risk of mortality and a lower chance of recovery (Mekuria et al., 2017; Singh et al., 2014). However, studies from Zambia found that median length of stay and death rate in hospitalized children with complicated SAM Pertaining to diarrhea as a co morbid disease, most studies showed that, diarrhea, is a major cause of complication in SAM (Munthali, Jacobs, Sitali, Dambe, & Michelo, 2015)Similarly, it has been shown that children with diarrhea on admission had two and half times higher hazards of mortality. A study done in Sekota found that co morbidity like malaria and tuberculosis are independent significant predictors of death. A child with severe anemia, Tuberculosis and malaria had seven, three- and two-times higher hazards of mortality respectively as well as slows the recovery rate. Furthermore, hypoglycemic children has been more likely to die during treatment compared to their counterparts (Desta, 2015).

The recent study conducted in Waghimra Zone from 2014 – 2017 showed that children who had pneumonia (AHR = 0.44; 95% CI: 0.32, 0.59), anemia (AHR = 0.65; 95% CI: 0.52, 0.81) and vomiting (AHR = 0.63, 95% CI: 0.49, 0.82) at admission are less likely to recover quickly compared to those who did not have those conditions (Tadesse et al., 2021).
Lastly, the study conducted in Sidama region from September 2021 to January 2022 revealed that Children with anemia (AHR=2.57, 95% CI: 1.90–3.48) and dehydration (AHR=1.34, 95% CI: 1.07–1.75) during admission time had a longer recovery time than children who did not have those conditions (Abebe et al., 2023).

2.5. Routine medication

Among the admitted severely critically malnourished children, ampicillin and gentamycin are the typical medicines used for treatment and prevention of bacterial infection (WHO, 2013a)The risk

of death is six, three, and three times higher for children receiving intravenous (IV) antibiotics, blood transfusions, and IV infusions, respectively. On the other hand, children who are dehydrated and receiving nutrition through a nasal gastric tube (NGT) do not significantly increase the risk of death (Gebremichael et al., 2014). According to a study done on a sample of 947 kids at Jimma University Specialised Hospital, children who were dehydrated had 2.3 times the risk of dying compared to other kids. However, there was no proven link between IV infusion and blood transfusion as a danger of mortality or recovery, according to the study. Another cohort research done in the Debre Markos and Fenote Selam hospitals showed that children had a 65% lower chance of recovering from SAM if they did not take folic acid supplements while receiving therapy (Mekuria et al., 2017). For instance, a retrospective cohort study undertaken in Bahir Dar city among 401 admitted SAM children showed that, all routine and special medications as well as supplements were not associated significantly.

Another experimental research done in Malawi in 2016 among under-5 children on the use of placebo or antibiotic in the management of SAM had compared different broad-spectrum antibiotics and placebo treatment. On this experimental study a total 924 children were randomly assigned to the amoxicillin group, 923 to the cefdinir group, and 920 to the placebo group and were showed us a significant variability among cefdinir, amoxicillin, and placebo treatment of SAM. Children who were treated with cefdinir, amoxicillin, and placebo showed a higher recovery rate difference of 90.9%, 88.7%, and 85.1% respectively. This study also revealed that among children who recovered, a greater weight gain and fast recovery time is observed among broad-spectrum antibiotic users than placebo treatment users therapy (Trehan et al., 2016).

There is limited evidence on public health institutions-based studies, the majority of the previous studies focused on investigating children aged over 6 months making it difficult to determine the precise impact of some conditions, in different prior studies the average recovery time and its important predictors was not well established in a comprehensive way. Thus, this study was carried out to fill the gap by generating evidence using public health institutions-based studies approaches.

2.6. Conceptual Framework

Conceptual framework of the study describing the distal and proximal determinants of time to recovery from severe acute malnutrition. Socio-demographic variables is distal factors, medical co-morbidity, Routine medication are proximal factors.

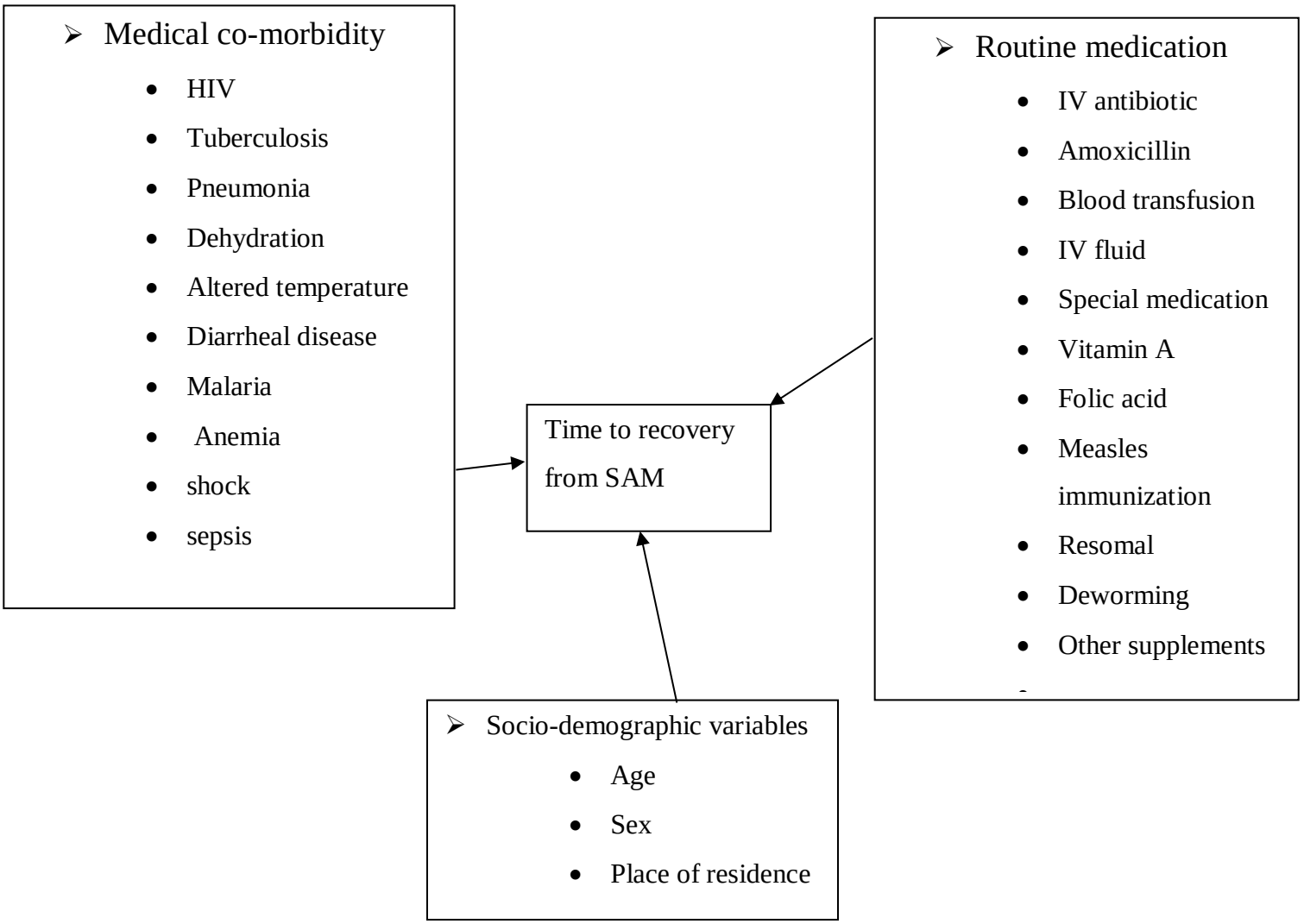

Figure 1 Conceptual framework for time to recovery from severe acute malnutrition and its predictors among 0-59 month's old children admitted to stabilization centers.

3. METHOD AND MATERIALS

3.1. Study Area and Period

The study was conducted in public Hospitals in West Harerghe zone, Eastern Ethiopia. The Zone is located 326 km far from Addis Ababa towards the Eastern of Ethiopia. The Zone has 15 rural and 5 urban districts. The altitude of this Zone ranges from 1200 to 2800 metres above sea level. The Climatic condition of west Harerghe is 44% Kola, 41% Weyinadega, and 15% Dega. The average temperature of the area ranges from 210 ℃ to 280 ℃. The annual rainfall of the Zone ranges from 650 mm to 1500 mm, which is influenced by the altitude and latitude of the direction. According to the projection of 2007 E.C population Census, the total population of the West Harerghe Zone is 2,667,000. Out of which 49% (214,712) were male and 51 % (223,476) are female of that under five children.

The zone has 7 government Hospitals and 85 health centers. The common health problems from top five causes of morbidity among health facilities attendants of under-five children are: acute Upper respiratory infection, pneumonia, diarrhea and malnutrition. Severe acute malnutrition is the first commonest reason for hospitals admission. In 2023 E.C. about 626 cases of severe acute malnutrition are admitted to the NRU in the public Hospitals (Zone Health Office annual report, 2023). This study was conducted from March 30, 2025 to April 30, 2025 in West Harerghe, Oromia region, Ethiopia.

3.2. Study Design

A hospital-based retrospective cohort study design was conducted.

3.3. Population

3.3.1. Source Population

The source population of this study was all children aged less than 59 months with SAM admitted to stabilization centers of public Hospitals in West Harerghe, Oromia region, Ethiopia.

3.3.2. Study Population.

The study population was all children aged less than 59 months with SAM admitted in a Stabilization center (SC) from September 01, 2019 to September 30, 2023.

3.4. Inclusion and Exclusion Criteria

3.4.1. Inclusion criteria

In this study all records of 0-59 month's old children with SAM admitted to SC and treated in therapeutic center of public Hospitals from September 01, 2019 to September 30, 2023 was included.

3.4.2. Exclusion criteria

In this study, incomplete records that missed socio-demographic information co morbidities; routine medications, patient treatment outcomes were excluded.

3.5. Sample Size Determination

An optimal Sample size was determined by STATA software Version 20 based on the formula designed for survival analysis sample size calculations. A hazard ratio of covariates detected as significant for median time to recovery as outcome variable was predetermined to obtain the maximum sample size.

The input parameters that used in sample size computation were standard deviation of 0.5, probability of Event, 5% probability of type I error, 80% power survival probabilities in exposed group and not exposed group are (TesfayeW, AbayM, Hintsa S, & Zafu T, 2016).

$$E = \frac{(Z(1-\alpha/2) + Z(1-\beta)^2}{[\ln(HR)^2 * p(1-p)]} \qquad n = E / Pr(E)$$

Where:

p = proportion in group 1 (for equal allocation p = 0.5) n = desired sample size

Zα= 1.96 (95% confidence level) E=Events

Zβ= 0.84 statistical power of 80%) Pr(E) =Event Probability

s1= survival probabilities in exposed group=0.578 ln (HR)=delta(loghazardratio)

s2 =survival probabilities in non-exposed group=0.4105 HR=hazard ratio

Then, the sample size is determined by different variables such as sex of the children, co morbidity, and dehydration. Finally, the variable sex of children is selected for final sample size calculation, the overall sample size became 264.

3.6. Sampling Procedure and technique

Simple random sampling was used to select the record of each child from the SC registration logbook from each health facilities based on their unique identification number, and then their charts was reviewed. Out of seven public Hospitals, three Hospitals are selected by the lottery method. Based on this I have selected Chiro Hospital, Hirna, and, Asabot Hospital.

The total sample size was allocated to the selected health facilities based on probability proportional to size (PPS). Accordingly, 135 participants from Chiro Hospital, 71 participants from Hirna Hospital, and 58 participants from Asabot Hospita are selecte by Stratified random sampling technique.

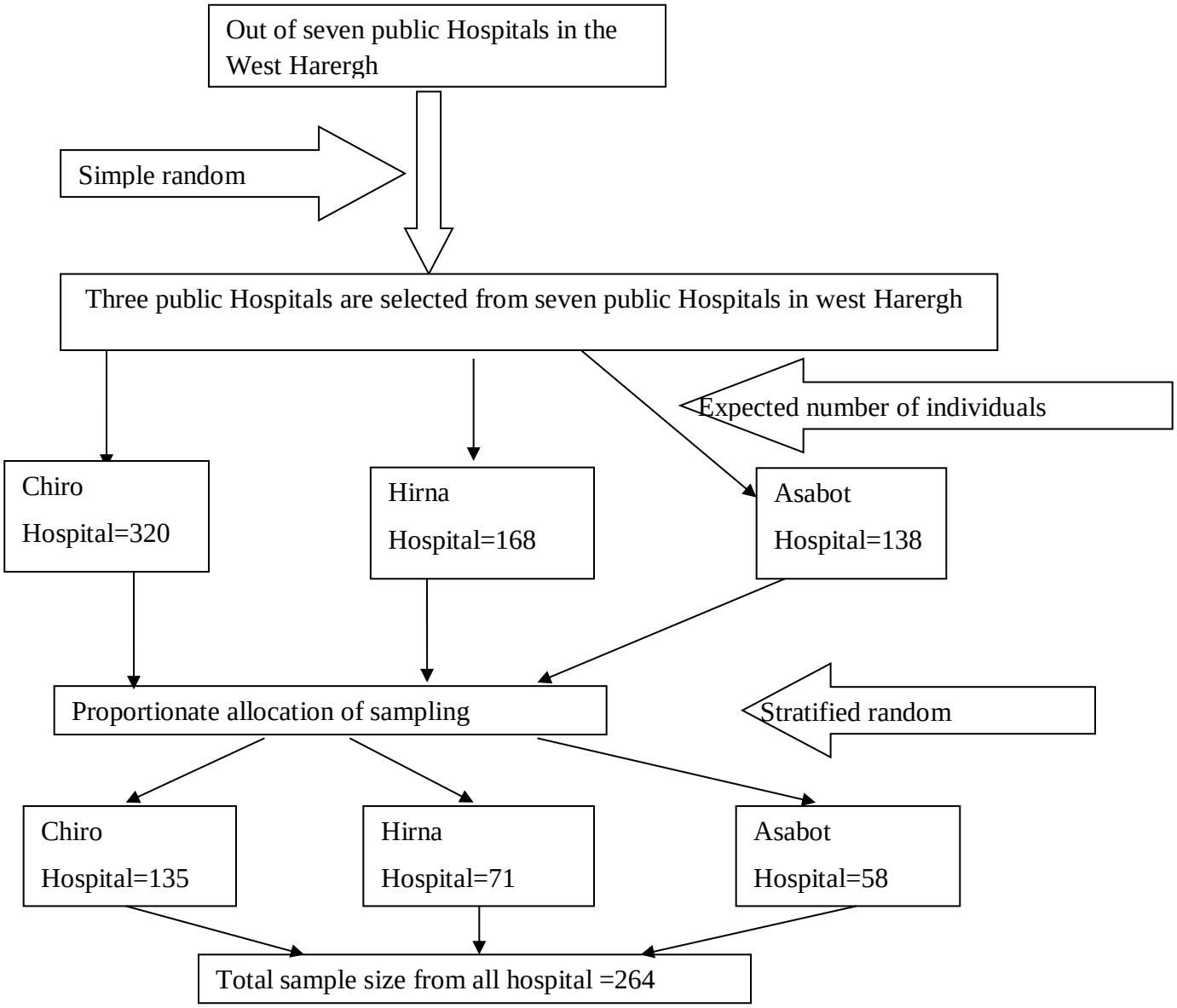

Figure 2: Diagrammatic scheme to display the sampling procedure for the time to recovery from severe acute malnutrition and its predictors Among 0-59 Month's old children admitted to stabilization centers of public Hospitals retrospective cohort study in West Harerghe, Oromia region, Ethiopia.

3.7. Data Collection Methods.

3.7.1. Data Collection instrument.

Data was collected using a Kobo Tool mobile app plat form and smart phone.

The structured data abstraction tool was developed from severe acute malnutrition management registration and the medical charts of children was used to collect data. The data extraction format was completed for each eligible patient card. Information regarding socio-demographic characteristics of the patients, clinical characteristics of children at admission, other medical complication at admission and other related data was gathered from the sampled individual patients' card. Then data was collected from the medical records and the SAM treatment registry through cross-validation.

3.7.2. Data collectors

Data collection was performed by four diploma nurses and two BSc nurses. The data collectors were recruited based on their good work experiences, being dedicated, hardworking and being involved in data collection as well as anthropometric and vital sign measurement.

3.7.3. Data collection Procedure

The medical record numbers were collected from SC ward TFU registration books. All collected medical record numbers were selected by simple random sampling using Excel method. Next, the medical record numbers were cross checked to avoid repetition and send to the medical record unit (MRU) access cards. Selected MRN were taken from MRU. Individual folders (cards) were reviewed after collecting them from the medical record unit (MRU) based on the selected medical registration numbers.

3.8. Variables for the study

3.8.1. Dependent variable

Time-to-recovery from severe acute malnutrition.

3.8.1. Independent Variables

Socio-demographic variables age, sex, place of residence.

Co morbid medical conditions HIV, tuberculosis, pneumonia, altered temperature, diarrhea diseases, Dehydration status, malaria, anemia, shock, sepsis, and "others".

Routine medication IV antibiotic, Amoxicillin, blood transfusion, IV fluid, Vitamin A, Folic acid, Deworming, special medication, measles immunization, Resomal, and other supplements.

3.9. Operational Definition

Time to recovery from SAM: - is defined as the time from the start of treatment to the time the child was cured.

Recovered- are those children who have become free from medical complications, edema and will be achieved and maintained sufficient MUAC (≥12.5cm) and weight for height (when WFH>-3 Score (WHO, 2013 a)

Censored- are those children whose death report is recorded, or against medical advice (caregivers sign on behalf of their child to leave the treatment before recovery), or SAM cases that are lost during treatment with unknown status.

3.10. Data Quality Control

Data was collected using a Kobo Tool mobile app plat form. Both the data collectors and supervisors were trained for two days on how to extract data, what to be extracted and to make to internalize the context of each question in the checklist. Further the aim of the study was also notified to them. Moreover, the training was strongly emphasizing the separate role of the supervisor and data collectors.

Supervisor was equipped with a skill on how to check the completeness and consistencies of extracted information and the investigator was assessed the quality of data during analysis stage to verify the completeness of the collected data. A pre-test was carried out on the 5% of the sample at Hospital, in an attempt to assess the level of skills of data collectors on how to extract an intended and impeccable data. The data was collected by using structured questionnaire that has been adapted and modified after reviewing relevant literature. The questionnaire was prepared in English. The day-to-day data collection process, corrects any problems, and ensures the completeness and consistency of the collected questionnaires on a daily basis.

3.11. Data Processing and Analysis

Data was downloaded with Microsoft Excel and code error, completeness, accuracy, clarity, and missing values was checked. And then were export to SPSS version 26. All statistical analysis was performed with SPSS version 26.

Descriptive exploratory analyses were running to assess missing values, presence of outliers. Summary statistics such as counts, percentages, medians, means, and standard deviations was computed. The Kaplan-Meier survival method was performed to estimate the probability of recovery at a given time and the log-rank test curves was applied to compare the survival curve. The assumption of Cox proportional hazards was tested graphically and the Schoenfeld residuals test. The Cox Snell residual test was used to assess the model's goodness of fit. Adjusted HRs (AHRs) with respective 95% CIs was estimated, and a value of P-value less than 0.05 was used to declare the presence of a significant association between predictive variables and outcome variable.

3.12. Ethical Consideration

The ethical approval and clearance for this study was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University. Officials governing Zonal and Hospitals was contacted with formal letters, which they must obtain from the Department of Public Health to secure permission. The permission letters were submitted to West Hararghe Zonal and Hospital. Informed, voluntary, written and signed consent was obtained from the hospital administration on behalf of the clients that the information collected was kept confidential and used only for the proposed study. Specific personal identifiers of children were not collected to maintain the client's private health issues, like HIV status.

3.13. Dissemination of the Results

The findings of this study will be submitted to Haramaya University, College of Health and Medical Science, School of Postgraduate Studies. It will be presented in an open public thesis defense to audiences. Copies of the study will be given to the West Hararghe Zonal Health Department and Hospital. Moreover, it will be sent to peer-reviewed journals for publication.

4. RESULTS

4.1. Socio- demographic Characteristics

Out of the total 264 children in the cohort, 133(50.4%) were females and more than two-third or 177(67%) of children were rural residents. The age of children ranges from 0 month to 59 months with majority of children 93(35.2%) were 24 – 35 months (Table 1).

Table-1: Distribution of socio-demographic characteristics of Time to recovery from severe acute malnutrition and its predictors among 0-59 Month's old children admitted to stabilization centers: a public Hospitals retrospective follow-up study in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264)

Variables	Categories	Frequency	**Percentage**
Age of the child	0 – 11	39	14.8
	12 – 23	68	25.8
	24 – 35	93	35.2
	36 – 47	52	19.7
	48 – 59	12	4.5
Sex of the child	Female	133	50.4
	Male	131	49.6
Place of residence	Rural	177	67.0
	Urban	87	33.0

4.2. Medical co-morbidity

One hundred ninety-two (72.7%) of the under-5 children who were chosen for the study had at least one comorbid condition. The most prevalent medical comorbidities among children under five who had SAM were diarrhea 102(39%), dehydration101 (38%), pneumonia 65(25%), and anemia 12(5%) respectively (Table 2).

Table-2: Distribution of Medical co-morbidity among admitted SAM cases in TFU of public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264)

Variables	Categories	Frequency (N=264)	Percentage
Presence of HIV/AIDS	No	263	99.6
	Yes	1	.4
Tuberculosis	No	262	99
	Yes	2	1
Pneumonia	No	199	75
	Yes	65	25
Fever (body temp>=37.5 ^{o} c)	No	255	97
	Yes	9	3
Diarrhea	No	162	61
	Yes	102	39
Dehydration	No	163	62
	Yes	101	38
Malaria	No	263	99.6
	Yes	1	.4
Anemia	No	252	95
	Yes	12	5
Presence of shock	No	264	100.0
	Yes	0	0
Sepsis	No	264	100.0
	Yes	0	0
Other medical co morbidities	No	260	98
	Yes	4	2

*Other medical comorbidities include: -TB, HIV/AIDS, Diabetes, congenital anomalies, intestinal parasites and measles.

4.3.Routine medication

IV antibiotics (gentamycin and ampicillin) accounted for 264 (100%) and PO antibiotics (amoxicillin) for 113 (42.8%) of the 264 children whose prescription records were chosen for evaluation. Regarding deworming of children, only 157 (59.5%) children were eligible (≥2 years) to take Albendazole/Mebendazole. Of those eligible children 152(96.8%) had been dewormed with Albendazole/ Mebendazole.

On the other hand, 102 (38.6%), 48 (18.2%), 9 (3.4%) and 243 (92%) SAM children took Resomal, IV fluid therapy, blood transfusion and vitamin A supplementation respectively (Table 3).

Table-3: Distribution of routine medication provision for admitted SAM cases in TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264)

Variables	Categories	Frequency (N=264)	%	Mean	Median	Std. Deviation
Blood transfusion	No	255	96.6	0.03	0.0	0.2
	Yes	9	3.4			
IV fluid	No	216	81.8	0.2	0.0	0.4
	Yes	48	18.2			
Folic acid Supplementation	No	255	96.6	0.03	0.0	0.2
	Yes	9	3.4			
Vitamin A Supplementation	No	21	8.0	0.9	1.0	0.3
	Yes	243	92.0			
Amoxicillin	No	151	57.2	0.4	0.0	0.5
	Yes	113	42.8			
Ampicillin and Gentamycin	No	0	0	1.0	1.0	0.0
	Yes	264	100.0			
Deworming	No	112	42.4	0.6	1.0	0.5
	Yes	152	57.6			
Special medication	No	260	98.5	0.02	0.0	0.1
	Yes	4	1.5			
Measles Immunization	No	29	11.0	0.9	1.0	0.3
	Yes	235	89.0			
Did the child take Resomal	No	162	61.4	0.4	0.0	0.5
	Yes	102	38.6			

4.4. Outcomes of inpatient management and length of hospitalization

Regarding the overall treatment outcomes of children with SAM, 257 (97%) of children were cured and 7(3%) of them were died.

Table-4: Time to recovery, and length of Hospitalization of children with severe acute malnutrition admitted in the TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264).

Days	Frequency	Percent
6	2	1
7	5	2
8	19	7
9	37	14
10	24	9
11	7	3
12	11	4
13	10	4
14	9	3
15	12	5
16	7	3
17	22	8
18	23	9
19	40	15
20	36	14
Cured	257	97
Death	7	3
Total	264	100

4.5. Kaplan-Meir survival estimates and Log-rank test for sever acute malnutrition recovery time by time series.

The overall cohort's median nutritional recovery time was 15 days (95%CI: 13.6-16.4)**.** Children without TB was significantly shorter recovery time compared with their counterparts (Log-rank test, $\chi 2=4.4$, $p<0.036$). Additionally, those who experienced no diarrhea was significantly shorter recovery time compared with their counterparts (Log-rank test, $\chi 2=108.8$, $p<0.000$). Similar to this, children with no dehydration were significantly shorter recovery time compared with their counterparts (Log-rank test, $\chi 2=108.8$, $p<0.000$).

Children without anemia was significantly shorter recovery time compared with their counterparts (Log-rank test, $\chi 2=13.9$, $p<0.000$). Children who got Amoxicillin (Log-rank test, $\chi 2=94.2$, $p<0.000$) had significantly shorter recovery time compared with their counterparts. Children who take Folic acid Supplementation (Log-rank test, $\chi 2=17.1$, $p<0.0001$) had significantly shorter recovery time compared with their counterparts**.** Additionally, children without various medical co-morbidities significantly shorter recovery time compared with their counterparts (Log-rank test, $\chi 2=8.9$, $p<0.003$).

Regarding treatments and supplements, a significant recovery time difference has been observed in children receiving Blood transfusion, IV fluid, Special medication and ReSoMal and their counter parts. However, there was no significant recovery time difference in children taking Vitamin A Supplementation, Measles Immunization, and Deworming, different supplements and their counterparts **(Table 5)**.

Table-5: Kaplan-Meir survival estimates and Log-rank test for sever acute malnutrition recovery time with different covariates at TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264).

Characteristics	Category	Estimate	95%CI	Log rank	P-Val
Tuberculosis	No	15.000	13.6-16.4	4.39	0.036
	Yes	20.000	17.7-22.3	.	
Diarrhea	No	10.000	9.2-10.8	108.8	<0.0001
	Yes	19.000	18.7-19.3		
Dehydration	No	10.000	9.2-10.8	108.8	<0.0001
	Yes	19.000	18.7-19.3		
Anemia	No	15.000	13.2-16.8	13.9	<0.0001
	Yes	20.000	17.5-22.5		
Other medical co morbidities	No	15.000	13.6-16.4	8.9	0.003
	Yes	20.000	18.8-21.2	.	
Blood transfusion	No	15.000	13.3-16.7	10.8	0.001
	Yes	20.000	17.7-22.3	.	
IV fluid	No	13.000	11.5-14.5	40.2	0.000
	Yes	19.000	18.6-19.4		
Folic acid Supplementation	No	15.000	13.3-16.7	17.1	0.000
	Yes	20.000	18.8-21.2	.	
Vitamin A Supplementation	No	13.000	8.5-17.5	2.8	0.094
	Yes	16.000	14.5-17.5		

Amoxicillin	No	18.000	17.5-18.5	94.15	<0.0001
	Yes	9.000	8.7-9.3		
Special medication	No	15.000	13.6-16.4	8.9	0.003
	Yes	20.000	18.8-21.2		
Did the child take Resomal	No	10.000	9.2-10.8	100.8	<0.0001
	Yes	19.000	18.7-19.3		
Overall		15.000	13.6-16.4		

The overall Kaplan Meier curve illustrates that, there was a 56% probability of surviving by the end of the 13th day of their stay and the likelihood to recover from severe acute malnutrition by the end of the 17th day of their follow up was 39% (Figure 3).

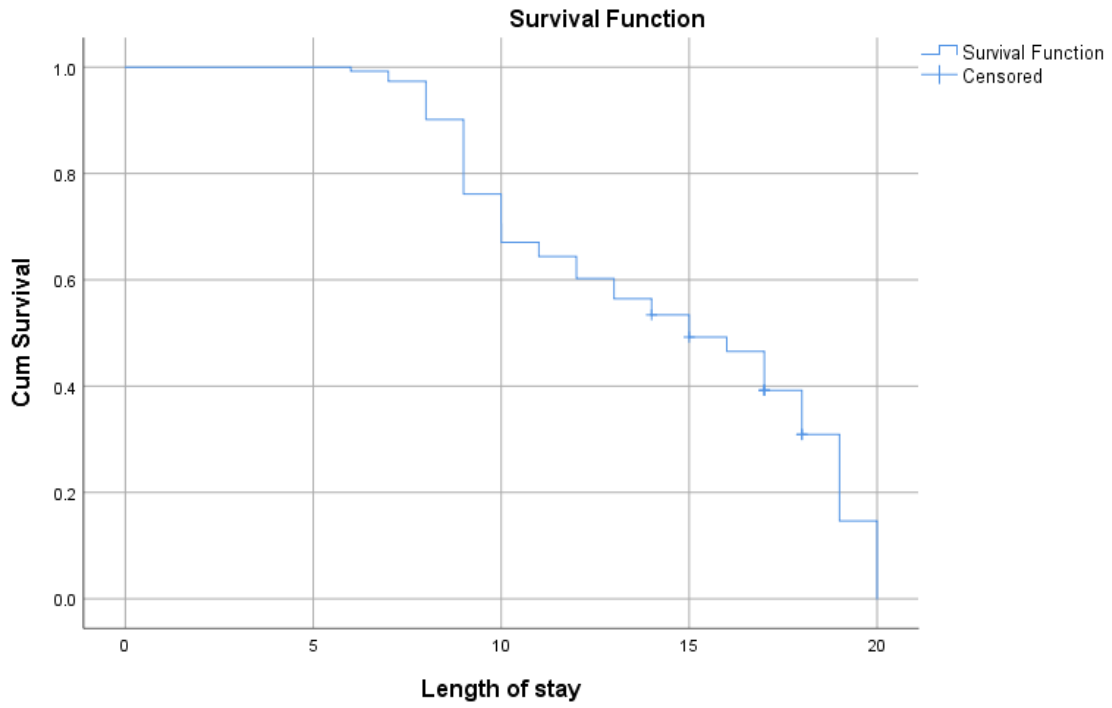

Figure-3: Shows overall Kaplan-Meier estimation of survival time to recover from SAM among under-5 children managed at TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264).

The Kaplan Meier curve illustrates that, the child with diarrhea was 78% probability of surviving by the end of the 18th day of their stay, while their counterparts had recovered from severe acute malnutrition by the end of the 18th day of their follow up was 13% (Figure 4).

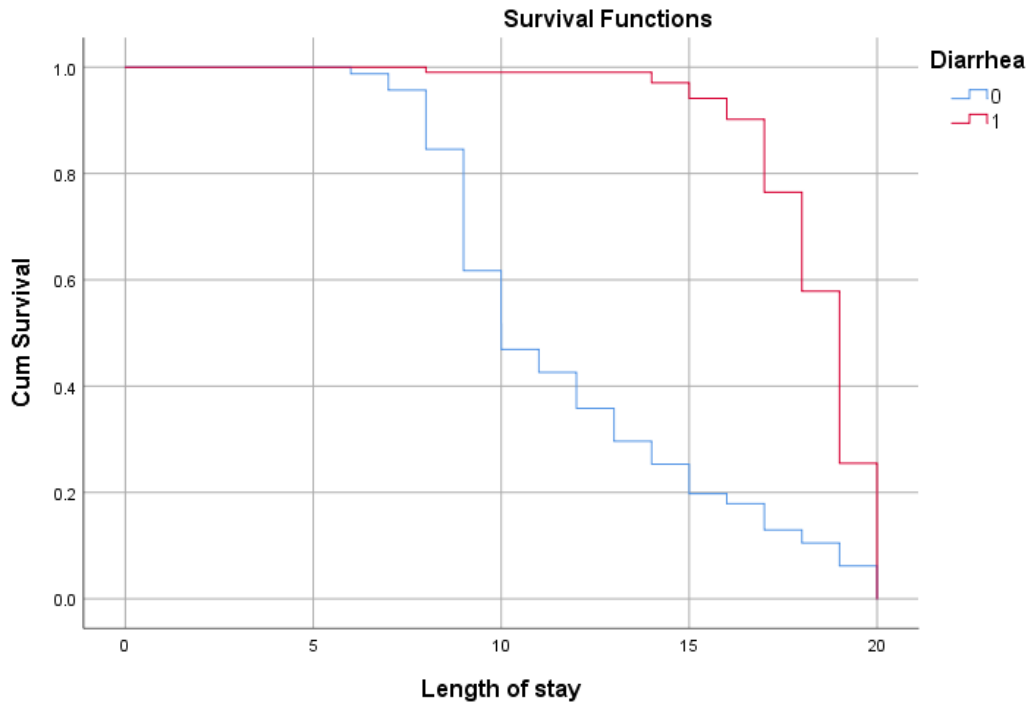

Figure-4: Kaplan-Meier survival curves comparing recovery time of under-5 children with SAM managed at TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264) based on diarrhea.

The Kaplan Meier curve illustrates that, the child with anemia was 83% probability of surviving by the end of the 15th day of their stay, while their counterparts had recovered from severe acute malnutrition by the end of the 15th day of their follow up was 47% (Figure 5).

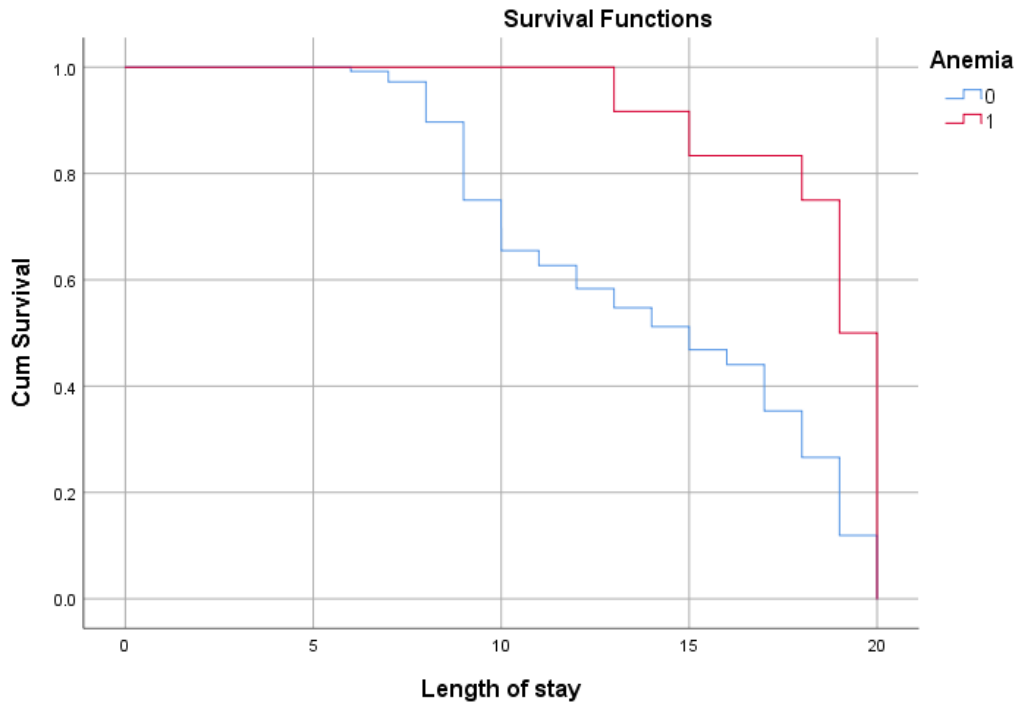

Figure-5: Kaplan-Meier survival curves comparing recovery time of under-5 children with SAM managed at TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264) based on Anemia.

The Kaplan Meier curve illustrates that, Children who got Amoxicillin was 18% probability of surviving by the end of the 15th day of their stay, while their counterparts had recovered from severe acute malnutrition by the end of the 15th day of their follow up was 70%.
Children who got Amoxicillin had shorter recovery time compared with their counterparts (Figure 6).

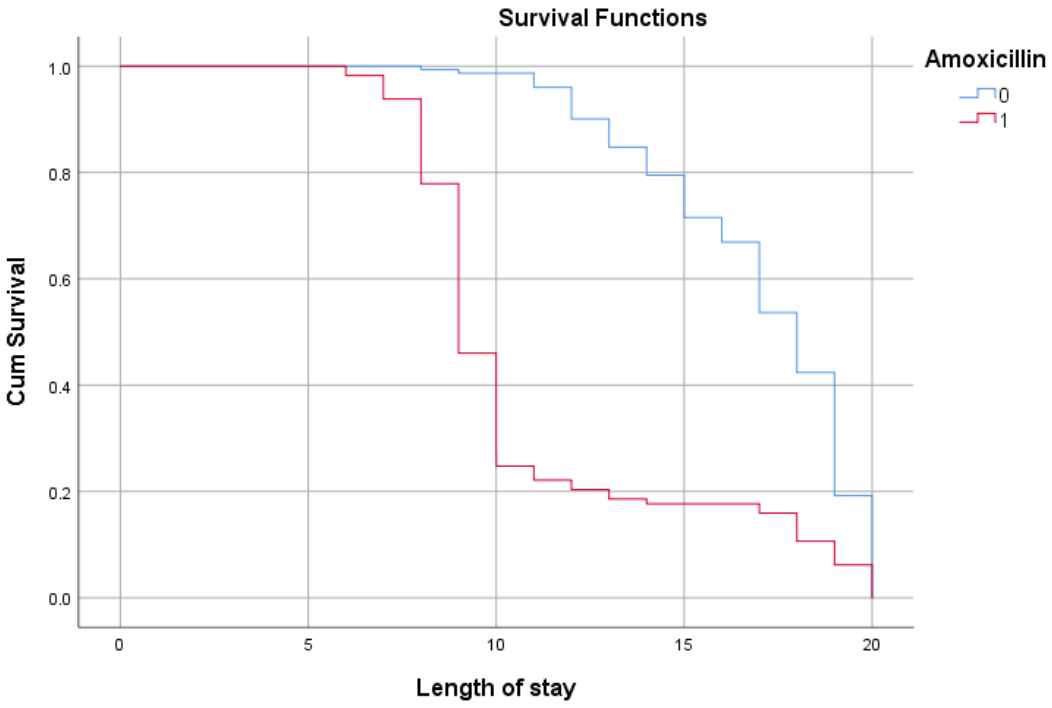

Figure-6: Kaplan-Meier survival curves comparing recovery time of under-5 children with SAM managed at TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264) based on Amoxicillin.

4.6. Predictors of Time to Recovery from Severe Acute Malnutrition

In Kaplan-Meier survival analysis, 12 variables that have P-value <0.25 were selected for Cox proportional hazards (tuberculosis, fever (body temp >=37.5 **^{o} c**), diarrhea, dehydration, anemia, other medical co morbidities, blood transfusion, IV fluid, folic acid Supplementation, Vitamin A Supplementation, amoxicillin and did the child take Resomal). Three of the variables (anemia, folic acid supplementation, and amoxicillin) were found to be a statistically significant predictors of time –to- recovery during Cox proportional hazards analysis at a 95% confidence level.

The study found that, children who developed anemia were 81% less likely to recover faster than those children who didn't develop (AHR=0.19, 95% CI: 0.044-0.82). Regarding routine medication children who were taking folic acid supplementation during hospital stay were 29% less likely to recover earlier compared to children who were not taking folic acid supplementation (AHR =0.29, 95 % CI: 0.105-0.79).

Lastly, Children who were taking amoxicillin during hospital stay were 3.3 time more likely to recover earlier compared to children who were not taking amoxicillin (AHR =3.3, 95 % CI: 2.4-4.5)

Table 6: Factors associated with recovery time from SAM among under-5 children at the TFU of a public Hospitals in West Harerghe, Oromia region, Ethiopia from September 2019 to September 2023 (N=264).

Variables	Time-to-recovery from severe acute malnutrition	Frequency	CHR (95%CI)	AHR (95%CI)	p-value
Tuberculosis	No	262	0.37(0.09-1.5)	0.75 (0.09-6.00)	0.8
	Yes	2	1		
Fever (body temp >=37.5 **^{o} c**)	No	255	1.59(0.81-3.1)	1.52 (0.76-3.03)	0.23
	Yes	9	1		
Diarrhea	No	162	0.32(.24-.41)	0.67 (0.09-4.89)	0.7
	Yes	102	1		
Dehydration among children with diarrhea	No	163	.32(.24-.41)	0.52 (0.06-4.44)	0.55
	Yes	101	1		
Anemia	No	252	.41(.21-.77)	0.18 (0.044-0.82)	0.026*
	Yes	12	1		
Other medical co morbidities	No	260	1.65(1.0-2.7)	1.7 (0.79-3.67)	0.17
	Yes	4	1		
Blood transfusion	No	255	.39(.18-.82)	1.0 (0.23-4.76)	0.95
	Yes	9	1		
IV fluid	No	216	.43(.3-.6)	1.5 (0.97-2.38)	0.068
	Yes	48	1		
Folic acid Supplementation	No	255	.35(.17-.71)	0.29 (0.105-0.79)	0.017*
	Yes	9	1		
Vitamin A Supplementation	No	21	.72(.46-1.12)	1.2 (0.78-2.04)	0.34
	Yes	243	1		
Amoxicillin	No	151	2.8(2.1-3.6)	3.3 (2.4-4.5)	<0.0001
	Yes	113	1		
Did the child take Resomal	No	162	.3(.25-.43)	0.46 (0.207-1.02)	0.056
	Yes	102	1		

5. DISCUSSION

The current study revealed important information on time to recovery from severely malnourished children and its predictors among under-five children admitted to stabilization center of a public Hospitals retrospective follow-up study in West Harerghe. The aim of the study was to determine recovery time from SAM and to identify predictors of nutritional recovery time. From the total of 264 under-5 children included in the study, 97% of children recovered, 3% of children died. Compared to the SPHERE project value, the overall recovery, and death rate were in acceptable ranges (>75% and 15%) (Sphere Association ., 2018).

The study found that the median recovery time was 15 days (95%CI: 13.6-16.4). Compared to the SPHERE standard, the overall median time to recovery from SAM was in acceptable ranges (i.e., <4weeks).The median time to recovery from SAM reported in this study was in line with studies done in Asosa General hospital (15days) (Bizuneh et al ., 2022), and India (11.71+7.59 days) (Singh et al ., 2014). However, it was higher than a report of nutritional recovery time from studies done in Sekota Hospital (10days) (Desta et al ., 2015), in selected public health facilities of Sidama region (8days) (Abebe et al ., 2023), Zambia (12days) (Munthali et al ., 2016) , Nekemte referral hospital (8-14days) (Mena et al ., 2018), two hospitals of Wolaiyta zone (11days) (Admasu et al ., 2017) and Waghimra zone of Tigrai region(11days) (Tadesse et al ., 2021). The difference in the recovery time could be due to sociodemographic status, health care setup and difference in study period.

On the other hand, report of nutritional recovery time was lower than studies done in Dilchora referral hospital (80days) (Oumer et al ., 2015), Afar region Dubti zone referral hospital (18.4days) (Bekele et al., 2022), Yirgelam hospital (18.16days) (Kabeta and Bekele, 2017), Gambia (18days) (Burrell et al., 2017), Hawasa university comprehensive specialized hospital (17days) (Fikrie et al., 2019), Jimma university comprehensive specialized hospital (16days) (Jarso et al ., 2015) .

The study also revealed that the children who received folic acid supplements, and amoxicillin were more likely to recover from SAM. However, those who admitted with anemia at admission were less likely to recover. Similarly, the study found that the cohort of SAM Children admitted with no anemia had a shorter recovery time from SAM as compared to those children admitted with anemia. This was supported by study conducted in Sidama region (Abebe et al., 2023), Nekemte referral hospital (Mena et al., 2018), and Waghimra Zone of Tigray region (Tadesse et al., 2021). The cause might be that malnourished children are more likely to have micronutrient deficiencies, especially iron deficiency anemia, and that early intervention was not provided because iron damages cell membranes, worsens infections, and increases the risk of heart failure in children who present with anemia and require prolonged recuperation (FMoH, 2019 ;Thakur et al., 2017). Regarding treatments, and supplements, folic acid supplementation, and taking Amoxicillin of children was the significant factor for nutritional recovery time of under-5 children.

Under-5 children who were folic acid supplementation were more likely to recover faster than those who were not folic acid supplementation. This was supported by study conducted in Debre Markos and Fenote Selam hospitals (Mekuria et al., 2017). The possible reason for this could be folic acid supplementation was important for treating and preventing anemia and repairing the damaged gut of children and reduce recovery time (FMoH, 2019).

Moreover, the finding of this study showed that the cohort of SAM children who were treated with amoxicillin had higher recovery rate than children who were not treated with amoxicillin. This was supported by study conducted in Malawi (Trehan et al., 2016). This can be explained by the supportive effect of Amoxicillin in the treatment of infections and other complications associated with SAM(Trehan et al., 2016).

These findings suggest that appropriate folic acid supplementation in combination with the national SAM management protocol promote early recovery from the program.

5.1. Strengths and Limitations of the Study

5.1.1. Strengths of the Study

The strength of this study include:

Using a 5-year record to increase representativeness.

5.1.2. Limitations of the Study

Due to the nature of the retrospective and secondary data, incomplete records were seen in some variables. So that analysis of predictors for nutritional recovery time was limited by the information that could be obtained from the patient's charts.

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

The average length of stay and the median time- to- recovery from SAM were within the acceptable ranges of SPHERE standard. Anemia, folic acid supplementation, and giving amoxicillin were independent predictors of nutritional recovery time from SAM. This study demonstrated that the administration of amoxicillin, and folic acid supplements was associated with a shorter nutritional recovery time. Conversely, anemia was associated with a prolonged the nutritional recovery time from SAM. Therefore, to prevent complications; to reduce length of hospitalization, emphasis should be given for improving early detection and treatment of SAM to prevent comorbidities like Anemia.

6.2. Recommendation

Based on the findings of this study, the following recommendations have been forwarded with each respective body: -

For chiro,Hirna,and Asabot hospital medical director and staffs:

Children receiving amoxicillin was a shorter nutritional recovery time. Conversely, Anemia, and folic acid supplements had a longer time to recover from SAM and required special care. Thus, strong emphasis should be given to early diagnosis and management of Anemia, and giving amoxicillin.

For Future Researcher

As this is, a hospital based retrospective secondary data analysis; future researchers should use a prospective cohort study design for better information including other factors not included under this study.

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8. ANNEXES:

8.1. INFORMATION SHEET AND INFORMED VOLUNTARY CONSENT FORM FOR HEAD OF Hospitals

1. Introduction:

My name is Usman Abdela Adem. I am the Principal Investigator of the study to be conducted in this Health facilies (Chiro,Hirna,and Asabot Hospitals). I am studying for my Master's degree at Haramaya University, the College of Health and Medical Sciences. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study setting.

2. The study/project title:

Time to recovery from severe acute malnutrition and its predictors among 0-59 month's old children admitted to stabilization centers: a public Hospitals retrospective cohort study in West Harerghe, Oromia region, Ethiopia.

3. Purpose/aim of the study:

The findings of this study can be of a paramount importance for the Hospital to plan intervention programs to prevent child hood severe acute malnutrition in the community, thereby improve child health and survival in general. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's Program in Public Health Nutrition for the principal investigator.

4. Procedure and duration:

I will be reviewing registration logbook and their charts of the <5 children through trained data collectors using a questionnaire to provide me with pertinent data that is helpful for the study. There are 49 questions to answer where the data collectors will fill the questionnaire by reviewing the charts /logbook. The review of each charts /logbook will take about 20 minutes.

5. Risks and benefits:

The risk of participating in this study is very minimal. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health planners.

6. Confidentiality:

The information that we will be provided will be kept confidential. There will be no information that will identify the participants in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

7. Rights:

The Hospital has also the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the Hospital's premises.

8. Contact address:

If you have any questions or concerns at any time about the study, you can contact the concerned bodies with the following address.

Principal investigator Haramaya University College of Health and Medical sciences

Name: Usman Abdela Adem Address of IHRERC: Haramaya University

Address: - Doba District P. O. Box 235, Harar, Ethiopia.

Office: -District Health office Tel 025-4662011

Tel: 0910157729/0922816333

Email: Usmanabdela6333@gmail.com

9. Declaration of informed voluntary consent:

I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that participants have the right to withdraw from the study at any time or not to answer any question that they do not want. I am also informed that the Hospital has the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the Hospital's premises. Therefore, I declare my voluntary consent on behalf of _____Hospital management to allow this study to be conducted in the Hospital with my initials (signature).

Name and Signature of Head of the Hospital: _____ _____ Date _____

Name and Signature of the PI: _____ _____ Date _____

8.2. QuestionnaireEnglish version

Questionnaire for Time to recovery from severe acute malnutrition and its predictors among 0-59 month's old children admitted to stabilization centers: retrospective follow-up study in West Harerghe, Oromia region, Ethiopia. (English Version).

Questionnaires on Time to recovery from severe acute malnutrition and its predictors among 0-59 month's old children admitted to stabilization centers: retrospective cohort study in West Harerghe, Oromia region, Ethiopia on selected Health Facilities _____ , West Hararghe, Oromia, Ethiopia, 2024.

Region: Oromia Zone: West Hararghe Hospital: _____,

1. Questionnaires ID NO_____

2. Code of Data Collector_____

3. Date of data review _____Time started _____Time finished_____

4. Name and Signature of the reviewer_____

Name and Signature of Supervisor_____

Instructions: This format contains 30 questions, which are pertinent to the research objectives. You are kindly request to answer all as completely as possible and carefully by filling the blank spaces and encircling one appropriate choice from the alternatives given.

Part I: Socio – Demographic Characteristics

Q. No	Question	Responses	Code	Skip to Q_
1	Age of the child	_____ months		
2	Sex of the child	1.Male 2.Female		
3	Place of Residence	1. Urban 2. Rural		

P art II: Medical co-morbidity

Q. No	Question	Responses	Code	Skip to Q_
1	Presence of HIV/AIDS	1.Yes 0. No		
2	Tuberculosis	1. Yes 0. No		
3	Pneumonia	1. Yes 0. No		
4	Fever (body temp >=37.5oc)	1. Yes 0.No		
5	Diarrhea	1. Yes 0.No		
6	Dehydration among children with diarrhea	1. Yes 0.No		
7	Malaria	1. Yes 0.No		
8	Anemia	1. Anemic 0. No anemic		
9	Presence of shock	1. Yes 0.No		
10	Sepsis	1. Yes 0.No		
11	Other medical co morbidities (list)	List)_____		

Part III: Routine medication

Q. No	Question	Responses	Code	Skip to Q_
1	IV antibiotics	1. Yes 0. No		
2	Blood transfusion	1. Yes 0. No		
3	IV fluid	1. Yes 0. No		
4	Folic acid supplementation	1. Yes 0. No		
5	VitaminA Supplementation	1. Yes 0. No		
6	Amoxicillin	1. Yes 0. No		
7	Ampicillin and Gentamycin	1. Yes 0. No		
8	Deworming	1. Yes 0. No		
9	Special medication	1. Yes 0. No		
10	Measles Immunization	1. Yes 0. No		
11	Did the child take ReSoMal?	1. Yes 0. No		
12	Other supplements	List_____		

Part IV: Outcomes of inpatient management and length of hospitalization

Q. No	Question	Responses	Code	Skip to Q_
1	Final outcomes of treatment	0. Death 1. Cured 2, Others		
2	Date of admission	Date._____		
3	Date of discharge	Date._____		
4	Length of stay	_____days		

Checked by supervisor; Name_____, Signature_____

8.3. CURRICULUM VITAE

l. Personal Information

Name	Usman Abdela Adem
Date of birth	15/01/1995 G.C
Place of birth	Oromia Region, West Harerghe Zone, and Doba District
Age	28
Sex	Male
Marital Status	Married
Nationality	Ethiopian

2. Educational Experiences

Elementary School	Doba primary school
High School and Preparatory	Doba Secondary school
Higher Institution	Woldia University
Qualification	

Bsc Degree in Nursing since Jun/2017

Work Experience

I have been working as General Nursing professional from October 2017- Sebtember 2023 at Biyo Health Center, Doba District.

As primary health, care unit Director, from December 2019 - May /2022 at Biyo Health Center, Doba District as primary health care unit Director.

Currently I am working at Biyo Health center, Doba District as oute patient Department coordinator since September /2023.

Address

Mobile 0910157729/0922816333 Email Usmanabdela6333@gmail.com

Language proficiency

Afan Oromo (excellent)

Very Good at Amharic and English

References

1. Sudi Jeylan Mobile: 0921503772 Doba District Health Offices Communicable Disease Coordinator

2. Abeba Tesfaye Mobile: 0935605373, Doba District Health Office Nutrition Coordinator

3. Niguse Dejene Mobile: 0913962364 Doba District Health Office Head.