

# Recovery Rate and Determinants in Treatment of Children with Severe Acute Malnutrition using Outpatient Therapeutic Feeding Program in Kamba District, South West Ethiopia

Negash Alemu Shanka<sup>1\*</sup>, Sebelewengel Lemma<sup>2</sup> and Direslgne Misker Abyu<sup>3</sup>

<sup>1</sup>Kamba Health center, Gamogofa Zone, Ethiopia

<sup>2</sup>Addis Continental Institute of Public Health, Addis Ababa, Ethiopia

<sup>3</sup>Arba Minch University, Department of Public Health, Arba Minch, Ethiopia

## Abstract

**Introduction:** Globally approximately one million children die every year from severe acute malnutrition. It is reported that severe acute malnutrition (SAM) is the commonest reason for paediatric hospital admission in many poor countries; 25 to 30% of children with severe malnutrition die during hospital admissions.

**Objective:** To assess the success rate of OTP in treatment of children with SAM and identify its determinants at Kamba district, South West Ethiopia.

**Method:** Institution based retrospective longitudinal study was carried out on children who were treated on the OTP. A total sample of 711 was selected from 4 health centers and 12 satellite health posts. A structured and pretested data abstraction form were prepared and used for data collection. The data were cleaned, coded and entered into Epi-INFO, analyzed by SPSS. The results were estimated using Kaplan-Meier survival curves, log-rank test and Cox-regression.

**Result:** The recovery rate was 67.7% and the median recovery time was 7.14 weeks (IQR 5.28-8.14). Children treated at a health centers have 1.36 times higher recovery rate than children treated at health post (AHR = 1.495, 95% CI = 1.188, 1.881). Controlling for other factors; the probability of a child to recover from SAM under OTP is 1.25 times higher among children aged greater than two years old than those children aged less than or equal to two years old (AHR = 1.255, 95% CI = 1.012, 1.556).

**Conclusion and Recommendation:** The recovery rate was lower than the international standard. Type of health facility providing the OTP services and age of the child had significant association (at 0.05 P-value) with survival time among children who recovered from SAM under OTP. Special focus should be given to young children and decentralization of OTP service from health centers to health posts should be carried out with great caution.

**Keywords:** Severe acute malnutrition; Outpatient therapeutic feeding program; Kamba

## Introduction

Malnutrition is abnormal physiological condition caused by deficiencies, excesses or imbalances in energy, protein and/or other nutrients. Malnutrition is also defined as “a state in which the physical function of an individual is impaired to the point where he/she can no longer maintain adequate bodily performance processes such as growth, pregnancy, lactation, physical work, and resisting and recovering from disease”. Malnutrition is categorised as acute or chronic. It can be either under-nutrition or over-nutrition [1-3].

Severe acute malnutrition (SAM), is defined as a weight-for-height measurement of 70% or more below the median, or three SD or more below the mean National Centre for Health Statistics reference values, which is called “wasted”; the presence of bilateral pitting oedema of nutritional origin, which is called “oedematous malnutrition”; or a mid-upper-arm circumference of less than 110 mm in children age 1–5 years [1].

Globally, it is estimated that there are nearly 60 million children with MAM and 20 million with SAM. About 9% of sub-Saharan African and 15% of south Asian children have moderate acute malnutrition and about 2% of children in developing countries have SAM [4,5]. The majority of those affected are found in South Asia and Sub Saharan Africa. Approximately 1-2 million children die every year from severe acute malnutrition. It is reported that SAM is the commonest reason for paediatric hospital admission in many poor countries. Twenty

five to 30% of children with severe malnutrition die during hospital admissions [6].

Ethiopia is one of the countries with highest under-five child mortality rate, with malnutrition underlying to 57% of all children deaths [4,7,8]. According to 2011 EDHS report the percentage of children who are stunted (below -2 SD) is 44 percent; of which 21 percent are severely stunted. In rural areas, 46 percent of children are stunted, versus 32 percent of children in urban areas. Thirty percent or more of children are stunted in all regions except Addis Ababa (22 percent) and Gambela (27 percent). The percentage of stunting, wasting and underweight at SNNPR is 44.1, 7.6 and 28.3 respectively [9].

Malnutrition has severe consequences. Malnutrition reduces functioning of the immune system, wound healing, increases the chance of developing pressure sores, impairs the quality of life and

**\*Corresponding author:** Negash Alemu Shanka, Department of Nutrition, Kamba Health center, Gamogofa Zone, Ethiopia, Tel: +251927013864; E-mail: [alemunegash30@gmail.com](mailto:alemunegash30@gmail.com)

**Received** January 21, 2015; **Accepted** March 31, 2015; **Published** April 04, 2015

**Citation:** Shanka NA, Lemma S, Abyu DM (2015) Recovery Rate and Determinants in Treatment of Children with Severe Acute Malnutrition using Outpatient Therapeutic Feeding Program in Kamba District, South West Ethiopia. J Nutr Disorders Ther 5: 155. doi:10.4172/2161-0509.1000155

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increases mortality. These complications of malnutrition lead to increased length of stay in hospital with increased use of medication, leading to increased healthcare costs [10-15]. In children malnutrition not only has direct consequences, but, because a child is developing, it also causes long-term effects such as lower IQ and stunted growth [9].

Case-fatality rates in hospitals treating SAM in developing countries average 20–30% and have remained unchanged since the 1950s despite the fact that clinical management protocols capable of reducing case-fatality rates to 1–5% have been in existence for 30 years [1].

The risk of mortality in acute malnutrition is directly related to severity: moderate wasting is associated with a mortality rate of 30–148 per 1000 children per year and severe wasting is associated with a mortality rate of 73–187 per 1000 children per year. This equates to over 1.5 million child deaths associated with severe wasting and 3.5 million with moderate wasting every year [5,6].

In Ethiopia, Outpatient Therapeutic Feeding Program (OTP) was piloted in specific areas in 2004 but now expanded to every health centre and health post of the country [16-20]. Despite the existence of OTP and other nutrition programs in every corner of the country, the national survey (EDHS) and different studies have showed that malnutrition is indicated to be still high [5,21].

Little is known about the treatment outcome and determinants of treatment success of OTP. Since the introduction of the OTP, there has not been any comprehensive study to evaluate the effectiveness of the program and identify any determinant factors in treating severely malnourished children in our country at health facility level except the study done in Tigray [5]. Two studies done in SNNPR [22-27] and a qualitative study [21] done in three regions of Ethiopia didn't even identify any determinant factors. The rationale for this study is that the outpatient therapeutic feeding program outcomes and determinant factors of success has been understood and necessary adjustment will be made to improve effectiveness in the program. The study will generate further knowledge to fill knowledge gap of the health care staff on the success of treatment and factors determining the treatment outcome. The generated knowledge will be used for improve management of SAM there by reducing the associated burden of disease. The Information that was derived from the study will also be used for policy makers in program planning and researchers [21,22,27].

## Methods

### Study setting and period

This study was conducted in Kamba district Gamo-Gofa Zone, South West Ethiopia. Kamba district is located in SNNPR State and situated at about 605 kms from Addis Ababa, the capital city of Ethiopia, and 265 kms away from Hawassa city in the south direction [28-30]. The district is one of the 15 districts in Gammo Gofa Zone SNNPR state. The health institutions available in the district are 9 health centers, 39 health post, and 13 private clinics [31].

According to district 2005 EFY report, Vitamin A Supplementation, De-worming, pentavalent 3, measles, pneumococcal vaccine 3 and fully immunized have coverage of 100%, 106%, 106%, 110%, 104% and 104% respectively. The report also shows that there are 1366 cases of malnutrition which was on OTP with 949(69.4%), 11(0.8%), 33(2.4%), 67(4.9%), 147(10.7) was the recovery rate, death rate, default rate, unknown cases rate and transfer out rate respectively [31]. The compositions of the population with respect to broader age groups by 2006 EFY were: children under one year age group 5,056; children

under three year age group 15,220, children under five year age group 29679.

This study was conducted from January /2013 to April /2014 GC.

### Study design

Institution based retrospective longitudinal study was conducted.

### Population

**Source population:** All records of children who were treated on the OTP at health facilities of Kamba district.

**Study population:** A sample of children who were treated on OTP between September 2011 and September 2013

### Sample size and sampling procedure

#### Sample size

##### a) Sample size determination for treatment success rate of OTP

The sample size for treatment success rate of OTP was determined using the sample size determination formula for single population proportion. A study done in Tigray [5] showed recovery rate of 61.78% and two different studies [12,13] in SNNPR showed recovery rate of 87% & 64.4%. For this calculation, the proportion that gives the highest sample size i.e. 61.78% was taken from the above study. To draw a minimum sample size from the source population, the following standard method was used,

$$n = \frac{Z_1^2 - \alpha / 2P (1 - P)}{d^2}$$

where,  $n_0$  = sample size derived from estimation formula

$Z_1^{2-\alpha/2}$  = is confidence interval, i.e. 1.96 to be 95% confident

P= is recovery rates of children who had been managed for SAM under OTP

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

$$\begin{aligned} n &= \frac{Z_1^2 - \alpha / 2P (1 - P)}{d^2} \\ &= \frac{(1.96^2)(0.61)(1 - 0.61)}{(0.05^2)} = \frac{0.9139}{0.0025} = 365 \end{aligned}$$

Considering 10% none response rate and design affect 1.5 the final sample size for determining the treatment success rate of OTP was 602.

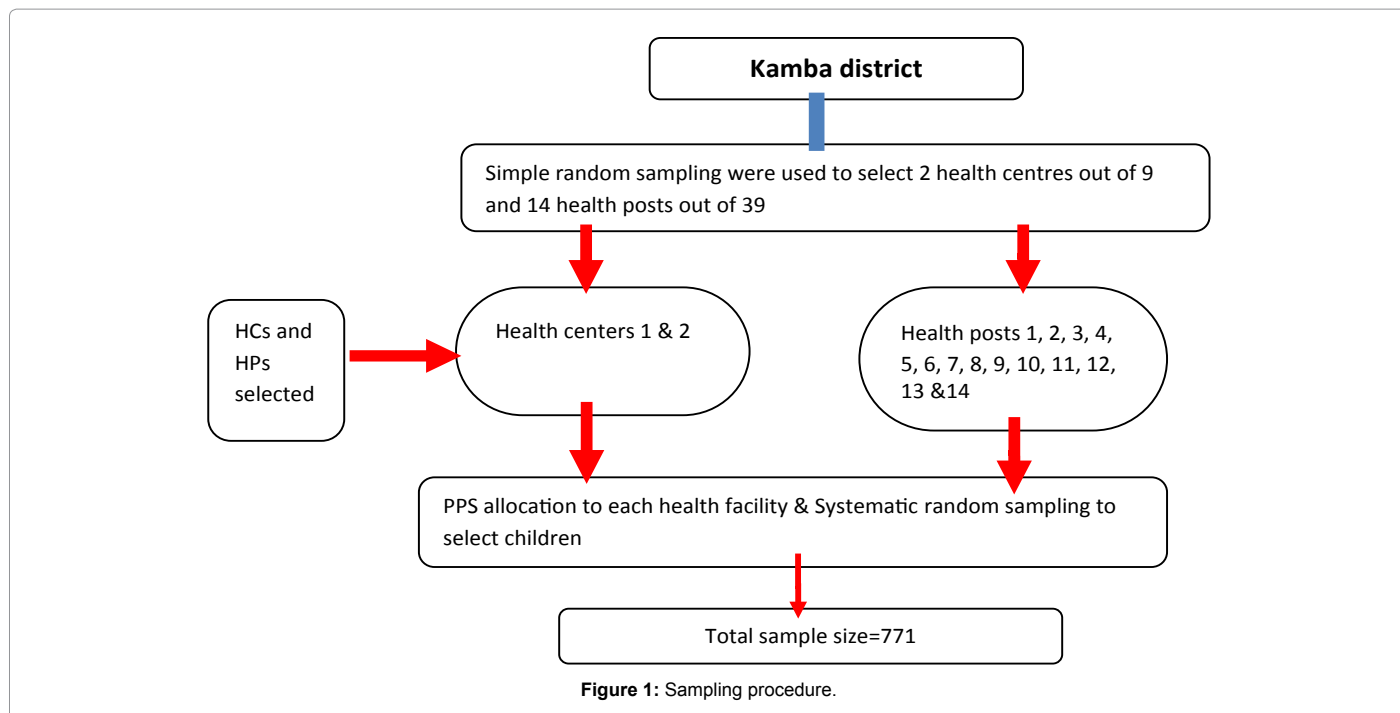
##### b) Sample size determination for determinants of treatment success rate of OTP

The sample size determination for determinant of treatment success rate of OTP is calculated based on double population proportion formula by using Epi info version 7 stat calc programs, and summarized in the table below (Table 1).

**Sampling procedure:** In the study district, there were nine health centers and 39 health posts. Populations living around these health centers and health posts were assumed more or less homogenous. As the result, two health centers and 14 health posts were selected at random using lottery method presuming that there was no information lost with the unselected health centers and health posts. Also the OTP protocol for management of SAM works equally to health center and health post level. So in total, a sampling frame of children managed

S.no	Factors	CI	OR	Power %	proportion	Sample size	Loss to follow up	Design effect	Total sample size
1	Intake of routine medication n(Amoxicillin), (5)	95	2	80	72.1	396	10%	1.5	652
2	Failure to gain weight for 3 consecutive weeks (5)	95	2	80	77.23	468	10%	1.5	771
3	Presence of medical problems, diarrhoea(5)	95	2	80	68.8	364	10%	1.5	600

**Table 1:** Sample size determination for determinants of treatment success of OTP.



for SAM from 2 health centers and 14 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 (Figure 1).

### Variables of the study

#### Dependent variables

- Time to recovery from SAM

#### Independent variables

- Socio-demographic characteristics: age and sex of children, distance from home to health facility, residence, and referred by (person referred the child to health facility).
- Baseline characteristics: anthropometry measurements, admission medical history, intake of routine medication, appetite test on admission with Plumpy'Nut, diagnosis on admission, admission status (new, readmission or return after default).
- Follow-up characteristics: follow-up anthropometry measurements and clinical features, routine medications and outcome status.
- Other- Type of health facility

### Operational definitions

- Treatment outcome of OTP: is an outcome of children under

OTP treatment and it will be one of recovery, defaulters, death, transfer out, Unknown and Non- responder.

- Successful Treatment outcome- : is an outcome of children under OTP treatment who discharged recovered.
- Unsuccessful Treatment outcome- : is an outcome of children under OTP treatment who died, defaulted, quit the program with unknown outcome status, those who are non- responders to the treatment or those who are transferred out to other facility.
- Recovered- are those individuals who have become free from medical complications and have achieved and maintained sufficient weight gain (Sphere.)
- Defaulter- is a patient that is absent for two consecutive weeks and confirmed that the patient is not dead by home visit.
- Readmission- patients that are declared cured or recovered but relapsed to be admitted to OTP.

### Data collection procedure and data quality control

A semi-structured and pretested data abstraction form on 5% of the sample size outside the study area was used for data collection. Data were abstracted within 30 days from OTP cards for socio-demographic, baseline characteristics, follow-up and outcome status by using 4 diploma nurses as data collectors. Two Public health professional (Health Officer) were used as supervisors.

Training was given by the principal investigator for 2 days before

data collection period about the objectives of the study, variables on the data abstraction sheet, OTP cards and how to abstract data for this study.

To ensure quality data collection, close supervision was carried out by principal investigator and a supervisor during data abstraction. The completed data abstraction form was checked for completeness of information by supervisors and principal investigator on daily bases.

### Data processing and analysis

The collected data were cleaned and coded, and entered into Epi info version 6 and then exported to SPSS version 20 for windows program for analysis. Both descriptive and analytic analyses were conducted. The risk period began at the date when the child entered in to the program and ended on the date when the child cured, defaulted, dead, transfer out or quit the program with unknown status.

First, time to recovery from OTP was estimated by using Kaplan-meier procedure; and Log rank test was used in order to test whether the observed difference is significant or not. Moreover, Multiple variable Cox proportional hazard regression analysis was conducted. Variables having P-value<0.25 during bivariate analysis were entered into multivariate analysis. P-value<0.05 was considered as statistically significant. The assumption of proportional hazard ratio was checked by using statistical method and the finding from global goodness-of-fit test (Schoenfeld's method) method supports proportional hazard assumption. So the regular cox regression was done.

### Ethical considerations

Ethical clearance was obtained from research and publication office of Addis Continental Institute of Public Health ethical review board. Permission letters was obtained from Kamba district Health Office in order to use the OTP cards for research purpose. Anonymity was maintained by not abstracting any personal information of patients while abstracting. To these ends, all the data abstracted was kept confidential, and won't be used for any other purposes than the stated research objective.

### Results

#### Socio demographic and admission characteristics of children

Out of the 711 child records, 316 (41.0%) of these were admitted to health center and 59% (455) admitted to health post. The records of children also showed 97.1% of children were admitted from rural areas and the rest 2.9% (22) from urban areas. It also shows that there were proportionally an almost equal number of female 381( 49.4 %) and males 390 (50.6%) children in the OTP (Table 2) (Figures 2 and 3).

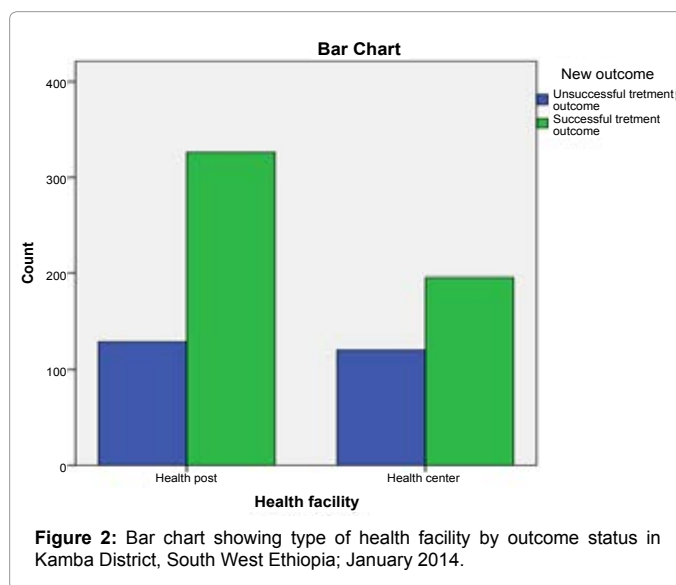
#### Clinical characteristics of children

Out of the total 711 children MUAC was taken for 647 (83.9%) children and It was observed 259 (33%) had edema. Overall median weight at admission was 7.5 kg (Inter quartile range: 6 to 10 kg). Median weight of marasmic patients was 6.8 kg (IQR 5.5 –8.8 kg), marasmic kwashiorkor patients 8 kg (IQR 6.8–9.5 kg), and patients with edema 9.95 kg (IQR 8.05–11.40 kg). Height was taken only for 84 (10.9%) children.

Of the total 771 records of children examined, 139 (18%) children had diarrhea, 101 (13.1%) had vomiting, 90 (11.7%) had cough, 13 (1.7%) had blood in stool, 4 (0.5%) had anemia and 2 (0.3%) had skin infections. Skin peeling, eye discharge, ear discharge and scabies were other medical problems reported on 14 (1.8%) of children. No children

Characteristics	Category	Frequency number (%)
Health facility (n=771)	Health post	455(59)
	Health centre	316(41)
Age of the child at admission (n=771)	< or = 24 months	427(55.4)
	>24 months	344(44.6)
Sex (n=771)	Male	390 (50.6)
	Female	381 (49.4)
Residence (n=771)	Urban	22 (2.9)
	Rural	749 (97.1)
Distance (time of travel) in hour (n=771)	< or = 1 hour	498(64.6)
	>1 hour	273(35.4)
Referred by (n=771)	Community volunteers	78(12.7)
	Self-referred	256(33.2)
	From EOS or CHD	346(49.9)
	Other (neighbours, screened by HEWs during home visit, from stabilization centre)	71(9.2)
Admission status (n=771)	New	724 (93.9)
	Return after default	27 (3.5)
	Readmission	20 (2.6)

**Table 2:** Socio- demographic and admission characteristics of children admitted to OTP from SAM, Kamba district south west Ethiopia, January 2014.



**Figure 2:** Bar chart showing type of health facility by outcome status in Kamba District, South West Ethiopia; January 2014.

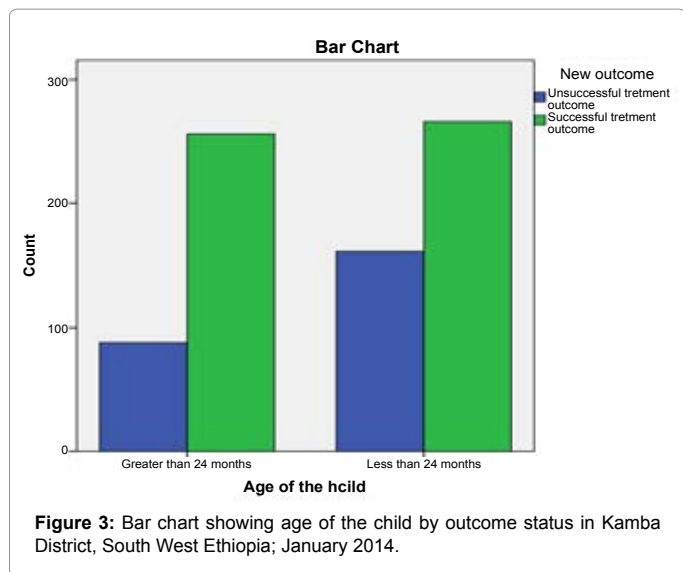
with severe symptoms were admitted to care centers. Children and mothers or care takers of the malnourished children were not totally tested for HIV (Table 3).

Of the total 711 children admitted to OTP 512 (66.4%) children were diagnosed as having marasmus (MUAC <11 cm), 232 (30.1%) children had kwashakor(bilateral pitting edema) and 27 (3.5%) children had both MUAC <11 cm and bilateral pitting edema (Marasmic-kwash). Also shown in the table below out of the total 771, 14(1.8%) children refused to be treated on TFU (Table 3).

#### Recovery rate from SAM

Of the total 711 children admitted to OTP; the recovery rate from SAM was 522(67.7%). Whereas 13(1.7%), 175(22.7%), 12 (1.6%), 48(6.2%), 1(0.1%) children died, defaulted, transferred, unknown (quit





the program with unknown outcome status) and non- responders (who didn't reach any of the discharge criteria) respectively.

Marasmic children who recovered from SAM had gained an average weight of 5.76 gm/kg/day (95% CI = 5.45, 6.08). However, the rate of weight gain among the children without any medical complications was 6.09 gm/kg/ day (95% CI = 5.75, 6.44) which were higher than those with at least one medical complication, 4.08 gm/kg/day (95% CI = 3.42, 4.73).

### Survival experience for different category and Testing for statistical differences

Overall the median recovery time was 7.14 weeks (IQR 5.28-8.14). Likewise, to reach the minimum sphere standard recovery rate, set at 75%, the children were to stay for 8 weeks more under treatment. The median recovery time for children treated at health centers was 6.57 weeks (95%CI 6.07-7.07) and at health posts was 7.43 weeks (95%CI: 7.12-7.74). There was significantly different recovery rates among children who were treated in health centers and health posts (Log rank test,  $X^2=19.656$ ,  $P<0.0001$ ) (Figures 4 and 5).

### Predictors of recovery from OTP

The bivariate analysis finding showed that; type of health facility (CHR = 1.475, 95% CI = 1.232, 1.767), age of the child at admission (CHR = 1.115, 95% CI = 0.937, 1.327), distance (time of travel) from home to health facility (CHR = 1.145, 95% CI = 0.955, 1.372), diagnosis at admission (CHR = 1.436 95% CI = 0.829, 2.488),and weight gain on the first three consecutive weeks (CHR = 0.702, 95% CI = 0.442, 1.116) had significant association with survival time among children who recovered from OTP at 0.25 P-value (Table 4).

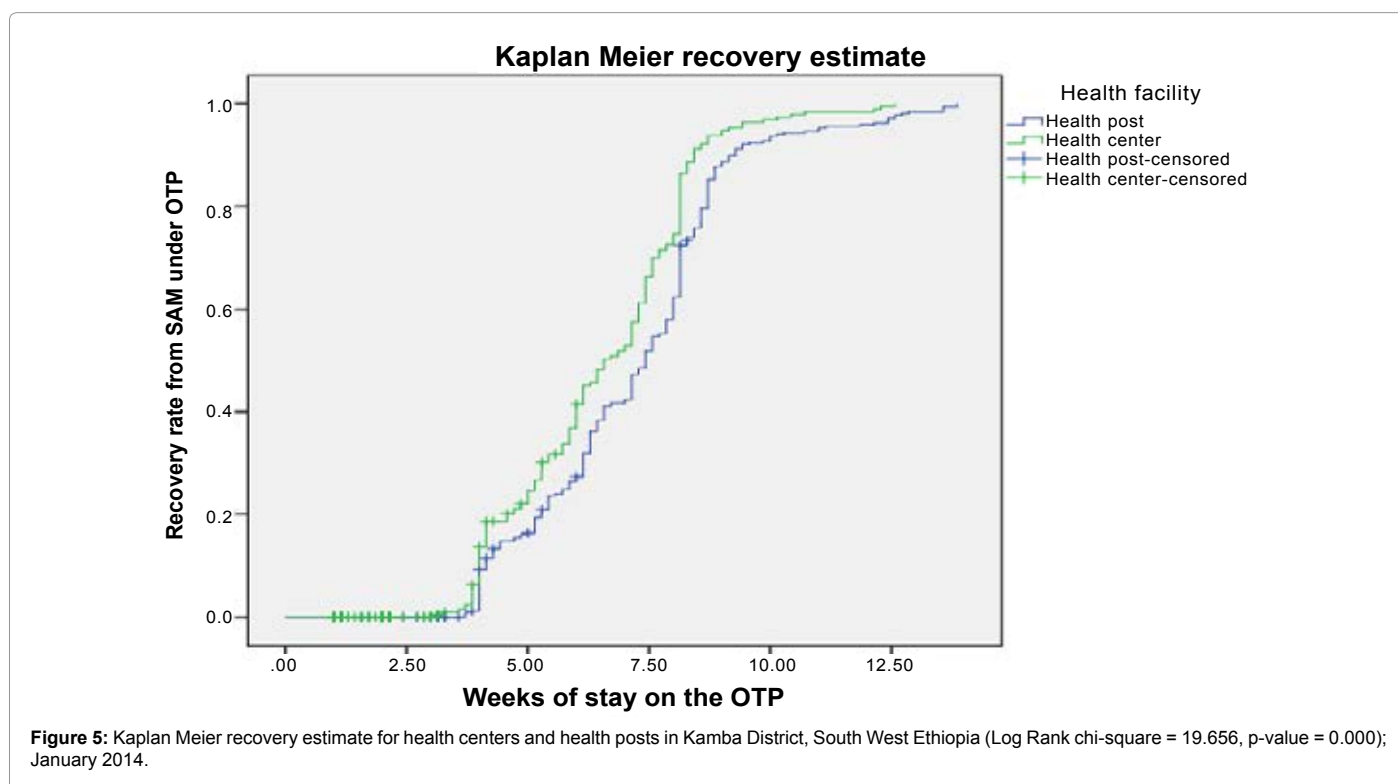
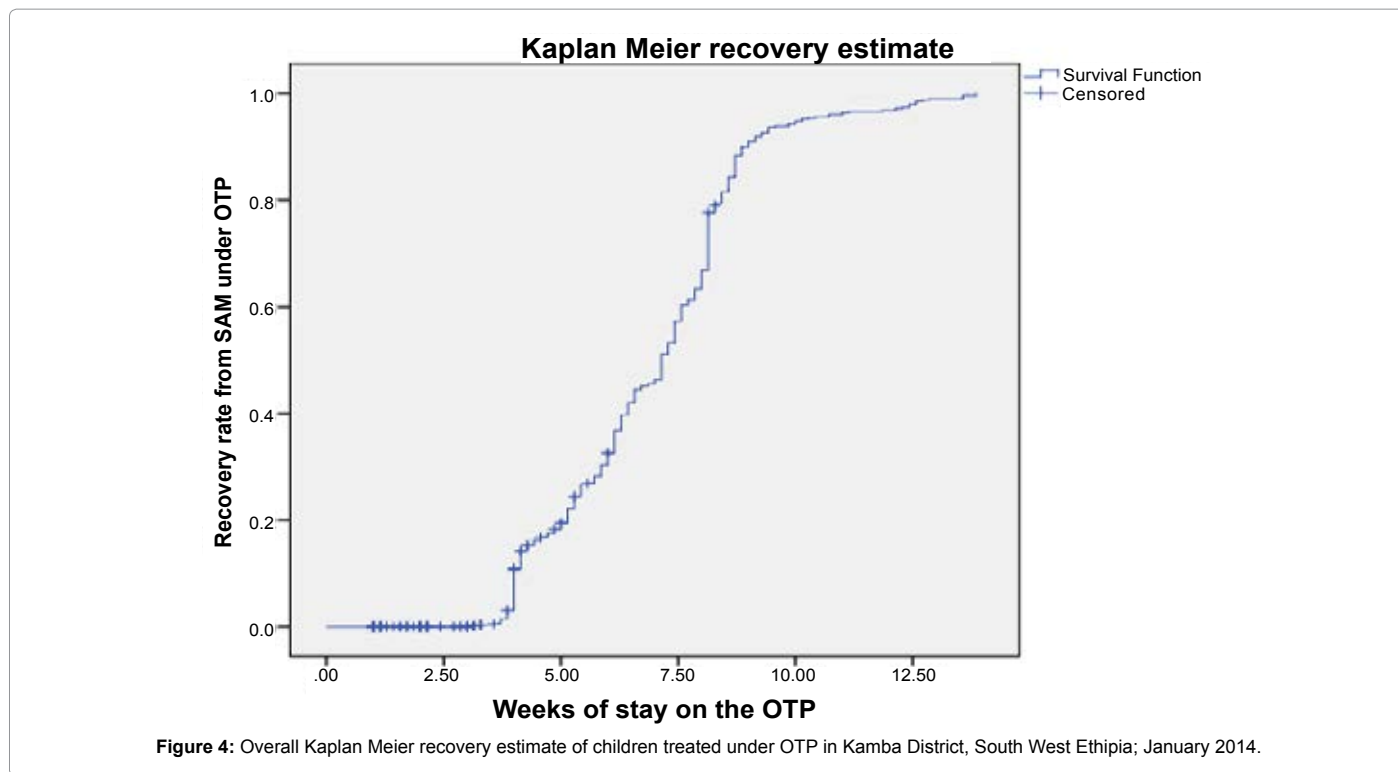
On multivariable cox regression analysis: type of health facility and age of the child on admission had significant association with survival time among children who recovered from OTP at 0.05 P-value. children admitted at health centers had 1.49 times higher probability of getting recovered from SAM as compared to children admitted at health centers (AHR = 1.495, 95% CI = 1.188, 1.881). Likewise, children older than two years had 1.25 times higher probability of recovering from SAM as compared to children aged less than or equal to two years (AHR = 1.255, 95% CI = 1.012, 1.556) (Table 5).

Characteristics	Category	Frequency number (%)
Amoxicillin(n=771)	Yes	111(14.4)
	No	660(85.6)
Measles immunization(n=771)	Yes	31(4.0)
	No	740(96.0)
Vitamin A(n=771)	Yes	245(31.8)
	No	526(68.2)
Anti-malarial(co-artem)(n=771)	Yes	24(3.1)
	No	740(96.0)
Mebendazole (n=771)	Yes	31(4.0)
	No	747(96.9)
Folic acid (n=771)	Yes	24(3.1)
	No	747(96.9)
General danger sign(n=771)	Yes	0
	No	771(100)
Diarrhoea (n=771)	Yes	139(18.0)
	No	632(82.0)
Vomiting(n=771)	Yes	101(13.1)
	No	670(86.9)
Cough(n=771)	Yes	90(11.7)
	No	681(88.3)
Blood in stool(n=771)	Yes	13(1.7)
	No	758(98.3)
Anaemia(n=771)	Yes	4(0.5)
	No	767(99.5)
skin infections(n=771)	Yes	2(0.3)
	No	769(99.7)
Breathing per minute(n=187)	<30	38(20.4)
	30-39	109(58.2)
	40-49	37(19.8)
	>50	3(1.6)
Body temperature(n=153)	Normal	148(96.7)
	Fever	3(1.9)
	Cold or hypothermic	2(1.3)
Breast feeding(n=771)	Yes	428(55.5)
	No	343(44.5)
Weight gain for the first three consecutive weeks (n=433)	Yes	394(51.1)
	No	39(5.1)
Oedema cleared on third week (n=167)	Yes	81(10.5)
	No	86(11.2)
Diagnosis at admission (n=771)	Marasmus	512 (66.4)
	Kwashakor	232 (30.1)
	Marasmic-kwash	27 (3.5)
Therapeutic feeding unit refusal (n=771)	Yes	14 (1.8)
	No	757 (98.2)
Appetite test (n=771)	Pass	758 (98.3)
	Fail	13 (1.7)

**Table 3:** Clinical characteristics of children on admission under OTP from SAM, Kamba district, Gamo-Gofa Zone, south west Ethiopia, January 2014.

### Discussion

In this retrospective follow up study the overall time to recovery from SAM using OTP and survival experience between different groups was assessed. The association between recovery rate from the OTP and independent predictors was also presented.



Overall the median recovery time was 7.14 weeks (50 days). It was outside of the acceptable minimum international standard [5] but it is well within the standard of the Ethiopian protocol for management of SAM which allows children to stay under treatment up to 8 weeks [5,32]. This length of stay is slightly lower than other similar studies

of OTP outcomes evaluation conducted in Bedawacho [33], Tigray [21], and Jimma [11]. However, it was also significantly higher than the study done in Southern Ethiopia where the length of stay was 21-25 days [22]. The possible explanation for this high estimated length of stay could be 174 (33.3%) children were allowed to stay 8-19 weeks

Characteristics	Category	Number (%)	P-value	CHR (95% CI)
Health facility (n=771)	Health post	455(59)	Reference	1
	Health centre	316(41)	0.000	1.475(1.232, 1.767)
Age of the child at admission(n=771)	< or = 24 months	427(55.4)	Reference	1
	> or = 24 months	344(44.6)	0.218	1.115(0.937, 1.327)
Sex(n=771)	Male	390 (50.6)	Reference	1
	Female	381 (49.4)	0.743	1.029(0.867, 1.223)
Residence(n=771)	Urban	22 (2.9)	Reference	1
	Rural	749 (97.1)	0.760	0.914(0.516, 1.622)
Distance (time of travel) in hour(n=771)	<or = 1 hour	498(64.6)	Reference	1
	>or = 1 hour	273(35.4)	0.114	1.145(0.955, 1.372)
Referred by(n=771)	Community volunteers	78(12.7)	0.672	1
	Self-referred	256(33.2)	0.416	1.126(0.846, 1.500)
	From EOS or CHD	346(49.9)	0.697	1.056(0.802, 1.391)
	Other (neighbours, screened by HEWs during home visit, from stabilization centre)	71(9.2)	0.720	0.932(0.632, 1.372)
Admission status(n=771)	New	224 (93.9)	0.548	1
	Return after default	27 (3.5)	0.628	1.131(0.687, 1.863)
	Readmission	20 (2.6)	0.328	1.339 (0.755, 2.377)
Diagnosis at admission(n=771)	Kwashakor	232 (30.1)	0.373	1
	Marasmus	512 (66.4)	0.823	0.978
	Marasmic-kwash	27 (3.5)	0.197	1.436(0.829, 2.488)
Therapeutic feeding unit refusal(n=771)	Yes	14 (1.8)	Reference	1
	No	757 (98.2)	0.820	0.876(0.282, 2.728)
Appetite test on admission(n=771)	Pass	758 (98.3)	0.885	0.919(0.295-2.863)
	Fail	13 (1.7)	Reference	1
Routine medication (at least one) at admission and follow-up period(n=771)	Yes	310(40.2)	0.921	0.991(0.832-1.181)
	No	461(59.8)	Reference	1
Medical complication(at least one) on admission and follow-up period(n=771)	Yes	213(27.6)	Reference	0.926(0.754, 1.136)
	No	558(72.4)	0.46	1
Weight gain for the first three consecutive weeks(n=433)	Yes	394(51.1)	0.135	1.424(0.896, 2.264)
	No	39(5.1)	Reference	1
Oedema cleared on third week(n=167)	Yes	84(10.8)	Reference	1
	No	83(10.9)	0.649	0.929(0.676, 1.276)

**Table 4:** The Bivariate Cox-regression for prediction of recovery rate from SAM under OTP, Kamba district, South Ethiopia; January 2014.

Characteristics	Category	Number (%)	P-value	AHR (95% CI)
Health facility (n=771)	Health post	455(59)	Reference	1
	Health centre	316(41)	0.001	1.495(1.188, 1.881)
Age of the child (n=771)	< or = 24 months	427(55.4)	Reference	1
	>24 months	344(44.6)	0.039	1.255(1.012, 1.556)

**Table 5:** Multivariate Cox-regression model for prediction of recovery rate from SAM under OTP, Kamba district, Gamo-Gofa Zone, South Ethiopia, January 2014.

more, under the intervention for better recovery. According to the Ethiopian OTP treatment guideline [34] these children should have been in-patients. That is, these children should have been referred to hospitals or other health facility which have SC service for inpatient treatment under TFU at their 8<sup>th</sup> week of stay under the OTP when they failed to reach any of the discharge criteria [17,25]. But these 174 children stayed in the programmes to recover from SAM.

The recovery rate was 67.7% which was lower than the international standard in which the minimum recovery rate was set at 75% [5] and it was slightly lower than the 2005 EFY annual OTP performance report of Kamba district which was 69.4% [31]. This finding was also lower than findings from studies in Southern Ethiopia which shows 87% recovery rate [22], Bedawacho-Ethiopia which shows 85% recovery rate [33] and Southern Malawi which shows 89% recovery rate [25];

and, in all the three studies the defaulter rate was less than 10%. But it was higher than the study done in Tigray- Ethiopia 61.78% recovery rate and Kenya 53.3% recovery rate [5,26]; the defaulter rate in both of these studies was 13.85 and 40.6 respectively. This low recovery rate may be explained by high defaulter (22.7%) and unknown cases rate (6.2%).

In this study, it was found that children treated at health centers had 49% better recovery rate than children treated at health posts. This finding was different from studies done in Ethiopia [5] and Malawi [24]. According to the study done in Tigray-Ethiopia [5] the recovery rates were similar for health centers and health posts. Also, according to the study from Malawi [24], there were no differences in recovery rate whether a severely malnourished child cared by medical professionals or a community health aid. Presence of better qualified

health professionals at health centers than health posts might be the possible explanation for this finding.

Age of the child was the other important variable which determined success rate of OTP. Children older than two years had 1.25 times higher probability of getting recovered from SAM as compared to children aged less than or equal to two years. This finding was consistent with the study done in southern region of Ethiopia [22] which states that with increasing age, the death rate decreased and cure rate increased. But this finding has ill explained difference from the study done in Tigray-Ethiopia [5].

## Strength and Limitations of the Study

### Strength

- This study was among a limited number of studies in our country which assessed success rate of OTP especially at health institution level.

### Limitations

- ❖ Measurement error may be introduced
- ❖ As we know that the study was based on secondary data, so incomplete registration was observed in some predictor variables such as weight for height at admission, breathing per minute at admission and body temperature at admission.

## Conclusion

The study identified that:

- ❖ The overall recovery rate was lower than the sphere standards.
- ❖ Type of health facility and age of the children are important predictors for success rate of OTP.

## Recommendation

### To the government and non-governmental organizations

- ❖ Success rate of outpatient therapeutic feeding program should be monitored regularly.
- ❖ Decentralization of outpatient therapeutic feeding program service from health centers to health posts should be carried out with great caution.

### To health care providers

- ❖ Special focus should be given to young children during outpatient therapeutic feeding program.
- ❖ Health care providers strongly advised to comply with OTP treatment protocols.

### For researchers

❖ Prospective study should be conducted for better information by including other factors not included under this study such as existence of sharing of Plumpy'Nut among siblings, proper provision of the treatment to the indexed child at home, household income level, perception of mother on the diseases and effect of the maternal educational level.

## Abbreviations Used

EDHS-Ethiopian Demographic and Health Survey

MAM-Moderate Acute Malnutrition

SNNPR-Southern Nations Nationalities and Peoples Region

## Acknowledgement

We would also like to express our appreciation to the staff of Gamo Gofa Zone Health department and Kamba district Health office for supplying us valuable information.

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