Time To Recovery From Moderate Acute Malnutrition And Its Predictors Among 6-59 Months Children Targeted For Supplementary Feeding In Shalla District, West Arsi Zone, Ethiopia, 2018.

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Research article

Keywords: Time to recovery, targeted supplementary feeding, and moderate acute malnutrition

Posted Date: October 23rd, 2019

DOI: <https://doi.org/10.21203/rs.2.16368/v1>

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Abstract

Abstract Background-Globally, acute malnutrition accounts for >50% cases of childhood mortality in under 5 children each year. Moderate acute malnutrition treatment would be to reduce child mortality and morbidity. Study done in Ethiopia showed treatment food share, lack of water and other factor suggested to cause lower chance of recovery at end of 16 week as per Ethiopian acute malnutrition treatment guide line. **Methods-** Retrospective cohort study design was conducted among children aged 6–59 months which were treated in targeted supplementary feeding program. A total of 402 children were selected from eight health posts by systematic random sampling. Data were collected by reviewing registration records and interview from January 1-10/2018. Data were analyzed using SPSS version 20, bivariate and multivariate statistical methods were used to analyze and describe the data and $p < 0.05$ was considered as significant. **Results-**the overall average timely recovery was 15 week (SD,3.3). Children treated by super cereal were 2.44 times more likely to recover timely than children treated by corn soybean blend (AHR 2.44; 95% CI 1.85-3.21). Children that had regular follows up has 48% (AHR 1.48; 95% CI 1.09-2.00) more chance of recovery than intermittent treatment follow up, children's from sever food in secured family had 51% lower chance to recover than moderate food insecured house hold (AHR 0.49; 95% CI 0.21-0.11) and, admission MUAC³11.6 cm had 1.18 times higher proportion of recovery than admission MUAC = 11.5 cm (AHR 1.18; 95% CI 1.13-1.12). Children who have no transport access has 2 times lower proportion of recovery than who have access (AHR 0.5; 95% CI 0.38-0.64). **Conclusion-** the mean time to recovery was 15 week which is consistent with the national standard 16 weeks. Type of treatment foods, treatment follow up status, and admission mid upper arm circumference had significant association with time recovery moderate acute malnutrition treatment.

Background

Acute malnutrition continues to be a major global public health problem affecting an estimated 51.5 million children aged less than 5 years and being associated with 12.6% of all under-5 child mortality[1].

Moderate acute malnutrition is weight for height indicator between -3 and -2 Z- score standard deviation of the international standard or mid upper arm circumference (MUAC) between 11.5 cm and 12.5 cm [2].

There are risk factors for MAM and SAM such as inadequate dietary intake, inappropriate feeding, fetal growth restriction, inadequate sanitation, lack of parental education, family size, incomplete vaccination, poverty, economic, political, and environmental instability and emergency situations. When compared to adequately nourished children, children suffering from acute malnutrition have increased risk of mortality, impaired physical and cognitive development, and infections [3].

Acute malnutrition is the major cause for child mortality. A child with MAM is up to 3 times as likely to die as well as well nourished child. Child with SAM is nine times as likely to die as well nourished child. For every child suffering from severe acute malnutrition there is eight to 10 suffering for moderate acute malnutrition and therefore absolute mortality is higher for MAM than SAM [4].

Targeted Supplementary Feeding is implemented in food insecure situations, including in emergencies, in order to treat MAM and to prevent children with MAM from becoming severely malnourished (falling into SAM) and usually indicated when MAM and SAM prevalence rates are between 10-14% or 5-9% with aggravating circumstances [5].

Ethiopia's 2013 National Nutrition Plan has overall goal for reducing the prevalence of wasting from 9.7% to 3% by 2015. The current strategy in Ethiopia is to restrict Targeted Supplementary Feeding Programs (TSFP) for treatment of moderate acute malnutrition (implemented through provision of supplementary food ration) to selected woredas of the country defined as chronically food insecure. Unfortunately, relative food security at the woreda level does not necessarily adequate to nutritional security in all households [6].

Studies conducted in Jimma by save the children and world food programme Ethiopia showed, only 49.2% recovered at 6 month follow-up and 47.2% did not recovered at 3 months of TSF treatments

[6]. So that needs further investigation to identify effective duration of time for MAM case management. There is a lack of sufficient evidence concerning the magnitude of treatment outcome at study area, duration of stay on treatment, and related factors at health post level in the Shala woreda. Therefore, this study will be conducted to fill in the gap with the specific objectives of time to recovery to moderate acute malnutrition and its predictors among 6-59 months children targeted for supplementary feeding, comparing the median times of recovery among children with moderate acute malnutrition, and identifying predictors of time to recovery.

1.2 Statement of the Problem

According to the World Health Statistics report, a global total of 52 million children under 5 have acute malnutrition of which 33 million had MAM. Thus, MAM affects about one in ten children under 5 years in the least developed countries [7, 8].

Acute malnutrition prevalence varies across regions and countries, in which high burden remains in low and middle income countries with an estimated figure of 7.7%, 2.0% and 0.7% in South Asia, Sub-Saharan Africa and Latin America respectively [8].

In Ethiopia 10% of children 6-59 months of age are wasted, with 70% of these having MAM, and about 35% to 57% of the deaths in under five children are attributable to malnutrition [9].

Malnutrition among children is a critical problem because its effects are long lasting and go beyond childhood and affects academic performance, physical and mental development throughout their lives [9].

To tackle this problem government of Ethiopia implemented TSFP activities in food insecure setting. Moderate acute malnourished children screened from community using MUAC, admitted to TSFP, promotive and preventive services such as provision of food ration, vitamin A supplementation and deworming is done according to MAM case management guidelines, and protocols. Despite standardized management, recent studies indicated that the child timely recovery for MAM ranges from 49.2 % to 73 % [8,10].

Though recovery time of MAM is with wide statistical range, no study reported MAM time of recovery of Shala district, west Arsi. Due different factor 12.5% children failed to achieve their target weight within specified period and a little research is done on this area to explain factor that affect time of recovery in the study area [10].

Some of TSF beneficiary children deteriorate or remain for long time without improvement for different reasons such as intra-household sharing, targeting problem and delay of distribution or other factor. So that this study helps to assess time to recovery to moderate acute malnutrition and its predictors among 6-59 months children targeted for supplementary feeding in case of Shala *Woreda* Oromia region.

Methods

2.1 Study setting and period

The study was conducted in Shala district, West Arsi Zone, Oromia region, located in the Great Rift Valley, 290 km to the south of Addis Ababa and 35 km to the west of Shashemene Town, with altitude ranging from 1800-2125 meters above sea level.

Shala is bordered on the south by seraro, on the west by the southern nations nationalities and peoples region, on the north by Shala lake which separates it from Arsi Negele, and on the east by shashemene Zuria ; its western boundary is defined by the course of the bilate river. The administrative center of this district is Aje.

The 2007 national census reported a total population for this district is 149,804, of whom 74,930 were men and 74,874 were women; 7,680 or 5.13% of its population were urban dwellers. According to 2010

e.c Shala woācreda health office report Children aged 6-12 month at risk of developing moderate acute malnutrition is 3318 [15].

Food products commonly produced in the woreda is corn, potatoes, soybean used for consumption and market purpose which is not enough throughout the year. To combat problems related to food insecurity there is targeted and blanket food supply program in the woreda. The health infrastructure of the district is composed of 8 government health centers, 39 health posts. The study was carried out from September 30, 2017 to April 30, 2018.

2.2 Study design

Retrospective cohort study was conducted using the data of moderate acute malnourished children aged 6-59 months which were admitted to TSFP and treated in 8 health posts in Shala district between May 1, 2017, and August 30, 2017.

The study was conducted on 201 MAM children who had been treated by using supplementary food CSB++ and 201 moderate acute malnourished children who have been treated by supplementary food plumpy sup (RUSF).

2.3 Source and study population

2.3.1 Source population

All moderate malnourished children whose age is between 6 to 59 month in Shala woreda who screened and recorded for supplementary feeding programme from the community for TSFP.

2.3.2 Study population

All moderate malnourished children whose age is between 6 to 59 month in Shala woreda screened and included to TSF programme in selected site from May 1, 2017 to August 30, 2017.

2.4 Inclusion criteria and Exclusion criteria

2.4.1 Inclusion criteria

Eligible 6-59 month age children who were identified from community and identified to have moderate acute malnutrition.

2.4.2 Exclusion criteria

Children identified from the community whose date of birth is missed by the mother.

Children screened and included in TSFP in other months of the year 2017.

a) Sample size for predictor of time to recovery to moderate acute malnutrition

The sample size is calculated based on the assumption that type I error 5 %, power of 80 %, proportion of recovery among MAM children used RUSF is 73 % (exposed) and proportion of recovery among MAM children used CSB+ is 67 % (unexposed) [16]. The sample size is calculated by using the formula **Fleiss JL. 1981. pp.44-45**

P_1 = proportion of recovery among unexposed is 67%

P_2 = proportion of recovery among exposed is 73 %

α = level of significance (0.05), $Z_{\alpha/2} = 1.96$ at 95 % confidence interval.

Power = $1 - \beta = 80\%$, $Z_{1-\beta} = 0.842$ n_1 = sample size for population 1

Ratio of exposed to unexposed (r) = 1 n_2 = sample size for population 2

The required MAM children in each group were calculated as follow.

$$n_1 = \frac{[Z_{1-\alpha/2} \sqrt{2P(1-P)} + Z_{1-\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)}]^2}{(p_1 - p_2)^2}$$

$$\text{where } P = \frac{p_1 + r p_2}{2} = \frac{0.73 + 0.67}{2} = 0.7$$

$$n_1 = \frac{\{1.96 \sqrt{2 \times 0.7 \times 0.3} + 0.84 \sqrt{0.73 \times 0.27 + 0.67 \times 0.33}\}^2}{\{0.73 - 0.67\}^2}$$

$$n_1 = \frac{\{1.96 \sqrt{0.42} + 0.84 \sqrt{0.4182}\}^2}{0.036} = \frac{\{1.270 + 0.5432\}^2}{0.036} = 91.34$$

$$n_{1f} = \frac{n}{4} \left\{ 1 + \sqrt{1 + \frac{2(r+1)}{n_1 + r/p_2 - p_1}} \right\}^2 = \frac{91.34}{4} \left\{ 1 + \sqrt{1 + \frac{2(1+1)}{91.34 \times 1/0.73 - 0.67}} \right\}^2$$

$$\sqrt{1 + \frac{2(1+1)}{91.34 \times 1/0.73 - 0.67}}^2$$

$$n_{1f} = 91.34/4 [1 + \sqrt{4/9.34(0.06)}] = 122 \quad n_{2f} = r \times n_1 = 1 \times 122 = 122$$

n = minimum sample size required for each group is 122 and after adding 10 % for incomplete records and multiplying with design effect 1.5 the sample size is 201 for each group

The total sample size is 402.

2.6 Sampling procedure

In the study district, there are 39 health posts. Populations living around these health posts are assumed more or less homogenous. As the result, 8 health posts was selected at random using lottery method presuming that there were no information lost with the unselected health posts.

Also the SFP protocol for management of MAM works equally to all health post level. So in total, a sampling frame of children managed for MAM from 8 health posts in the district was prepared. Samples were allotted to each health institution using the probability proportional to size sampling. Finally, the children were selected by systematic random sampling from each institution based on their unique identification number.

Sampling frame was obtained from TSFP treatment registration book which documented by health extension worker work in the health post (figure 1).

2.7 Data collection technique and procedure

Data were collected by record review using a semi structured questionnaire. Questionnaire developed based on published studies and adapted to local situation with certain modifications. Then the questionnaire was pretested in Shala district MAM treatment community of 10% of sample size. Corrections were done on the questionnaire following the pretesting. The questionnaire was prepared in English and translated to Afaan oromoo. The data collection process was administered in Afaan oromo.

Data were collected by experienced 8 diploma nurses supervised by 2 Bsc nurse and data collector and supervisor was trained on how to collect quantitative and qualitative data.

The questionnaire included information on Socio economic and demographic characteristics of the family care takers and household leaders, Individual factors affecting recovery time- admission condition of a child, Discharge condition of a child with moderate acute malnutrition management outcomes, Family related factor affecting recovery time, child feeding practice, health care related factor affecting recovery time, Environmental related factor affecting recovery time. Data collection was completed in 10 days from January 1-10, 2018

2.8 Data quality assurance

Both the data collectors and the supervisor were given 1 days training regarding the objective of the study to capacitate the skill of data collection methods.

As part of the training, the data collection tool was pretested at shala district before the actual data collection is done to maintain data quality.

Completed questionnaires was collected on daily basis and checked for completeness and consistency by immediate supervisors. Cleaning was done on daily basis and timely feedback was communicated to the data collectors.

Incorrectly filled or miss ones was back to the respective data collectors for correction.

The principal investigator was supervised five percent of the secondary data collection and confirmed the data are correctly collected from the beneficiary registration and their care takers.

Ten percent of the data was re-entered in order to compare and assure the quality of the data.

2.9 Study variables

2.9.1 Dependent variable

- Time to recovery of moderate acute malnutrition treatment.

2.9.2 Independent variable

- **Individual factor:-**
 - care taker age
 - care taker sex
 - place of residence
 - Admission weight, MUAC,WFH Z score category
 - admission MUAC
 - WFH Z score category
- **Family factor**
 - Educational status of the care giver
 - Occupation of the care giver
 - marital status of care giver,
 - House hold food insecurity,
 - inadequate care and feeding
 - Family income
 - Child feeding practice
- **Environmental factor**
 - Drinking Water source
 - Safe solid disposal/stool disposal
 - Un healthy household environment
- **Health care related factor**
 - Treatment foods
 - Follow ups

- Health education Topic covered by HEW
- Food sharing
- Cooking demonstration conducted

2.10 Operational definition

Recovered = Children reach the target weight gain of 13% from admission weight and MUAC $\geq$ 12.5 cm or $\geq$ -2 z-score period of two consecutive distributions.

(Ethiopian Acute malnutrition management guide line 2016)

Defaulter = child absent from the program for three consecutive visit and confirmed.

Time of recovery = Acceptable to stay the program with in less than or equal to sixteen weeks.

Intermittent follow up = Lost the TSFP program at least once during treatment period.

Non response = (failure to respond to treatment) where child fails to reach the discharge criteria over a period of four months.

Targeted Supplementary Feeding programme = is the program which aims to

rehabilitate children under five years old as well as pregnant and lactating women (PLW) identified as moderate acute malnutrition.

Censored data (unobserved outcome) = time-to-event is not observed.

Subjects are said to be censored if they are lost to follow up or drop out of the study, if the study ends before they recover or have an outcome of interest.

Transport access = easy to reach desired distinction by means of a specific transport system.

Overcrowded condition = is condition occur when Person/room is greater than 2 person per 1 room, 3 person per 2 room, 5 person per 3 room.

2.11 Data processing and analysis

Data was checked for the completeness and consistencies. After that the data was coded and entered in to EPINFO version 7 and then exported to the Statistical Package for Social Science (SPSS) IBM version 20 for further analysis Frequency, proportion, was used to summarize information about dependent and

independent variables. Proportional of hazard rate is calculated to measure the association and the probability of time to recovery among MAM children during the specified period. Kaplan– Meier product limit, life table analysis and log rank test were used to estimate the time to recovery and the cumulative proportion surviving in a given interval, and compare the survival curves, respectively. Co-linearity was checked for the covariates in the final model and some of highly correlated independent variable was removed.

Cox proportional hazard regression was used to identify predictors of time to recovery.

In bivariable cox regression analysis variable that has p value less than 0.25 is selected as a candidate for multivariable cox regression analysis.

All statistical tests in multivariable analysis study were declared significant if p-value is <0.05.

2.12 Ethical clearance

Ethical clearance was obtained from Institutional Review Board of Hawassa University College of Medicine and health Sciences. Official letters was taken from west Arsi zone Health department prevention control office.

2.13 Data dissemination

Results of the study was be presented during thesis defense and the final result was submitted to Hawassa University College of Medicine and health Sciences. In addition to this the final result document was be presented to west Arsi zone health bureau and other responsible bodies.

Results

3.1 Socio demographic characteristics of study population

A total of 402 MAM children were included in the interview from these female constituted 54.2% of the Children Studied. The overall median ages was 18 month and inter quartile range (IQR) 12 month. The mean number of family members of the respondent households was 5.19. Regarding Occupation of house hold leader 371(92.25%) of them are farmer and 19(4.75%) are private employee, 12(3 %) are daily laborer.

Of the total 402 Sex of household leader 401 (99.75%) are male and only 1 (0.25%) are female and also about 237 (58.75%) has transport access to nearest healthy facility and the rest 165 (41.2%) of house hold had no transport access to distribution centre.

From all the children admitted to TSFP, the majority 394 (98%) received Vitamin A,

99 (24.6%) children had taken deworming and 336 (77.5%) received measles vaccination.

Out of 402 children admitted to TSFP, 54(13.4%) children were affected by diarrhoea, and the rest 347 (86.7%) are not, only 2(0.5%) children were affected by cough with difficulty of breathing, and fever and the rest 398(99.8%) are not affected.

Regarding the admission types of children to the TSFP in this study, 377 (93.75%) children were newly admitted and 19 (4.8%) were re-admission, and the remaining 6 (1.5%) were return after default. Among the study cohort of children treated in the programme, 288 (71.6%) was recovered, and 114 (28.4 %) were censored (Table 1).

Among family related Factor affecting time recovery, the most (87.5%) of the children started Complementary food at 6 month and the remaining 50 (12.5%) children started complementary food at 5 month, about 396(98.5%) mother breast feed their children but the rest 6 (1.5%) mother is not breasts fed their children for 2 year.

Out of total children data reviewed 330(82.2%) beneficiary children of TSFP was in one Supplementary feeding Programme, and the remaining 72(17.75 %) were supported under two or more Supplementary feeding programme. Likewise 160 (40%) house hold are in other programme providing food support and the rest 242(60%) are only get food support from blanket supplementary feeding programme.

Regarding food security status of the total children family assessed only 2 (0.5%) of the child family were food secured, and 385 (95.7%) of the child family were moderately food in secured and the rest 15(3.75%) were severely food in secured house hold (figure 2).

Out of all MAM child family interviewed 393 (97.8%) of them get health education related to TSFP but Cooking demonstration is not conducted for 277 (68.9%) care giver, total number of care giver know the exact amount of food ration given 382(95%)and the rest 20(5%) did not know.

Regarding ration use for MAM children 226(56.2%) care giver used ration only to MAM diagnosed child the rest 176(43.8%) is not. similarly, One hundred sixty (39.8%) MAM children treated at TSFP were shared treatment food for other family members especially for Child of the house hold and 16(4%) shared with parents/care giver, and Three hundred fifty one (87.3%) admitted children were attending TSFP ration distribution regularly and 51 (12.7%) of children were intermittently follow food ration distribution.

Concerning availability of latrine, 193 (48%) of the households had latrine and 209(52%)were had no latrine and use open field for defecation, as well 356 (89%) people dispose solid waste in open field and 46(11%) use solid waste disposal site.

Related to water source of the households in the study area 366 (91%) getting water for drinking purposes from improved water source and the rest 36 (8.9%) uses unimproved water source for the households in addition about 307(76.4%) house hold had enough water supply to drink and other purposes were as 95(23.6) had no enough water for the use of all purposes.

Regarding living condition of house hold environment 284(70.6%) households of children admitted to TSFP were leave in overcrowded condition greater than two person per room and 118(29.3%) are not live in an overcrowded house.

3.2. Proportion of recovery of MAM children treated at shalla district

January 2018.

From the total of 402 children admitted to TSFP, 333 (82.8%) were recovered within 16 week. Whereas 69 (17.1%), were censored (figure 3).

3.3. Proportion of recovery of MAM children at different week

time interval during study period.

The proportion of recovery of MAM children treated using TSFP in shalla district was 82.8 % at 16 week with hazard rate of 0.26, the majority of recovered children were found among those treated using super cereal (87.5%) where as those used CSB+ and oil were (55.7%). Overall median time to recovery was 15 weeks (IQR,5). and the average recovery time for children treated by super cereal was 13 weeks and those used CSB+ and oil was 16 weeks.

There were a difference in recovery time among children who were treated by super cereals and CSB+ and oil (table 2).

3.4 Predictors of time to recovery

In this study the findings of bivariate analysis showed that person with primary child care responsibility, education status of house hold leader, number of house hold member, transport access to nearest TSFP distribution center, co morbidities such as diarrhea, fever, measles vaccination, admission MUAC ,admission status ,house hold food security status, open field disposal of wastes , treatment food share to other family members, regular follow up treatment food , types of treatment food, type of water source and being no enough water were significantly associated with dependent variable at p- value of <0.25, and can be considered as a candidate for multivariate regression analysis (table 3).

On the multivariable Cox-regression analysis, variables that have significant level at 95% CI and p -value < 0.05 were considered to be the predictor of time to recovery of children with moderate acute malnutrition admitted at shalla district TSFP.

The multivariate cox regression analysis of this study showed that, transport access to nearest health facility, Admission MUAC, house hold food insecurity status, type of treatment food used and follow up status were a significant predictors of time to recovery of MAM treatment(table 4, Figure 4, Figure 5).

Discussion

The study assessed time to recovery from MAM and its predictors among children aged 6-59 months treated at targeted supplementary feeding program at Shala district. The mean time to recovery was 15 weeks. Transport access to nearest health facility, co morbidities such as diarrhea, Admission MUAC, house hold food insecurity status, type of treatment food used and follow up status were identified as independent predictors of time to recover.

In this study the overall MAM treatment mean time to recovery was 15 week (SD, 3.3) which is consistent with Ethiopian national standard malnutrition treatment guide line which is 16 week [5]. Similarly, the studies conducted in sidama zone SNNPR Ethiopia, (CSB+=67%, RUSF=73%) timely recovered at the end of 16 week [13] .This may be due presence of regular follow up by nongovernmental organization working on it and continuous health education support given by health extension service worker at their locality .

The study also found that the median time to recovery was 15 weeks (IQR, 5) which is consistent with the Ethiopian national malnutrition treatment guide line recommendation 16 week [5] but this is lower than the study conducted in Jimma zone/Ethiopia [1].

The study showed recovery time of TSFP admitted children treated by super cereal was 13 weeks and CSB+ and oil was 16 weeks this shows that children treated by super cereal has lower median time to recovery than CSB+ and oil treatment groups, which implies children treated by super cereals was 2.4 times higher estimated better timely recovery than children treated by CSB+ treatment groups (AHR =2.44, 95% CI ,1.85-3.21) p-value <0.05) which is consistent with study conducted in sidama zone/SNNP Ethiopia which showed the hazard rate for children in the CSB group was (AHR= 0.85 95% CI:0.73- 0.99), which indicated that they had 15% lower recovery . Recovery rates of children at the end of the 16-wk treatment period is higher in the RUSF group (73%) than in the CSB group (67%) [13].

Similarly the other study conducted in Jimma /Ethiopia showed that MAM children treated by CSB+ and oil is (49.2%) under TSFP was lower timely recovery than children treated by super cereals. From this we understood that treating MAM child with super cereal is more effective than CSB+ and oil.

Additionally , the study showed that child admission MUAC has also a significantly associated with time to recovery from MAM, child admitted with MUAC $\geq$ 11.6-12.5 cm has recover early with in 16 week than child admitted with MUAC $\leq$ 11.5 cm (AHR 1.18, 95% CI 1.13-1.23, p-value< 0.05) which is consistent with a study conducted in Jimma showing children who has higher MUAC on admission 11.5–11.9 cm (AHR 0.40 95% CI 0.31–0.52) better recovered timely than child with 11.0–11.4 cm (AHR 0.24 95% CI 0.16–0.36) p<0.05 [1].this indicates that early child screening for malnutrition and giving treatment enable as to get better out come.

This study also revealed that transport access to the nearest health facility where targeted supplementary feeding service given was also significantly associated with the time to recovery. Among family who has transport access, proportion of children recovered from MAM is (AHR 0.50 95% CI, 0.38-0.64) p<0.05

which is consistent with the study done at kamba district south Ethiopia [17]. This indicates that child who has transport accesses has got the service easily and show better prognosis.

This study revealed that the proportion of timely recovery among children from house hold with severe food insecurity (AHR 0.49,95% CI 0.21-0.11) $p<0.05$ which show 51% lower chance of recovery than moderate food in security. likewise the study done in Jimma zone Ethiopia showed children from family with severe food insecurity has 86% lower chance to recover timely than moderate food insecurity (AHR 1.86 95% CI 1.22-2.83) $p<0.05$. within 16 weeks[1].Another study conducted in Amahara region Awi zone showed the median recovery time was 62 days for children from food secure households (95% CI 61.65–62.35) and 63 days for children from food insecure households (95% CI 62.78–63.22). This indicates that Children from food-secure households had timely recovered than child from moderately food insecure. Their median recovery time was 61 days (95% CI 60.65- 61.35) compared to 63 days (95% CI 62.44-63.56) for children whose mothers were well-nourished from food- insecure households [12].

This study also verified MAM children admitted to TSFP that had regular treatment follow up (AHR 1.48, 95% CI 1.09-2.00, p-value 0.01) 48% higher proportion of recovery than intermittent treatment follows up. This may be related with appropriate use of treatment food and other health services.

Conclusions

The median Time to recovery of MAM children admitted to TSFP is less than 16 week which is consistent with national standard acute malnutrition treatment guide line of Ethiopia, 2016.

TSFP times to recovery were 82.8% at 16 week in shalla district.

Predictor of time to recovery were ,house hold food insecurity, intermittent treatment follow up, admission MUAC and type of treatment foods (super cereal and CSB+) had also a fundamental significant predictor of MAM treatment time to recovery.

Abbreviations

AHR	Adjusted Hazard Ratio
AM	Acute Malnutrition
CMAM	Community Based Management of Acute Malnutrition
CHR	Crude Hazard Ratio
CSB +	Fortified Corn Soya Blend
DMFASS	Disaster Management and Food Security Sector
DPPA	Disaster Preparedness and Prevention Agency
EOS	Emergency Out Reach Strategy
EDHS	Ethiopian Demographic and Health Survey
IQR	Inter quartile range
MAM	Moderate Acute Malnutrition
MUAC	Mid upper Arm Circumference
OR	Odds Ratio
RUSF	Ready to Use Supplementary Food
SAM	Severe Acute Malnutrition
SPSS	Statistical Package for Social Science
TSFP	Targeted Supplementary Feeding programme
UNICEF	United Nation's International Children's Emergency Fund
WFP	World Food Programme
WHZ	Weight for height Z-score
WHO	World Health Organization

Declarations

Ethics approval and consent to participate

Ethical approval was received from institutional review board at the college of medicine and health science of Hawassa University.

Consent for publication

It is the retrospective study and the data was extracted from patient registration.

Availability of data and material

All the data were included in the manuscript and the SPSS data is also uploaded in the supplementary material

Competing interests

No conflicts of interest prevail among researchers.

Funding

No fund

Authors' contributions

KK- participated in the design of the study and data extraction, performed statistical analysis, and drafted the first manuscript.

WT- participated in the design of the study, and reviewed the manuscript. All authors have read and approved the final manuscript

Acknowledgements

we would like to thank Hawassa University College of medicine and health sciences, school of public health for giving me a chance to conduct this research.

We would also express our gratefulness for west Arsi Zone health Department, for their helpful aid of the compulsory information, Shala woreda health office for their genuine cooperation and facilitation to get appropriate information.

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Tables

Table 1. Socio demographic characteristics of Study Population at shala district, January, 2018.

Characteristics	Category	Frequency (n=402)	Percent (%)
Age	6 - 24 month	241	59.9 %
	25-41 month	132	32.8%
	42-59 month	29	7.2%
sex	Male	184	45.8 %
	Female	218	54.2%
Place of residence	Urban	19	4.75%
	Rural	383	95.25%
Occupation of care giver	House wife	393	97.7%
	Farmer	3	0.75%
	Merchant	5	1.25%
	other	1	0.25%
Religion of care giver	Muslim	397	98.5%
	Protestant	5	1.25%
Education status Of care giver	No formal education	288	71.65%
	Primary (1-8)	110	27.2%
	Secondary(9-12)	4	0.9%
Marital status of care giver	Married	399	99.25%
	Divorced	3	0.75%
Person with primary child care responsibility	mother	385	95.7%
	Father	11	2.75%
	other	6	1.51%
Educational status of house hold leader	No formal educat.	213	52.9%
	Primary &secondary edu.	189	47.01%

Table 2. Proportion of recovery of MAM children at different week during Study period, shala district TSFP, January, 2018.

Interval Start Time	Number Entering Interval	Number Withdrawing during Interval	Number Exposed to Risk	Number of Terminal Events	Proportion Terminating	Proportion Surviving	Cumulative Proportion Surviving at End of Interval	Hazard Rate
0	402	0	402.000	0	.00	1.00	1.00	.00
4	402	0	402.000	0	.00	1.00	1.00	.00
8	402	0	402.000	35	.09	.91	.91	.02
12	366	4	364.000	179	.49	.51	.46	.16
16	183	1	182.500	124	.68	.32	.15	.26
20	58	0	58.000	57	.98	.02	.00	.48
24	1	0	1.000	1	1.00	.00	.00	.00

Table 3. Bivariate analysis of predictor of time to recovery in shalla district January 2018

Characteristics	Category	No	CHR (95% CI)	P value
Age of children	< 24 month	252	1	1
	≥ 24 month	150	1.26(1.00-1.6)	0.49
Sex of children treated	Male	184	1	1
	Female	218	1.06(0.83-1.3)	0.62
Place of residence	Urban	19	1	1
	Rural	383	0.87(0.51-1.46)	0.60
Education of care giver	No formal edu.	288	1	1
	Primary& secondary edu.	114	1.07(0.83-1.38)	0.59
Occupation of care giver	House wife	393	1	1
	other	9	0.89(0.39-2.01)	0.78
Religion of care giver	Christian	397	1	1
	Muslim	5	0.64(0.20-2.0)	0.44
Marital status	Married	399	1	1
	Divorced	3	0.88 (0.22-3.5)	0,86
Person with primary Child care responsibility	Mother	385	1	1
	Father or other	16	1.90 (0.78-4.6)	0,15
Educational status of house hold leader	No formal edu.	213	1	1
	Primary & secondary	189	0.93(0.72-1.20)	0.59
Occupation of household leader	farmer	371	1	1
	Other*	31	1.31(0.87-1.96)	0.19
No of house hold member	≤ 4	174	1	1
	>4	228	1.18(0.93-1.49)	0.16

Characteristics	Category	No	CHR (95% CI)	P value
Diarrhea	yes	54	1	1
	no	348	1.29 (0.89-1.88)	0.17
Cough	yes	2	1	1
	no	400	2.18(0.30-15.5)	0.43
Fever	yes	2	1	1
	no	400	2.47(0.61-9.99)	0.20
Admission status	New admission	376	1	1
	Re-admission	19	1.43(0.85-2.42)	0.17*
Deworming	no	303	1	1
	yes	98	1.25(0.96-1.63)	0.93
Measle vaccination	yes	336	1	1
	No	66	0.81(0.60-1.10)	0.18*
Admission MUAC	11.5 cm	81	1	1
	11.6-12.5	321	1.23(0.91-1.66)	0.17*
No of children in different supplementary food programme	Only in TSFP	330	1	1
	Get Rx food from TSF&BSF	72	0.94(0.69-1.27)	0.70
House hold food in security	Moderate food insecure	385	1	1
	Severe food insecure	17	1.71(0.84-3.47)	0.13*
Health education During distribution	yes	395	1	1
	no	9	1.04(0.49-2.20)	0.91
Treatment Food share	yes	176	1	1
	no	226	0.86(0.68-1.09)	0.21*

Characteristics	Category	No	CHR (95% CI)	P value
Treatment food	CSB+&oil	201	1	1
	Super cereal	201	1.90(1.48-2.41)	0.00*
Follow up status	Intermittent	51	1	1
	Regular	351	1.48(1.09-2.00)	0.01*
Disposal of faeces	Use latrine	193	1	1
	Open field	208	1.04(0.83-1.32)	0.69
solid waste Disposal	Use open field	356	1	1
	Have waste disposal site	46	1.48(1.00-2.18)	0.04*
Water source	Improved	364	1	1
	Unimproved	38	0.77(0.52-1.13)	0.18*
Shortage of quantity of water available for use	yes	307	1	1
	No	95	0.59(0.44-0.79)	0,001*
Overcrowded condition	Yes	281	1	1
	no	120	1.09(0.85-1.41)	0.47

Table 4. Bivariate and Multi variate analysis of predictor of time to recovery in shalla district January 2018.

Characteristics	Category	No	CHR (95% CI)	P -value	AHR (95%CI)	P-value
Transport access to health facility	yes	235	1	1	1	1
	No	167	0.79(0.64-0.96)	0.023*	0.50(0.38-0.64)	0.00*
Admission MUAC	11.5 cm	81	1	1	1	1
	11.6-12.5 cm	321	1.23(0.91-1.66)	0.17*	1.18(1.13-1.23)	0.00*
House hold food in security	Moderate food insecure	385	1	1	1	1
	Severe food insecure	17	1.71(0.84-3.47)	0.13*	0.49(0.21-0.11)	0.00*
Treatment food	CSB+&oil	201	1	1	1	1
	RUSF	201	1.90(1.48-2.41)	0.00*	2.44(1.85-3.21)	0.00*
Follow up status	Intermittent	51	1	1	1	1
	Regular	351	1.48 (1.09 -2.00)	0.01*	1.48(1.09-2.00)	0.01*

Figures

Figure 1

The schematic representation of sample selection procedure in Shala district TSFP, January , 2018.

Figure 2

A bar graph showing food type used for supplementary feeding in Study Population at shala district, January, 2018.

Figure 3

A bar graph showing proportion of recovery of MAM children treatment at shala District TSFP, January, 2018.

Figure 4

A Kaplan-Meier curve showing probability of recovery at the end of each week at Shala District TSFP January 2018.

Figure 5

Time to Recovery of MAM children by Treatment food at, shala district TSFP, 2018.

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