

Factors Affecting Treatment Outcomes of Outpatient Therapeutic Program for Treatment of Severe Acute Malnutrition in Under-Fives: A Systematic Review

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ABSTRACT

Background: Severe Acute Malnutrition (SAM) is a major global health concern, particularly affecting children under the age of five. SAM is associated with a high risk of mortality and morbidity, making effective treatment essential. Outpatient Therapeutic Programs (OTPs) have been widely used as a community-based approach to treating SAM in low-resource settings, offering Ready-to-use Therapeutic Foods (RUTF) and medical care to affected children. However, the success of OTPs can be influenced by various factors, including the child's age and nutritional status, the caregiver's education and socioeconomic status and the quality of care provided. Understanding these factors and how they impact treatment outcomes is crucial for improving the effectiveness of OTPs and reducing the burden of SAM in under-fives.

Objective: This systematic review aims to analyse the factors influencing treatment outcomes in Outpatient Therapeutic Programs (OTP) designed for addressing Severe Acute Malnutrition (SAM) among children under five years old.

Study selection: A search was carried out on Cochrane, Elsevier and PubMed to retrieve all publications on treatment outcomes of outpatient therapeutic programs. Studies published between 2016 to 2024 were considered eligible for inclusion. Relevant studies were selected based on a predefined inclusion and exclusion criteria and twenty-four studies were initially retrieved for data synthesis.

Data synthesis: Thirteen unique studies that met the study criteria were chosen for data synthesis. The publications were analysed to determine factors affecting treatment outcomes in Outpatient therapeutic programs.

Results: A total of thirteen studies met the inclusion criteria and were included in the study. The findings revealed several key factors impacting

treatment outcomes in OTPs for SAM. These factors encompassed various domains, including socio-demographic characteristics, clinical features, programmatic aspects as well as caregiver-related factors. Factors such as age, nutritional status, comorbidities, program adherence, caregiver knowledge, and program support emerged as significant determinants of treatment success.

Conclusion: This study highlights the multifaceted nature of factors influencing treatment outcomes in OTPs for SAM among under-fives. Understanding these determinants is crucial for optimizing program effectiveness and improving child health outcomes in resource-limited settings. Further research focusing on tailored interventions addressing these factors is warranted to enhance the quality and impact of SAM treatment programs.

Keywords: Outpatient therapeutic programs; Factors influencing treatment outcomes; Treatment outcomes; OTP for severe acute malnutrition

INTRODUCTION

Acute malnutrition is a state of nutritional deficiency brought on by insufficient consumption of protein or energy [1]. Primary acute malnutrition in children is a prevalent condition in underdeveloped nations due to insufficient food supply resulting from social, economic, and environmental causes. Depending on the degree of malnutrition, a child can either be classified as moderately malnourished or severely malnourished. According to the World Health Organization (WHO) statistics, an estimated 19 million children under the age of five suffer from severe acute malnutrition worldwide, which is thought to be one of the causes of 400,000 child fatalities annually, and most of these children live in south Asia and in sub-Saharan Africa (WHO 2023). Severe Acute Malnutrition (SAM) is characterized by a very low weight-for-height/weight-for-length (<-3SD), visible severe wasting, clinical symptoms of bilateral pitting oedema or a very low mid-upper arm circumference (<115 mm) in children aged 6 months to 59 months. A thorough clinical examination should be performed on children suffering from severe acute malnutrition in order to determine whether they exhibit any complication. Previously all severely malnourished children were managed in the inpatient setting which greatly limited its coverage and impact. The United Nations (UN), World Food programme (WFP) and United Nations International Children's Emergency Fund (UNICEF) issued a joint statement endorsing Community Management of Acute Malnutrition (CMAM) also known in some countries as Integrated Management of Acute Malnutrition (IMAM) guidelines that recommended outpatient care for children with uncomplicated SAM.

There are four components of IMAM guidelines

Community outreach which refers to a variety of initiatives aimed at building community mechanisms for the early identification of wasting and prompt referral of such instances to treatment providers, as well as encouraging

community involvement in the program. Supplemental Feeding Program (SFP) that is used in the management of moderate acute malnutrition to treat moderate wasting in children aged 6 months-59 months in an outpatient setup. Inpatient or stabilization care is the third component and is used in management of infants and children with SAM that is complicated, i.e. presenting with other underlying medical complications. They are managed in a facility and following the resolution of the medical issues, the child is discharged and continues to receive outpatient care for wasting.

The fourth component and the main focus of this systematic review is treatment for uncomplicated severe wasting i.e. wasting with no medical complications. It is provided by outpatient care (also called Outpatient Therapeutic Program, or OTP) for children aged 6 months-59 months. Children and infants visit the nearest facilities/health centers for weekly follow-up visits as well as an initial medical evaluation and enrollment to the program.

The outpatient therapeutic program entails Ready-to-Use Therapeutic Food (RUTF) as well as routine drug administration. Some of the routine drugs given include an antibiotic, where the first dose is given at first contact/during enrollment, deformers, Vitamin A, folic acid/Iron and Measles vaccine if the child has not been vaccinated before. An appetite test is conducted during the medical examination and if they pass the appetite test and the physician is satisfied the child has no underlying complications, they are enrolled into the OTP program and given RUTF. RUTF is an energy and protein dense therapeutic feed given to children between 6 months-59 months for treatment of malnutrition. The RUTF is rationed by weight and the stock is replenished after every follow-up visit. It is advised that follow-up visits take place every week, during which the child is reassessed by taking their weight, MUAC, and appetite test, and any rising complication/ medical issues are checked [2].

Treatment outcomes for OTP include being cured, defaulter, referred or dead [3]. Patients who miss two follow up sessions in a row are considered defaulters. A child who has completed their recovery and been released from the Outpatient Therapeutic Program (OTP) is considered cured; a child who was in the OTP program but was later admitted to the hospital due to medical complications is considered referred.

While there are a lot of studies regarding treatment outcomes of OTP programs, there is a lack of documentation regarding the predictors and factors that affect the treatment outcomes of OTP programs and the duration of recovery for children enrolled in the program. Thus, the purpose of this study is to determine what variables affect SAM treatment outcomes in children receiving outpatient care.

MATERIALS AND METHODS

A literature search was conducted using online databases i.e. PubMed, Cochrane and Elsevier as well as the search engine Google Scholar to identify relevant articles and studies related to treatment outcomes of outpatient therapeutic programs and factors influencing the outcomes of OTP. Search terms included “outpatient therapeutic programs”, “factors influencing treatment outcomes”, “treatment outcomes” and “OTP for severe acute malnutrition”.

Eligibility criteria

Inclusion criteria: Articles that satisfied the following requirements were added to the final analysis after the investigator evaluated the contents of every study that was included.

Study population: Included were population studies conducted with children under five.

Study setting: The research carried out in health posts and health centers areas where OTPs are implemented were taken into account.

Study design: Original research that measured treatment outcomes and related variables using cross-sectional and cohort study designs was taken into consideration.

Language: Research done using the English language was taken into consideration.

Publication criteria: The date of publication was restricted to articles published within the past 7 years i.e. from 2016-2024.

Exclusion criteria: Excluded studies included systematic reviews, those that were hard to read in full due to missing correspondence from the associated authors, and those that didn't discuss factors influencing the treatment outcomes of OTP.

RESULTS

The initial search on google scholar identified 1,970 articles, most of which discussed outpatient therapeutic programs but were not related to severe acute malnutrition. A more specific search on online databases yielded a total of 30 articles, of which 24 articles were retrieved according to their relevance to the search criteria. 11 articles were further excluded since they were review articles. The remaining 13 articles were analyzed and were used to provide the results of this study as summarized in Table 1 below.

Table 1. Summary of results findings.

Study Region	Sample size	Study description	Findings	References
Southern Ethiopia	1048	In this cohort study, 1,048 children admitted to 94 OTPs between July to December 2011 in Southern Ethiopia and followed for 14 weeks. Independent anthropometrics and information on treatment outcome were collected at four home visits.	Children admitted to OTP programs with edema had a higher fatality rate than those with non-edematous SAM.	[4]
Arba Minch Zuria Woreda, Ethiopia	402	An institution-based retrospective cohort study was conducted from January 1, 2016 to December 31, 2018 in the health posts of Arba Minch Zuria Woreda, Eligible children with SAM were randomly	Children <24 months had longer recovery time than those >24 months Children diagnosed with edema at admission were nearly 2 times more likely to recover early than those children with marasmus.	[5]

		<p>selected from the registration logbook. In the health posts, children are followed for maximum of eight weeks visiting the facilities weekly for monitoring.</p>	<p>Children who had anemia during enrollment were less likely to recover from SAM as compared with those without anemia</p> <p>Children admitted with diarrhea were 78% less likely to recover from SAM as compared with those children without diarrhea during the admission.</p>	
Nagele Arsi, Ethiopia	357	<p>Institutional based retrospective cohort study was conducted among 357 children treated in Nagele Arsi district from July 1, 2018 to June 30, 2020. The children were selected using simple random sampling from 20 health posts. Information was gotten from the treatment cards and SAM treatment outcomes were compared against international SPHERE standards.</p>	<p>Non-edematous children were less likely to recover from SAM as compared with edematous children.</p> <p>Rate of time to recovery among new admissions were two times more likely as compared with readmission.</p> <p>Children provided with Amoxicillin at admission were more likely to recover compared with those not provided with Amoxicillin.</p> <p>Children who received vitamin A were more likely to recover from SAM as compared to their counterparts.</p> <p>Dewormed children were more likely to recover faster compared to those not dewormed.</p> <p>Children with diarrhea were less likely to recover compared to those without diarrhea.</p>	[6]
Gubalafto Wereda, North Wollo, Ethiopia	600	<p>Retrospective cohort study conducted on 600 children who had been managed for SAM under OTP from April to May 2019. The children were selected using systematic random sampling from 9 health posts. A structured questionnaire was used to collect the data.</p>	<p>Children provided with amoxicillin were 3.38 times more likely to recover when compared to their counterparts.</p> <p>Presence of cough, the presence of diarrhea, PO antibiotics, admission category, and the immunization status of a child are factors affecting SAM treatment outcome.</p> <p>Children who were fully and partially vaccinated had approximately 7 times better recovery rate when compared to those who have been not vaccinated.</p>	[7]

			The odds of recovery on SAM were nearly 2 times higher among children who took PO antibiotics compared to counterparts Approximately 4 times higher odds of recovery were observed among newly admitted children as compared to those who are readmitted	
Dire Dawa, Eastern Ethiopia	713	A facility-based retrospective cohort study supplemented with qualitative inquiry(interviews) was conducted between February-March 2017 to analyze the records of 713 under-5 children with SAM that were randomly selected from four health centers and one hospital in Dire Dawa.	Low provision of RUTF could cause delay recovery time in OTP. In this study, being dewormed had 1.44 times more likely to recover faster compared to those who did not take them. Availability of Plumpy Nuts, distance from their home to health center, lack of awareness on how to use Plumpy Nut lead to delayed recovery rates Sharing of Plumpy Nut at home contribute to delayed recovery from SAM.	[8]
Karamoja , Uganda	788	Retrospective cohort study conducted using a dataset consisting of treatment records of children aged 6–59 months admitted to nine OTC sites in Karamoja from January 2016 to October 2017. All the children in the dataset used for this analysis were children with SAM. Treatment records were extracted from three outpatient health facilities in three districts	Wasted children are likely to experience lower incidence rates of recovery than those with edematous malnutrition. Children aged <24 months in the study probably had worse severity of acute malnutrition leading to poor treatment outcomes.	[9]
West Hararghe, Ethiopia	561	A facility-based retrospective cohort study was conducted in the inpatient unit of two health centers and seven health posts in West Hararghe, Ethiopia, from March to May 2017. The sources of data for the study were individual outpatient therapeutic record cards	Children's length of stay on the program for edematous children was less than wasted children. Children provided with amoxicillin were more likely to recover compared to their counterparts Being enrolled with edema, not taking routine medication (amoxicillin and	[10]

			folic acid) and failing to gain weight in the first 3 weeks were the strongest predictors of a low recovery rate.	
Bench Sheko, South-West Ethiopia	588	A retrospective cohort study was conducted on 588 children who had been managed for SAM under OTP, from September 01, 2018, to August 30, 2019, in 4 public health centers in Bench Sheko zone. Records of all randomly selected eligible children aged 6–59 months who were treated on OTP at selected health institution the year between September 01, 2018, and August 30, 2019 and analyzed.	The rate of recovery from SAM among children who were new admissions was 1.52 times higher than that of children with a history of readmission. The rate of recovery from SAM among children with no history of diarrhea were 1.9 times higher than those children with history of diarrhea The rates of recovery from SAM among children with no cough were 1.4 times higher than those children with cough The rates of recovery from SAM among children who were dewormed were 1.4 times higher than children who had not been deworming	[11]
North Gondar zone, Northwest Ethiopia	408	Facility based prospective follow up study was conducted from March 24 to May 24, 2017. A total of 408 children with the age of 6–59 months were included in the study. Structured interviewer administered questionnaire was used. Anthropometric measurements were conducted every week.	Factors that prolong time-to-recovery include diarrhea and vomiting on admission. In addition, routine medicines provision like amoxicillin on admission result in faster time to recovery from SAM.	[12]
Wolaita, Southern Ethiopia	794	A retrospective facility-based cross-sectional study was conducted in OTP records of 794 children, treated at 24 health posts retrieved from January to December 2014	Factors identified as associated with treatment outcome were the distance from OTP to residence by foot, type of malnutrition, and provision of amoxicillin	[13]
Kabale District, South-western Uganda	637	Retrospective cross- sectional study: All the health centers running the OTC program were purposively selected. A total of 17 health centers were selected to participate in the study. They used all records of	It was seen that children who were admitted from the community were 0.3 times less likely to cure from SAM than those admitted from other health facilities	[14]

		children 6–59 months treated under the programme between 2013 – 2015.	The number of visits the child made to the programme to receive supplies was positively associated with the cure of children from severe acute malnutrition.	
Shebedido worded (district), Southern Ethiopia	348	A retrospective cohort study was conducted using the data of severe acutely malnourished children admitted to 12 of the available health posts in Shebedino district between January 1, 2011, and January 1, 2013. The study was conducted through record review of eligible patient cards of children who were treated for SAM in the selected health posts.	Miasmic children stayed longer on treatment compared to children with kwashiorkor. Factors identified as positively affecting the time to recovery were admission weight and the rate MUAC gain. Alternatively, the age and type of SAM affected time to recovery negatively.	[15]
Eastern province, Zambia	390	Mixed- methods study: Records of 390 eligible children admitted with SAM between 2008 and 2010 were reviewed. Information on the barriers to effective implementation of a sustainable OTP intervention was collected through semi-structured interviews with key stakeholders.	Clients defaulted because of stock out of RUTF and drugs, long distances from home to the OTP center and clients defaulted because the caregivers assumed their children had recovered, even though they have not met criteria for discharge	[16]

DISCUSSION

The results from the table above show some of the factors that influence the treatment outcomes of children enrolled in OTP programs. A compiled and more detailed analysis is discussed below.

Age

The results from the Arba Minch study indicate that the age of the children at admission had a substantial impact on the research participants' recovery times. Children younger than 24 months old required more time to recover from SAM than did children older than 24 months. Studies conducted in Karamoja, and Shiseido Woreda were in line with this conclusion. The observed differences between the groups may be the result of a child's need for appropriate nourishment throughout the first 24 months of life, which may necessitate a longer recovery period. Furthermore, infants younger than 24 months old may be more susceptible to infections because of their underdeveloped immunity at the time of admission, which could mean a longer recovery period [5].

Type of malnutrition

According to research by Tadesse children who had significant edema at admission were at a higher risk of dying and of continuing to be very malnourished 14 weeks later. This could be because children with severe edema should not

follow the nutritional management plan with RUTF in an OTP since it provides more protein and energy than the suggested F-75 milk-based diet, which might aggravate the symptoms [4]. On the other hand, studies from Arba Minch, Karamoja, West Harare, Shiseido Woreda, and Olaitan concur that children with edema at admission had a roughly two-fold higher chance of recovering sooner than those with marasmus. The rationale offered was that the observed differences between the groups might be explained by the fact that children enrolled by the edema criteria resolve their edema easily after OTP which results in shorter time to recovery than those children who were admitted with marasmus [5]. Another possible explanation according to that caregivers and health-care providers provide relatively better care to edematous children as the study shows that caregivers are more concerned about edematous children than severely wasted children [10]. The degree of edema may be the reason for the discrepancy between the Southern Ethiopia report and the other papers. While the other studies do not address severe edema, Tadesse's study focused exclusively on severe edema and did not provide any results on moderate edema.

Presence of comorbidities

The length of time it took for SAM recovery in this trial was considerably impacted by the existence of anemia at admission [5]. Compared to children without anemia at enrollment, those with anemia had a lower chance of recovering from SAM. This may be because, in accordance with the national protocol for the management of SAM, children who were anemic upon arrival require more time to recover before receiving iron supplements. Research from Arba Minch, Nagele Arsi, Jubilate Woreda, Bench Shako, and North Gondar concur that children who had diarrhea at the time of admission had a lower chance of recovering from SAM than children who did not have diarrhea. This association may have as its explanation that children who are malnourished and have diarrheal illness are more likely to lose the intestinal mucosal barrier, which leads to systemic immunosuppression. As a result, these children require longer times to recover than children who are admitted but do not have diarrhea [14]. Children without coughs recovered from OTP at rates 1.4 times greater than those with coughs, according to the Bench Shako study. The reason for this according to the Jubilate Woreda study is that due to appetite loss and the likelihood that they would vomit while coughing, children with coughs may not consume the appropriate amount of RUTF (plumpy nut) required per day thus increasing the chance of poor outcomes.

Type of admission

Findings from the study in Jubilate Woreda show that new admissions had approximately 4 times higher odds of recovery compared to those who were readmitted. This could be explained as new admissions are not likely to have medical complications whereas children who have been readmitted may come with more complications or latent infections which ultimately decreases the recovery rate [7]. This is further supported by studies in Nagele Arsi and Bench Shako.

Administration of routine medications

The North Gondar study found that children who received amoxicillin as part of their regular treatment regimen at the time of admission recovered more quickly than those who did not [12]. This could be explained by the fact that PO antibiotics, like amoxicillin, address asymptomatic infections that limit the effectiveness of SAM treatment and speed up recovery. This conclusion was also supported by studies conducted in Nagele Arsi, Jubilate Woreda, West harangue and Olaitan. The Nagele Arsi study found that children who had vitamin A had a higher chance of recovering from SAM than those who did not. It is the only study that brought up vitamin A as a regular prescription that had a big impact on the patients' treatment results. The rationale is that vitamin A is necessary for immune system maintenance and the integrity of the body's epithelial cells. As a result, vitamin A is crucial for preventing infections

as well as the chance of disease and mortality from infections in children^[6]. Consistent with the findings of the studies conducted in Nagele Arsi and Bench Shako, the Dire Dawa study indicated that individuals who received deworming treatments were 1.44 times more likely to recover faster than those who did not. This could be because deworming children on a regular basis may enhance their appetite and improve their nutritional absorption, since children with SAM are more likely to become infected. Helminth infections typically result in anemia, which can further delay recovery, and loss of appetite owing to stomach distention^[17].

Immunization status: Results from the Jubilate Woreda study indicate that children who had both complete and partial vaccinations recovered at a rate that was around seven times higher than that of children who did not receive any vaccinations. The most likely explanation for this is that vaccination boosts and primes the immune system, making it better able to fight off or avoid diseases that could impede healing.

Availability of rutf: Poor treatment outcomes for SAM children receiving OTP are caused by service providers' inadequate provision of RUTF, according to the Dire Dawa study. It also revealed that one major factor in the delayed recovery from SAM is the sharing of plump Nut among family members. This is consistent with the Zambian study, which suggests that a primary cause of poor treatment results is supply issues, or running out of supplies^[16]. The article further documents that some caregivers sell RUTFs in stores, and giving RUTFs to healthy kids at home could postpone the nutritional recovery of SAM kids and result in long-term nutritional deprivation for the children.

Distance to OTP centers

Children who lived fewer than 25 minutes away from the health centers had a 1.53 times higher chance of recovering than those who lived more than 25 minutes away, according to the Oblation study^[13]. The study's findings may be explained by the fact that kids who live farther away from OTP are less likely than those who live closer to the site to routinely attend OTP facilities. This is corroborated by research conducted in Kabala, which found a favorable correlation between the number of times a kid visited the program to obtain supplies and the recovery of children from severe acute malnutrition. This is due to the fact that individuals with greater attendance rates were more likely to follow the treatment plan, which allowed the children to recover.

CONCLUSION AND RECOMMENDATIONS

It is evident from this analysis that children engaged in OTP programs have different treatment results depending on both controllable and non-modifiable characteristics. Age, the kind of malnutrition, and the type of admission are examples of non-modifiable variables. The rest of the factors which are modifiable need immediate intervention to ensure timely recovery of SAM children. In order to ensure that all children enrolled in OTP programs have a fair chance at recovery, it is imperative that RUTF supplies be kept well-stocked to prevent shortages; additionally, caregivers should be provided with appropriate nutrition counseling and advised against sharing RUTF with stable children, as this will lessen the likelihood of the ill child's recovery. Patients with comorbidities should also receive the necessary care prior to enrollment in OTP programs.

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