ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF NURSING

SURVIVAL STATUS AND PREDICTORS OF MORTALITY AMONG UNDER-FIVE CHILDREN WITH SEVERE ACUTE MALNUTRITION ADMITTED TO STABILIZATION CENTER AT JINKA GENERAL HOSPITAL, SOUTHERN ETHIOPIA

BY: TAMIRU CHONKA (BSC)

A THESIS TO BE SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCE, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF NURSING FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER'S OF SCIENCE IN PEDIATRICS AND CHILD HEALTH NURSING

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ADDIS ABABA

JUNE, 2020

Acknowledgement

First of all, thank you Almighty God, this is the only word you seek from me for all your priceless gifts.

I would also like to express my genuine gratitude to my advisors Mr. Bereket Gebremichael (Ass't Professor) and Mrs. Kalkidan Wondwossen for their consistent guidance, encouragement and critical reviews and for giving constructive and valuable comments and suggestions during the course of this thesis.

At last, I would like to extend my appreciation to Addis Ababa University, College of Health Sciences, school of Nursing and Midwifery for providing me this opportunity to carry out the study.

Abbreviations and Acronyms

AHR- Adjusted Hazard Ratio

CHR- Crude Hazard Ratio

CI- Confidence Interval

EDHS- Ethiopian Demographic and Health Survey

HR- Hazard Ratio

IMCI- Integrated Management of Childhood Illness

IV- Intra-Venous

JGH- Jinka General Hospital

MUAC- Mid-Upper Arm Circumference

NCHS- National Center for Health Statistics

NGO- Non-Governmental Organization

OTP- Out-Patient Program

ReSoMal- Rehydration Solution for Malnourished

RUTF- Ready to Use Therapeutic Feeding

SAM- Severe Acute Malnutrition

SC- Stabilization Center

SD- Standard Deviation

SNNPR- South Nations Nationalities of Peoples Region

TB- Tuberculosis

TFC- Therapeutic Feeding Center

UNICEF – United Nations International Children's Emergency Fund

WFA- Weight for Age

WFH- Weight for Height

WHO- World Health Organization

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Abstract

Background: Globally, nearly 49 million under-five children were wasted and 17 million were severely wasted in 2018.In Africa, about 13.8 million and 4 million children were wasted and severely wasted respectively. Severe acute malnutrition contributes to one million under five deaths each year which is about 45 percent of deaths in this particular age group. With the existence of functional Stabilization centers following standard protocol many developing countries continue to experience high mortality of children with severe acute malnutrition.

Objective: To determine survival status and identify predictors of mortality among under-5 children with severe acute malnutrition admitted to Stabilization Center.

Methods: A retrospective cohort study was employed among 388 under-five children with Sever Acute Malnutrition admitted to stabilization center at Jinka General Hospital between January 2017 and December 2019. The data was collected from randomly selected records from each year. Data was entered to Epi-Data and exported to SPSS Version 25 for analysis. The Kaplan Meier survival curve is used to estimate the cumulative survival time. Log rank tests were used to compare probability of hazard among variables. Bi-varaite and multivariate Cox proportional hazards models were used to identify predictor variables and variables having p value < 0.05 were considered as statistically significant.

Result: Findings of this study showed that the overall survival times at 1st, 7th, 14th, 21st and 28th days were; 99.2%, 97.9%, 90.5%, 87.9%, and 86.6% respectively with mean length of stay of 12 days. Adjusting other variables children with edema were AHR 2.38, Tuberculosis (AHR 2.39), malaria (AHR 4) and anemia (AHR 3.12) times more likely to die than their counterparts. On the other hand, children treated with amoxicillin were 59% and mebendazole 84% more likely to survive than not treated.

Conclusion: Death rate while being on treatment is high in this study area. But recovery rate, default rate and transfer rate are acceptable according pre-existing standard. Children having edema, malaria, anemia, Tuberculosis and being treated with amoxicillin and mebendazole were independent predictors of mortality.

Key words: Survival status, severe acute malnutrition, under-five children, South Ethiopia, Jinka Hospital

1. INTRODUCTION

1.1. **Background**

Malnutrition is a clinical conditions which results from lack of one or more nutrients leading to altered physical functioning up to the body can no longer maintain enough bodily performance(1). It encompasses both over nutrition, associated with overweight and obesity, and under nutrition, referring to multiple conditions including acute and chronic malnutrition and micronutrient deficiencies(2,3). Many factors can cause malnutrition, most of which are related to poor diet or severe and repeated infections, particularly in underprivileged populations(2). Malnutrition, including both calorie and micronutrient deprivation, causes acute and chronic morbidity, contributes to reduced immunity, and increases the likelihood of mortality and morbidity in association with infectious diseases(4).

Acute malnutrition is defined indifferent ways and referred to by different names like protein-energy malnutrition, kwashiorkor and marasmus. It results from sudden reductions in food intake or diet quality and is often combined with pathological causes(3). According to the degree of wasting and the presence of edema it is classified into severe acute malnutrition (SAM) and moderate acute malnutrition (MAM). Acute malnutrition is classified as MAM if the wasting is less severe, weight for height (WFH) between 70% and 80% of the National Center for Health Statistics (NCHS) median. It is SAM if the wasting is severe (WFH < 70% median or <-3SD of the mean or MUAC less than 115 mm in children 6-59 months) or there is bilateral pitting edema of nutritional origin(5). Degrees of malnutrition can be associated with high risk of all-causes of mortality due to pneumonia, diarrhea, and measles(3).

Under-five children are those who are majorly affected by acute malnutrition. Malnutrition in childhood has many adverse consequences for child survival and long-term well-being. It also has far-reaching consequences for human capital, economic productivity, and national development overall(6). Key strategies to prevent the development of acute malnutrition in under 5 children include proper breastfeeding, complementary feeding practices and accessible health care for the prevention and treatment of disease.

In addition to prevention strategy, treatment of those who are sick also plays important role. (7). For the past 30 years, the approach to treatment of SAM has focused on the clinical aspects of the condition. Currently, recommended treatment regimens are exclusively inpatient at stabilization center based on intensive medical and nutritional protocols administered by highly trained health care professionals(8).

Stabilization center (SC) is a place/ward where children with SAM are kept for stabilizing their health. The principle of management of severe acute malnutrition at SC; children who failed appetite test, and/or with one or more medical complication, and/or with severe edema (+3) are first admitted to a stabilization center for consecutive phases of treatment. Children with severe acute malnutrition can be discharged from therapeutic care includes those who have recovered, died, defaulted or not recovered. According to Nutrition Fact Sheet, Ethiopia 2018, a recovery rate for severe acute malnutrition is 88.7%(9).As WHO and Sphere Hand Book 2018, with the existence of functional SCs following standard protocol, the acceptable proportion of discharges from therapeutic care who have, recovered >75%, defaulted <15% and died <10%.

1.2. **Problem Statement**

Malnutrition continues to be a major public health problem throughout the developing world, particularly in southern Asia and sub-Saharan Africa(10). Globally, malnourished children, particularly those with severe acute malnutrition, have a higher risk of death from common childhood illnesses as a result of weakened immunity. Nearly 51 million children under-five are wasted, an estimated 16 million are affected by severe acute malnutrition with one million under five deaths each year. This contributes to about 45 percent of deaths in children under-five years of age. (11).

This figure is significantly high, because comparing with well-nourished children; those with severe acute malnutrition are more than nine times more likely to die. It is due to the direct result of malnutrition itself, and the indirect effect of childhood illnesses like pneumonia, diarrhea and measles that severely malnourished children are too weak to survive(12,13). Moreover, children suffering from wasting are susceptible to long term developmental delays(14).

Sub-Saharan Africa and Southern Asia are significantly affected by acute malnutrition. According to United Nations International Children's Emergency Fund (UNICEF), WHO, World Bank Group joint malnutrition estimates, more than two thirds of all wasted under-five children lived in Asia and more than one quarter resides in Africa. This number is. about 13.8 and four million under-five children were wasted and severely wasted only in Africa (12).

According to 2016 Ethiopian demographic health survey (EDHS), about 10% children under-five years of age suffered from wasting including 3% who were severely wasted nationally(6,14).The magnitude of wasting is 6% in South Nations Nationalities of Peoples Region (SNNPR), Ethiopia(14).The prevalence is expected to be higher in the study area than the regional average as it is evidenced by larger admission at SC. , Findings of research showed 3.8% to 29% mortality has been reported among children admitted to stabilization center in Ethiopia(15,16).

Although efforts made in screening and treating severely malnourished children based on WHO standard protocol, in stabilization centers, it still results in unacceptably high mortality rate, low level of recovery rate, and prolonged hospitalization.

An institution based retrospective study conducted in Bahir Dar, Ethiopia, showed that 51.9%, 4.2%, and 35.7% of children admitted to stabilization center (SC) were recovered, died and defaulted respectively (17). Another retrospective cohort study conducted in Gedeo Zone, Southern Ethiopia had shown 59.7%, 16.3% and 9.3%were cured, transferred and died respectively. This findings varies across study areas and are unacceptably higher according to the minimum international standard (17). Likely predictors for this high inpatient mortality are the severity during admission, co-morbidity/complication, type of treatment given and socio-economic variability results in increasing severity at presentation(19,20).

Studies conducted in Ethiopia revealed that many predicting variables contribute to death while on treatment for SAM. But the findings are not consistent and variable in different study areas(15). (16), (19). Furthermore, survival status and predictors of mortality among under-five children with SAM is not studied and documented in many areas. Particularly, there is no study conducted in this study area. Therefore, the purpose of this study is to assess survival status and identify predictors of mortality among under-five children with SAM admitted to Stabilization Center of Jinka General Hospital.

1.3. **Significance of the Study**

Evidence-based estimation of child mortality is a cornerstone for tracking progress towards child survival goal and identifying priority areas to improve progress towards eliminating preventable deaths due to SAM. Improvement in child survival is good indicator of quality care. So, it is important for health care providers and health officials to prioritize and improve outcomes.

This study is conceptualized to generate baseline data for policymakers, nongovernmental organizations, researchers and program managers on survival status and predictors of mortality among under-five children with SAM admitted to SC. Moreover, the result of this study will be important for health care providers to evaluate their treatment outcome in terms of WHO standards, prioritize care to improve survival and to reduce death. In addition, the finding of this research will also help the Hospital administrators and clinicians to have information on magnitude of mortality from SAM in a hospital setting. This can help to identify best practice or work to improve the survival and reduce death from SAM.

2. LITERATURE REVIEW

Malnutrition occurs when an individual's dietary intake is not balanced with his or her nutritional needs, harming health, well-being and/or productivity. Malnutrition includes under-nutrition and over-nutrition. Under-nutrition is defined as a lack of nutrients caused by inadequate dietary intake and/or disease. It encompasses a range of conditions, including acute malnutrition, chronic malnutrition or stunting(8).

Child malnutrition is the first contributor to under-five mortality due to greater susceptibility to infections and slow recovery from illness. Children who do not reach their optimum height or consistently experience weight loss during childhood are affected in the long term in numerous ways. From these, they do not reach their optimum size as adults, their brains are affected (resulting in lower IQs) and they are at greater risk of infection (which kills many children during their early years). As a result they will have impacts on education attainment, economic productivity(21).

SAM is a nutritional condition defined by severe wasting (thinness) and/or presence of bilateral pitting edema. SAM in children 6–59 months is defined as the presence of nutritional (bilateral pitting) edema or severe wasting based on a MUAC less than 11.5 cm or a WFH < −3 z-score. SAM in infants less than 6 months is defined as the presence of nutritional edema or severe wasting based on a WFL < −3 z-score(8).

Globally in 2017, nearly 51 million children under 5 were wasted and 16 million were severely wasted. This figure is shocking, because comparing with well-nourished children; those with severe acute malnutrition are more than nine times more likely to die. Sub-Saharan Africa and southern Asia are significantly affected by acute malnutrition. According to UNICEF, WHO, World Bank Group joint malnutrition estimates, in 2017, more than two thirds of all wasted children under-5 lived in Asia. In Africa, about 13.8 million children under 5 were wasted from which 4 million children were severely wasted(12).In Ethiopia, about 10% children under 5 years of age suffered from wasting including 3% who were severely wasted(14).

A child with SAM especially presenting with medical complications is vulnerable and at increased risk of death that requires specialized hospital care which differs from the standard treatment of children who do not have SAM(8).

2.1. **Survival status and treatment outcome**

Children admitted to SC with SAM can be discharged by the outcomes of recovery, death, default or transfer. As WHO and Sphere Hand Book 2018, with the presence of functional SCs following standard protocol, the acceptable proportion of discharges from therapeutic care, >75% by recovery, <15% by default and <10% by death. According to Nutrition Fact Sheet, Ethiopia 2018, a recovery rate for severe acute malnutrition is 88.7%(9) This outcome can be achieved by prompt treatment of all infections in these children with appropriate antibiotics, correction of the electrolytes, hypothermia, hypoglycemia, micronutrients and macronutrients by strictly following WHO criteria(22).

Many researchers strive to determine the survival status and predictors of mortality among under-5 children with SAM throughout the world. For instance, a prospective study in Uganda to assess the predictors of mortality among hospitalized children with severe acute malnutrition reported that from the total of 400 children enrolled, 9.8% died during in-patient therapeutic care, and 81.8%, 7.3% and1.3% were respectively; improved, lost to follow-up and terminated from the study. Of 39 deaths, above one fourth of the deaths occurred in the first 48 h of admission, and 46.2% died in the first 7 days with the mean duration of hospitalization was 18.1 ± 9.2 days(23).

A study of 251 severely malnourished children were admitted to St. Mary's hospital Lacor, Northern Uganda shows about two third were successfully discharged as cured, 30 (11.9 %) died, and the rest had potentially unsatisfactory outcome comprising defaulting treatment, transfer out and non-response (21.2%).

Different researches were conducted in Ethiopia to assess survival status and predictors of mortality among under-5 children with severe acute malnutrition admitted to stabilization center. An institutional cohort study done among 527 under-5 children with SAM who were admitted to SC at Gondar comprehensive specialized hospital shows; sixty six (12.52%) children were dead

and two third of participants were recovered at the end of follow-up and the average length of stay in the hospital was 12 days. As the study, about 90% of deaths were within the first two weeks. The overall cumulative probability of survival at the 5th, 10th and 15th day was respectively 90.2%, 84.7%, and 80.9%,(20).

Another retrospective study was conducted in Gedeo Zone to assess survival status and predictors of mortality among 545 children admitted to SC and treated for SAM. During the follow-up period, 51 (9.3%) had died during treatment, about sixty percent children had got cured, eighty nine (16.3%) had required nutritional transfer, thirty seven (6.8%) had transferred to higher health facility due to medical reason, twenty six (4.8%) had defaulted and sixteen (2.9%) were right-censored. From the total of 51 deaths, 17.6% had occurred within the first two days, 47%, 84% of death occurred respectively within the first week and the second week. As the report of the study, the overall cumulative probability of survival at the 1^{st}, 7^{th} , 14th and 21^{st} days was respectively; 99%, 95.3%, 90% and 85%, with fourteen days of the average length of stay in the hospital(18).

On the other hand, a research finding of institutional based record review of 947 children with SAM in Jimma University Specialized Hospital reported that; above three fourth (77.8 %) were cured and eighty eight (9.3 %) were died during treatment. From 88 deaths, 27.3 % occurred in the first two days and 60.2 % at the end of first week with 17.4 days of the average length of stay in the hospital(24). Also a retrospective study conducted on 415 children aged 0-59 months who were admitted for complicated severe acute malnutrition at Sekota Hospital shows 119 (28.67%) children were died, with 80 (67.22%) were died within forty eight hour (HR= 0.7). The remaining 296 (71.32%) were alive to the last censoring date. The estimated mortality rate was 13%, 7% and 2% at 2, 4 and 6 days of their hospitalization(15).

Another retrospective research done in selected hospitals from Ethiopia to assess Co-morbidity and treatment outcomes shows; out of 413, 24 (5.8%) were discharged by death, where as more than half (55.9%) and 16.3% were recovered and defaulted from TFCs respectively(25).

Furthermore, a retrospective follow up study was conducted to determine survival status and predictors of mortality among 566 under-5 children with SAM admitted to SCs in general hospitals of Tigray. According to the study report, 21 [3.8% (95% CI 2.2–5.6)] were died where

as 82%, 6.65%, 4.5% and 1.44% were cured, absconded, had got medical referral and transferred out respectively. The cumulative survival probability at the end of 1st, 7th, 14th, 21stand 28th days were 99.5%, 98%, 96.4%, 92.7% and 89.1% respectively(16).

Despite the presence of functional therapeutic feeding centers with following standard protocols, the death of children in SCs in Ethiopia is unacceptable. Therefore, the determining factors for poor outcomes are not well understood in stabilization center, Jinka General Hospital.

2.2. **Factors associated with the death of children with SAM admitted to SCs**

Many scholars have tried to determine the predictors of mortality among <5 children with SAM. Although, they found different factors associated with; socio-demographic variables, baseline anthropometric measurements, type of malnutrition, immunization status, medical co-morbidity, clinical profile(19) during admission and treatments and supplements are considered as having association(16,19,20,23,26).

2.2.1. Socio-demographic factors and survival status

A prospective observational study was conducted among 120 children in Uganda to assess risk factors for death during inpatient SAM. According to this study, age ≥24 months were 5.7 times risk of death than age below 24 months(27). Unlikely, another retrospective study done at Jimma University Specialized Hospital among 997 uner-5 severely malnourished children showed children age less than 24 months were two times more likely to die earlier than children with age above 24 months(24).

On the other hand, a retrospective study of 569 under-five children with SAM admitted to SC in general hospitals of Tigray shows the risk of mortality among children with SAM admitted to SCs from the urban areas were 2.73 times higher as compared to rural residents (AHR = 2.73) 95% CI 1.12–6.64)(16).

2.2.2. Baseline anthropometric measurements and survival status

A diagnostic test accuracy study was done among 1663 children 6-59 months of age in Pediatric emergency department of a tertiary care hospital in Delhi, India to assess MUAC and WFH Z-score predicting mortality in hospitalized children. As the findings of this study, both MUAC <

11·5cm (adjusted OR (95% CI): 3·7 (2·43, 5·60), P<0·001) and WHZ<−3(2·0 (1·37, 2·99), P<0·001) were independent predictors of inpatient mortality(28).

2.2.3. Types of malnutrition and survival status

Research findings in Ethiopia also show an association of anthropometric measurements with survival status. For example, a cohort study was done among 420 children with severe acute malnutrition aged from 6 to 59 months who have been managed at stabilization center in southern Ethiopia. According to the study, SAM children with oedema were 1.8 times more likely to survive than severely wasted (AHR = 1.8, 95 % CI: 1.3–2.4)(29).

An institution based retrospective study assessing survival status and predictors of mortality among 947 under-5 children with SAM admitted to Jimma University Specialized Hospital indicated, type of malnutrition was not independent predictors of earlier death(24).

2.2.4. Medical co-morbidity and survival status

Several studies have been reported on the magnitude and association of co-morbidity among children with SAM admitted in SC. A retrospective study involved 251 severely malnourished children treated at St. Mary's hospital Lacor, northern Uganda has showed an association of medical co-morbidity with survival status. As the study, HIV positive children were three times more likely to die compared to HIV positive counterparts (OR 3.087, p = 0.010)(30).

A retrospective cohort study was done in selected hospitals in North Shoa Zone, Ethiopia, among 413 children with SAM. As the finding of this report, children who had pneumonia were 29% more risky to die as compared to children who had no pneumonia (AHR = 0.71; 95% CI: 0.51, 0.98)(25). Another study done in Gedeo Zone revealed the hazard of death among children with anemia was more than six and half times more likely(AHR =6.7, 95%CI=3.22, 13.97) to die than children with no anemia(18).

A retrospective study was conducted at Sekota Hospital Waghemra Zone among 415 under-5 children who were admitted for SAM to assess survival status and predictors of mortality. As a result indicates; among children with severe acute malnutrition who had malaria at admission, more than two times (Hazard ratio 2.13, 95% CI = 1.12, 7.35), children with severe anemia (<4

gm/dl) had more than six and half times and children with TB were about three times higher hazard of death compared to their counterpart(15). On the other hand, another study conducted in Dilchora Hospital, eastern Ethiopia showed the children with malaria were more than twelve times more likely die than children not infected by malaria(31).

2.2.5. Routine and special medications

According to a retrospective study involved 251 severely malnourished children treated at St. Mary's hospital Lacor, northern Uganda, indicated children who received IV fluid infusion were significantly more likely to die compared to those who did not receive IV fluids (31.7 %, 5.0 %), with P< 0.001. And also significantly higher proportion of children that received blood transfusion died (27.6 %) compared to those who were not transfused (5.0 %), P< 0.001(30).

As a study conducted among 527 under-five children who were admitted to SC for SAM management at Gondar University comprehensive specialized hospital, children who did not treated with routine antibiotics were about two times more likely to die as compared to those treated with routine antibiotics(20). Another retrospective cohort study was done to assess incidence and predictors of mortality among 450 under-5 children with SAM admitted to Dilla University Referral Hospital. The study indicated IV fluid administration (AHR=3.24 (95 % CI [1.54-6.8) was found to be independent predictor of death in severely malnourished children admitted to SC(19).

2.2.6. Treatment and supplements

A retrospective cohort study done among 415 severely malnourished under-5 children admitted to SC at Sekota Hospital, Waghemra Zone to assess survival status and predictors of mortality. According to this study, the hazard ratio of children not treated by anti-biotics was three times higher compared to those treated with antibiotics. And also children not supplemented folic acid during their hospitalization were more than two times hazard of death (AHR 2.30, 95% CI=1.54, 3.40) and children not supplemented for Vitamin A were 53% times higher risk of death (AHR= 1.53, 95% CI = 1.05, 2.24), than their counterparts(15).

An institution based retrospective study conducted in Northwest Ethiopia to assess Predictors of mortality among 527 severely malnourished under-5 children admitted to SC. The study reveals,

children who had not treated with routine antibiotics were about two times more likely to die as compared to those treated with routine antibiotics (AHR: 2.3,95% CI: 1.2, 4.4)(20).

2.3. **Conceptual framework**

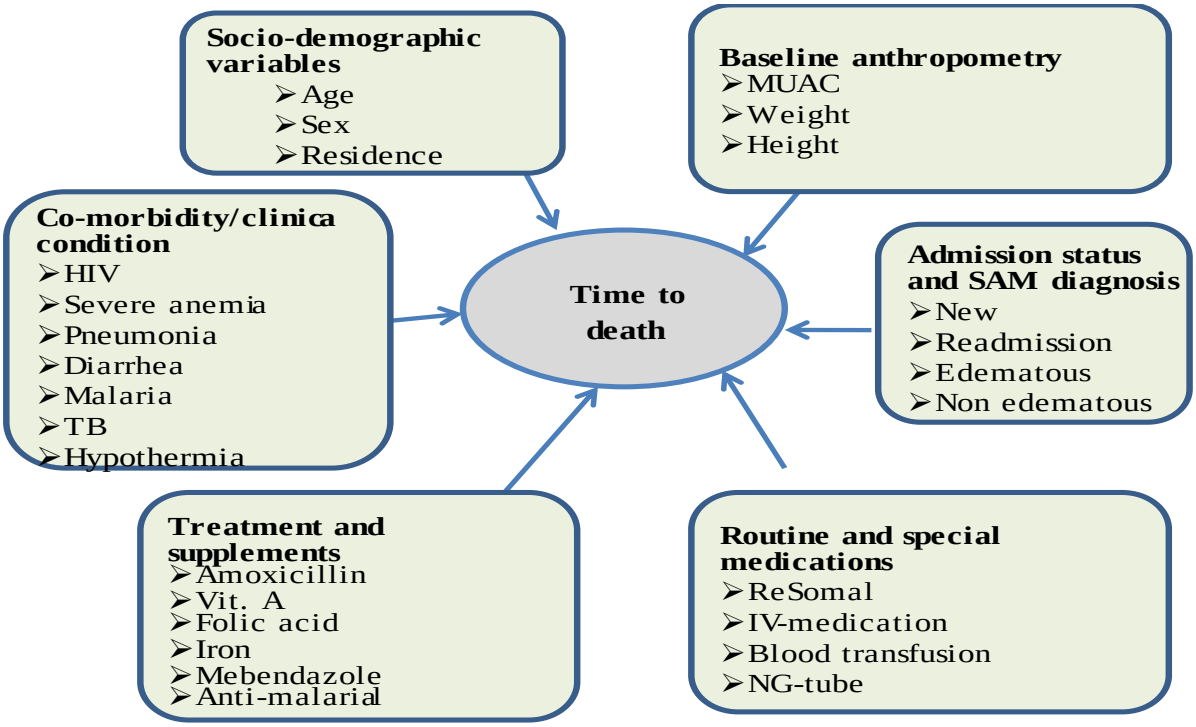

Figure 1:Schematic presentation of conceptual framework developed by reviewing related literatures (15,16,18,24,32)

3. OBJECTIVES

3.1. General objective:

To determine survival status and predictors of mortality among under-five children with severe acute malnutrition admitted to Stabilization Center of Jinka General Hospital, South Ethiopia

3.2. Specific objectives

- To determine survival status among children under-five years of age with severe acute malnutrition.
- To determine predictors of mortality among children under-five years of age with severe acute malnutrition.

4. METHOD AND MATERIALS

4.1. Study area

This study was conducted in Jinka General Hospital, Jinka. Jinka General Hospital is located in South Omo Zone, Southern Ethiopia. South Omo is a Zone in the Ethiopian Southern Nations, Nationalities and Peoples' Region (SNNPR). The zone is bordered in the south with Kenya, in the west with Bench Maji, in the northwest with Keffa, in the north with Konta, Gamo, Gofa and Basketo, in the northeast with Dirashe and Konso, and in the east with the Oromia regional state. The administrative center of South Omo Zone is Jinka, which is about 676 km to south direction from Addis Ababa, the capital city of Ethiopia.

Based on the 2007 census, the total population of the South Omo Zone was 577,673 (7.5% urban and 92.5% rural) of whom 50% were men(33). Presently, Jinka General Hospital, the first Hospital in the South Omo Zone, has been serving the community since April 2009 GC(34).

Jinka General Hospital has stabilization center for inpatient management service for SAM. In the Hospital, SC was established and equipped in 2013 GC. Currently, the SC is well equipped and there are four trained health care workers for the management of SAM.

4.2. Study design and study period

Institution based retrospective cohort study was conducted from January 1/2017 to December 31/2019 in Jinka General Hospital.

4.3. Source population

All records of under-five children with SAM admitted in JGH stabilization center from Jan, 1/2017- Dec, 31/2019.

4.4. Study population

Records of randomly selected under-five children with SAM admitted in stabilization center, JGH from Jan, 1/2017- Dec, 31/2019.

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

All records of under-five children with SAM admitted in JGH stabilization center admitted in from Jan, 1/2017- Dec, 31/2019.

4.5.2. Exclusion criteria

Records of children with SAM who were admitted to SC but whose records lack the following data were excluded.

- Records of children whose admission date and discharge date not recorded
- Records of children with incomplete anthropometric data
- Records of children whose treatment outcome not recorded

4.6. Sample size determination

The sample size for the first objective (death as outcome of SAM treatment) was determined by the single population formula with the specification of death rate 29%(15), 95% confidence level, 5% margin of error.

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

The ultimate sample size of records to review was 348 with 10% of compensation for possible missing values according to the above formula.

The sample size for the second objective (predictor variables of mortality) was determined by Epi-info version 7.2.2 by considering the following assumptions: CI = 95%, power = 80%, ratio of unexposed to exposed 1:1 and parameters:

P1- percent of death outcome among exposed children

P2- percent of death outcome among unexposed children

Table 1: Sample Size calculated based on some predictor variables of death from different studies done in different areas**.**

Variables	Proportions (% of outcome)	Risk ratio	References	Sample size
Dehydration at admission - **Yes (P_1)** - **No (P_2)**	P_1 = 86.6% P_2 = 62.7%	0.72	(19)	**Exposed = 59** **Unexposed = 59** **Total = 118**
MUAC - **< 11.5 (P_1)** - **≥ 11.5 (P_2)**	P_1 = 14.8% P_2= 3.73%	0.25	(18)	**Exposed = 124** **Unexposed = 124** **Total = 248**
Routine antibiotics - **No (P_1)** - **Yes (P_2)**	**P_1 = 18.2%** **P_2= 8.1%**	**2.24**	**(20)**	**Exposed = 194** **Unexposed = 194** **Total = 388**

The highest sample size calculated for the second objective was (388), which was also larger than the first objective.

4.7. **Sampling procedure**

The sampling frame was records of all children aged 0-59 months with severe acute malnutrition admitted to SC from January 1st 2017 to December 31st, 2019. The total numbers of children admitted to SC for SAM treatment in three years were 583.

The total sample size for each year was allocated proportionally from the sampling frame. Simple random sampling was used to select samples (patient chart) by using patient registration number in each year.

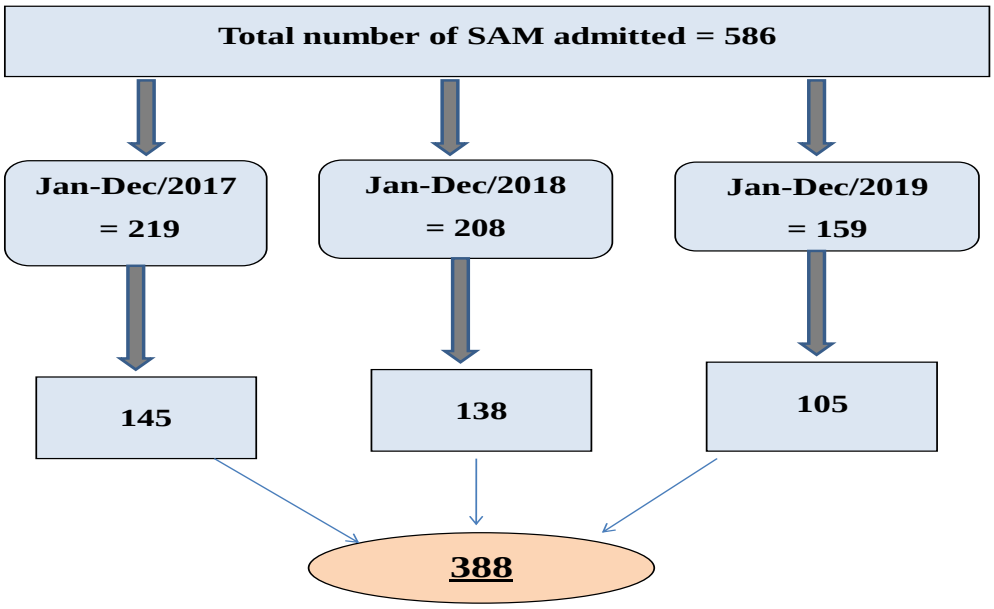

Figure 2: Schematic presentation of sampling procedure

4.8. Data collection tool

Structured data abstraction format was used for data collection. The data abstraction format was adopted from the standard treatment protocol for the management of SAM(35), SAM registration logbook and reviewing articles to assemble the required individual information(15,19,36)

Data extraction format includes the children's socio-demographic data (age, sex, and residence), baseline anthropometric measurements (weight and MUAC), types of malnutrition (edematous and non-edematous), co-morbidity (anemia, malaria, and pneumonia), medication given and outcomes of the treatment.

4.9. Data collection procedure

Four data collectors (Nurse by training) and two supervisors were recruited for data collection. Two days training was given to ensure common understanding of the data collection process. They perform the data abstraction from the patient medical record and SAM treatment registry. Two supervisors of MSc holders with principal investigator closely supervised and organized the whole process of data collection.

4.10. Variables

4.10.1. Dependent variables

Time to event (death)

4.10.2. Independent variable

- Patient socio-demographic characteristics (age, sex, residence)
- Baseline anthropometrics (weight, height, MUAC, edema)
- Co-morbidities (HIV, malaria, TB, severe anemia, pneumonia, diarrhea)
- Types of malnutrition (edematous, non-edematous)
- Medication and supplements (routine antibiotics, Vitamin A, folic acid, mebendazole, anti-malarial,) and special medication (IV medication, NGT feeding, blood transfusion and ReSomal)

4.11. Definition of terms/ operational definitions

- **Severe Acute Malnutrition**- if the wasting is severe (WFH < 70% median or <-3SD of the mean or MUAC less than 115 mm in children 6-59 months) or there is bilateral pitting edema of nutritional origin(35).
- **Recovered**- children free from medical complications, edema and have achieved and maintained sufficient weight gain (when they reach 85% weight for length)(37).
- **Died**: Patient that has died while s/he was in the in-patient care and death report is recorded in patient card(37).
- **Defaulted**- SAM cases that are sign(parents on behalf of their child)against treatment to leave treatment before cure or lost for 2 consecutive days with unknown status(37).
- **Survival**: lack of experience of death. It is being alive and not experiencing SAM related death during hospitalization period.
- **Co-morbidity**- children with severe acute malnutrition, who have another medical problem like; TB, HIV, malaria, severe anemia or any co-infection at admission to SC.
- **Medical transfer**: child is referred to higher health facilities for medical reasons
- **New admission:** Patients that are directly admitted to in-patient care to start the nutritional treatment
- **Relapse:** if that patient has ever been severely malnourished before and cured

- **Marasmus -**non-edematous SAM
- **Kwashiorkor -** edematous SAM
- **Marasmic-kwash -** SAM cases with both edema and severe wasting.
- **Percentage of recovered** - number of recovered/total number of discharged x 100
- **Percentage of died** - number of deaths/total number of discharged x 100
- **Percentage of defaulted** - number of defaulters/total number of discharged x 100

4.12. Data quality control

Data quality was assured by using structured extraction format adopted from WHO protocol for the management of SAM and different literatures. Pre-test was conducted on 5% of sample size with at JGH two weeks prior to the actual study to check usually recorded variables on the patient's medical record. Tool was amended based on the pretest findings.

Two days training was given concerning the data abstraction tool and data collection process for both data collectors and supervisors. During the data collection time, close supervision and monitoring have been carried out by supervisors and principal investigator to ensure the quality of the data. After collection, the completeness and consistency have been checked on a daily base by the investigator.

4.13. Methods of data analysis and presentation

Data was coded, entered into Epi-Data 3.1, exported to SPSS version 25 for analysis. Survival curve and hazard curve were used to display the survival (time to death) among different characteristics. Bi-variate Cox regression was fitted and those independent variables having p-value ≤ 0.25 level of significance were included in the multivariable analysis. Cox proportional-hazard regression was fitted at 5% level of significance to determine the net effect of each explanatory variable on outcome variable (Hazard ratio with its 95% confidence interval and p-values was used to measure strength of association and identify statistically significance). P-value < 0.05 was considered as statistically significant association. Finally, the results of the study were presented with text, graph and table.

4.14. **Ethical consideration**

This study was carried out after getting approval from the Institutional Review Board (IRB) of Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery. Then, data was collected after getting permission from Zonal Health Department and Jinka General Hospital. Since the study was conducted through review of medical records, there was no direct contact with children/care givers, informed consent was not obtained.

However, all the necessary measures were taken to keep and assure the privacy, confidentiality and benefits of patient. To keep the confidentiality names and unique numbers were not included in the data abstraction format and the data was not disclosed to any person or organization other than principal investigator. All collected data were coded and after data entry abstraction form was kept confidential.

4.15. **Dissemination of the research findings**

Findings of this study will be submitted and presented to school of Nursing and Midwifery, College of Health Sciences, Addis Ababa University. It will also be disseminated to Jinka General Hospital, Debub Omo Zone Health Department, and different NGOs working on malnutrition around Debub Omo. Attempt will be made to publish the finding in peer reviewed and reputable journal.

5. RESULT

5.1. Socio-demographic and anthropometric characteristics of the study participants

Out of 388 under-five children with SAM enrolled in the study, more than half 204(52.6%) were males. Majority of children 324(83.5%) were rural residents and 245(63.1%) of the study participants were age below 24 months.

Table 2: Socio-demographic characteristics of under-five children with SAM admitted and treated in SC in Jinka General Hospital from January 1/2017- December 31/2019 (N=388)

Type of treatment given	Category	Frequency	Percent
Sex	Male	204	52.6
	Female	184	47.4
Age	<24 months	245	63.1
	≥ 24months	143	36.9
Residence	Urban	64	16.5
	Rural	324	83.5
MUAC	< 115	243	62.6
	≥115	145	37.4

5.2. Admission status and SAM diagnosis

From all cohorts 212(54.6%) were MUAC below < 115mm, 145(37.4%) were MUAC 115mm and above and the rest 31(8%) of participants were not eligible for MUAC, age below 6 months. Moreover, about 46.1% of children were diagnosed with edematous type of malnutrition (kwashiorkor or marasmic-kwash) and 7.2% of children were re-admitted.

5.3. Co-morbidity/complication on admission

Among all study participants, 329 (84.8%) had at least one medical complication at admission. From those with complications about 226(58.2%) of children had diarrhea and other most common medical complications were pneumonia 128 (33%), anemia 55 (14.2%), malaria 35 (9%) and other medical co-morbidities were 40 (10.3%).

Table 3: Complication/co-morbidity illness among under-five children admitted with SAM at Jinka general hospital from January 1/2017 – December 31/2019

Characteristics of the child	Category	Frequency	Percent
HIV	Reactive	11	2.8
	Non-reactive	377	97.2
Tb	Yes	31	8.0
	No	357	92.0
Pneumonia	Yes	128	33.0
	No	260	67.0
Malaria	Yes	35	9.0
	No	353	91.0
Diarrhea	Yes	226	58.2
	No	162	41.8
Anemia	Yes	55	14.2
	No	333	85.8
Presence of other Complication	Yes	40	10.3
	No	348	89.7

5.4. Routine and special medications

Different medications were given and procedures were done based on the standard guideline. From the total children enrolled, most 319(82.2%) were treated with IV medication. While 227(58.5%), 206(53.1%) and 52(13.4%) of children at SC were given ReSoMal, NG tube insertion and blood transfusion respectively.

Table 4: Routine and special medications given for under-five children admitted with SAM at Jinka General Hospital, January 1/2017- December 31/2019

Characteristics of the child	Category	Frequency	Percent
Did the child take IV medication?	Yes	319	82.2
	No	69	17.8
Did the child take Blood?	Yes	52	13.4
	No	336	86.6
Did the child have NG tube insertion?	Yes	206	53.1
	No	182	46.9
Did the child take ReSoMal?	Yes	227	58.5
	No	161	41.5

5.4. Treatment and supplements

Different treatments and supplements were given for children enrolled in the study based on acute malnutrition treatment guidelines. About half 209(53.9%) of children received amoxicillin and 32(8.2%) were treated with anti-malarial. In addition, nearly one fifth 84(21.6%) had vitamin A supplementation, 53(13.7%) took folic acid, 16(4.1%) took iron supplements and 88(22.7%) of children were dewormed.

Table 5: Distribution of supplements given for under-five children admitted to SC with SAM at Jinka General Hospital, January 1/2017 – December 31/2019 (N=388)

Type of treatment given	Category	Frequency	Percent
Amoxicillin	Yes	209	53.9
	No	179	46.1
Vitamin A	Yes	84	21.6
	No	304	78.4
Anti-malarial	Yes	32	8.2
	No	356	91.8
Folic Acid	Yes	53	13.7
	No	335	86.3
Mebendazole	Yes	88	22.7
	No	300	77.3
Iron	Yes	16	4.1
	No	372	95.9

5.5. Survival status and Treatment outcomes

A total of 388 children were followed for different periods from January 1/2017 to December, 30/2019 for a minimum of 1 and maximum of 40 days. The cumulative survival probability at 1^{st}, 2^{nd}, 7^{th}, 14^{th}, 21^{st} and 28^{th} day was 99.2%, 97.9%, 90.5%, 87.9%, 86.6% respectively with average length of stay in SC was 12 days.

Among all study participants, fifty-four (13.9%) died while the rest 334(86.1%) were censored. Among 334 children censored 314(80.9%) were discharged with recovery, 14(3.6%) were defaulter and 6(1.5%) were transferred to other health facility.

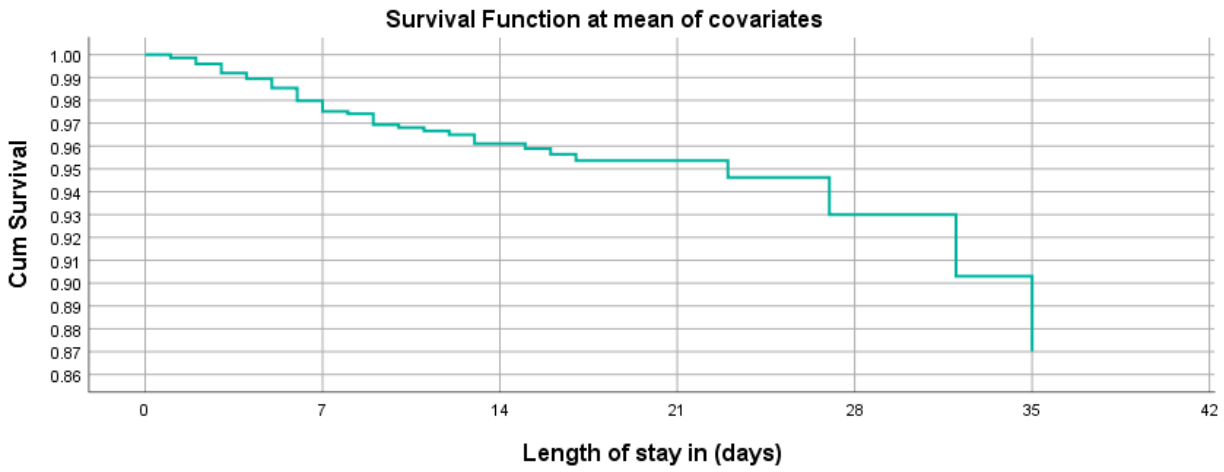

Figure 3: Kaplan-Meier estimation of survival time to recovery from SAM among under-5 children treated in SC at Jinka General Hospital, January 1/2017 – December 31/2019

Mean survival time estimate among under-five children in stabilization center

There was a significant mean survival time difference among children with malaria, 28days (95% CI=19.675-31.888) and without malaria, 32days (95% CI=29.334-33.756); and children with anemia, 22days (95% CI=17.555-26.574) and without anemia, 35days (95% CI=32.432-37.101). And also the analysis showed significantly different mean survival time among children who took blood transfusion, 24days (95%CI=19.536-29.088) and those who didn't, 33days (95%CI=30.715-36.274); and who were treated with amoxicillin, 33days (95%CI=29.009-37.063)

Table 6: Kaplan-Meier survival estimate for severe acute malnutrition time to death with different co-varaite among under-5 children in SC at Jinka General Hospital, January 1/2017 – December 31/2019

Predictor variables	Category	Mean time to death			
		Estimate	95%CI	Log rank X^2-value	P-Value
HIV status of the child	Reactive	16.344	10.779-21.909	8.564	.003
	Non-reactive	32.722	30.315-35.128		
TB	Yes	24.761	18.588-30.934	5.882	.015
	No	33.217	30.810-35.625		
Pneumonia	Yes	31.564	28.601-34.526	6.334	.012
	No	31.432	28.799-34.065		

Malaria	Yes	25.782	19.675-31.888	16.055	.000
	No	31.545	29.334-33.756		
Anemia	Yes	22.064	17.555-26.574	38.239	.000
	No	34.767	32.432-37.101		
IV medication	Yes	30.741	27.990-33.493	9.210	.002
	No	36.508	35.550-37.465		
Blood transfusion	Yes	24.312	19.536-29.088	19.633	.000
	No	33.495	30.715-36.274		
NG tube insertion	Yes	30.632	27.304-33.960	6.674	.010
	No	32.822	29.540-36.104		
ReSoMal	Yes	31.133	28.143-34.124	5.849	.016
	No	32.459	29.672-35.247		
Amoxicillin	Yes	33.036	29.009-37.063	18.009	.000
	No	28.831	25.548-32.115		
Mebendazole	Yes	34.616	30.685-38.547	7.736	.005
	No	31.161	28.494-33.828		
Antimalarial	Yes	27.907	21.801-34.013	6.950	.008
	No	31.299	29.083-33.514		
Dewarming	Yes	34.822	30.143-39.501	9.305	.002
	No	31.160	29.694-34.537		

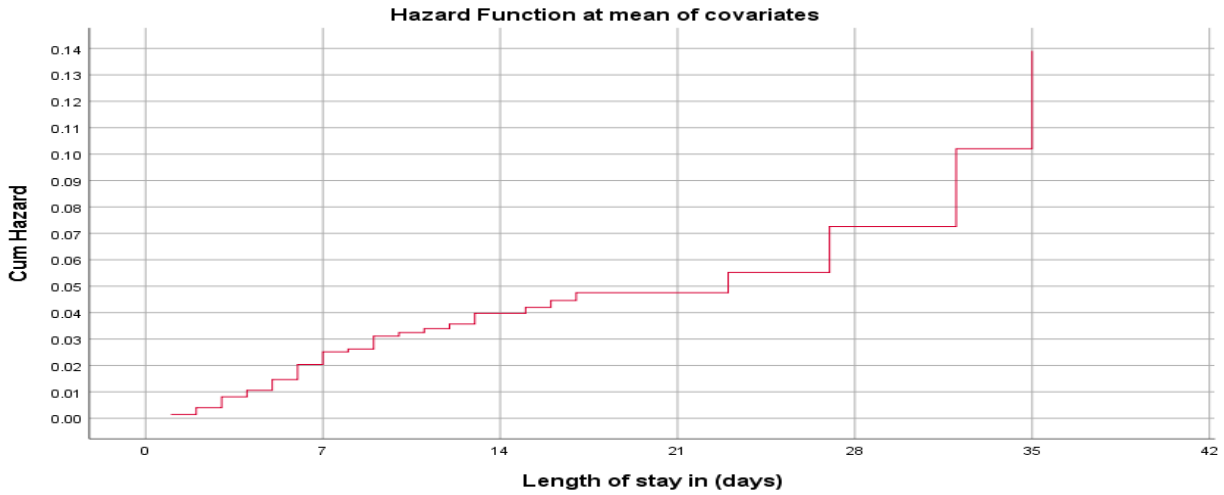

Figure 4: Kaplan-Meier estimation of hazard function among under-five children with SAM at Jinka General Hospital, January 1/2017 – December 31/2019

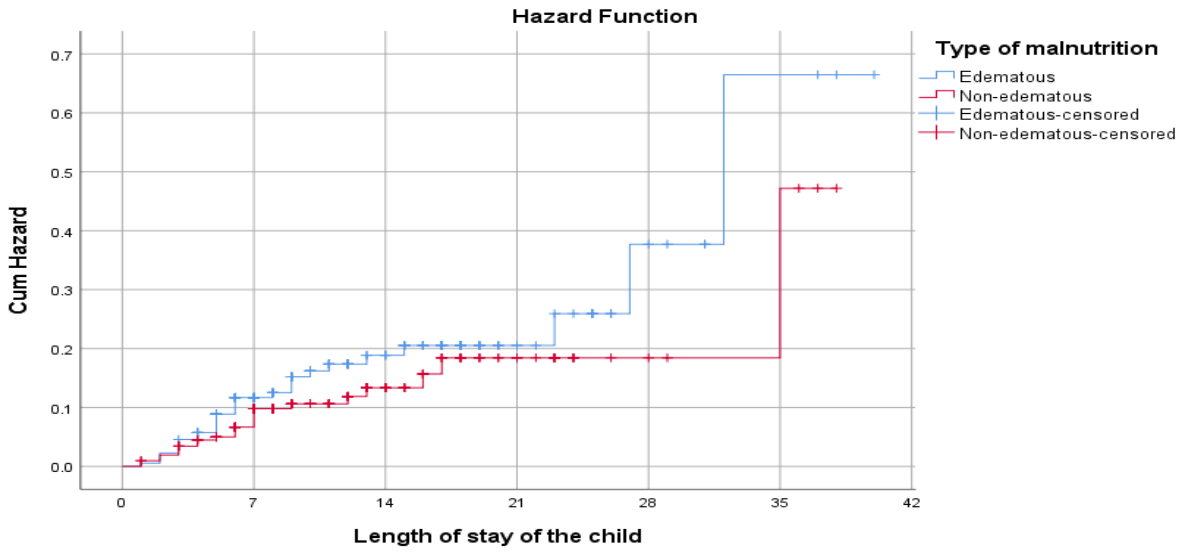

Figure 5: Comparing Kaplan-Mieir estimation of hazard function based on type of malnutrition among under-five children with SAM at Jinka General Hospital, January 1/2017 – December 31/2019.

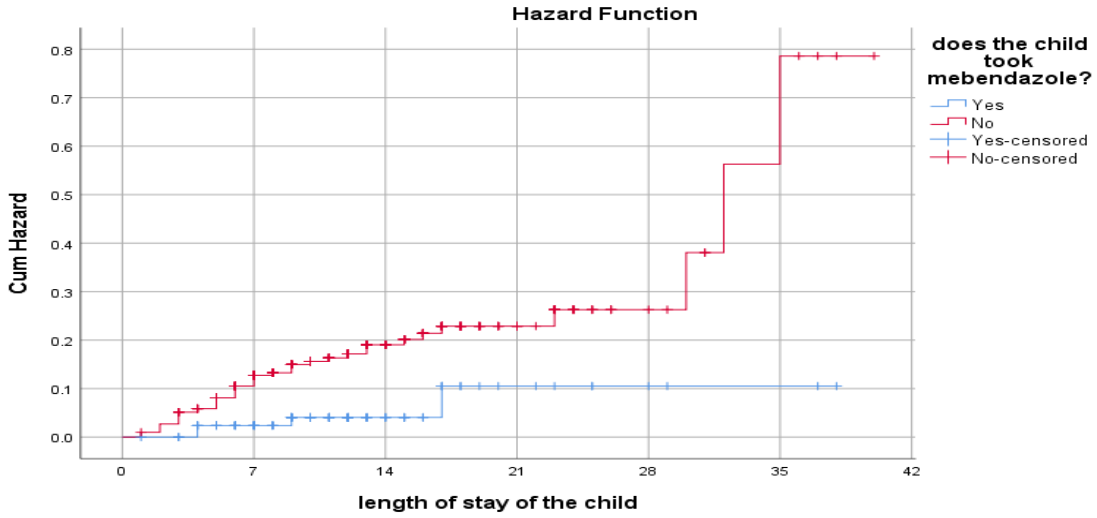

Figure 6: Comparing Kaplan-Mieir estimation of hazard function based on deworming among under-five children with SAM at Jinka General Hospital, January 1/2017 – December 31/2019.

5.6. Factors associated with death of severely malnourished children

In bi-varaite Cox-regression presence of complications like HIV status (CHR=.275 P-value=.007), TB (CHR=.438, p-value=.019), pneumonia (CHR=.512, p-value= .014), malaria (CHR=.301, p-value=.000), anemia (CHR=.212, p-value=.000), iv medication (CHR=.089, p-value=.017), blood transfusion (CHR=.299, p-value=.000) and others were not found to be significantly associated with mortality. During regression death was considered as failure and other outcomes were censored.

To show the effect of independent variables to death, all variables having p-value <0.25 in bi-variate regression were computed in multi-variate regression. Type of malnutrition AHR=2.38 (95% CI=1.245-4.55), TB AHR=2.38 (95% CI=1.093-5.21), malaria AHR=3.97 (95% CI=1.283-12.30), anemia AHR=3.12 (95% CI=1.30-7.44), not treated by amoxicillin AHR=.41 (95% CI=.209-.807) and mebendazole AHR=.16 (95% CI=.031-.857)were found significant predictors of mortality in children with SAM admitted to SC at Jinka General Hospital.

Table 7: Bi-variate and Multi-variate (Cox-regression) analysis of predictors of mortality among under-five children with SAM admitted to SC of Jinka General Hospital, January 1/2017 – December 31/2019

Covariates	Category	CHR(95%CI)	p-value	AHR(95%CI)	p-value
Residence of the child	1=Urban 2=Rural	.583(.311-1.093) 1	.093	1.543 (.75-3.182) 1	.241
Weight of the child in KG		.943(.855-1.041)	.245	.996(.828-1.197)	.964
Type of malnutrition	1=Edematous 2=Non-edematous	.714(.417-1.222) 1	.219	2.380(1.245-4.55) 1	.009
Type of admission	1=New 2=Readmission	1.769(.70-4.470) 1	.228	.462(.154-1.387) 1	.169
HIV status of the child	1=Reactive 2=Non-reactive	.278(.110-.699) 1	.007	1.770(.552-5.681) 1	.337
Presence of TB	1=Yes 2=No	.438(.220-.873) 1	.019	2.386(1.093-5.21) 1	.029
Presence of pneumonia	1=Yes 2=No	.512(.300-.873)	.014	1.271(.696-2.318)	.435
Presence of malaria	1=Yes 2=No	.301(.161-.563) 1	.000	3.97(1.283-12.30) 1	.017

Presence of diarrhea	1=Yes 2=No	.674(.379-1.199) 1	.180	.559(.220-1.422) 1	.222
Presence of anemia	1=Yes 2=No	.212(.123-.364) 1	.000	3.115(1.30-7.44) 1	.011
IV medication?	1=Yes 2=No	.089(.012-.645) 1	.017	6.602(.853-51.08) 1	.071
Did the child took Blood?	1=Yes 2=No	.299(.170-.529) 1	.000	1.229(.500-3.022) 1	.654
NG tube insertion?	1=Yes 2=No	.466(.256-.846) 1	.012	.933(.457-1.907) 1	.850
Did the child took ReSoMal?	1=Yes 2=No	.473(.253-.883) 1	.019	1.975(.724-5.39) 1	.184
Amoxicillin given?	1=Yes 2=No	3.54(1.894-6.63) 1	.000	.411(.209-.807) 1	.010
Anti-malarial given?	1=Yes 2=No	.409(.205-.816) 1	.011	.572(.182-1.802) 1	.340
Folic Acid given?	1=Yes 2=No	1.84(.728-4.627) 1	.198	.497(.177-1.395) 1	.184
Age of the child in months		.980(.959-1.004)	.062	.989(.950-1.029)	.571
Mebendazole given	1=Yes 2=No	3.81(1.37-10.55) 1	.010	.163(.031-.857) 1	.032

6. DISCUSSION

The study aim was to determine survival status and identify predictors of mortality among under-five children with severe acute malnutrition admitted to Stabilization Center. Under-five children with SAM admitted to SC were followed until the date of death, recovery, loss to follow-up or transferring out. Socio demographic, nutritional and clinical factor that could affect survival status were assessed. The survival time was calculated in days using the time between the dates of treatment initiation and the date of the death. Type of malnutrition, co-morbid illness like TB, malaria and anemia were found to be the independent predictors of mortality among under-five children admitted to SC in the study area.

According to this study, most (80.9%) were recovered while 13.9% died. The recovery rate in this study is acceptable according to national management protocol and SPHERE hand book 2018. It is also in line with researches done at Uganda, Jimma and Tigray(17,25,26) but higher than the findings of researches conducted in different parts of the country (18–21,28). This discrepancy may be due to difference in implementing management protocol, staffing profile and medical supplies.

On the other hand, the death rate was congruent with findings of researches done Gonder, Yirgalem and Dilla(19,20,39). But this finding was higher than SPHERE standard and national protocol for management of SAM and even studies conducted in Ethiopia(16,18,24). However, the death rate in studies done in Zambia and Ethiopia was higher than the finding of current study(15,40). This may be due to lack adhering to SAM management protocol, medical supplies, socioeconomic status and different cultures practicing in the catchment population.

In this study the cumulative probability to survive from SAM at the end of 1^{st}, 7^{th}, 14^{th}, 21^{st} and 28^{th} day was 99.2%, 97.9%, 90.5%, 87.9%, 86.6% with mean length of stay of 12 days which is acceptable according to standard maximum recovery time (<28) days(5). This finding is also similar with other institution based studies in Ethiopia; Gedeo (14 days), South Wollo (12 days) and Tigray (12 days)(16,18,26). But this finding is slightly lower than studies in Uganda and Jimma 18 days(23,24). The difference may be due to the first study was among children 6-59 months of age and the later had no age limitation.

The mean survival time of exposed children is significantly shorter than unexposed children; 16 and 36.5 days respectively. Complications/comorbidities like HIV status, presence of TB, pneumonia, malaria, anemia, taking IV medications, blood transfusion, NG tube insertion and being treated with anti-malarial drugs were significantly predicted shorter mean survival time where as being treated with amoxicillin and mebendazole had significantly high mean survival times. This may be due to since children exposed have complications/comorbidities which determine early death; they spend shorter time in SC than unexposed. This result was also identified by other research(18).

As findings of this study as shown in (table 7) type of malnutrition, presence of TB, malaria, anemia, treatment with amoxicillin and mebendazole are significant predictors of mortality and the others were not independent predictors. Accordingly, children with edema were 2.38 times more likely to die than non-edematous children. This might be due to the effect of edematous children are prone to fluid overload and metabolic complication however, no related result reported from previous studies.

In this study, children with malaria were 3.9 (AHR) times more likely to die than their counterpart. Similarly, researches done at Sekota and Dilchora Hospitals, Ethiopia showed children with malaria were respectively; more than two and eleven times more likely to die compared with children not diagnosed malaria(15,31). Another study conducted in Dilla University Referral Hospital, Ethiopia showed malaria was not predictor of mortality(19). This variation in findings might be related with differences in epidemiology of malaria, adherence to management protocol and medical supplies.

The hazard ratio of death among children with TB was about two and half times high than children not diagnosed TB. Similar research done at Sekota Hospital, Ethiopia showed children with TB die more than three times compared to their counterpart(15). However, being diagnosed with TB was not predicted death in a study conducted in Dilla University Referral Hospital, southern Ethiopia(19). This difference might be related with differences in adherence to management protocol and medical supplies.

This study showed that children with anemia were more than three (AHR= 3.12) times more likely to die than with no anemia. This finding is in line with a research conducted in Gedeo Zone, Ethiopia in which the risk of death is more than two and half times high(18). But a research conducted in Sekota Hospital, Ethiopia showed children with severe anemia were more than six and half times more likely to die compared to no anemia(15). This wide difference may be due to in the later study, severe anemia (hemoglobin less than 4gm/dl) only was considered.

According to this study, there was a significant difference in hazard of death among children who were treated by amoxicillin and not treated. Those who were treated 59% less likely to die than children not treated by amoxicillin. This finding is congruent with studies in Ethiopia children who were not treated with antibiotics had higher hazard of death compared to treated with antibiotics(15,20). It might be due to bacterial infections related to suppressed immunity. In this study, children who took mebendazole were 83.7% more likely to survive compared to children not dewormed. In contrary, studies conducted in Ethiopia(18–20,26,32) showed deworming was not significant predictor of mortality. This discrepancy might be due to differences in children's clinical profile and differences in adhering management protocols.

Limitations of this research

A wide range of variables like; socio-economic factors, management factors, appetite test, immunization status and biochemical compositions were not considered which can influence the outcome variable.

7. Conclusion and Recommendation

Conclusion

Findings of this study showed that treatment outcomes in SC were acceptable according to national and SPHERE standard set. However, the death rate is higher than most studies done in Ethiopia.

Type of malnutrition, presence of complications/comorbidities like; TB, malaria, anemia and being treated with amoxicillin and mebendazole were independent predictors of mortality.

Recommendation

According to the findings of this study, the following recommendations are forwarded;

For JGH, SC health care providers: - proper diagnosis and management for children in SC is needed based on national malnutrition management protocol. Special attention should be given for children with complication/comorbidities.

For government and NGOs: - this study indicated there are high mortality rate and identified some death predictor variables among children in SC. As result Jinka General Hospital in collaboration with nongovernmental organizations should strive to improve the outcome of mortality. In addition, further studies on the level of practicing national case management protocol and level of patient's adherence to management protocol are recommended.

For researchers: - since this study was retrospective cohort, it was based on secondary data prospective study is recommended to get better information including variables ignored in this study due unavailability in records.

References

1. Guideline: Uptodates on the Management of Severe Acute Malnutrition in Infants and Children, Geneva. World Heal Organ. 2013;
2. Blössner M, Onis M De, Prüss-üstün A, Campbell-lendrum D, Corvalán C, Woodward A. Malnutrition Quantifying the health impact at national and local levels. 2005;(12).
3. Lenters L, Wazny K, Bhutta ZA. Management of Severe and Moderate Acute Malnutrition in Children. 2016;(Who 2012):205–23.
4. Torjesen K, Olness K. Nelson Textbook of Pediatrics. In: Nelson Textbook of Pediatrics. 19th ed.
5. FMoH. Protocolfoe the Management of Secere Acute Malnutrition. Fed Minist Heal. 2016;
6. Situation FS. Ethiopia : Nutrition Profile. 2018;(February):1–7.
7. Kulkarni B. Management of moderate and severe acute malnutrition in children. Proc Indian Natl Sci Acad. 2016;82(5):1519–28.
8. Bruno L. No Title No Title. J Chem Inf Model. 2019;53(9):1689–99.
9. Agency TUR. Nutrition Fact Sheet Ethiopia. 2018;
10. Olaf M, Michael K. Malnutrition and health in developing countries.
11. Developed E, Group I, Mortality C, Estimation M. Child Mortality 2019. 2019;
12. America IL. LEVELS AND TRENDS IN CHILD MALNUTRITION. 2018;1–16.
13. UNICEF. Severe acute malnutrition | Nutrition | UNICEF [Internet]. Unicef. 2015. Available from: https://www.unicef.org/nutrition/index_sam.html
14. Agency CS. Ethiopia; Demograpphic and Health Survey. Ethiop Demograpphic Heal Surv. 2016;
15. Shitaye K. Journal of Nutritional Disorders & Therapy Survival Status and Predictors of Mortality among Children Aged 0-59 Months with Severe Acute Malnutrition Admitted to Stabilization Center at Sekota Hospital Waghemra Zone. 2015;5(2):1–11.
16. Guesh G, Degu G, Abay M, Beyene B, Brhane E, Brhane K. Survival status and predictors of mortality among children with severe acute malnutrition admitted to general hospitals of Tigray , North Ethiopia : a retrospective cohort study. BMC Res Notes [Internet]. 2018;1–7. Available from: https://doi.org/10.1186/s13104-018-3937-x
17. Asres DT, Prasad RPCJ, 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. 2018;1–8.

18. Girum T, Kote M, Tariku B, Bekele H. Survival status and predictors of mortality among severely acute malnourished children <5 years of age admitted to stabilization centers in Gedeo Zone: A retrospective cohort study. Ther Clin Risk Manag. 2017;13:101–10.
19. Adal TG. Incidence and Predictors of Mortality among Severe Acute Malnourished Under Five Children Admitted to Dilla University Referal Hospital : A Retrospective Longitudinal Study. 2016;6(13):114–27.
20. Wagnew F, Tesgera D, Mekonnen M, Abajobir AA. Predictors of mortality among under-five children with severe acute malnutrition , Northwest Ethiopia : an institution based retrospective cohort study. 2018;1–10.
21. Impact of Malnutrition - Mother, Infant and Young Child Nutrition & Malnutrition - Feeding practices including micronutrient deficiencies prevention, control of wasting, stunting and underweight.
22. Security F. What Is New in the 2018 Sphere Handbook ? 2018;1–47.
23. Nabukeera-barungi N, Grenov B, Lanyero B, Namusoke H, Mupere E, Christensen VB, et al. Predictors of mortality among hospitalized children with severe acute malnutrition : a prospective study from Uganda. Pediatr Res [Internet]. 2018;(September 2017). Available from: http://dx.doi.org/10.1038/s41390-018-0016-x
24. Jarso H, Workicho A, Alemseged F. Survival status and predictors of mortality in severely malnourished children admitted to Jimma University Specialized Hospital from 2010 to 2012 , Jimma , Ethiopia : a retrospective longitudinal study. BMC Pediatr [Internet]. 2015;1–13. Available from: http://dx.doi.org/10.1186/s12887-015-0398-4
25. 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. 2018;1–8.
26. Hassen SL, Astatkie A, Mekonnen TC, Bogale GG. Survival Status and Its Determinants among Under-Five Children with Severe Acute Malnutrition Admitted to Inpatient Therapeutic Feeding Centers in South Wollo Zone , Amhara Region , Ethiopia. 2019;2019.
27. Rytter MJH, Babirekere-iriso E, Namusoke H, Christensen VB, Michaelsen KF, Ritz C, et

al. Risk factors for death in children during inpatient treatment of severe acute malnutrition : a prospective cohort study 1 , 2. 2017;494–502.

28. Sachdeva S, Dewan P, Shah D, Malhotra RK, Gupta P. Mid-upper arm circumference v . weight-for-height Z- score for predicting mortality in hospitalized children under 5 years of age. 2016;19(14):2513–20.
29. 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 [Internet]. 2015;1–11. Available from: http://dx.doi.org/10.1186/s12889-015-2593-5
30. Nyeko R, Calbi V, Ssegujja BO, Ayot GF. Treatment outcome among children under- five years hospitalized with severe acute malnutrition in St . Mary ' s hospital Lacor , Northern Uganda. BMC Nutr [Internet]. 2016;1–7. Available from: http://dx.doi.org/10.1186/s40795-016-0058-6
31. Oumer A, Mesfin F, Demena M. East African Journal of Health and Biomedical Sciences (2016) Survival Status and Predictors of Mortality among Children Aged 0-59 Months Admitted with Severe Acute Malnutrition in Dilchora Referral Hospital , Eastern Ethiopia . 2016;1:13–22.
32. Id FW, Dejenu G, Eshetie S, Alebel A, Worku W. Treatment cure rate and its predictors among children with severe acute malnutrition in northwest Ethiopia : A retrospective record review. 2019;288:1–13.
33. Ethiopia CSA of. Summary and statistical report of the 2007 population and housing census-population size by age and sex, Federal Democratic Republic of Ethiopia, Population Census Commission, with support from UNFPA. Addis Ababa, Ethiopia. 2008;
34. Wondale B, Medihn G, Teklu T, Mersha W, Tamirat M, Am G. RESEARCH NOTE A retrospective study on tuberculosis treatment outcomes at Jinka General Hospital , southern Ethiopia. 2017;1–7.
35. ACUTE MALNUTRITION MANAGEMENT GUIDELINES May16 2016.
36. Girum T, Muktar E, Worku A. Comparative Analysis of the Survival Status and Treatment Outcome of Under-five Children Admitted with Severe Acute Malnutrition Among Hospital-based and Health Center Based Stabilization Centers, South Ethiopia.

Open Public Health J. 2018;11(1).

37. Edition S, Ababa A. TRAINING COURSE ON THE MANAGEMENT OF SEVERE ACUTE MALNUTRITION Federal democratic Republic of Ethiopia , Ministry of Health Ministry of Health. 2013;
38. 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;45(1):1–9.
39. Kabeta A, Bekele G. Clinics in Mother and Child Health Factors Associated with Treatment Outcomes of Under-five Children with Severe Acute Malnutrition Admitted to Therapeutic Feeding Unit of Yirgalem Hospital. 2017;14(2).
40. Munthali T, Jacobs C, Sitali L, Dambe R, Michelo C. Mortality and morbidity patterns in under-five children with severe acute malnutrition (SAM) in Zambia : a five-year retrospective review of hospital-based records (2009 – 2013). 2015;1–9.

Annex-II: Data Abstraction Format

This data abstraction format is prepared for collecting information on survival status and predictors of mortality among under-5 children with severe acute malnutrition at stabilization center at Jinka General Hospital from Jan, 2017 to Dec, 2019.

Card no: _____ Unique SAM no: _____

s.no	Admission Characteristics	Response	Remark
1/ Socio-demographic characteristics			
	Sex	1. Male 2. Female	
	Residence	1. Urban 2. Rural	
	Age on date of admission in months	_____ months	
2/ Anthropometry and type of malnutrition			
	MUAC (for 6–59 months)	_____ mms	
	Weight	_____kg	
3/ admission status and SAM diagnosis			
	Type of malnutrition	1. Oedematous 2. Non oedematous	
	Type of admission	1. New admission 2. Relapse (readmission)	
4/ Co-morbidity/complication on admission		1. Present 2. Absent	
	Type of co-morbid condition		
	HIV Status	1. Reactive 2. Nonreactive	
	TB	1. Present 2. Absent	
	Pneumonia	1. Present	

		2. Absent	
	Malaria	1. Present 2. Absent	
	Diarrhea	1. Present 2. Absent	
	Anemia	1. Present 2. Absent	
5/ Routine and special medications			
	IV infusion	1. Yes 2. No	
	Transfusion	1. Yes 2. No	
	NG tube feeding	1. Yes 2. No	
	ReSoMal	1. Yes 2. No	
6/ Treatment and supplements			
	Amoxicillin	1. Yes 2. No	
	Vitamin A	1. Yes 2. No	
	Anti-malarial	1. Yes 2. No	
	Folic acid	1. Yes 2. No	
	Mebendazole	1. Yes 2. No	
	Iron	1. Yes 2. No	

	Date of admission	_____/_____/_____(EC/GC)	
	Date of discharge	_____/_____/_____(EC/GC)	
	End result /outcome/	1. Cured/discharged 2. Dead 3. Defaulter 4. Transferred 5. Research terminated	

Checked by supervisor; Name_____, Signature_____

STATEMENT OF DECLARATION

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis.

This thesis is submitted in partial fulfillment of the requirement for a graduate degree from the Addis Ababa University at College of Health Sciences, School of Allied Health Sciences department of Nursing and Midwifery. The thesis is deposited in the Addis Ababa University Digital Library and is made available to local, national and international scientific community. I solemnly declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

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APPROVAL BY THE BOARD OF EXAMINATION

This thesis by Tamiru Chonka is accepted in its present form by the board of examiners as satisfying thesis requirement for the degree of masters in Pediatrics and Child Health Nursing.

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