

ORIGINAL ARTICLE

Recovery Time and Predictors among Under-Five Children with Severe Acute Malnutrition Admitted to Outpatient Management at Dodota District of Oromia, Ethiopia

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ABSTRACT

Background: Severe acute malnutrition (SAM) is one of the common childhood problems worldwide endangering the lives of 17 million (2.5%) children under five years old. It is also highly prevalent among Ethiopian under-five-year children (7%). This study assessed recovery time and its predictors among under-five children with severe acute malnutrition admitted to outpatient management at Dodota District, Oromia Regional State, Ethiopia.

Methods: Institution-based cohort study was done on secondary data of children who were treated on an outpatient therapeutic feeding program. Totally, 984 subjects were collected from registries; while their data were coded and statistically analyzed.

Results: The median recovery time was 7.12 weeks [Inter Quartile Range (IQR): 6.09-8.42] or 50 days with an overall recovery rate of 84.2%. The Kaplan Meier estimates of recovery rate were 7%, 35%, 47%, 54%, and 88% at 4th, 6th, 8th and 12th weeks of follow-up, respectively. Routine Amoxicillin treatment had 1.28 times higher probability of getting recovered [Adjusted hazard ratios (AHRs): 1.28, 95%Confidence interval (CI): 1.03-1.60]. Recovery time for children who were supplemented with vitamin A was determined (AHR: 1.71, 95%CI: 1.35-2.16). Outpatient admission of children at health centers had 1.37 times higher probability of getting recovered from SAM (AHR: 1.37, 95%CI: 1.16-1.63).

Conclusion: The recovery rate is within national and international standards. Amoxicillin treatment, vitamin A supplementation, and type of health facility had a significant association with the recovery time among SAM children treated at outpatient therapeutic feeding program (OTP).

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Introduction

Malnutrition is a pathological state resulting from nutritional inadequacy or over nutrition to be correlated to excess of food intake that would

encompass specific deficiencies or excess intake of essential nutrients (1-4). Malnutrition has persisted for centuries and has been the leading public health problem on earth and is an underlying factor for

several millions of deaths of under-five-year children who died from several other preventable causes. Malnutrition manifests itself by limiting the development of children to their potential status (5-7). Children with $< -3Z$ scores or $< 70\%$ median weight-for-height (WFH) and/or nutritional edema are classified as severe acute malnutrition (SAM) with no medical complication and are admitted to outpatient therapeutic feeding program (OTP). Mid-upper arm circumference (MUAC) < 11.0 cm can also be considered for admission; but it is recommended not to be used alone unless as part of a two-stage screening (6-8).

A study conducted by United Nations Children's Fund (UNICEF), World Health Organization (WHO) and World Bank Group demonstrated that the estimated burden of under-five-year children's malnutrition is as high as 7.7% for wasting worldwide (i.e. 51.7 million). It was shown that majority of acutely malnourished children were from Asia and Africa (69% and 27% of all wasted children, respectively) of which South Asia and Sub Saharan African (SSA) nations were the leading burden. Acutely malnourished children account for 3.5% of the under-five-year children and 2.8% of SSA nations (2). Ethiopia, as it lies in SSA, bears the largest amount of malnourished children. Several surveys and reviews reinforce this truth. According to Ethiopian Demographic and Health Survey (EDHS) held in 2016, the proportion of under-five-year children with wasting was 10% and its severe form was 3%. The underweight status of under-five-year children was 24% and for severest form was 7%; while the prevalence was higher among rural areas (2). Although figures of underweight showed a decline when compared to the previous studies undertaken during 2000, 2005 and 2011 (41%, 33%, and 29, respectively); wasting of children brought no significant discrepancy over the specified periods (2).

Among the forms of malnutrition, severe acute malnutrition (SAM) is the major area of global importance causing annually millions of preventable deaths. Once SAM children are admitted to OTP, they are expected to be managed based on standard treatment protocol and discharged after being cured within the 8 weeks period (6, 9, 10). This is well articulated by the national management protocol and Sphere standard (the maximum of 8 weeks and 4 to 8 weeks, respectively); although the extended length of time for treatment period pose a question on program efficacy (5). The status of recovery time from SAM treatment in this study area is not yet examined; hence, understanding predictors of recovery time in which the standard management of SAM requires is instrumental in the design of interventions to

improve child health management (5).

Implementation of community based management in SAM is a nationwide child management strategy in the essence of early management of childhood illnesses and hence attributes to the reduction of child mortality from malnutrition and its consequences (5). There is standard protocol for management of SAM, while understanding determinant factors affecting the time to recover from SAM after OTP enrolment would be instrumental in the design and adjustment of intervention modalities to improve child health (5).

The area of Dodota District in our study has not yet been explored and also does not resemble other areas for which socio-demographic, agro-economic and ecologic dynamics are peculiar. Dodota District is also well known for its erratic rainfall and extremely poor harvesting trend every year. Subsequently, residents of this district are suffering from various levels of malnutrition. The presence of malnourishment at every door in this area clicks not merely on what would be the magnitude of SAM, but also about how fast children do recover from the situation. Henceforth, beyond understanding the determinant factors affecting the time to discharge from OTP, this study will use this baseline information to determine other related factors in relation to the recovery time and predictors in which children with SAM are discharged from OTP in Dodota District that will help maximize health professionals' about SAM management and redesign the existed program towards better services.

Materials and Methods

The study was conducted in the Oromia Regional State in Arsi Zone of Dodota District in governmental health institutions performing outpatient management of SAM for under-five-year children. The district has an estimated population of 90,424 out of which 13,564 are under-five-year children. The Dodota District is located in Arsi zone of Oromia Regional State where all of its localities are situated within the Great East African Rift Valley and therefore, the climatic condition is totally lowland which is known for its erratic rainfall. As a result, even though the district is capable of producing diverse types of crops, minimal rainfall has ultimately resulted in variable productivity. This is why the district is known for its high food insecurity over years. Dera town is the administrative center of the district which is located about 125 km South-East of Addis Ababa and 50 km away from the zonal town Asella to the North-East. The health services system in Dodota District comprises of public, private and

non-governmental organization (NGO) health care institutions. There are two public health centers in the district. In addition, there are 13 health related posts, 14 private clinics, and 5 drug vendors/drug stores. Dodota District is among the 26 districts in the Arsi Zone (11).

This retrospective cohort study design was used to assess recovery time on OTP records captured from July 8, 2016 to July 7, 2018. The source population was all under-five-year children with identified SAM condition admitted to OTP in the district. The study population for this assessment included all registries of under-five-year children who were managed for SAM in the district for the last three years (July 8, 2016 to July 7, 2018). Registries of all under-five children who came to health facilities and admitted to OTP from July 8, 2015 to July 7, 2018 by health institutions were enrolled. The data used in this study were obtained from Dodota District of Arsi Zone, Oromia Regional State. All under-five-year children diagnosed for SM and were admitted to OTP and started treatment during the period July 8, 2015 to July 7, 2018 were included in the study. A sum of 1,021 children who visited health facilities in the district for SAM was enrolled; while 37 cases were exempted for not fulfilling the criteria.

Therefore a total of 984 children with SAM from 12 health posts and 2 health centers were finally considered for analysis. Date of children's admission to OTP was deducted from the date discharged after recovery to obtain the time-to-recover from SAM. Recovery of a child was operationalized according to the protocol of SAM treatment in which weight for height >85% and no bilateral edema were considered. So the children who were cured and discharged were considered if they fulfilled the criteria for SAM. In contrast, children who died, transferred, or those absconded the treatment were censored for the time-to-recover. Treatment outcome of OTP was considered as recovery, death, getting out, unknown, non-responder and defaulter. Defaulter was a patient who was absent for two consecutive weeks and confirmed that the patient was not dead by home visits. Readmission patients were those who declared to be cured or recovered, but with a relapse to be admitted to OTP.

A structured checklist was used to collect the data from registries and all health facilities. The checklists were adopted from literature in consistent with the standard OTP admission, follow-up and discharge registries. Collection of data was done by 3 trained nurses under a close supervision of a supervisor nurse and the principal investigator. Data collection training was presented for the data collectors and one supervisor for two consecutive

days. Data was checked for being properly completed and the accuracy and consistency were checked in every step. Missing data and information were excluded from the study.

After checking of all data for completeness and consistency, they were entered into computer using Epi-Info (Version 7) and exported to SPSS (Version 26, Chicago, IL, USA) for statistical analysis. Descriptive data were analysed by Kaplan Meir test to determine the preliminary relationship between the independent and dependent variables. Variables found significant at $P < 0.25$ were taken to multivariate Cox regression to identify the independent predictors of time to discharge from OTP admission. Results from the multivariate Cox regression were reported as adjusted hazard ratios (AHRs), with a 95% confidence interval (CI) at level of significance of 0.05. Ethical approval was obtained from Arsi University. All targeted Health Institutions and respective officials in the district health office were informed before starting the study. Also, a letter from Arsi University was sent to concerned officials to secure engagement permissions. Since this study was conducted through review of records, no need for consent form was undertaken from study subjects.

Results

The total numbers of children admitted to OTP were 984. Out of them, more than two third (765, 77.70%) were admitted to health posts and the remaining 219 (22.30%) were admitted in health centers. More than half of children admitted to OTP for having SAM were females (541, 55%). Of the total children, 497 (55%) were under 12 months of age; where 12-23 months were 328 (33.30%) and the rest 159 (16.20%) lied between 24-59 months of age. The median age of children was 11 months (IQR: 8.2629-16.6316) (Table 1). Nine tenths of cases were newly admitted to the OTP (912, 92.7%) and the rest were children who returned after default, readmitted and transferred to these OTP sites [18 (1.8%), 41 (4.2%) and 13 (1.3%), respectively] (Table 1).

From the total 984 children enrolled to OTP, almost all were Marasmic (951, 96.6%; i.e. MUAC < 11 cm), and 31 (3.2%) were Marasmic-Kwash (MUAC < 11 cm and bilateral pitting edema); while the remaining 2 (0.2%) were Kkwashiorkor (bilateral pitting edema). All children admitted to OTP due to SAM were assessed for their weight and MUAC; but none of them were evaluated for their height levels. The overall median weight at admission was 6.5 kg [Inter Quartile Range (IQR): 5.6-71 kg] whereas; that of Marasmic, Kwashiorkor

Table 1: Socio-demographic characteristics and admission reasons of children admitted to OTP for SAM in Dodota District, Oromia Regional State of Ethiopia from July 8, 2016 to July 7, 2018.

Variable	Frequency	Percent
Health facility type		
HC	219	22.3
HP	765	77.7
Children sex		
Male	443	45.0
Female	541	55.0
Age of the child (month)		
<12	497	50.5
12-23	328	33.3
24-59	159	16.2
Status of admission		
New	912	92.7
Return after default	18	1.8
Readmission	41	4.2
Transfer in	13	1.3

HC: Health center, HP: Health facility, OTP: Outpatient therapeutic feeding program, SAM: Severe acute malnutrition

Table 2: Clinical characteristics of children when admitted at OTP for SAM in Dodota District, Oromia Regional State of Ethiopia from July 8, 2016 to July 7, 2018.

Variable		Frequency	Percent
Malnutrition type	Marasmus	951	96.6
	Marasmic-Kwash	31	3.2
	Kwash	2	0.2
Breast feed	No	249	25.3
	Yes	735	74.7
RR count	No	290	29.5
	Yes	694	70.5
T. measured	No	284	28.9
	Yes	700	71.1

OTP: Outpatient therapeutic feeding program, RR: Respiratory rate, SAM: Severe acute malnutrition, T: Temperature

and Marasmic-Kwash were 6.5 kg (IQR: 5.6-7.1 kg) and 7.4 kg (IQR: 7.2-7.4 kg), respectively. Among the 984 children classified as SAM at OTP sites, 35 (3.6%) suffered from cough, 24 (2.4%) from diarrhea, and 10 (1.0%) from other type of illnesses. Five children (0.5%) reported vomiting at the time of admission. The overall recorded history of illness was 63 (6.4%) and none of these children were sent to inpatient management.

Around three fourth of the total OTP admitted children were breast fed during admission for SAM treatment. At admission time, the respiratory rate (RR) count and temperature measurement record were captured for close to three fourth of SAM cases. Nearly half of the children had 30-39 breath per minute; while two fifth had 40-49 breath/min and the rest had breath above 50 per minute. Likewise, from the measured 700 cases, normal temperature range were visible among three fourth of cases (Table 2). Overall, routine drugs were provided for majority of SAM cases (86.5%). Out of 984 children

admitted to OTP centers in the facilities, amoxicillin was provided for most of cases (86.5%); while folic acid and other drugs were minimal at the time of admission. In contrast, all admitted children received Ready-to-Use Therapeutic Feeding (RUTF) during their program (Table 3).

About 18 (1.8%) cases developed illness; while they were in the course of SAM treatment. Cough accounted for 11 cases; whereas diarrhea, vomiting and fever were noticed among 6, 4 and 2 cases, respectively. All health workers undertaking the outpatient therapeutic feeding program at the health center and also at the health post level had received standard training on SAM management and were familiar with the treatment protocol. Although it demands further approval, all providers were always dependent on SAM guidelines in treatment of children. In contrast, none of these facilities were specific with supportive supervision neither for facility nor for district senior staffs/experts. Out of 984 children admitted to OTP, 829 (84.24%, CI: 81.9-86.5)

Table 3: Treatment and follow-up of children after admission at OTP for SAM in Dodota district, Oromia Regional State of Ethiopia from July 8, 2016 to July 7, 2018.

Variable	Frequency	Percent
Routine drug given		
No	133	13.5
Yes	851	86.5
Given amoxicillin		
No	133	13.5
Yes	851	86.5
Given folic acid		
No	964	98.0
Yes	20	2.0
Given other drugs		
No	971	98.7
Yes	13	1.3
Given RUTF		
Yes	984	100.0
No	0	0
HEW ever visited		
No	975	99.1
Yes	9	0.9
Treatment outcome at discharge		
Cured	829	84.2
Not cured	155	15.8

HEW: Health Extension Workers, OTP: Outpatient therapeutic feeding program, RUTF: Ready-to-Use Therapeutic Feeding. SAM: Severe acute malnutrition

cases recovered from SAM during 7,190 person weeks of observation (PWO). A total of 155 children (15.75%) were also censored. The median recovery time was 7.12 wks (IQR: 6.09-8.42) or 50 days. The Kaplan Meier estimate of recovery rate was 7%, 35%, 47%, 54% and 88% at the follow up time of 4th, 6th, 8th and 12th weeks after admitted to OTP, respectively.

The Kaplan Meir (KM) survival curve for routine amoxicillin treatment illustrated that the recovery rate of those treated was better than untreated children among them the cure rate was 89% and 77%, respectively. The length of stay in OTP by amoxicillin treatment for SAM was relatively shorter when compared to untreated children (7.14 weeks, IQR: 6.14-8.29) and 7.29 weeks (IQR: 5.79-9.00). The Kaplan Meir survival curve of vitamin A supplementation showed that those who got the supplementation had better recovery from SAM (recovery rate of 100%, the median length of stay of 6.64 weeks, QR: 5.86-7.43) when compared to those who did not get the supplementation (recovery rate of 87% and the median length of stay of 7.14 weeks (IQR: 6.14-8.71).

In this study, children diagnosed for SAM and admitted to OTP at health centers had a better recovery rate when compared to health posts; i.e. 97% and 87% and median recovery time of 7.01 wks (IQR: 6.07-7.95) and 7.22 (IQR: 6.10-8.67), respectively [Log

rank test (Mantel Cox), $X^2=17.219$, $p<0.001$]. Those children who were not cured were 155 (15%) cases; while 60 (6.1%) were from the program for unknown reasons including 58 (5.9%) as absconded/defaulted, 31 (3.2%) were transferred to EOS and TFU and 2 (0.2%) were dead. Bi-variable and multi-variable Cox regression analyses to identify predictors of recovery time from SAM showed history of cough prior to date of admission (CHR=1.48, 95%CI=1.01-2.15); developing any type of illness after admission to OTP (CHR=0.43, 95%CI=0.16-1.14); taking amoxicillin (CHR=1.28, 95%CI=1.05-1.61), vitamin A supplementation (CHR=1.90, 95%CI=1.54-2.34) and measles (CHR=1.55, 95%CI=1.06-2.28) as routine OTP treatment packages. The type of health facility that SAM cases were admitted (i.e. health center) had significant association with survival time of children from OTP ($p<0.25$, CHR=1.40, 95% CI=1.18-1.65) (Table 4).

Afterwards, multivariable Cox regression model to control the potential effect of confounding variables showed significant association revealing amoxicillin treatment, vitamin A supplementation and the treatment at health centers had significant association with survival time among children recovered from OTP ($p=0.05$). Hence, children treated with amoxicillin had 1.28 times higher probability of getting recovery from SAM in comparison to children who did not receive

Table 4: Bivariate and multivariate analysis of recovery time predictors for SAM among under-five-year children in Dodota District, Arsi Zone, Oromia Regional state from July 8, 2016 to July 7, 2018.

Variable	Total (%)	Median week of recovery (IQR)	CHR (95%CI)	P value	AHR (95%CI)	P value
Total N	984 (100)	7.14 (6.04-8.43)				
Age of child (months)						
<12	497 (50.5)	7.14 (6.14-8.43)	1.12 (0.92-1.37)	0.258	1.11 (0.91-1.36)	0.303
12-23	328 (33.3)	7.00 (6.00-8.39)	1.20 (0.97-1.47)	0.089	1.14 (0.92-1.40)	0.222
24-59	159 (16.2)	7.00 (6.14-8.57)	1.00		1.00	
Had history of cough						
No	949 (98.0)	7.14 (6.14-8.50)	1.00		1.00	
Yes	35 (3.5)	7.00 (5.14-8.00)	1.48 (1.01-2.15)*	0.044	1.19 (0.79-1.81)	0.405
Developed any illness						
No	966 (98.2)	7.14 (6.14-8.43)	1.00		1.00	
Yes	18 (1.8)	6.21 (4.71-8.14)	0.43 (0.16-1.14)	0.089	0.38 (0.14-1.05)	0.062
Given Amoxicillin						
No	133 (13.5)	7.29 (5.79-9.00)	1.00		1.00	
Yes	851 (86.5)	7.14 (6.14-8.29)	1.30 (1.05-1.61)*	0.016	1.28 (1.03-1.60)**	0.027
Given Vitamin A						
No	873 (88.7)	7.14 (6.14-8.71)	1.00		1.00	
Yes	111 (11.3)	6.86 (5.86-7.43)	1.90 (1.54-2.34)*	0.001	1.71 (1.35-2.16)**	0.001
Given Measles						
No	955 (97.1)	7.14 (6.14-8.43)	1.00		1.00	
Yes	29 (2.9)	6.86 (6.00-7.64)	1.55 (1.06-2.28)*	0.025	1.11 (0.72-1.69)	0.647
Type of Health Facility						
Health Center	219 (22.3)	7.00 (6.00-8.00)	1.40 (1.18-1.65)*	0.001	1.37 (1.16-1.63)**	0.001
Health Post	765 (77.7)	7.14 (6.14-8.71)	1.00		1.00	

*Statistically significant. SAM: Severe acute malnutrition

amoxicillin for treatment (AHR: 1.28, 95%CI: 1.03-1.60). Similarly, children supplemented with vitamin A had 1.71 times higher probability of getting recovery from SAM in comparison to children who were not supplemented with vitamin A (AHR: 1.71, 95%CI: 1.35-2.16). Likewise, children admitted at health centers had 1.37 times higher probability of getting recovery from SAM when compared to children who were treated at health posts (AHR: 1.37, 95%CI: 1.16-1.63) (Table 4). Figure 1 presents Kaplan Meier recovery estimate of the overall/cumulative for amoxicillin treatment and Figure 2 demonstrates Kaplan Meier recovery estimates of the overall/cumulative, amoxicillin treatment, vitamin A routine

supplementation and health center and health post in Dodota district.

Discussion

In this study, 829 (84.24%) children recovered from SAM and this finding is above the standard of 75% (12). Recovery in our study was viewed by Health Extension Workers (HEWs) as maintenance for target weight in successive two weeks where most admissions were based on MUAC finding. It was followed by records of weight; while health centers considered Z-score. Also, the presence and absence of bilateral edema was considered a key issue by all facilities when termination of OTP was decided. So

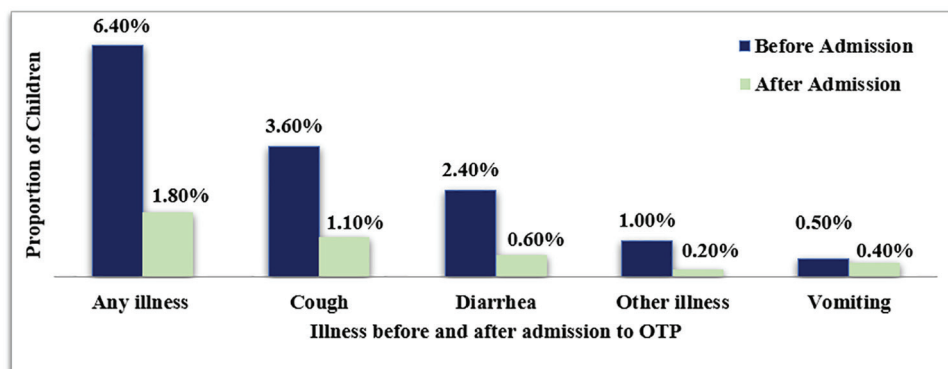


Figure 1: Ill health situation among under-five children with SAM before and after admission to OTP in Dodota District, Oromia Regional State, July 8, 2016 to July 7, 2018.. OTP: Outpatient therapeutic feeding program.

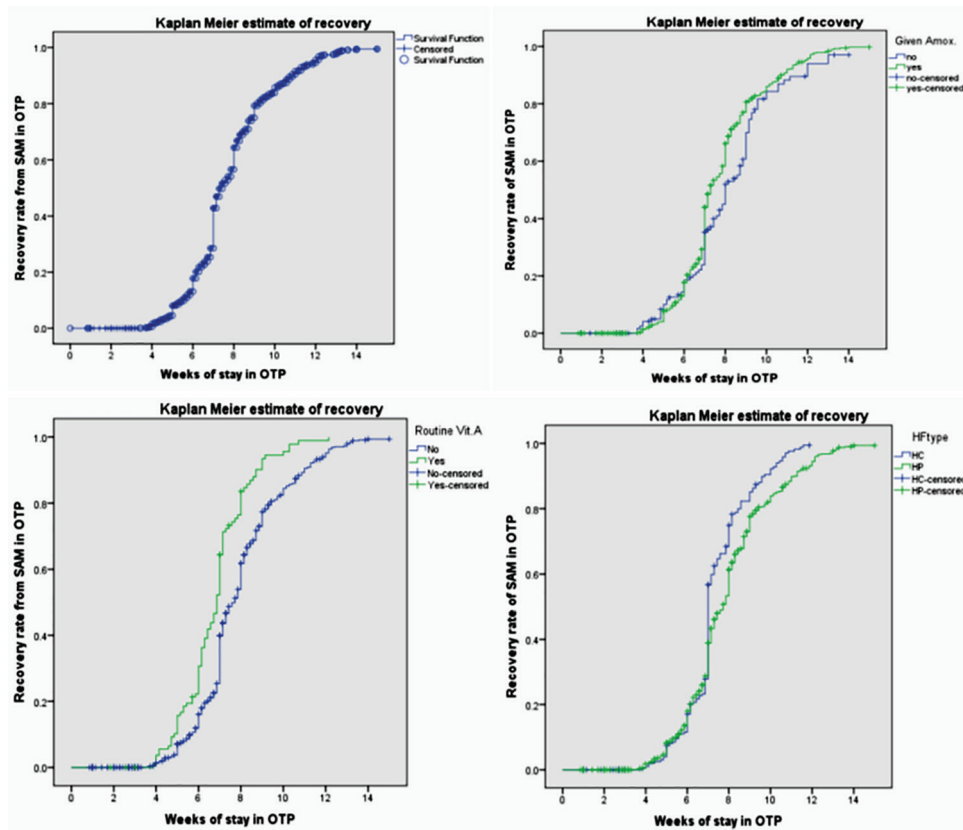


Figure 2: Kaplan Meier recovery estimates of the overall/cumulative (A); Amoxicillin treatment (B); vitamin A routine supplementation (C); and health center and health post (D) in Dodota district, Oromia Regional State of Ethiopia from July 8, 2016 to July 7, 2018.

the median recovery time was 7.12 weeks (50 days) which is higher than standard of 30-40 days length of stay, but within an acceptable maximum standard of the Ethiopian protocol for management of SAM which put limitation to the treatment period up to eight weeks (6, 11). These findings are in consistent with the median of 7.14 weeks reported at Kamba and Sidama with 49 days in Northern Ethiopia (13-15). However, these results showed a significant higher recovery time in comparison to the studies conducted in Mali, Zambia, and Shebedino with recovery time of 42 days, 48.04 days, 28 days and 35 days, respectively (16-19). This difference in the time of recovery might arise from the disparity in socio-demographic and socio-cultural backgrounds as children with SAM were allowed to stay up to 15 weeks. Although the national SAM treatment protocol guideline emphasizes to discharge of cases within 8 weeks to cover the criteria, children still remained in the OTP for an extended time.

The national management protocol recommended that children who entered the program for more than 8 weeks should be transferred or linked to inpatient management centers because they failed to comply with criteria of discharge after being recovered (6). However, 408 (41.5%) children stayed in the OTP for more than 8 weeks. This in turn might amplify the

rate of program efficacy in the area. In this study, the overall recovery rate was 88% and this finding is similar with studies done in Malawi (88.30%), Nigeria (93.40%) and Weliso (93.16%) (14, 20, 21). But, in contrast to these findings, the recovery rate was markedly higher than other studies in Zambia (59%), Mali (46%), Karat (84.40%), Fasha (84.10%), Kamba (76.80%), Northern Ethiopia (76.80%), Sekota (71.32%), Sidama (68.80%) and Tigray (61.78%) (22-26). This difference might be due to time difference, the number of health facilities, presence of more than two trained health staffs at every service point, availability of guidelines, and feasibility of health facility options in these localities. Predictors of the overall time of recovery among SAM children admitted to OTP were identified in this retrospective study. Also, the association between outcome of interest and independent predictors was presented. The amoxicillin treatment, vitamin A supplementation and the type of health facility that SAM cases were admitted were other factors that were significantly associated with recovery time from OTP for SAM.

Treatment with amoxicillin was significantly associated with recovery time from OTP. It was shown that the probability of survival among SAM children in OTP was 1.28 times more than children

who did not get amoxicillin. This was supported by a report of WHO in 2012 (27). Also, the 2013 WHO guideline showed that reduction in mortality was significant for antimicrobial uses (6). Similar results were noticed in a systematic review (1.3) and in Malawi (1.32) (27-29). But, this finding is slightly lower than other findings in Sidama (1.46), Tigray (1.95) and Wolayita (1.52) (15, 21, 30). The availability of supplies, failing to deploy and a timely restock, and reduced concerns for routine provision of amoxicillin among health facilities (health post mostly) might have been the main reason for the difference in results.

Likewise, this study found that vitamin A was significantly associated with time of recovery from SAM. Children supplemented with vitamin A during SAM had 1.71 times more probability of recovery than children who did not get vitamin A. Among the few studies with similar concerns, a study at Sekota (North Ethiopia) supported the finding of this study showing that the children who did not get vitamin A supplementation had 1.53 (53%) hazard rate in comparison to the children who did receive vitamin A (24). The technical justification for this result might be the biophysical benefits of vitamin A in improvement of tissue maintenance and function, cellular integrity, immune competence, and metabolic processes (31). However, even though vitamin A supplementation hastened the rate of recovery and reduced the time of recovery (6.86 weeks), it only addressed 111 (11.67%) children from the total eligible of 951 children to be in OTP.

The type of facility in which children were admitted to OTP services showed marked difference. Under-five-year children who had SAM and were treated at health centers were 1.37 more likely to recover when compared to their health post counter parts. This result is almost the same as finding in Kamba (Gofa Zone) which was 1.36 (32). Moreover, a study in Zambia demonstrated a strong relationship between the type of facility and the recovery time from SAM (26). This might be justified as more the facility is furnished/equipped and staffed, the better the result would be. The relative situation in provision of static/stable programs and health facility opening periods were illustrated to be better in health centers when compared to health posts. Marked decline in the true intention and engagement at home visits and a supportive supervision was an additional gap that might reinforce the condition in health posts. The level of profession, supply chains, trainings' qualities might also impact the HP performance.

Conclusion

This research revealed the overall median time to

be within an acceptable national and international range for SAM treatment (7.12 weeks), and showed a difference between groups of predictors. The cumulative recovery rate of SAM children was estimated 84.24 and was 88% at 12 weeks of follow up (not yet optimum). The recovery time indicated to a significant association with amoxicillin treatment, vitamin A supplementation and type of health facility when children of SAM when enrolled for treatment in OTP in Dodota District health facilities.

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Authors' Contribution

GL conceived and GL, HF, AE designed the study. GL, HF, AE and DT performed analysis and interpretation of the data. GL and DT prepared the manuscript.

Conflict of Interest

None declared.

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