ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTHSCIENCES
SCHOOL OF NURSING AND MIDWIFERY
POSTGRADUATE PROGRAM

TREATMENT OUTCOME OF SEVERE ACUTE MALNUTRITION AND ASSOCIATED FACTORS AMONG UNDER_FIVE CHILDREN ADMITTED AT HOSPITALS IN ARSI ZONE, OROMIA REGIONAL STATE, SOUTH EAST ETHIOPIA

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APPROVAL BY THE BOARD OF EXAMINATION

This thesis by **Misrak Abera** is accepted in its present form by the board of examiners as satisfying thesis requirement for the degree of masters in Pediatrics &child health nursing

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LIST OF ABBREVIATIONS AND ACRONYMS

EDHS	Ethiopian Demographic Health Survey
IMCI	Integrated Management of Childhood Illness
MOH	Ministry of Health
MUAC	Mid Upper Arm Circumference
MAM	Moderate Acute Malnutrition
NCHS	National Center for Health Statistics
OTP	Outpatient Therapeutic Program
PPS	Proportion to population size
RUTF	Ready to Use Therapeutic Food
SAM	Severe Acute Malnutrition
SRS	Simple Random sampling
SPHERE	Social and Public Health Economics Research Group
TFU	Therapeutic feeding unit
UNICEF	United Nations Children's Fund
WFH	Weight For Height

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Background: Malnutrition is a major public health problem throughout the developing world and a significant factor, approximately one third of, nearly 8 million deaths in children who are under the age of five years worldwide. Despite numerous advances made in improving child health and the clinical management protocols for treating severe acute malnutrition at treatment centers, evidences concerning the treatment outcomes are scarce.

Objective: To assess treatment outcomes of severe acute malnutrition and associated factors among children age less than five years in Arsi zone, Ethiopia, 2018.

Method: Institution based cross-sectional study design was conducted to collect information from 410 records of severely malnourished children who were admitted from January 2016 to January 2018. Data was entered to EpiData version 3.1 and then exported to SPSS version 20 for analysis. Bivariable and multivariable logistic regression model were fitted to identify factors associated with treatment outcomes. Adjusted Odds ratio with its 95% CI is reported and P-value less than 0.05 were considered to declare presence of significant association.

Result: A total of 410 records of children with a diagnosis of severe acute malnutrition were reviewed. Of these cases of malnutrition, 83.7% (343) had severe wasting and 16.3% (67) had edematous malnutrition. Regarding treatment outcome, 74.4% were cured while 7.1% had died. The average length of stay was 12.3 and 14 days with an average weight gain of 14.7 and 5 g/kg/d for children with severe wasting and edematous malnutrition, respectively. Taking IV antibiotics plus amoxicillin and having no anemia were factors significantly associated with recovery rate.

Conclusion: The recovery rate of severely malnourished children admitted at the three hospitals was 74.4 % is almost equivalent with the standard, least 75 % cure rate. However a high proportion of patients 17.6 % were defaulted from their treatment. Absence of anemia and treatment with IV antibiotic plus amoxicillin were the factors significantly associated with recovery rate. In order to address the high defaulter rate, the health Facilities should design a strategy like home based care through the outpatient therapeutic care should be strengthened.

Key words: Severe Acute Malnutrition, treatment outcome, Arsi

1. INTRODUCTION

1.1 Background

Malnutrition is a condition that results from deficiencies, excess or imbalance in a person's intake of energy and or nutrients. It is broadly classified as under nutrition which includes stunting, wasting, under weight and micronutrient deficiency and the other form is overweight and obesity (1). Acute malnutrition is one of the three main types of under nutrition affecting potentially all categories of the population but especially vulnerable groups such as children under five, pregnant and lactating women, and people living with a disease or chronic illness (2).

Acute malnutrition resulted from sudden reduction in food intake or diet quality and it is often combined with pathological causes. It is classified as moderate acute malnutrition(MAM) and severe acute malnutrition (SAM) (3). Sever acute malnutrition is defined as a very low weight for height (WFH) (below –3z scores of the median WHO growth standards, or <70% of the median National Center for Health Statistics (NCHS) standard) and by the presence of nutritional edema or MUAC <11.5 cm (4, 5).

Ethiopia Demographic and Health Survey (EDHS) 2016 report showed that 38, 10 and 24% of under 5 years of age children in Ethiopia were stunted, wasted and underweight respectively. In Oromia region, 10.6% of under-five years of age children were wasted of which 3.5 are severely wasted (6).

Malnutrition contributes to nearly half of all deaths in children under-five years and is widespread in Asia and Africa. This translates in to the unnecessary loss of 3million young lives a year. Under nutrition puts a child at greater risk of dying from common infections, increase the frequency and severity of such infections, and contribute to delayed recovery (7).

Nutrient deficiency result from disease and inadequate food intake, which result from underlying poverty, household food insecurity, inadequate care practices at household or community levels, poor water, hygiene and sanitation, and insufficient access to healthcare. Disasters such as cyclone, earthquakes, floods, conflict and drought all directly affect the underlying causes of under nutrition (8).

A community based study done in southern Ethiopia reported that maternal education, maternal autonomy in decision making and inappropriate infant and young child caring practices were predictors of sever acute malnutrition (9)

In Previous days SAM was managed in health facilities and therapeutic feeding centers (10), however limited coverage, cross infections, and high mortality rate were the challenges of this management (5). To overcome the challenges, WHO and UNICEF endorsed community based management of acute malnutrition with a joint statement in 2007(11). Therefore, community outreach program, outpatient management of SAM children without medical complications, and inpatient management of SAM with medical complications were designed as components of community based management of acute malnutrition (3, 10).

In the inpatient treatment program Children will be admitted when MUAC is <11.5 cm, having nutritional edema, they failed the appetite test, and with medical complications. The management of program was mainly with F 75,F100 and ready-to-use therapeutic foods (RUTF); other routine medications like antibiotics, vitamin A, folic acid; and de-worming. Children admitted to inpatient are discharged by their respective admission criteria . That is, MUAC admittances are assessed for recovery or progress by MUAC and the same works if admitted by percent(%) of weight for Height. However, admissions with only edema are discharged by anthropometric indicator like MUAC and percent (%)of weight for Height as well (3, 11, 12)

Treatment outcomes could be stated as recovered, defaulted, died, medical transfer, and non-respondent based on WHO management protocol (3). Based on that, the recovery, death, and default rates were considered as acceptable when >75%, <10%, and <15% respectively and alarming when <50, >15, and >25% respectively. Moreover, weight gain, length of stay, and coverage were thought as acceptable when ≥8 g/kg/day, <4 weeks, and >50–70%, respectively, and considered as alarming when <8 g/kg/day, >6 weeks, and <40% respectively (8).

1.2. Statement of the problem

At global level, the world is of course to meet global targets for nutrition, however SAM is still among the major health problems especially in low and middle-income countries (13) . Globally, 52 million children of age less than five years were affected by acute malnutrition from which 17 million were severely wasted. Data shows that more than half of all wasted children in the world live in Southern Asia and Sub-Sahara African countries (7).

Severe acute malnutrition is still a major public health problem in many African countries affecting the overall health and development priorities due to the resulting effects. In Africa, 14.0 million children under 5 are wasted, of which 4.1 million are severely wasted (7).

Despite the improvement made in child health and nutritional interventions, Ethiopia remains in a precarious situation where under nutrition is an underlying cause to half of its child deaths and wasting contributing to 23% of these deaths(14). The 2016 EDHS indicates that in Ethiopia, 3% of children under-five are severely wasted in which highest percentages found in Somalia and Afar regions, 6.1% and 5.3% respectively (6).

In Ethiopia studies indicate that the recovery rate among children attending the inpatient facilities were still low and the defaulter rate was high compared to the acceptable minimum standard, this have the negative impact on the child health and survival (15-19).

Inpatient therapeutic feeding units are faced with a lot of challenges in handling cases of severe acute malnutrition. Some of the challenges include; limited in-patient capacity, lack of enough skilled staff in the hospitals to treat the large numbers needing care, the centralized nature of hospitals promotes late presentations and high opportunity cost for careers, serious risk of cross infections for immune suppressed children with severe acute malnutrition and mortality rates before and after discharge (3).

Children with severe acute malnutrition are nine times more likely to die than well-nourished children as a direct result of malnutrition itself. There are also indirect deaths as a result of childhood illnesses like diarrhea and pneumonia among malnourished children (20).

Every year, under nutrition contributes to the deaths of nearly 3 million children and threatens the futures of hundreds of millions worldwide, undermining the healthy development of their bodies and mental capacity affecting their ability to learn later life(13).

In low and middle income countries, the case-fatality rates for inpatient treatment of severe acute malnutrition using the WHO protocol ranges from 3.5 to 35 % despite the fact that clinical management protocols are capable of reducing case fatality rates to 1–5%(21).

Beside the prevention strategies, the improved management of SAM is an integral part of the World Health Resolution on Infant and Young Child Nutrition to improve child survival and to reduce the global burden of disease. Children with SAM have profoundly disturbed physiology and metabolism, such that if intensive refeeding is initiated before metabolic and electrolyte imbalances have been corrected, mortality rates are high for which WHO has developed clinical guidance on the management of the child with severe acute malnutrition(4).

A finding from study conducted in Gonder revealed that 11.7% children had died during the period of follow-up which was consistent with the minimum standard of 10% mortality. However, the finding was not consistent with some other studies, in which 28.67% and 40.5% of children had died and the rate of mortality was higher than most national studies.(16). Another study conducted in Yirgalem hospital, south Ethiopia, revealed that the recovery and default percentages were in the international acceptable standard ranges but the death percentage was alarming(22).

Even though malnutrition is one of the major public health problems in Ethiopia, limited information is available on inpatient treatment outcome of SAM and associated factors in Arsi Zone. Besides, the high percentage of death rate in some hospitals in the country is alarming which needs further study to describe the treatment outcome of SAM in other hospitals to assess the factors contributing to the treatment outcome. The study therefore, is aimed at describing the treatment outcome among children of age less than five years and identifies factors contributing to the treatment outcome. It is also intended to forward doable recommendations to health institutions and policy makers on the way to improve treatment outcome of children with severe acute malnutrition.

1.3. Significant of the study

Severe acute malnutrition still contributes to inpatient morbidity and mortality in Ethiopia. There is no research done or at least recently published regarding recovery of management of SAM in the study area. This study will contributed data on the outcomes of management of severe acute malnutrition in the study area by comparing key clinical outcomes to known international standards. It has also contributed to the knowledge on the risk factors associated with the outcomes of treatment of severe acute malnutrition in the study area.

The findings from this study will help the Zonal health office, for the health institution, administrators and other non - governmental organization working on therapeutic feeding program service to give great emphasis to the problem of severe acute malnutrition, to identify the gaps on the management of severe acute malnutrition and measure the effectiveness of inpatient therapeutic feeding program of severe acute malnutrition and develop best interventional approaches in the future. In addition to that all children in the woreda will be expected to benefit from the findings of this research at large and it serves as base line data for further study. Based on the study finding the concerned body will develop strategies to improve treatment outcome of SAM and to reduce prevalence of SAM this will benefit all children in the area.

2. LITERATURE REVIEW

2.1. Outcome of treatment of severe acute malnutrition among children

A descriptive analytical study conducted in three hospitals of Dhaka city, Bangladesh showed that, Of the 388 malnourished children 62.4% recovered, 21.4% were defaulted or took early discharge and 13.7% died .This finding negatively far from minimum standard (23).

A retrospective observational hospital-based study conducted in Sudan showed that among children less than five years admitted to Paediatric Hospital ,75.7% improved and discharged, 15% discharged against medical advice and 9.3% died. this finding were in line with minimum standard (24)

A prospective study conducted on16 OTP sites in a rural Nigerian shows that among 12,073 under 5 SAM children admitted to OTP program, rate of cured and defaulted were 58% and 40% respectively which is below the accepted minimum sphere standard and death occurred in 2% of the cases (25).

A retrospective study done at Uganda shows that of the 251 severely malnourished hospitalized children, 66.9 % were successfully discharged as cured, 11.9 % died, and the rest had potentially unsatisfactory outcome comprising defaulting treatment(8.0 %), transfer out (9.6 %), and non-response (3.6 %). The treatment cure rate was below the accepted standard and high death rate was also observed (26).

A mixed-methods design done in Zambia out Of 390 severely malnourished children admitted into OTP recovered, died and defaulted were 80%, 2.8% and 17.2%. However, the defaulter rate was higher than the minimum standard expected (27).

According to a hospital-based cross-sectional study done at Bahir Dar Felege Hiwot Referral hospital inpatient therapeutic feeding unit, out of 401 severely malnourished children, recovery and defaulter rate were 58.4%, and 21.7% respectively which is below the accepted minimum Sphere standard and death occurred in 8.5% of the cases (15).

A cross sectional retrospective study done in Gondar University tertiary hospital out of 298 under five children admitted with severe acute malnutrition, 68.5% of children were cured and discharged, 19.8% were defaulted and 11.7% died (16).

A retrospective cohort study conducted in Gedeo Zone revealed that out of 545 children admitted to stabilization centers of therapeutic feeding program, recovered and death rate were 76% and9.3 % respectively and this is within the range of minimum international standards(28).

A retrospective cohort study conducted in Debre Markos and Finote Selam shows that outcomes of children in OTP were within sphere standards with proportions of cured and died being 77.9% and 5.5% respectively and the overall median recovery time was 11 days (29)

A prospective cohort study done in Enderta district, Tigray region reported that recovery and defaulted rate were 76.8% and 17.5% respectively. The defaulter rate was higher than of the minimum standard expected. Non-response rate and deaths rate were 5.1 and 0.6% respectively, which are much lower than that of the sphere standard. The overall mean weight gain and length of stay of the malnourished children on OTP was found to be 7.3(± 3.8)g/kg/day and 6.28 weeks respectively. This result is by far outside of the acceptable minimum sphere standards (30). Other retrospective cohort study conducted in Tigray region shows that among SAM children age 6to 59 month, recovery, defaulter and average weight gain were 61.78%, 13.85%, 3.02% and 5.23 g/kg/days respectively. The recovery and average weight gain were below the minimum sphere standard(17).

A retrospective facility-based cross-sectional study conducted in Wolaita zone shows that among 794children treated at OTP the rates of treatment outcomes were 64.9%, 23.9%, 1.2%, 2.2%, 4.2 g/kg/days, and 6.8 weeks for recovery, false recovery, death, default rate, weight gain, and length of stay respectively. The recovery rate and weight gain were lower than sphere standard(18).

A retrospective cohort study conducted in Woldia hospital North Ethiopia among 334 under five children admitted at inpatient feeding unit , recovery, died, and defaulter rate were

85%,6%and4% respectively. recovery and death rates were found above and below the minimum acceptable cut-off points of the sphere standards respectively (31).

A hospital based retrospective study conducted in Yirgalem Hospital shows that among 196 under-five children admitted at inpatient feeding unit, 78% were cured, 16% were dead, 3.1% transferred out and 2.6% were defaulted. The average weight gain was found 9.5 g/kg/day within 18.16 days mean length of stay. The Cured and default percentages were acceptable but death percentage was far from the minimum acceptable cut-off points (22) .

A retrospective cohort study was conducted on 415 children aged 0-59 months who were admitted for complicated severe acute malnutrition at Sekota hospital from January1/2011 to December 30/2013 During the follow up period 46%,28.67%,21.4% 3.9% were recovered, died, defaulted and discharged as none recovered respectively(19).

2.2. Factors associated with treatment outcomes of severe acute malnutrition

2.2.1. Socio demographic factor

A one year period retrospective study done in Uganda on 251 severely malnourished children three to fifthly nine months of age admitted at hospital, 61.4 % of the children were in age 3 and 24 months, mean age of presentation was 24.2 months and about two-third (61.0 %) of whom were males. other study conducted at Zambia OTP clinic showed that out Of 390 severely malnourished children between six to fifty nine months of age showed that majority (83.9 %)of the children were aged between 12 and 59 months, and only 16.2 % were aged below 12 months.57.4 % were females(26, 27).

A study conducted in Tamale teaching hospital, Ghana reported that children aged 24 to59 months had 5.8 times higher probability of recovery from severe acute malnutrition compared to children aged 6 to 11 month. Contrary to the above finding a study conducted in Debre Markos and Finote Selam hospital from on 253 children age 6–59 months old, children age from 24 to 35 months had 34% lower probability of recovery from SAM compared to 6–11 months old children. Children whose ages from 36 to 59 months had 47% lower probability of recovery from SAM compared to 6–11 months old children(29, 32).

A study conducted at at Bahir Dar Felege Hiwot Referral hospital showed that compared to male, females were 1.86 times more likely to recovery. However other study conducted in Enderta woreda, Tigray region reported that rate of recovery from OTP, among male children were 1.30 times higher than that of females(15).

A four years retrospective cohort study conducted on 500 under-five children in Hadiya zone, South Ethiopia showed that ,Children with new admission were 86% less likely to die than repeated admission(33).

A prospective institutional based general prospective cohort study conducted in Enderta woreda, Tigray region, showed that there is almost equal chance of recovery among children with severe acute malnutrition who were on breast feeding on admission (76.7%) and who were not on breast feeding on admission (77.2%).other study conducted at Yirgalem hospital also showed that among admitted children 79.1%were on breast feeding, out of this 78.8% were recovered and among children not on breast feeding on admission 75% were recovered(22, 30).

Studies conducted in Ethiopia showed that most of the admitted children in the case of severe acute malnutrition from rural part of the country. A prospective institutional based general prospective cohort study conducted in Enderta woreda, Tigray, North Ethiopia on 332 children of 6-59 months age admitted to Outpatient therapeutic program, 307(92.5%) were from rural part of the woreda, among children admitted from rular area 242(78.8%) were recovered and children admitted from urban area 52% of them were recovered. Other study conducted in Yirgalem hospital also showed that 97.9%of the admitted children from rular area. However Study conducted in Felege Hiwot hospital showed the proportion of recovery is almost similar among children from rular area (59.4%) and urban area (56%)(15, 22, 30).

A retrospective chart review done at Tamale Teaching Hospital Ghana on 348 patients showed that among admitted children 67.5% referred from inpatient care, 22.7% direct from community and 9.8% from health centers. Other study conducted in Kamba District, South west Ethiopia also showed that among admitted children 33.2% were self referred. However study conducted at wolaita showed that only 11,6% of children were self referred, out of this 69.1% recovered(18, 32, 34).

2.2.2. Type of malnutrition

A retrospective study conducted in Hadiya Zone, South Ethiopia showed that among 500 under five children admitted with severe acute malnutrition, kwashiorkor was found to be the most frequent cause of morbidity which accounts for 43%.Other retrospective study conducted in Yirgalem hospital showed that 50% of edematous children had Grade II edema followed by Grade III edema 32.4% .Study from Woldiya hospital reported that the probability of recovery among edematous children was reduced by 73% as compared to wasted children(22, 31, 33).

2.2.3 Co morbidities

A prospectively observational study conducted in Bangladesh on 407 SAM children less than five years of age admitted at intensive care unit or acute respiratory ward of Dhaka hospital, who had both WHO defined clinical as well as radiological pneumonia reported that severe malnourished children admitted in Hospital with danger signs of severe pneumonia more often experienced treatment failure (58% vs. 20%) and fatal outcome (21% vs. 4%) compared to those without danger signs(35).

According to study done at Bahir Dar Felege Hiwot Referral hospital inpatient therapeutic feeding unit, at admission, children who were presented with co-morbidity were 84% times less likely to be recovered than children without co-morbidities at admission. Severely malnourished children co-morbid with HIV/AIDS and tuberculosis were less likely to be recovered. The study conducted in Debre Markos and Finote Salam hospital also showed HIV negative children had 2.48 times higher probability of recovered from SAM compared to HIV positive children (15, 29).

A retrospective cohort study conducted at Sekota hospital shows that among children with severe acute malnutrition who had malaria at admission time, more than two times hazard of death as compared to children with SAM without malaria. Children with severe anemia (<4 gm/dl) had more than six and half times hazard of death when compared to those with no anemia. Moreover children with moderate anemia were more than four and half times hazard of death when compared to children with no anemia. Furthermore the hazard of death due to TB was about three times as compared to children with no TB (19).

A retrospective cohort study conducted in Gedeo Zone showed that altered body temperature (hypothermia or hyperpyrexia), altered pulse rate(bradycardia or tachycardia), shock, NG tube insertion, anemia, hypoglycemia and type of health facility (hospital SC) were found to be independent predictors of death in severely malnourished children (28).

2.2.4. Routine medication

A study conducted in Malawi shows that the addition of antibiotics to therapeutic regimens for uncomplicated severe acute malnutrition is associated with a significant improvement in recovery. A study finding from Southern Ethiopia also showed that Children provided with amoxicillin were 1.52 times more likely to recover compared to their counterparts(18, 36).

A retrospective cohort study comprised of 340 under-five children admitted for treatment of complicated severe acute malnutrition in two hospitals of Wolaita Zone reported that children who did not have antibiotics at admission 3.7 times more at risk of death compared to those had had it (37).

According to study done at Bahir Dar Felege Hiwot Referral hospital inpatient therapeutic feeding unit, children who were fully and partially vaccinated, who stayed longer in the hospital, and children who took routine vitamin-A supplementation had better recovery rate and also recovery rate was increased by 44% for every one-centimeter increase in MUAC (15).

A study conducted in Debre Markos and Finote Selam hospital reported that children who didn't take folic acid supplement had 65% lower probability of recovery from SAM compared to children who took folic acid supplement. A retrospective cohort study conducted at Sekota hospital also showed that, children not supplemented with folic acid, not supplemented for vitamin A and children not managed by intravenous antibiotic were found to be predictors of mortality. Findigs from Bahir Dar Felege Hiwot Referral hospital also reported that children who did take vitamin-A as routine medication were 2.8 times more likely to be recovered as compared to those who did not take vitamin-A. (15, 19, 29).

A retrospective cohort study conducted in woldia hospital The odds of recovered children who had given Plumpy'nut were 3.7 times the odds of recovered children who were not taking Plumpy'nut (31).

Review of different literature as depicted in the above section, there are different gaps in the existing literature in relation to assessing the treatment outcome of severe acute malnutrition. Most of the studies done at single treatment center and also infants under six month of age were not included. This study tries to address the existing gap by including infants less than six month of age and conducting the study in different health facility.

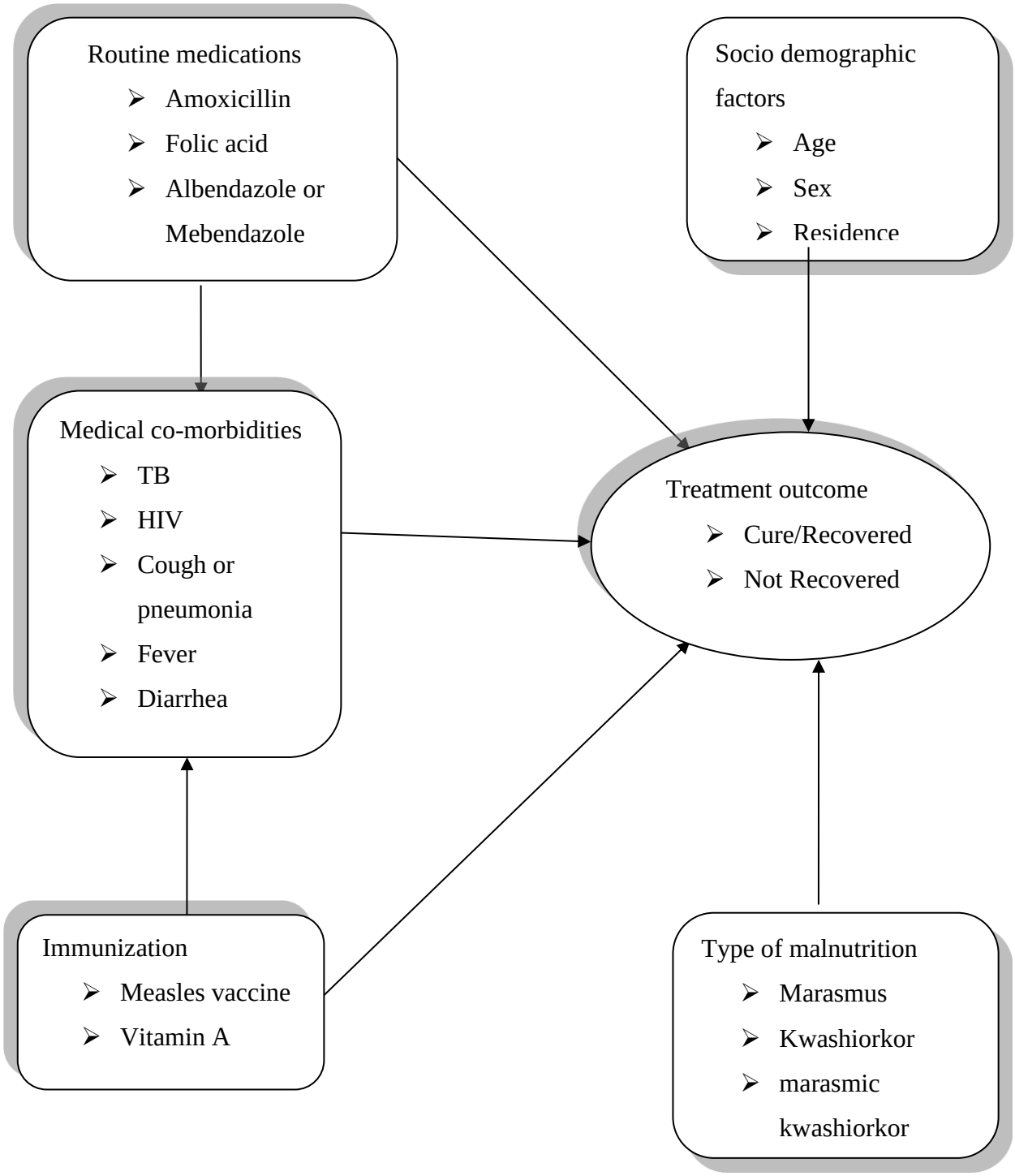

Figure: 1: Conceptual frame work of SAM treatment outcome and associated factors among under-five children admitted to inpatient therapeutic feeding units. Source: Adapted from previous literature (19)

3. OBJECTIVES

3.1 General objective

- To determine the magnitude of treatment outcomes of severe acute malnutrition and identify associated factors among under-five children who are admitted at inpatient therapeutic feeding units in Arsi Zone, Oromia region, Ethiopia.

3.2 Specific objectives

- To determine the magnitude of treatment outcome of sever acute malnutrition among under-five children.
- To identify factors associated with treatment outcome of sever acute malnutrition among under-five children.

4. METHODS AND MATERIALS

4.1 Study area and periods

The study was conducted in Arsi Zone. Arsi Zone is located in Oromia region, South east Ethiopia. The capital town of the zone, Asella, is located around 175 Km from Addis Ababa in the South east direction. The Zone has 25 districts and an estimated total population of 2,637,657 of whom 1,314,233 are female. (2007 population and housing census) (38). Concerning health facilities, there are seven hospitals of which one is teaching and referral hospital while the rest are district hospitals. There are also 104 health centers. Currently all hospitals and 52 health centers are providing therapeutic feeding service for children with severe acute malnutrition. The study was conducted from March 1 to March 30. 2018. in the selected three hospitals.

4.2 Study design

Institution based retrospective cross sectional study was conducted using document review in inpatient therapeutic feeding units of the selected hospitals in Arsi Zone, Oromia region, Ethiopia, 2018.

4.3. Population

4.3.1 Source population:

All under-five children who were admitted to inpatient therapeutic feeding units with the diagnosis of severe acute malnutrition in Arsi zone hospitals from January 2016 to January 2018.

4.3.2 Study population:

Under-five children who were admitted to inpatient therapeutic feeding units of the selected hospitals from January 2016 to January 2018

4.3.3 Study unit

Medical records of the sampled under-five children who were admitted to inpatient therapeutic feeding units of the selected hospitals from January 2016 to January 2018

4.3.4. Inclusion criteria

Records of under-five children who have been admitted from January 2016 to January 2018 based on Federal Ministry of Health of Ethiopia admission criteria for severe acute malnutrition.

4.3.5 Exclusion criteria

Transferred cases, those have not ended treatment and records with incomplete information were excluded.

4.4. Sample size and sampling procedure

4.4.1. Sample size

Sample size determination for magnitude of treatment outcome

The sample size for magnitude of treatment outcome is determined using the sample size determination formula for single population proportion. A study done in Wolaita zone showed recovery rate of 64.9% and two different studies in Amhara region showed recovery rate of 78% & 58.4%. For this calculation, the proportion that gives the highest sample size i.e. 58.4% is taken from study done at Felege Hiwot hospital (15).

$$n = \frac{\left(Z\frac{\alpha}{2}\right)^2 p(1-p)}{d^2}$$

Where,

n = sample size derived from estimation formula

Zα /2 = the value of z at confidence level of 95%= 1.96

P= is recovery rates of children who had been managed for SAM = .584(58.4%)

d = is margin of error to be tolerated and taken as 5%

Considering 10% contingency for missing data the final sample size for determining the treatment success rate is 410.

4.4.2. Sampling technique

In Arsi Zone all the seven (Asella, Abomsa, Robe, Bekoji, Kersa, Bele and Gobesa) governmental hospitals provide inpatient management for severe acute malnutrition. However Asella, Abomsa and Robe Hospitals are selected purposively because they have data since 2014. From the selected hospital eligible children with severe acute malnutrition were identified from the registration log book and sampling frame was developed per each hospital. The total sample size was then proportionally allocated to the number of the patients admitted to each hospital. Finally from each hospital eligible study subjects were selected using simple random sampling technique.

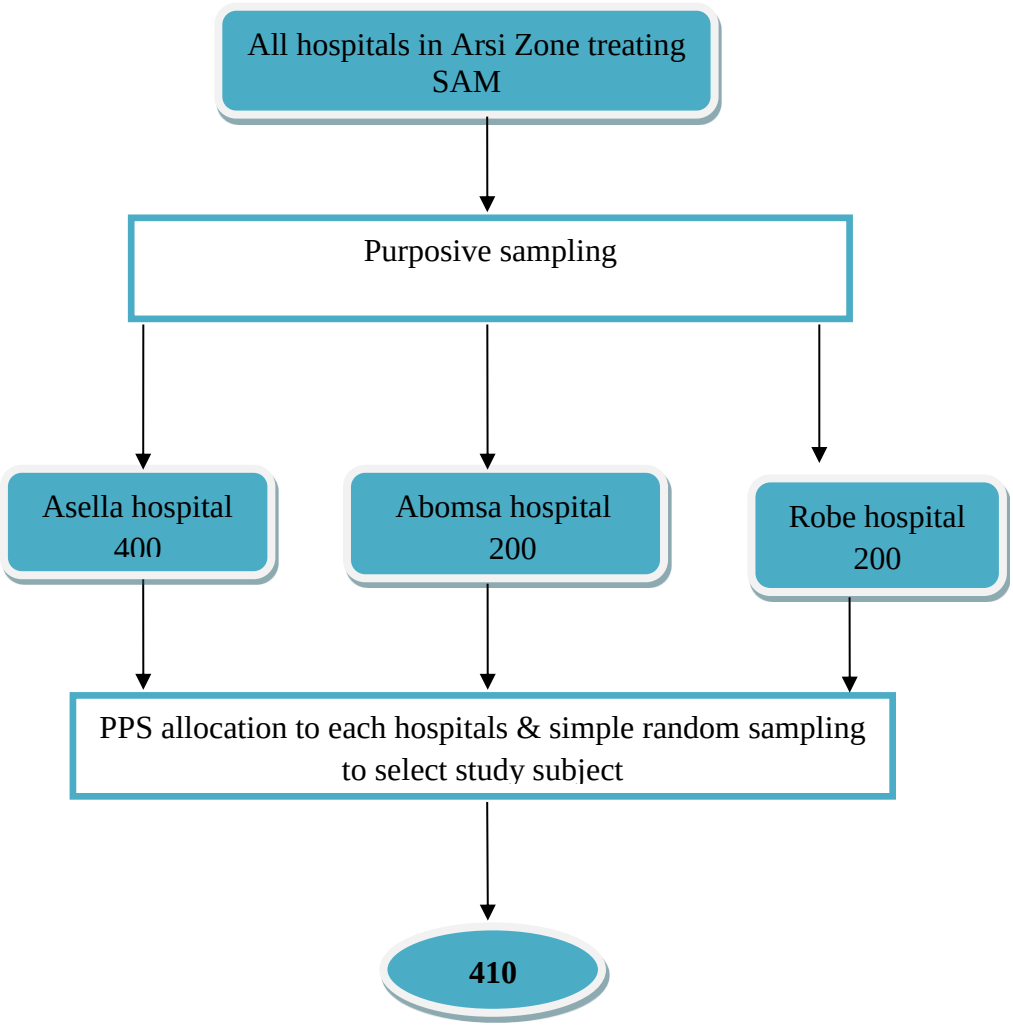

Figure 2 Schematic presentation of sampling procedure

4.5. Study variables

4.5.1. Dependent variable:

Treatment outcome (Recovered or not recovered)

4.5.2. Independent variables:

Socio-demographic variables, immunization, medical co-morbidities, type of malnutrition, routine medication and length of stay in hospital.

4.6. Operational definitions

1. Treatment outcome: grouped as recovered and not recovered from SAM management at inpatient therapeutic feeding units in this study

Recovered: children with severe acute malnutrition declared as cured | Recovered in the log book of inpatient therapeutic feeding units.

Not recovered: defined as children discharged from inpatient therapeutic feeding units with outcome other than recovery in this study (death, default, non-responder).

2. Severe acute Malnutrition (SAM): weight-for height ratio of less than minus 3 standard deviations below the median WHO growth standards or weight-for-height ratio of below 70% of the median NCHS reference or presence of nutritional edema.

3. Inpatient Management: Management of SAM of children of 6 - 59 months with medical complications or poor/fail appetite and infants < 6 month.

4. Defaulter: A SAM patient who become absent continuously from the therapeutic feeding program inpatient care for 48 hour.

5. Non-responder: SAM patient admitted to inpatient that do not reached discharge criteria after 40 days in the inpatient program.

6. Died: Severe Acute Malnutrition Patient admitted that discharged as died.

7. Type of malnutrition: grouped as marasmus (nonedematous), kwashiorkor (edematous), marasmic kwashiorkor (both edema and severe wasting) and visible severe wasting.

4.7. Data collection tool

A check list was developed from standard treatment protocol for the management of severe acute malnutrition, SAM registration log book, SAM monitoring multi chart and reviewing related literatures to collect the required individual information from the relevant documents(3, 4, 15, 22). The checklist included, demography (age, sex and residency), anthropometry (weight and height/length, MUAC), presence or absence of edema, immunization status, medical diagnosis at admission (co morbidities) and treatment outcome of severe acute malnutrition.

4.8. Data collection procedure

A total of six data collectors (diploma nurses), who have experience and trained on SAM management, two supervisors (BSc level)and three data Clarks were recruited, and three days training was given. Records of eligible children were retrieved from the registration book. The records consisted of information recorded at admission such as sex, place of residence, age of the child and anthropometry measurements. Children cards were also reviewed to record admission medical history, physical examination and routine medications, follow-up anthropometry measurements and clinical features, routine medications and outcome status. All these data were collected using a pre tested checklist.

4.9. Data quality control

Check list is prepared after reviewing different literatures to record the necessary information from the registration book(3, 4, 15, 22). Prior to the start of data collection three days training was given for the data collectors about study objectives and how to fill the check list. Pretest was conducted on 10% of the total sample size to test consistency of the check list at Bekogi Hospital where there are no geographical and cultural variations. During data collection close super vision was carried out by supervisor and principal investigator. Before receiving the filled checklist from each data collector supervisors made a thorough check to identify incomplete checklist.

4.10. Data processing and analysis

Data were checked, coded and entered into Epi-Data version 3.1and was exported to SPSS version 20 for analysis. Descriptive analysis was done using percentages for Categorical data and mean/median for continuous variables. Bivariable analyses were done and all covariate variables which have association with the outcome variables at p-value of 0.25 were entered in to multivariable model. A p-value 0.05 was considered to indicate statistical significance. The strength of association was expressed in odds ratio (OR).

4.11. Ethical consideration

This study was carried out after obtaining ethical clearance from Addis Ababa University, institutional review board. Formal letter was sent and permission sought from the zonal health bureau and the selected hospitals before conducting the study. As the study is conducted through a review of records, no consent is obtained from the mothers or caregivers of the study subjects. No personal identifiers were used to collect the data to maintain Confidentiality of the information and privacy during data collection.

4.12. Dissemination of research finding

The study result will be submitted and presented to Addis Ababa University, school of graduate studies, nursing and midwifery department. The summary will also go to Arsi Zone health office, hospitals and different NGOs. Publication of research finding also considered.

5. RESULT

5.1. Socio-demographic, breast feeding status, admission category and type of severe acute malnutrition

The study included records of 410 under-five children with the diagnosis of severe acute malnutrition admitted to TFU from January 2016 to January 2018 in 3 hospitals (Asella teaching & Referral hospital and Abomsa & Robe district hospital) at Arsi zone.

From all children included in the study 119(29%) were children younger than six months, 225 (54.9%) were children in 6 to 23 months of age group. The mean (±SD) of the age of the admitted children was 11.76 (±10.143) months. There were 227(55.4%) males and 183(44.6%) females admitted with SAM. Out of these admitted children, 284(69.3%) of them had history of breastfeeding at admission. More than two-third or 330 (80.5%) of the admitted children were from rural part of Arsi Zone. Majority (97.3%) of children was identified as newly admitted children .Most of the admitted children in the program was self-referred (81%). From those enrolled children, marasmus (non-edematous) was the predominant cause of admission followed by marasmic kwash (edematous and non-edematous) and kwashiorkor (edematous) **(Table 1)**

Table 1: Socio-demographic Characteristics, Breastfeeding Status and Admission Category of children admitted for SAM case admitted to TFU at selected hospitals in Arsi Zone 2018.

Characteristics		**Frequency (N=410)**	**percentages**
Age group	Less than 6M	119	29.0
	6-23 months	225	54.9
	24 - 59 months	66	16.1
Sex of the child	Male	227	55.4
	Female	183	44.6
Breast feeding on admission	Yes	284	69.3
	No	126	30.7
Place of residence	Urban	80	19.5
	Rural	330	80.5
Admission type	New	399	97.3
	Repeat	11	2.7
Admission criteria	Only edema	33	8.0
	Only wasting	285	69.5
	Both edema and wasting	34	8.3
	MUAC	58	14.1
Grade of edema	Grade 1	18	26.9
	Grade 2	27	40.3
	Grade 3	22	32.8
Child is referred from	Hospital	22	5.4
	Outreach	20	4.9
	SFC	28	6.8
	Spontaneous(self)	332	81.0
	Other	8	2.0

5.2. Medical Co-morbidities

Among children admitted in the therapeutic feeding unit 93.9% had at least one form of co-morbidities The most common sign of infection at admission was fever (33.9%), followed by hypothermia (5.4%). The most common medical co-morbidities accompanied with SAM children at time of admission were cough or pneumonia (62.9%), vomiting (58.8%) and Anemia (40.2%). 49.5 % of the case had diarrhea from this 93.1% were having watery diarrhea. The other identified co morbidity were TB (3.4%), Dehydration(3.4%), hypovolomic shock(2.2%)and malaria (0.7%).Regarding the HIV status of the children 34.1% were unknown HIV status and 65.4% were negative .

Table 2: Distribution of medical co-morbidities information on treatment outcome of under-five children with SAM admitted to TFU at selected hospitals in Arsi Zone, 2018.

Co morbidities		**Frequency**	**%**
Fever	Present	139	33.9
	Absent	271	66.1
Hypothermia	Present	22	5.4
	Absent	388	94.6
Appetite at admission	Good	36	8.8
	Poor	374	91.2
pneumonia	Present	258	62.9
	Absent	152	37.1
Vomiting	Present	241	58.8
	Absent	169	41.2
Diarrhea	Present	203	49.5
	Absent	207	50.5
Type of diarrhea	Watery diarrhea	189	93.1
	Dysentery	14	6.9
HIV status of the child	Positive	2	0.5
	Negative	268	65.4
	Unknown	140	34.1
Presence of TB	Yes	14	3.4
	No	396	96.6
Presence of malaria	Yes	3	0.7
	No	407	99.3
Anemia	Present	165	40.2
	Absent	245	59.8
Severe superficial infection	Present	23	5.6
	Absent	387	94.4
Dehydration	Present	14	3.4
	Absent	396	96.6
Hypovolomic shock	Present	10	2.4
	Absent	401	97.8

5.3. Routine medication

Admitted cases with severe acute malnutrition to TFU were managed in accordance with federal ministry of health of Ethiopia guideline protocol for treatment of severe acute malnutrition. Out of 410 children whose medication records were available for review, the most prescribed medications were IV antibiotics (65.9%) followed by both IV antibiotic plus Amoxicillin (27.3%). Of the total 60% of the children received vitamin A supplementation, 62.7% received folic acid.

Table 3: Information on treatment given for under-five children with SAM admitted to TFU at selected hospitals in Arsi Zone 2018.

Variable categories		Frequency	%
I.V fluid given	Yes	44	10.7
	No	366	89.3
Antibiotics	IV Antibiotic given	270	65.9
	Amoxicillin	22	5.4
	Both(IV Antibiotic & Amoxicillin)	112	27.3
	Not given	6	1.5
Vitamin A	Yes	246	60.0
	No	164	40.0
Folic acid	Yes	257	62.7
	No	153	37.3
Anthelminthic	Yes	44	10.7
	No	242	59.0
	Not applicable	124	30.2
Paracetamol	Yes	105	25.6
	No	305	74.4
Measles vaccine (n=291)	Yes	154	37.6
	No	153	37.3
	Not applicable	103	25.1
Fully immunized	Yes	125	30.5
	No	129	31.5
	Not applicable	156	38.0

Treatment outcome

Among 410 records of children with the diagnosis of severe acute malnutrition included in the study 305(74.4%), (95% CI 70 -78.4%) recovered from severe acute malnutrition with average weight gain of 14.9gm/kg/day and the average duration of stay in the therapeutic feeding center was 13.6 days. The remaining 305(25.6%) (95% CI 21.6- 30.4) were not recovered, which is 72(17.6%) (95% CI, 14.2 -21.6%), 4(1%) (95% CI 0.3-2.5) and 29(7.1%) (95% CI, 5 -10%), of the cases were defaulters, non-responder and those who died respectively. (Figure. 1)

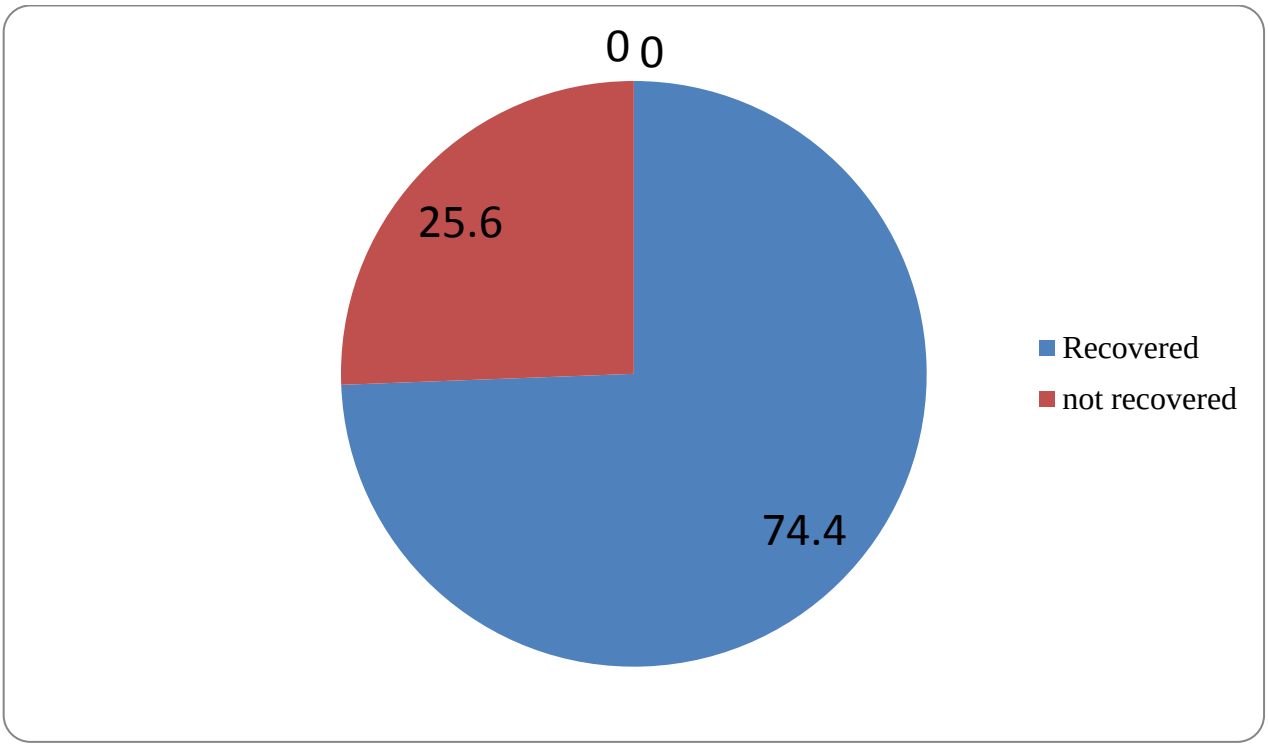

Fig. 3: Treatment outcome of SAM children treated at TFU in selected hospital, Arsi Zone 2018

Treatment outcome of SAM by type of diagnosis in the treatment centers

The predominant form of malnutrition in this study was marasmus (78/3%). Among children diagnosed as marasmus, 75.1% were recovered, 17.1% were defaulters and 6.9% died. Highest proportion of death was recorded among marasmic kwash children 14.7%. With regard to treatment centers those children treated at Robe hospital had the highest recovery rate 86.5%. **(Table 4)**

Table 4 Treatment outcome of SAM by type of malnutrition, Health facility and age categories of children admitted in the treatment centers.

Variables		**Treatment response of the child**							
		Recovered		**Defaulter**		**Non responder**		**Died**	
		freq	%	freq	%	freq	%	freq	%
Type of malnutrition	kwashiorkor	24	72.7	8	24.2	0	.0	1	3.0
	marasmus	241	75.1	55	17.1	3	.9	22	6.9
	marasmic kwash	23	67.6	5	14.7	1	2.9	5	14.7
	Visible severe wasting	17	77.3	4	18.2	0	.0	1	4.5
Name of health facility	Abomsa hospital	75	78.1	12	12.5	1	1.0	8	8.3
	Asella hospital	147	67.4	54	24.8	0	.0	17	7.8
	Robe hospital	83	86.5	6	6.3	3	3.1	4	4.2
Age group	< 6 Months	90	75.6	16	13.4	1	.8	12	10.1
	6-23 Months	164	72.9	48	21.3	2	.9	11	4.9
	24 - 59 Months	51	77.3	8	12.1	1	1.5	6	9.1

Factors associated with Treatment Outcome

Socio demographic of children, type of health facility, co morbidities, type of severe acute malnutrition and routine medication were tasted for their association with treatment outcome of severe acute malnutrition among under five children by bivariate logistic regression analysis. First the association of each variable with treatment outcome among under-five children was assessed by the binary logistic regression and then variables which were significant at the level of 0.25 were entered into the final model (multivariate analysis) to control confounding factors.

On bivariate analysis, socio-demographic and type of severe acute malnutrition were not significantly associated with the outcome variable. From the type of health facility, those who were treated at Robe district hospital (COR: 3.1, 95%CI: 1.6, 5.9) were found to have association. Similarly, those who had no anemia at admission (COR: 1.9, 95%CI: 1.2, 3.1) as co morbidity and with provision of both IV antibiotics plus amoxicillin (COR: 5.2, 95%CI: 2.6, 10.4) from routine medication were showed association with treatment outcome.

Out of the three associated factors found on bivariate analysis, IV antibiotic plus amoxicillin (AOR: 4.8(95% CI: 2.4, 9.8) and have no anemia (AOR: 1.8(95% CI: 1.1, 2.8) during admission were found to be independent associated factor for treatment outcome.

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Table 5: Results of Binary logistic regression analysis of factors associated with treatment outcomes under-five children admitted with SAM to TFU at Hospitals in Arsi Zone.

Variables	Not recovered		Recovered		Unadjusted	P-Value
	Frequency	%	Frequency	%	OR(95% CI)	
Type of Health Facility						
Asella hospital	71	32.6	147	67.4	1	0.002
Abomsa hospital	21	21.9	75	78.1	1,7(0.9,3.0)	
Robe hospital	13	13.5	83	86.5	**3.1(1.6, 5.9)***	
Age group						
< 6 Months	29	24.4	90	75.6	1	0.723
6-23 Months	61	27.1	164	72.9	0.87(0.52,1.45)	
24 - 59 Months	15	22.7	51	77.3	1.1(0.54,2.23)	
Sex of the child						0.627
Male	56	24.7	171	75.3	1	
Female	49	26.8	134	73.2	0.9(0.6,1.4)	
Breast feeding on admission						0.296
yes	77	27.1	207	72.9	1	
No	28	22.2	98	77.8	1.3(0.8,2.1)	
Place of residence						
Urban	22	27.5	58	72.5	1	0.666
Rural	83	25.2	247	74.8	1.1(0.7,1.9)	
Type of malnutrition						
Kwashiorkor	9	27.3	24	72.7	1	
Marasmus	80	24.9	241	75.1	1.1(0.5,2.5)	0.793
Marasmic kwash	11	32.4	23	67.6	0.8(0.3,2.2)	
Visible wasting	5	22.7	17	77.3	1.3(0.4,4.5)	
Duration of stay						
< 4 weeks	102	26.5	283	73.5	1	0.108
4-6 weeks	3	12.5	22	87.5	2.6(0.8,9.0)	

Table 5: Results of Binary logistic regression analysis……. Continued

	Not recovered Frequency	%	Recovered Frequency	%	Unadjusted OR(95% CI)	P-Value
Co morbidities						0.849
yes	99	25.7	286	74.3	1	
no	6	24.0	19	76.0	1.1(0.43,2.83)	
Fever						0.703
Present	34	24.5	105	75.5		
Absent	71	26.2	200	73.8	0.9(0.6,1.5)	
Hypothermia						0.750
Present	5	22.7	17	77.3	1	
Absent	100	25.8	288	74.2	0.8(0.3,2.4)	
cough or pneumonia						0.358
Present	70	27.1	188	72.9	1	
Absent	35	23.0	117	77.0	1.2(0.8,1.9)	
Vomiting						0.278
Present	57	23.7	184	76.3	1	
Absent	48	28.4	121	71.6	0.8(0.5,1.2)	
Diarrhea						0.823
Present	51	25.1	152	74.9	1	
Absent	54	26.1	153	73.9	0.9(0.6,1.5)	
TB						0.715
Yes	3	21.4	11	78.6	1	
No	102	25.8	294	74.4	0.7(0.2,2.9)	
Anemia						0.003
Present	55	33.3	110	66.7	1	
Absent	50	20.4	195	79.6	**1.9(1.2,3.1)***	
Severe superficial infection						0.126
Present	9	39.1	14	60.9	1	
Absent	96	24.8	291	75.2	1.9(0.8,4.6)	
I.V fluid given						0.173
Yes	15	34.1	29	65.9	1	
No	90	24.6	276	75.4	1.6(0.8,3.1)	
Antibiotic given						
IV antibiotics	91	33.7	179	66.3	1	
Amoxicillin	4	18.2	18	81.8	2.3 (0.8, 6.9)	< 0.001
Both	10	26	102	74	**5.2(2.6,10.4)***	

Measles vaccine						0.495
Yes	38	24.7	116	75.3	1.2(0.7,1.9)	
No	43	28.1	110	71.9	1	
Fully immunized						
Yes	30	24.0	95	76.0	1.2(0.6,2.1)	0.567
No	35	27.1	94	72.9	1	
Folic acid						0.093
Yes	73	28.4	184	71.6	0.7(0.4,1.1)	
No	32	19.9	121	80.1	1	
Albendazole or mebendazole						0.220
Yes	7	15.9	37	84.1	2.1(0.8, 4.9)	
No	66	28.1	169	71.9	1	
Vitamin A						0.106
Yes	70	28.5	176	71.5	0.7(0.4, 1.1)	
No	35	21.3	129	78.7	1	
Appetite at admission						0.626
Good	8	22.2	28	77.8	1	
Poor	97	25.9	277	74.1	0.8 (0.4,1.9)	

* Factors significantly association with treatment

Table 6 Multivariable logistic regression analysis for factors associated with treatment outcomes of children admitted with SAM to TFU at hospitals in Arsi Zone, 2018

	Not recovered		Recovered		Unadjusted OR (95% CI)	Adjusted OR (95% CI)
	No	%	No	%		
Anemia						
Present	55	33.3	110	66.7	1	1
Absent	50	20.4	195	79.6	1.9(1.2,3.1)	**1.8 (1.1,2.8)**
Antibiotic given						
IV antibiotics	91	33.7	179	66.3	1	1
Amoxicillin	4	18.2	18	81.8	2.3(0.8, 6.9)	2.1(0.7,6.7)
Both	10	26	102	74	5.2(2.6,10.4)	**4.8(2.4,9.8)**

The odds recovery was 4.8 times as much in those children with severe acute malnutrition and received IV antibiotic plus oral amoxicillin compared to those who received IV antibiotic only, and children who have no anemia at admission were 1.8 times more likely to recover as compared to children who have anemia.

6. DISCUSSION

This study investigated the treatment outcome of severe acute malnutrition and identify factors associated with treatment outcome among under five children who were admitted at therapeutic feeding unit. We also assessed other common clinical conditions in order to come-up with co-existing problems probably predicting treatment outcome.

The major finding of the study showed that among children treated for severe acute malnutrition, 74.4 % were recovered. The proportion of recovery in this study was below the recommended sphere standard which should be >75% (8). Similarly it is lower than the finding from Woldiya hospital (85%)(31). However this finding is higher than previous study done in Bangladesh (62.4%), Uganda (66.9%), Felege Hiwot hospital (58.4),Sekota (59.7%), and Walaita(64%) (15, 18, 19, 23, 26). The finding from Easter India, Sudan, Debre markos, Finoteselam and yirgalem were consistent with the finding of this study (24, 29, 39).

This study found that high proportion of death (7.1%) than previous findings in wolaita and study conducted in India (31, 40). However, it is lower than recommended minimum sphere standard which should be <10% and reports from Bangladesh, Felege Hiwot, yirgalem and Sekota (15, 19, 23, 39). In this study the proportion of death was higher this is mainly could be children reach referral hospitals late after developing complications. The other reason may be inappropriate management of children such as, partial prescription of routine medication and high prevalence of co morbidities (16, 40).

The proportion of defaulted children was 17.6%. It is similar with the finding from Sudan (15%) and Gonder (19.8%). This outcome is below acceptable range of sphere standard, it is also lower than another studies conducted in Yirgalem hospital (22, 24, 41).

The average length of stay for recovered children in the TFU of 13.6 days was much lower than the international standard (Sphere) set for the management of SAM(8), which is less than 28 days. In the same way, It was also lower than reported in Yirgalem Hospital (18.16day) and Bahir Dar Felege Hiwot Referral hospital(18.00 day)(15, 39). But it was similar with study report at Gedio Zone (14 day) and Debre markos and finoteselam hospital(11.1 day)(28, 29).The average weight gain of 13.1 g/kg/day was also in agree with the minimum international

standard set for the management of SAM which is >8 g/kg/day, and it also higher than similar studies in Yirgalem hospital (9.5 g/kg/day),Woldiya (9.86 g/kg/day) and Gede(28)o Zone(8.7 g/kg/day) (31, 39).

Differ from a broad study in Ethiopia, provision of IV antibiotics plus Amoxicillin showed that preventive effect (AOR: 4.8(95% CI 2.4, 9.8) to treatment outcome. This finding agree with the WHO recommendation, treating complicated severe acute malnutrition with IV antibiotic for two day then oral Amoxicillin for five day (4).

Children who have no anemia at admission were 1.8 times more likely to recover as compared to children who have anemia 1.8(95% CI: 1.1, 2.8). This finding is in line with previous study conducted at Sekota and Gedeo which reported anemia was a predictors of death in severe malnourished children (19, 28).

The study finding showed majority 330(80.5%) of the children admitted to therapeutic feeding center were from rural area which is consistent with the study done in Debre markos and Finote Selam hospital, Yirgalem hospital and south west Ethiopia (29, 34, 39). The mean age of the children at admission was 11.76 (±10.143) months, similar with the finding at Debre Markos and Finoteselam hospital(13 month) (29).However it was less than studies conducted in Uganda(24.2 month),Sudan(22.3 month) and Woldiya hospital(24, 26, 31). The reason for the high proportion of cases of SAM to be among the age group less than 24 months could be due to sub optimal breast feeding and poor complementary feeding practices of the community.

Marasmus was found the predominant form of malnutrition in this study (78.3%), which is in line with the study done at Pediatric Hospital, Sudan (68.6%)(24) and hospitals in Dhaka city of Bangladesh (64.5%),(23). But the finding was different from study conducted in Uganda (41.8%) (26). This variation may be explained by the fact that marasmus is more common in the age group below two years which is the case in this study in which 83.9% of the study population lie in the age category less-than two years.

This study finding showed that more than two third of the study subject have at least one form of co morbidities at admission from this Pneumonia was the most prevalent (62.9%) co-morbidity found in this study and the other co- morbidities vomiting, Diarrhea and anemia

their respective prevalence being (58.8%), (49%), and (40.2%) respectively. other studies done in different area had also indicated these co morbidities are common in children with severe acute malnutrition (29, 39).

This finding showed that there was no significant association between treatment outcome and type of malnutrition. This result was similar with the finding from Yirgalem hospital(39). However it differs from previous finding conducted at Wolaita Zone in which children with the diagnosis of kwashiorkor had 2.6 times more likely to recover than marasmic pt(31). This difference might be due to high defaulter rate among kwashiorkor patient in the current study.

Strength

This study was among a limited number of studies especially in Oromiya region which assessed the inpatient treatment out of severe acute malnutrition.

The sample size is much enough to represent the SAM children managed at inpatient therapeutic feeding unit in Arsi Zone

Limitation

This study has its own limitation. The study used the recorded data of the discharged children to measure treatment outcomes and associated factors. Therefore, this study was limited in measuring treatment outcome only using medical records due to that could not permit including other factors such as, distance from the hospitals, education and economic status of parents, completing breast feeding history and factors related to health care provider.

7. CONCLUSION AND RECOMMENDATION

7.1 Conclusion

Proper management of severe acute malnutrition and high proportion of recovery has huge contribution to save the lives of many children. This study tried to assess treatment outcome of severe acute malnutrition among children under the age of five years. Accordingly proportion of recovery was approximately within the acceptable range of global Sphere standards which is >75%; however, defaulter rate is higher than the acceptable range. Treatment with IV antibiotics plus Amoxicillin and having no anemia at admission were found to be associated with higher likelihood of recovery during the treatment for severe acute malnutrition.

7.2 Recommendations

Based on the finding of this study the following recommendations are forwarded:

For the hospitals

The hospitals should design appropriate and ongoing supervision mechanism for defaulter tracing

During patient management health care provider should give emphasis to give oral antibiotics like amoxicillin during the discontinuation of IV antibiotic which were identified as predictors of recovery, should be given and Proper follow up for adherence of the medication should be established.

For zonal health office

The zonal health office should work with all concerned bodies to create awareness in the community for early treatment seeking. In addition data from hospitals regarding severe acute malnutrition management treatment outcome should be analysis for local decision making. Capacity building training for therapeutic feeding program staffs on proper management of severe acute malnutrition to achieve the desired treatment outcome.

For researchers

Researchers should conduct further prospective studies using both qualitative and quantitative techniques that better investigate the determinants of severe acute malnutrition treatment outcome.

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ANNEXES

ANNEX I

Data collection format

Part I: Sociodemographic characteristic of children with SAM treated at selected Hospitals. Health facility name _____ Address of the child Wereda _____ Kebele _____ Data recorder name_____ signature _____ date ___//___// Child's Medical record number(MRN) _____			
S no	Particulars	Categories of response	Skip
101	Age of the child (month		
102	Sex of the child	1.male 2.female	
103	Breast feeding on admission	1 Yes 2 No	
104	Place of residence	1. urban 2.rural	
Part II: Anthropometric finding			
201	Weight at admission (kg)		
202	Weight at discharge (kg)		

203	Height /length (cm)		
204	MUAC at admission(mm)		
205	MUAC at discharge (mm)		
206	Date of admission		
207	Date of discharge		
208	Admission type	1. new admission 2. re-admission	
209	Admission criteria	1.only edema(kwashiorkor) 2. only wasting (W/H)(marasmus) 3. both edema and wasting 4. MUAC	If 1&4 skip to 211
21o	If oedema is present, what grade?	1. Grade 1 2. Grade 2 3.Grade 3	
211	Child is referred from	1. Hospital 2. Outreach 3. SFC 4. spontaneous(self) 5. other	
212	Lowest weight during the stay (kg)		
Part : 3 medical co-morbidities at admission			
300	co-morbidities	1.Present 2.Absent	
301	Fever (temp >37.5)	1. present 2. absent 3.not checked	
302	Hypothermia (<35.0)	1. present 2. absent	

		3. not checked	
303	Appetite at admission	1. Good 2. Poor	
304	pneumonia	1. present 2.absent	
305	Vomiting	1. present 2.absent	
306	Diarrhea	1. present 2.absent	If 2 skip to 309
307	If diarrhea, which type?	1. watery diarrhoea 2. dysentery 3. othejr specify)_____	
308	Duration of diarrhea (days)	_____	
309	HIV status of the child	1. positive 2. Negative 3. Un know	
310	Does the child have TB?	1. Yes 2. No 3. Un know	
311	Presence of malaria?	1.yes 2. no 3. Un know	
312	Anemia (pale conjunctiva and palmer pallor and/or a hemoglobin count of <11g/dl	1.present 2. absent	
313	Severe superficial infection (ear discharge or skin that is ulcerating)	1. present 2. absent	

314	Others (specify)		
315	If any complication during stay (specify)		
Part : 4 Treatment given at admission			
401	I.V Fluid given	1. Yes, 2. No	
402	I.V Anti-biotic given	1. Yes, 2. No	
403	Amoxicillin	1. Yes, 2. No	
404	Vitamin A	1. Yes, 2. No	
404	Measles vaccine	1. Yes, 2. No 3. Not applicable	
406	Fully immunized	1. Yes, 2. No 3. Not applicable	
407	Folic acid	1. Yes, 2. No	
408	Albendazole/ Mebendazole	1. Yes, 2. No 3Not applicable	
409	Paracetamol Tab/syrup	1. Yes 2. No	
Part 5: Treatment Outcome			
501	Treatment response of the child?	**1.Cure/Recovered** **2.Defaulter** **3.Non-responder** **4. Died**	If 1 502

502	Treatment response for those who had been cured	Weight gain(g/kg/week)_____ Length of stay (weeks)_____ MUAC gain (mm|week	

ANNEX II CURRICULUM VITAE

I. Personal data

NAME_____MISRAK ABERA

DATE OF BIRTH_____1984GC

GENDER_____ FEMALE

NATIONALITY_____ETHIOPIAN

ADDRESS_____ASELLA

CELL PHONE_____ 0911372766

Email_____ misri2016@yahoo.com

II. Educational Background

2014 Bsc in Nursing from JimmaUniyersity, Jimma Ethiopia

2006 Diploma in Nursing from Goba Health Science College, Bale Goba Ethiopia

III.Work Experience

Three years at Gobesa Health center on different department .Eight years at Asella Hospital different department, currently at Asella hospital Neonatology department

ANNEX III Training module for data collectors and supervisors

I. Instruction

1. Since this is secondary data extraction, make sure that you have all source, patient record and registration book

2. Try to collect pertinent information from the document some coding conventions have been used throughout the review (like SKIP questions, OTHERS options which needs text description) seek clear understanding.
3. Get instructions from the supervisor as to the daily schedule of carrying out the review.
4. Incomplete record should be excluded and data completeness must be checked by supervisors and principal investigators.
5. Make sure that all the relevant parts of the questionnaire are completed before going to the next record.

6. II. Methods of training

- ✓ Every instruction during training pass through the data extraction tool
- ✓ example of a completed instrument or an interview transcript for the data Collectors
- ✓ Data collectors were allowed to practice with the tool

Table: training module manual

Data collection method Or instruction	Data collector	Training needs	Training activities
Health professionals in selected hospitals of Arsi zone,	Diploma Nurses	observation and distribution techniques How to follow and feel the instrument	Observation instruction How to review records Trainee observation practice