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Research Article

Outpatient management of severe acute malnutrition among children under five years old, in Yemen: a retrospective cohort study

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ABSTRACT

Background: severe acute malnutrition is one of the major health problems in Yemen. The aim of this study is to determine the efficacy of national guidelines of C-MAM on management of severe acute malnutrition among under five years old children in Yemen.
Methods: Retrospective cohort study, conducted during the period from 5 October 2011 to 5 October 2013. Study procedures involved assessing clinical records of 303 children aged 6-59 months. The outcomes were recovery, death, default and transfer from programme.
Results: a total of 303 children (6-59 months old) suffered from SAM were underwent treatment in the C-MAM programme. Recovered 31 (10.2%), died 10 (3.3%), transferred 19 (6.3%), defaulted 243 (80.2%) and median stay of children in programme were 40 days. In children who defaulted from the programme, a Chi-square test for independence indicated significant association to children aged less than 24 months (Chi(2); 4.441, df;1, and p = 0.025). There were no significant associations between defaulted children and gender, residents and distances to OTP service. Logistic regression identified four significant contributing factors to high defaulter rate: new admission in the programme (OR 6.904; 95%CI: 1.089-43.788), MUAC entrance criteria less than 115 (OR 0.247; 95%CI: 0.115-0.533), z-sore less than -3SD (OR 9.236; 95% CI: 4.940-16.475) and length of stay in the programme more than 42 days (OR 6.353; 95% CI: 3.623 – 11.022).
Conclusions: Low recovery and high defaulter rates of children with SAM were identified as a major determinant of a performance indicator values in these communities.

Keywords: Severe acute malnutrition, Children, Yemen

INTRODUCTION

Malnutrition among children under five years-old is a common public health problem worldwide and a major cause of high morbidity and mortality among children in developing countries.[1,2] The disease and its associated problems constitute a hidden disability, putting children at risk of death or impairment of mental, social and physical growth and development, a disadvantage from which they cannot recover.

Severe Acute Malnutrition (SAM) is defined as severe wasting with weight-for-height ratio of less than -3 standard deviations below the median reference population or weight-for-height ratio of below 70% or presence of nutritional oedema.[3] It is widely seen in children, contributes to more than half (53%) of mortality among under-five children in low resource countries.[4]

In Yemen, the state of food security and nutrition comes into the front sight. It has been estimated a total of 10 million people suffering from food insecurity. This

together with Poverty, conflicts, resource depletion, underdevelopment, drought, lack of basic infrastructure, and poor health services all combined to increase the risks of malnutrition in children and in the targeted populations.[5] It has been indicated that chronic malnutrition among children under five years old were remarkably high, reaches over a half (53.1%), while acute malnutrition comes to 13 percent.[6,7] With regard to WHO standards, the rate of severe cute malnutrition makes Yemen in a serious phase.[8]

In 2008, Yemen had launched a national guidelines for the management of severe malnutrition (YNG), adopted from the original WHO guidelines.[9] The YNG program is composed of two arms; Outpatient Therapeutic feeding Program (OTP) and Inpatient Therapeutic feeding centre (TFC). The inpatient TFC program is a hospital level program and has been known to provide better health care for severely malnourished children but however, issues of limited hospital capacities, long stay and having to be away from work and family, high cost of service and transportation makes TFC is to cover only complicated SAM cases, constitutes between 4% to 10% of children with SAM.[10,11]

Community-based management of acute malnutrition (C-MAM) is a package of treatment, treating uncomplicated SAM children at community level with regular organization and follow up on weekly basis from OTP clinic. it composed of Ready-to-Use Therapeutic Food (RUTF); de-warming tabs; antibiotics; vitamin A supplementation; folic acid; anti-malaria (if required); and measles vaccine for children with low coverage; while children with poor appetite and those with related complication are transferred to the inpatient TFC.[12]

C-MAM programme have been effectively implemented in a number of low resource countries and found to be more affordable, acceptable, and accessible and the performance indicator values have been effectively achieved with cure rate more than 90%, death rate less than 2% and defaulter rate less than 10%.[13-16] It is now implemented in a number of districts in Yemen with an organization from Ministry of Public Health and Population (MPH&P) and/or external partners. However, little is known about the performance indicator values of C-MAM programme. One current study carried out in Al-Gumhouri Hospital at Sana'a (Yemen) reported a significant reduction of the mortality rate from 18.4% to 7% for inpatient TFC, but no studies about the outcomes of OTP programme.[17]

In order to obtain accurate information about the performance indicator values of C-MAM programme in Yemen, a retrospective cohort study was carried out among a vulnerable group, namely children aged 6 months to 59 months old. The objective of the study was to assess the performance indicator values in terms of recovery, default, transfer, and mortality rates in comparison to the global SPHERE standards.

METHODS

Study design and location

A retrospective cohort study was conducted among children aged 5-59 months suffering from severe acute malnutrition over a period of two years extending from 5th October 2011 to 5th October 2013. The study was carried out in Al-Mukala Mother and Child Health hospital in the Hadramouth Governorate, south-east Yemen. Al-Mukalla MCH hospital is a central referral hospital serving a catchment area of Hadramout, Al-Mahra, Shabowa and Socotra Governorates representing half the area of Yemen.

Study participants

All children aged between 6 – 59 months attending the nutritional clinic for treatment of SAM under OTP at AL-Mukala MCH hospital were eligible for the study. The study covers both children from Urban and rural settlements. Urban were defined as those who lives in Al-Mukala city while rural were defined as those living in the mountains.

Inclusion criteria: severely malnourished children aged 6-59 months, having Mid Upper Arm Circumference (MUAC) of less than 115mm or weight-for-height ratio of less than -3 standard deviations below the median reference population or weight-for-height ratio of below 70% or presence of nutritional oedema with good appetite and no major medical complication.

Exclusion criteria: children with comorbidities, children with chronic illness and children with congenital anomalies.

Sample strategy and procedures

Identification

Detailed information were conducted from the registration book including date of admission, unique SAM number, type of admission; either new admission or transfer in from inpatient TFC or re-admission defaulter, name, age, sex and address.

Anthropometrics

Anthropometric measurements on admission and discharge were conducted and involve weight, height, oedema, MUAC and date of discharge.

Outpatient therapeutic feeding package

The OTP programs were run on a weekly basis. The treatment package is composed of feeding with RUTF; a formula designed for SAM to rapidly gain weight, and routine medicines including vitamin A, folic acid, systematic antibiotics and de-warming medicine.

Table 1: OTP treatment package.

Treatment package	Details
RUTF	Daily 200 Kio/kg
Vitamin A	Single dose in the 4th visit
Folic Acid	Single dose at 1th visit
Amoxicillin	Daily for 7 days
Measles vaccine	Single at 4th visit (for low coverage)
Albendazole	Single dose at 2nd visit

Yemeni Nutritional Guidelines for management of SAM, 2008.

Outcomes

Cured, defaulter, death and transfer rates were assessed according to Yemen National Programme definitions (Table 2).

Table 2: Definition of performance indicator values in C-MAM programme.

Indicator	Definition
Cure rate	defined as participants that reached the discharge criteria= No of patient discharged for recovery / Total No of exits
Death rate	Patient that has died while he was in the programme or in transit to another component of the programme but has not yet been admitted to that facility. Represented as No of patient died in the programme / Total No of exits.
Default rate	Defined as absent for two consecutive weighing confirmed by home visit. as we cannot reach to accurate information in the category of defaulters wither they have defaulted, moved away or being dead, the term defaulter were used as it has documented in registers. Represented as No of defaulters / Total No of exits.
Transfer rate	Transfer is defined as patients referred to in-patient care or to another OTP programme. No of patient transferred from OTP programme /Total No of exits

Data management and analysis

All participants were assigned a unique personal identification number (PIN) and used for data collection procedures. Descriptive tables were prepared of the characteristics of children and the data were compared for urban and rural locations. The general characteristics are described. Tests for statistical significance have been assessed using chi square for difference in proportions. SPSS18 statistical software was used for analysing the objectives.

RESULTS

A total of 303 children aged 6 months to 59 months and have been diagnosed with SAM were enrolled in the study. Over half of SAM cases were girls (169: 58.8%); children aged 6 months to 24 months were found to be higher than older children (192: 63.4%); up to three quarters of cases were came from urban settings (224: 73.9%), similar figure of SAM cases have found the access to the OTP clinic was with less than one drive hour (217: 71.6%). Entrance criteria into the OTP program have found a majority of SAM cases were with Z-score <-3 (300: 99%), together with MUAC (73: 24.1%) and interestingly, no SAM cases have found with oedema (Table 3).

Table 3: Demographic characteristics of the studied Severe Acute Malnutrition cases.

SAM Cases		Number	Percentage
Gender	Boys	134	44.2%
	Girls	169	58.8%
Age group	<24 M	192	63.4%
	>24 M	111	36.6%
Place of living	Rural	79	26.1%
	Urban	224	73.9%
Distance by car	<1 hour	217	71.6%
	>1 hour	86	28.4%
Admission status	New	226	74.6%
	Re admission	77	25.4%
Parents can reed	Yes	157	51.8%
	No	146	48.2%
Z Score entrance criteria	< - 3	300	99%
	> -3	3	1%
MUAC entrance criteria	< 11.5	73	24.1%
	> 11.5	230	75.9%
OEDEMA entrance criteria	Yes	0	0%
	No	303	100%

Table 4: Performance indicator values of the OTP programme compared to the SPHERE project reference values.

Performance indicators	Study outcomes	The SPHERE project reference values	
		Acceptable	Alarming
Cure	10.2%	>75%	<50%
Death	3.3%	<10%	>15%
Defaulter	80.2%	<15%	>25%
Length of stay	40 days	<28 days	>42 days

An important finding in this study was the substantial performance indicator values of the 303 SAM cases admitted into the OTP programme in comparison to the

SPHERE project reference values. The performance indicator profile have showed; a lower cure rate (10.2%), acceptable death rate (3.3%), striking high defaulter rate (80, 2%), and median stay in the programme of 40 days (Table 4).

In children who defaulted from the programme, a Chi-square test for independence (with Yates continuity correction) indicated significant association to children aged less than 24 months (Chi(2); 4.441, df;1, and p = 0.025). There were no significant associations of defaulted children to gender, location, and distances to OTP clinic: (Chi(2); 0.764, df; 1, and p = 0.246); (Chi(2); 0.001, df;1, and p = 0.582), and (Chi(2); 0.113, de;1, p = 0.460), respectively.

Table 5: Association between defaulter status and demographic characteristics of SAM cases.

SAM Cases Profile		Defaulter rate Yes N (%)	No N (%)	Chi(2)[a]	df[b]	P value[c]
Gender	Boys	110 (82.1)	24 (17.9)	0.764	1	0.246
	Girls	143 (84.6)	26 (15.4)			
Age group	<24 M	25 (13)	167 (87)	4.441	1	0.025
	>24 M	6 (5.4)	105 (94.6)			
Residency	Rural	8 (10.1)	71 (89.9)	0.001	1	0.582
	Urban	23 (10.3)	201 (89.7)			
Distance by car	<1 hour	23 (10.6)	194 (89.4)	0.113	1	0.460
	>1 hour	8 (9.3)	78 (90.7)			

a: Pearson Chi-Square, b:degree of freedom, c; Fisher's Exact Test

Table 6: Logistic regression of contributing factors to high defaulter rate among children with SAM from OTP programme.

Risk factor	Odds ratio (95% CI)	p-value
Age (1)	0.598 (0.269 - 1.331)	0.208
Resident (1)	1.490 (0.644 - 3.447)	0.352
Presentation (1)		
• Direct	0.396 (0.062 - 2.548)	0.329
• Internal	0.233 (0.024 - 2.236)	0.207
• Volunteer referral	0.459 (0.065 - 3.237)	0.434
Admission (1)		
• New	6.904 (1.089 - 43.788)	0.040
• Re-admission	8.436 (0.990 - 71.852)	0.051
MUAC (1)	0.247 (0.115 - 0.533)	0.000
ZSCORE (1)	9.236 (4.940- 16.475)	0.000
Length of stay (1)		
• 1- 28 days	0.547 (0.189 - 1.453)	0.125
• 29-42 days	1.8712 (0.783- 3.542)	0.183
• >42 days	6.353 (3.623- 11.022)	0.001
Gender (1)	1.396 (0.704 - 2.767)	0.340

a. Variable(s) entered on step 1: AGE, RESIDENCY, REFFERED, ADMISSION, MUAC, ZSCORE, STAY, GENDER

Logistic regression was performed to assess the association of a number of factors on the likelihood that children with SAM would have defaulted from OTP management programme. The model contained eight independent variables; age, sex, residents of children, mode of presentation to the programme, admission in the programme either as new cases or readmission, MUAC entrance creteria, z-score entrance criteria and length of stay in the programme. The full model containing all predictors was statistically significant; chi (13) = 44.610, p < 0.001, indicating that the model was able to distinguish between children with SAM have defaulted from the programme and those not defaulted. The model as a whole explained between 13% (Cox and Snell R square) and 23% (Negelkerke R square) of the variance of defaulters, and correctly classified 84.2% of cases. The table shown four of the independent variables made a unique statistically significant contribution to the model; new admission in the programme (OR 6.904; 95%CI: 1.089 43.788), MUAC entrance criteria less than 115 (OR 0.247; 95%CI: 0.115 - 0.533), z-sore less than -3 SD (OR 9.236; 95% CI: 4.940-16.475) and length of stay in the programme more than 42 days (OR 6.353; 95% CI: 3.623 - 11.022).

DISCUSSION

In Yemen, Severe Acute Malnutrition (SAM) is remaining a public health problem and an important preventable cause of under five deaths and illnesses. This study is among very little studies having assessed the performance indicator values of C-MAM programme in Yemen.

The study indicates that the overall SAM cases entered into the OTP programme were non-oedematous SAM (marasmic), with z-score less than -3 and MUAC less than 115mm. This is in corroborate with a study in Sana'a (Capital of Yemen) have tested 100 cases with

SAM and found an 83%, 9%, and 8% were marasmic, kwashiorkor, and marasmus plus kwashiorkor, respectively.[17] This could be explained by the conditions of drought, poverty, illiteracy and conflicts which make parents to give a little, inadequate and insufficient foods required for body metabolism of the growing childhood and thus, enhance utilization of energy from other body sources including fats and muscles given up a state of marasmus.

Important findings of this study were the substantial performance indicator values of the OTP programme, indicating that the majority of SAM children are more likely to continue suffering from this condition. In comparison to the performance indicator values of SPHERE project, the current study has indicated low recovery rate (10.2%) and high defaulters (80.2%).[18] Both exceeded the minimum acceptable standards and alarming, while the median length of stay in the programme was 40 days, which is higher than the minimum acceptable standard of SPHERE project. Findings are in corroborating with the study by Al-Zoa et al.[17] From Yemen, have followed 82 SAM children at OTP programme in Sana'a and yields cure rate at 48%, which is lower than the minimum acceptable standard and 52% discontinued from the programme. In contrast, optimistic results have been reported in a number of small emergency nutrition interventions by international non-governmental organizations (INGOs).[19] Semi-quantitative Evaluation of Access and Coverage (SQUEAC) report of Save the Children International (SCI), at Al-Qanawis district, Hudeidada Governorate (Yemen) have summarized the outcome of the project and found a 99.3%, 0.1%, and 0% for cure, death and defaulter rates respectively (SCI; non-published data). However, this is a small project and success may occurs due to the external supervision and Community Outreach Worker (COW) components in the project responsible for case finding, nutrition counseling, carrying RUTF to the homes of absent SAM children, referral and follow up visits. In similar countries where SAM burden is high, the performance indicator values of the OTP programme are varied. The study by Collins and Sadler from Bedawacho-Ethiopia, found 85% recovery rate, Shanka et al.[16,20] From Ethiopia found 67.7% recovery rate, Linneman et al.[21] From Malawi found 89% recovery rate, study by Rawat and Marskole from India have found recovery rate at 63.3%, while defaulter rates from the programme in these studies were less than 10%.[22] Other studies have found high defaulter rates including the study by Saaka et al.[23] From Ghana have found low recovery rate (33.6%) and high defaulters (49.1%), another two studies from India have found defaulter rates at 36.2% and 45% respectively.[24,25] High defaulters of SAM children from C-MAM programme are believed to cause a substantial recovery and death rates.

The risk factors for increasingly defaulted children from SAM programme are many. Country instability, poverty, low maternal education, drought, poor nutrition governance policy, lack of service delivery and supply, poor referral, monitoring and supervision mechanism are known to contribute to high defaulter rates in these communities.[26,27] The current study had revealed significant association between high defaulter rate and children aged less than 24 months (Chi(2); 4.441, df;1, and p = 0.025). No significant association was found between gender, residency of children, distances of SAM children to OTP centre, parent education; whether mother can read or not and overall cure and defaulter rates. The four factors found to have the strongest association with high defaulters from the OTP proramme in this study were; new admission in the programme, MUAC entrance criteria less than 115, z-score sore less than -3 SD, and longer stay in the programme. Findings of this study are partly in agreement with current evidence by Burza et al.[24] From India have found; no community referral for admission, more severe wasting on admission, younger age, and a long commute for treatment as a significant risk factors for defaulted children with SAM from the programme. Despite C-MAM have achieved good success in many low resource settings and appeared to be cost-effective and feasible in treating uncomplicated SAM children in community level, the increasing level of defaulters from the programme are adversely affecting the performance indicator values and reduces the impact of C-MAM.[28,29] Contributing factors to high defaulter rates are need to be addressed and efforts are to continue to improve on these factors.

The strength of this study is that it assessed the performance indicator values of C-MAM in public sector where no externally programme management and it involves SAM children from over half the area of Yemen. However, it thus has limitations. The study does not assessed coverage of C-MAM programme in these communities, which is an important component of the impact of an intervention, and thus, it may underestimate the number of children suffering from SAM.[30,31] Second concern is that the study is retrospective cohort, based on data from records which may be biased, however, data collectors in the programme were well trained according to Yemen National Programme on Management of SAM, minimizing the risk of bias. Third concern is high defaulters from the programme as it has been indicated in the study, which their outcomes were unknown and it thus, may underestimate recovery and case fatality rates. Such a probability is high but in the current study, the international SPHERE project indicators were used as a reference for performance indicator values of the C-MAM programme.

CONCLUSION

Low recovery and high defaulter rates of children with SAM from C-MAM programme were identified as a major determinant of a performance indicator values in these communities. There is a need for better understanding of risk factors and barriers for substantial performance indicator values in these communities and to

improve on these factors in order to reduce the burden of under-five morbidity and mortality.

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