ORIGINAL ARTICLE

Treatment Outcome of Uncomplicated Severe Acute Malnourished children aged 6-59 months evaluated at Outpatient Therapeutic Feeding Centre: a 12 year retrospective cohort study at tertiary care hospital in Multan

SAADIA KHAN, SARA RUBAB, HAROON GUL KHAN, REEMA ARSHAD, TEHSEEN IKRAM, MUHAMMAD MUAZ QUERISHI

Pak Pediatr J 2026; **50(2-3):** 129-136

Correspondence to:

Reema Arshad
M.Phil.
Human Nutrition and Dietetics, Clinical nutritionist
Department of preventive pediatrics, Children Hospital and Institute of Child Health CH & ICH, Multan.

E-mail: reemaarshad0@gmail.com

DOI:
https://doi.org/ 10.66347/ppj.v50i2&3.709

ABSTRACT

Objective: This study analyzed the treatment outcome of uncomplicated severe acute malnutrition (SAM) at Outpatient Therapeutic Program in children aged 6 months to 59 months.

Study design: A retrospective cohort study design was used

Place and duration of study: Outpatient Therapeutic Feeding Program of Children Hospital and Institute of Child Health, Multan, from 01.01.2011-31.12.2022.

Materials and methods: This study analyzed children diagnosed with malnutrition, screened from all the children aged 6–59 months at Outpatient Therapeutic Feeding Program. Data included demographics, anthropometric measurements, and treatment outcomes, with biweekly monitoring of weight, height, and response to therapeutic interventions.

Results: Out of 17,793 children registered as malnourished, 10,733 were diagnosed with SAM, predominantly affecting children under 36 months (85%), with 90% diagnosed as Marasmus. Moderate acute malnutrition was found in 7,060 children. Referrals primarily came from the hospital subspecialties (60%), with self-referrals at 30% and community referrals at 10%. The SAM recovery rate was 85%, with an average weight gain of 11 g/kg/day and a 15% defaulter rate, while the average program stay for SAM cases was approximately 8 ± 1 week.

Conclusion: This study demonstrates the effectiveness of the Outpatient Therapeutic Program (OTP) in achieving effective recovery and weight gain. Early detection and community-based care are crucial for reducing malnutrition and enhancing pediatric health outcomes.

Keywords: *Child malnutrition, Community-based nutrition intervention, Moderate Acute Malnutrition (MAM), Outpatient Therapeutic Program (OTP), Ready to use therapeutic food, RUTF, Severe Acute Malnutrition (SAM)*,

INTRODUCTION

One of the most important health concerns globally is moderate acute malnutrition (MAM) and severe acute malnutrition (SAM) which primarily affects regions with undeveloped countries like Pakistan. World Health Organization (WHO) along with other UN agencies emphasize that malnutrition stands as the top morbidity and mortality risk factor for children's infants under five years old and affects populations heavily in Asia and Africa[1]. WHO defines SAM as weight-for-height Z-score below -3SD or/ along with MUAC less than 11.5 cm. This results in severe nutritional deficiencies, developmental delays, weakened immune system and elevated infection risks[2]

A total of 45% of under-five years' child mortality worldwide is directly connected to malnutrition with Pakistan ranking among the nations displaying extreme child malnutrition rates. UNICEF identifies Pakistan as one of the three nations which leads the world in child stunting 42 % alongside wasting upto 17 %. There is a dire need for permanent approaches to resolve this situation[3,4]. The Outpatient Therapeutic Programs (OTP) serve as a fundamental tool that delivers therapeutic nutrition care with monitoring to SAM children in community-based locations to prevent prolonged hospital stay while promoting care back in their homes. OTP sites deliver effective therapeutic foods such as ready to use therapeutic foods (RUTF) on WHO and UNICEF guidelines of community based management of acute malnutrition (CMAM) to help patients recover in areas with limited resources [5].

This research aims to analyse SAM and MAM cases registered in OTP sites from 2011 to 2022 based on their recovery rates, alongside weight gain, defaulter rates. The performance and effectiveness of OTPs for the management of SAM is not evaluated in detail in Punjab province where this program is working in more than 42 districts[6]. Hence this study can contribute to provide a real time picture of CMAM effectiveness in the most vulnerable populations of Punjab. The findings of this research will enhance global knowledge about effectiveness and success of OTP program for treating malnutrition in the most vulnerable population living in the deprived and undeveloped areas of southern Punjab.

MATERIAL AND METHODS

A retrospective cohort study involves all children aged 6–59 months screened as SAM at OTP of CH & ICH, Multan with "weight for height (below -3 z scores of the median WHO growth standards), by visible severe wasting, or by the presence of nutritional edema" between 1st January 2011 till 31st December 2022. MUAC <11.5 cm was taken as indicator for referrals from the community by the lady health workers[7].

Permission was taken from the IRB committee of the institute CH & ICH, Multan. Consecutive sampling technique was used to ensure maximum enrolment. All the children screened and registered within the age bracket were included in the study. The children that were transferred to stabilization centers or other sub-specialties or whose records were incomplete were excluded from the study. The children registered at Outpatient Therapeutic program (OTP) were included in the study. For data collection purpose a questionnaire was designed by the lead investigator to collect the desired information. The data was collected from record registers and files of Outpatient Therapeutic Feeding Program of the institute. Main variables were age, gender, demographics, anthropometry, presenting medical symptoms and treatment outcomes. The data collected included treatment outcomes assessed via recovery percentage, defaulter rates, and weight gain. demographic information, anthropometric measurements, presenting medical symptoms, while on RUTF. routine medications and follow-ups as per OTP guidelines.

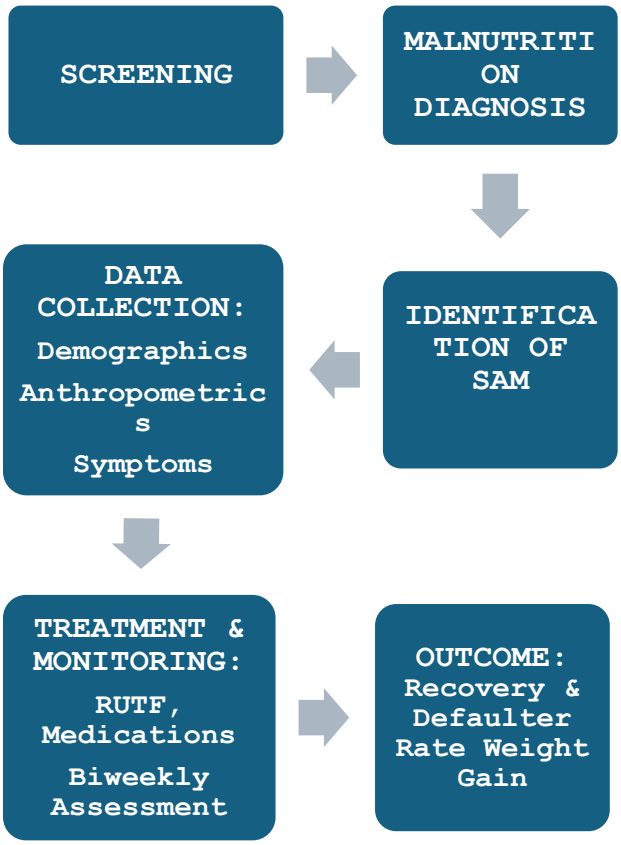
The children were admitted at OTP after screening as per OTP program guidelines provided there was no medical complications and passed appetite test. at OTP RUTF sachet with 500 kcal/92 gm is given to child as per weight of the child. Dosage of RUTF is calculated as per WHO guidelines for CMAM program.

Other routine medications like antibiotics, vitamin A, folic acid, deworming was done at OTP.

- **Amoxicillin:** 50 mg/kg/day orally for 7 days.

- **Vitamin A:** 100,000 IU for infants <12 months, 200,000 IU for children ≥12 months (on day 1 and repeated after 4–6 weeks if necessary).
- **Folic acid:** 5 mg single dose at admission.
- **Deworming:** Albendazole 200 mg for children 12-23 months, 400 mg for ≥24 months (single dose at admission, if not dewormed within past 6 months).
- **Measles vaccine:** Given at week 4 if not received earlier (children ≥9 months).

Figure 1; Data collection procedure



All dosages were per WHO/CMAM guidelines. Appetite tests were done at admission, and medical complications warranted immediate referral to SC.

Children were kept on follow up for at least eight weeks at OTP for RUTF supply, routine checkups and supportive care where required.
Children were assessed biweekly (every 15 days), with records taken for weight, height, MUAC, and their response to therapeutic treatment. The children with edema were assessed for edema free weight gain, as the edema children first loose edematous-weight and then start gaining weight. Outcome assessments at OTP sites evaluated recovery rates, defaulter rates, and weight gain, with follow-up parameters recorded until discharge. This systematic data collection and monitoring process enabled a thorough evaluation of treatment outcomes and program effectiveness for malnourished children enrolled in OTP.
Children remained admitted at OTP until they achieved wt/ht > -2SD or MUAC ≥12.5 and no edema for at least two consecutive weeks[2]. Children discharged from OTP were periodically monitored to avoid relapse.

This structured data collection and monitoring process allowed for comprehensive evaluation of treatment outcomes among children diagnosed with SAM in the OTP program, providing insights into recovery rates, growth metrics, and program efficacy. The data was entered into SPSS version 26 for statistical analysis and descriptive analysis was conducted for the data.

Operational Definitions:

- **Severe Acute Malnutrition:** Wt/Ht Z-score <-3SD or MUAC ≤11.5cm or presence of any bilateral pedal edema.
- **Moderate acute Malnutrition (MAM):** children Wt/Ht Z-score <-2SD or MUAC 11.5- 12.5 cm
- **Malnutrition type:** Grouped as marasmus (non-edematous) and kwashiorkor (edematous) based on the diagnosis.
- **Recovered:** A child attaining 15% body weight and without edema (two successive **visits** or weeks) declared cured by the healthcare professionals were categorized as recovered or WHZ > -2 SD or MUAC ≥12.5 cm and no edema.

- **Non-recovered:** If a child failed to recover at the end of the eighth week (2 months), he/she was rated as non-responsive and hence was referred to inpatient settings.
- **Defaulter:** In case of absence of three consecutive follow-up visits, the child was declared as a defaulter.
- **Appetite test:** A child was said to pass the appetite test when he/she could consume the 1/3rd packet of RUTF within an hour [2].
- **Fully vaccinated child:** the child who had received all age-appropriate vaccines according to the Extended Program on Immunization (EPI) of Pakistan.
- **Partially vaccinated child:** the child who had received at least one or more, but not all age-appropriate vaccines according to.

the Extended Program on Immunization (EPI) of Pakistan.

Not vaccinated: the child who had not received any dose of age-appropriate vaccines according to the Extended Program on Immunization (EPI) of Pakistan[8]

RESULTS

In the given time period of the study 59,815 children were screened at the OTP site, CH & ICH, Multan. Of the 17,793 children identified as malnourished, 10,733 were identified with (SAM). Among these, 53% were male and 46.7% were female. Most SAM cases (85%) were observed in children under 36 months (n = 9,123), with the remaining 15% (n = 1,610) in children over 36 months. Within the SAM group, 90% of cases were diagnosed as Marasmus (n = 9,660), while 10% were Kwashiorkor (n = 1,073). Moderate Acute Malnutrition (MAM) was found in 7,060 children, with 54% male and 45% female. Age distribution in MAM cases was similar, with 90% (n = 6,354) under 36 months and 10% (n = 706) over 36 months. 75 % (13,344) malnourished children were fully vaccinated, while 9 % (1601) were partially vaccinated, and 16% (2848) were not vaccinated.

Table 1: Annual distribution of patient screened, and SAM and MAM cases identified

Sr. #	Yearly	Total patient	Malnutrition Patient	SAM Male	SAM Female	MAM Male	MAM Female
1	2011	3650	1216	400	310	304	202
2	2012	2890	963	325	326	160	152
3	2013	3150	1050	420	275	204	151
4	2014	2846	948	340	246	200	162
5	2015	4276	1997	640	494	560	303
6	2016	3441	978	370	384	140	84
7	2017	4080	899	330	244	163	162
8	2018	5663	1262	245	257	360	400
9	2019	5628	1294	471	377	244	202
10	2020	3762	661	270	259	56	76
11	2021	7386	1685	577	522	314	272
12	2022	13043	4840	1314	1336	1150	1039
		59815	17793	5703	5030	3855	3205

Table 2: diagnosis, age and gender distribution of SAM and MAM

Parameter	Group	Number (n)	Percentage (%)
SAM Gender	Male	5,790	54.6
	Female	5030	46.4
SAM Age	<36 months	9,123	85
	≥36 months	1,610	15
SAM Diagnosis	Marasmus	9,660	90
	Kwashiorkor	1,073	10
MAM Gender	Male	3,855	54
	Female	3,205	45

MAM Age	<36 months	6,354	90
	≥36 months	706	10

Table 3: Sources of Referrals(n=17,793)

Source of Referral	Number of Cases (n)	Percentage
CH&ICH subspecialties	10,676	60%
Self-referrals	5,338	30%
Community referrals	1,779	10%

The primary sources of referrals included CH&ICH subspecialties, accounting for 60% (n = 10,676), followed by self-referrals at 30% (n = 5,338) and community referrals at 10% (n = 1,779).

Table 4: SAM Recovery Rate and Weight Gain (n= 17,793)

Parameter	Findings	Percentages
Recovery Rate	15,124)	85%
Defaulter Rate	2,669)	15%

The SAM recovery rate was 85% (n = 15,124) with an average weight gain of 11 g/kg/day, while the default rate stood at 15% (n = 2,669). The average stay for SAM cases at the OTP was approximately 8 ± 1 week

DISCUSSION

The primary goal of this study was to report on SAM treatment outcomes in OTP and related factors among children receiving SAM treatment. Community management of acute malnutrition is an effective program for addressing malnutrition problems in undeveloped countries. The Outpatient Therapeutic Program of this study showed recovery rates of (85%) in SAM children that match previous findings in third world countries thus demonstrating community-based SAM management of acute malnutrition can be effective[9].These recovery statistics indicate OTPs effectively decrease SAM cases except for complicated situations while patients stay in treatment for about 8 weeks reaching a success rate of 85%. Early intervention together with therapeutic feeding strategy using RUTF helps patients recover rapidly because RUTF provides high protein and high calories for rapid weight gain and stabilization. Outpatient therapeutic feeding programs have demonstrated effectiveness in treating SAM in resource-constrained settings based on the high recovery data collected across Ethiopia, Nigeria and Sudan with rates reaching between 80% to 90%[10,11]. The community-based management of acute malnutrition (CMAM) model through its key component OTPs shows successful reach of numerous affected children to stabilization centers. The findings of our study are consistent with the research conducted globally demonstrating that community-based treatment models are effective[12].

The current study shows a defaulter rate of 15% which is realistically acceptable, but better outcomes can be achieved by implementing more effective strategies such as better referrals systems and taking the lady health workers on board for community mobilization and to ensure timely follow-ups, to achieve better rates similar to previous documented data researchers. This information contrasts with our study because in regions of Tigray recorded non-response at 8.91% while in Woko northern Ethiopia showed 8% non-participation but our study had higher numbers[13,14]. The non-response rates varied because of different factors related to program implementation follow-up methods and active community participation. Strong community mobilization along with regular home follow-up visits and effective defaulter tracking procedures may lead to reduced defaulters and lead to increased timely referrals of MAM and SAM children from community to OTP and SC sites in Multan[15,16]. High recovery rates depend on the success of proper program execution with consistent follow-up effort to inspect defaulters. Better follow-up procedures include home visits, telephonic communications and community-based voluntary support networks, these strategies have proven to be effective in success of OTPs as stated by Sheikh et al[17]. Weak

follow-up systems within health programs drive patients to drop out from treatment and failure to respond to care. As depicted by the current findings the OTP sites in Multan need to focus on strengthening follow-up procedures for complete recovery and weight gain for all SAM children. The Lady Health Workers Program in Punjab can strengthen the follow-up as well as referrals from the community to the OTP sites which was deemed as poor (10%) of all the cases registered at the OTP sites. Community Health Workers (CHWs) and nutrition educators are instrumental in bringing this gap by providing education and support to caregivers. Abate et al also reported that in several low-income countries the understanding of caregivers has a direct impact on early screening and referrals, regular OTP visits and adherence to therapeutic feeding protocols and better recovery outcome for both SAM and MAM[6]. In contrast, lack of awareness, misconceptions about the treatment, and socio-economic barriers can lead to defaulting or non-response.

In our study marasmus was found to be the predominant form of malnutrition (90%) which is comparable to the findings of studies done in northern Ethiopia stating that marasmus is more common than kwashiorkor. Another comparable finding in both studies are the age group of malnourished children in northern Ethiopia most of the SAM children were under twenty-four months old however in the current study the majority of severe acute malnourished children (85%) from 6 months to 36 months of age, and in MAM children 90% children were under 36 months old. These findings can also be related to the poor IYCF practices with insufficient nutrient and caloric intake[18,19]. The number of immunized children in this study was quite high (75%), which is in contrast to the findings of Bitew et al who state that malnutrition, specially SAM, was much more common in children who were not immunized leading to low immunity and frequent infections as diarrhea and pneumonia[13]. The recovery rate for SAM children at OTP sites may vary depending on numerous clinical and non-clinical factors i.e. presentation of child at the time of admission, degree of malnutrition and SAM-related complications such as diarrhea, hypothermia, hypoglycaemia, loss of appetite, lethargy and edema, as well as any existing medical issues and caregiver's knowledge and the quality of their nutritional therapy. Children with complicated SAM involving persistent diarrhea alongside pneumonia or other infections tend to experience a longer recovery process and need hospital admission. The referral process into stabilization centers before OTP admission potentially led to high recovery results because the program managed only straightforward cases of uncomplicated SAM. Many previous studies confirmed that proper screening along with quick triaging during admission enables the best possible outcomes in OTPs[9].

CONCLUSION

This study demonstrates the effectiveness of the Outpatient Therapeutic Program (OTP) in achieving an effective recovery rate among children with Severe Acute Malnutrition (SAM), with significant weight gain. Early detection and community-based care are crucial for reducing malnutrition and enhancing pediatric health outcomes.

Source of funding: None

Conflict of interest: None

Authors' affiliation

Dr. Saadia Khan,
MD, Assistant professor
Department of preventive pediatrics
Children Hospital and Institute of Child Health (CH & ICH) Multan
Dr Sara Rubab,
FCPS, Assistant Professor,
Pediatric Medicine
Children Hospital and Institute of Child Health (CH&ICH) Multan

Dr. Haroon Gul Khan,
FCPS, Senior Registrar
Children Hospital and Institute of Child Health (CH&ICH) Multan

Reema Arshad,
M.Phil. Human Nutrition and Dietetics, Clinical nutritionist
Department of preventive pediatrics, Children Hospital and Institute of Child Health CH & ICH, Multan.

Dr Tehseen Ikram,
MBBS, WMO, Department of preventive pediatrics,

Children Hospital and Institute of Child Health
CH & ICH, Multan

Dr Muhammad Muaz Querishi
MBBS, Medical Officer,
Children Hospital and Institute of Child Health, Multan

REFERENCES

1. World Health Organization. UNICEF/WHO/The World Bank Group joint child malnutrition estimates: key findings of the 2021 edition [Internet]. Geneva: World Health Organization; 2021 [cited 2023 Jun 1]. Available from: https://www.who.int/data/gho/data/themes/topics/joint-child-malnutrition-estimates-unicef-who-wb
2. World Health Organization. Malnutrition. Available from: https://www.who.int/health-topics/malnutrition#tab=tab_1. Accessed August 20, 2023.
3. Government of Pakistan, National Nutritional Survey of Pakistan, 2018, Islamabad. Doi: https://www.unicef.org/pakistan/media/1951/file/Final%20Key%20Findings%20R eport%202019.pdf.
4. Aguayo VM, Badgaiyan N, Qadir SS, et al. Community management of acute malnutrition (CMAM) programme in Pakistan effectively treats children with uncomplicated severe wasting. *Matern Child Nutr*. 2018;14:e12623. doi:10.1111/mcn.12623
5. Ministry of National Health Services Regulations and Coordination. Pakistan national guidelines for community-based management of acute malnutrition. Available from: https://www.unicef.org/pakistan/media/4161/file/CMAM%20Guidelines.pdf. Accessed June 10, 2023.
6. Abate BB, Tilahun BD, Kassie AM, Kassaw MW. Treatment outcome of Severe Acute Malnutrition and associated factors among under-five children in outpatient therapeutics unit in Gubalafto Wereda, North Wollo Zone, Ethiopia, 2019. PLoS One. 2020: 3;15(9):e0238231.
7. Khan S, Hasan G, Ali I, Arshad R, Ali I, Abbas A. Management of infants less than six months with severe acute malnutrition (SAM). Prof Med J. 2020;27(06):1113-8. doi:10.29309/TPMJ/2020.27.06.3386.
8. Khan S, Arshad R, Sultan MT, Tabasum S, Batool N, Ikram T. Treatment outcome of kwashiorkor in children as per World Health Organization guideline at Nutrition Stabilization Center, Multan, Pakistan. J Islamic Int Med Coll. 2023;18(4):257-61.
9. Kabalo MY, Seifu CN. Treatment outcomes of severe acute malnutrition in children treated within outpatient therapeutic program (OTP) at Wolaita Zone, Southern Ethiopia: retrospective cross-sectional study. J Health Popul Nutr. 2017;36(1):7.
10. Mengesha MM, Deyessa N, Tegegne BS, Dessie Y. Treatment outcome and factors affecting time to recovery in children with severe acute malnutrition treated at outpatient therapeutic care program. Glob Health Action. 2016;9:30704. doi:10.3402/gha.v9.30704.
11. Teshome G, Bosha T, Gebremedhin S. Time-to-recovery from severe acute malnutrition in children 6–59 months of age enrolled in the outpatient treatment program in Shebedino, Southern Ethiopia: a prospective cohort study. BMC pediatr. 2019;19:1-0.
12. Kebede F, Kebede T, Negese B, Abera A, Fentaw G, Kasaw A. Incidence and predictors of severe acute malnutrition mortality in children aged 6–59 months admitted at Pawe general hospital, Northwest Ethiopia. *PloS One*. 2022;17(2):e0263236. doi:10.1371/journal.pone.0263236
13. Bitew ZW, Alemu A, Worku T. Treatment outcomes of severe acute malnutrition and predictors of recovery in under-five children treated within outpatient therapeutic programs in Ethiopia: a

systematic review and meta-analysis. BMC pediatr. 2020;20:1-4.
14. Bizuneh F, Bekonjo N, Kebede T. Severe acute malnutrition treatment cure rate for under-five children admitted in stabilizing center: north west Ethiopia 2021. *J Nutr Med Diet Care*. 2021;7:1–9.
15. Ahmed N, Umar F, Saleem F, Iqbal Q, Haider S, Bashaar M. Treatment Outcomes of Severe Acute Malnutrition and Its Determinants Among Paediatric Patients in Quetta City, Pakistan. J Multidisc Hc. 2023 Dec 31:2809-21.
16. Khan S, Iqbal MI, Ibad A, Ishfaq K. Weight Gain in Malnourished Children on WHO Recommended Therapeutic Feeding Formula F-100. Pak Pediatr J. 2018;42(2):120-25.
17. Shaikh S, Chohan MN, Ahmed I, Shaikh S, Shah MA. Outcome of severe acute malnutrition in less than six months old infants at Nutrition Stabilization Center, LUMH, Jamshoro, Pakistan. Rawal Med J. 2023;48(4):986-9.
18. Mezemir M, Girma M, Bekele D. Treatment outcome and associated factors of acute malnutrition among children in the therapeutic feeding center of Public Hospitals in Addis Ababa, Ethiopia: an Institutional-Based Cross-Sectional Study. *Pediatric Health Med Ther*. 2022;Volume 13:145–154. doi:10.2147/PHMT.S296979
19. Yebyo HG, Kendall C, Nigusse D, Lemma W. Outpatient therapeutic feeding program outcomes and determinants in treatment of severe acute malnutrition in tigray, Northern Ethiopia: a retrospective cohort study. Plos one. 2013;8(6):e65840 10.1371/journal.pone.0065840

Author's Contribution

S.K: conceptualization of work and execution
HG: Methodology and review of paper,
S : Data Collection and analysis
RA : Statistical Analysis and correspondence
TI: Review and analysis
MM: Data collection and data cleaning

All the authors have approved the final manuscript draft and accept the responsibility of research integrity.