ORIGINAL PAPER

Set Criteria in the Management of Severely Malnourished Children in Zambia: Evidence from the Evaluation of an 'Outpatient Therapeutic Care Program (OTP)'

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ABSTRACT

Background*:* Severe malnutrition is still a leading cause of morbidity and mortality in sub-Saharan Africa. The Outpatient Therapeutic Care Program (OTP) is one of the interventions that seek to reduce the burden associated with severe malnutrition in children. Performance of the OTP against the Integrated Management of Acute Malnutrition (IMAM) set criteria in the selected public health facilities in Lusaka urban, Zambia was evaluated.

Methods: Records of children (n=828), discharged from OTP between September 2005 and September 2007 in eleven health centres where this program was running, were evaluated for performance. The selection process adapted a multistage sampling technique using proportional to size approach in order to get the number of records for each site. Performance was determined by developing a compost indicator from weight gain, length of period of stay in the OTP, recovery rate, default rate and mortality. Logistic regression was used to assess performance and its determinants. In addition, a sampling frame of health care staff working in the OTP was made for each health facility from which twenty five of them participated in in-depth interviews assessing corroborative evidence for performance of the program (results reported elsewhere). Health facility and sex were used as indicator for completeness of data and as a measure for non-participation. Lack of completeness of records was the most important cause of non-response.

Findings: Overall prevalence of good performance was 86% (n=828). However, the study showed contrasting differential performance by health facility (Ranging from 73% for N'gombe to 100% for Matero). Disaggregating the composite indicators revealed that 60% of children gained acceptable weight (above 4 g per kg body weight per day, mean weight gain of 5.7 g per day, SD 1.2); 75% stayed less than 60 days recommended (median length of stay of 48 days); Recovery rate of 59%, 31% default rate and 3.2% death rate. In multivariate logistic regression, source of admission and appetite were the main determinants of performance. Poor performance was associated with referrals from a health facility (Prevalence, 86.7%; OR=0.01, 95CI%CI 0.001-0.301) and reported lack of or inadequate breastfeeding at the time of admission to the program (OR=0.481, 95%CI 0.27-.85).

Conclusion: Good overall program performance of the OTP suggests high feasibility to fight severe malnutrition in this setting. However, it was not clear how some factors such as poor appetite affected performance, suggests that there may be interplay of factors at work and further research is needed to explore them. Nonetheless, finding that breastfeeding was associated with good performance suggests how important this factor might be to child survival as a whole. Inversely, its lack could be pointing to limitations to breastfeeding interventions in the community.

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INTRODUCTION

Severe Malnutrition continues to be an important public health problem in many poor and or crisis ridden countries suggesting an immediate need to adjust existing setting specific prevention and management efforts. The

existence of huge resource and competence associated challenges further suggests the need to identify and prioritize these preventive management efforts. Clearly, therapeutic programs are still needed as "safety nets" in parallel with prevention programs. In Lusaka, Zambia the Outpatient Therapeutic care Program (OTP) component of the Integrated Management of Acute Malnutrition (IMAM) program is one such example.

In Zambia severe malnutrition is associated with a mortality rate of 73-187 per 1000 children per year[1]. Currently, wasting stands at 5%[2]. Like elsewhere with similar environment, factors associated with severe malnutrition include poverty, low education and poor access to health services including reproductive health and family planning[3,4]. The IMAM programs consist of several components; Inpatient Therapeutic Programme (ITP), Outpatient Therapeutic Programme (OTP), Supplementary Feeding Programme (SFP) and Community mobilisation. There were limitations associated with inpatient care based measures (which served as the major program for treating severe malnutrition before IMAM program) to which among others included poor coverage, high program expenditure, cross contamination between patients and care givers, as well as longer stay of caregivers causing them to have insufficient time to care for other household members. Given these limitations, very little impact has been realised by such approaches[4-6]. Community based approaches such as the IMAM program are therefore increasingly being preferred to in-patient strategies.

The IMAM program in Zambia therefore, aims at treating severely malnourished children at home and only referring those with complications for inpatient care[5]. It has been suggested that such a program might be enabling for timely detection of severely malnourished children in their communities[5-7], use and build on existing capacities, and might make the services easily accessible[5]. In Zambia, IMAM program was introduced in 2005 in Lusaka district[8]. It is currently being implemented in many health facilities.

We examined the performance of the OTP program in Lusaka against a set of predetermined indicators.

METHODS

Population and sampling procedures

The data stem is from records of children cohorts discharged from the OTP program (n=828) from September 2005 to September 2007 in selected health facilities serving defined catchment areas using stratified random-multistage sampling method.

The sampling frame consisted of 11 health facilities (8 were in high density areas and 3 in medium to low density areas) with 2424 records. The health facility defined the primary sampling unit (cluster) of the study and at first stage 100% sampling of health facility was adopted. In the second stage and using probability proportional to size, 828 records were selected out of the 2424 records. All records that satisfied the entry criteria for this evaluation in the selected clusters were enrolled for evaluation in the study. At health facility level, systematic random selection was used to get the records.

Data collection, entry and analysis

In the sampled clusters (health centers) and using trained assistants, a structured checklist was used to collect information on social demographic characteristics, weights, defaulting, length of stay and deaths and associated information on all eligible records. Data collection tool was pretested for completeness and user-feasibility in another health facility which was not part of the centres selected for this study. The collected data was entered in Epi data (Version 3.1, Denmark) where inconsistencies and thorough checks for errors were carried out.

Analysis

Analysis was mainly guided by proximate determinant conceptual framework adapted from Davis and Blake (1956). Statistical Package for Social Sciences (SPSS, Chicago, Illinois, USA) version 15.0 was used for main analysis, The associations between performance and its predictors were measured using logistic regression models. Aggregated performance of the program was determined by composite indicator computed using SPSS using sensitivity and specificity multi-level principles. The distribution of age as a continuous variable conformed to normality as assessed by probability plots. Model diagnostics were done using the maximum likelihood estimation (MLE) and the Hosmer-Lemeshow goodness-of-fit. The variables in the model were age, sex, residence, religion, state of and distance to health facilities, source of admission, support status, appetite status, illness and treatments provided.

Ethical approval

The survey protocol received clearance from the University of Zambia Research Ethics Committee and the Lusaka Urban District Health Management Team (LUDHMT). In addition, participation in the evaluation

survey was based on granted permission to access records at the local health facility.

RESULTS

Participation and distribution

Overall of the 828 listed records, 803 (48.9% males; 51.1% females) were enrolled (Table 1).. Non-participation was due to incomplete data or missing record (3.5%). The missing records were mostly due to filing challenges. Of the *de facto* eligible and successfully collected records evaluated 8.1% were from Bauleni, 25.2% Chawama, 1.3% Chelstone, 3.5% Chilenje, 10.4% Chipata, 6.5% George, 15.7% Kamwala, 11.2% Kanyama, 7.1% Matero ref, 4.7% Mtendere and 6.2% Ngombe. Only the records with completed data were included in the final analysis

Table 1: Description of Factors of Performance

Variable	Frequency	%
Health Centre		
Bauleni	67	8.10
Chawama	209	25.2
Chelstone	11	1.30
Chilenje	29	3.50
Chipata	86	10.4
George	54	6.50
Kamwala	130	15.7
Kanyama	93	11.2
Matero ref	59	7.10
Mtendere	39	4.70
N'gombe	51	6.20
Sex of children		
Female	410	51.1
Male	393	48.9
Age at admission		
0-5 mths	3	0.40
6-11 months	137	17.5
12-23 months	470	59.6
4-59 months	178	22.6
People in HH		
<6 People	339	59.3
6-12 People	220	38.4
>12 People	13	2.30
Distance to health Facility		
<10 minutes	118	18.4
11-30 minutes	351	54.8
31-60 minutes	149	23.3
61-120 minutes	19	3.00
>120 minutes	3	0.50

n-828, based on the response rate

Performance

Overall, 85.8% (range 73-100%), of the children subjected to OTP showed good performance using aggregated indicators (Table 2). Out of the total of 780 exits, 59% (95%CI 55.5%-62.4%) were cured, 31% (95%CI 27.8%-34.3%) defaulted and 3.3% (95%CI 2.1%-4.6%) died. Of the 460 record cards that showed discharge as cured, 60.3% (95%CI 55.7%-64.7%) had gained weight above 4 grams per day while 39.7% (95%CI 35.3%-44.3%) gained below 4 grams per day. The mean weight gain was 5.7 g (SD 4.89, 95%CI 5.3-6.2) /kg/day. It further showed that 74.7% of children cured stayed less than the recommended 60 days in the OTP, while 25.3% stayed longer. The mean length of stay was 48.0 (SD 22.9 days, 95%CI 45.9-50.15). The transfer rate was 4.6%, refusal of transfer 0.1% and non cure rate 1.9%.

Evaluation of Factors Associated with Performance

In the regression model, factors used to assess performance were identified as state of health facilities, sex, age, distance to health facility, source of admission, support status of child, appetite status of child, illness and treatments provided.

Performance of children varied across the health facilities, ranging from 73% in Ngombe to a performance of 100% in Matero Ref (OR, 0.58; 95%CI 0.37-0.89). Children from Chelstone 75.0% (OR, 2.82; 95%CI 1.12-7.13) and Kanyama 80.5%, (OR 4.67; 95%CI 1.46-14.95) performed better. Performance was also significantly higher in year 1 (2005-2006) than year 2 (2006-2007) of the program (91.7% vs. 83.4%, P=0.038). However there were no performance differences by age group (OR 1.24; 95%CI 0.96-1.61-Table 3) and by sex, although females tended to perform poorer than males (OR 0.28; 95%CI 0.03-2.44-Table 3) as well as history of illness or treatment.

However, performance tended to be better in children referred from particular centres and with good appetite which had 85.5% likelihood of good performance (OR 0.009; 95%CI 0.00-0.67).

Although breastfeeding was uncommon (26.9%) among children who were admitted to OTP, it was significantly associated with good performance (77%, OR 2.08; 95%CI 1.17-3.70).

The analysis of goodness of fit using the Hosmer and Lemeshow test, and the Nagelkerke R Squared test both indicated that between 39.9% and 61.0% of the variability is explained by the variables in the model.

Table 2: Summary of Outcomes

	Factor	Performance	Description
Key Outcome Variable	1.Weight gain	60.3% (n=453/460) (5.7g/kg/day)	Weight gain >4g per kg per day is recommended (CTC Manual, 2006)
	2.Length of stay	74.7% (n=459/780)	<60 days
	3.Cure	59% (n=460/780)	>75%
	4.Default	31.1% (n=242/780)	15% exits is recommended CTC Manual 2006, and Sphere, 2006.these are children who were absent for 3 consecutive weeks
	5.Dead	3.20% (n=26/780)	10% of deaths is the highest recommended by CTC criteria, 2006 and Sphere standards, 2004
	Average of Factors	71.9%	This is the average of the five key factors above
Composite Variable	Desirable	85.8% (n=388)	children who performed well when processing the composite indicator
	Undesirable	14.2% (n=64)	Children who d id not meet the composite criteria of having performed well.
Other variables	transfer rate	4.60% (36),	Children whose condition deteriorated and required inpatient therapeutic or hospital care
	refusal of transfer	1% (1)	
	non cure rate	(1.90%).	Children who had not reached discharge criteria within 4 months
		Good	**Bad**
Health Facility	Bauleni	(33) 89.2%	(4) 10.8%
	Chawama	(99) 88.4%	(13) 11.63%
	Chelstone	(6) 75.0%	(2) 25.1%
	Chilenje	(17) 94.4%	(1) 5.60%
	Chipata	(40) 87.0%	(6) 13.0%
	George	(31) 76.9%	(9)23.1%
	Kamwala	(63) 92.6%	(5) 7.40%
	Kanyama	(33) 80.5%	(8)19.5%
	Matero ref	(20) 100.0%	(0.0) 0%
	Mtendere	(18) 75.0%	(6)25.0%
	N'gombe	(28) 73.0%	(10) 27.0%

*NB: Composite indicator was made of 5 different indicators -weight gain, length of stay, cure, default rate and death rate. Sample size for performance was 460/828 as performance was based on children who were discharged as cured. Default, death, transfer refusal and non cure rates were based on sample size of 780. Definitions are f rom CTC Field Manual, 2006

DISCUSSION

Overall, children admitted to the OTP program performed well (85.8%) using the five program evaluation indicators decided aprior. The findings are similar to reports by Grobler[9], and Collins[10], who reported that the OTP prevents further illness and death among the severely malnourished children. However, this study has shown contrasting differential health centre specific performance levels ranging from 73% for N'gombe to 100% for Matero Reference. A similar situation was observed between the two project years with high performance seen in the first project year.

It is possible that biases may have influenced these findings in each of the 5 factors that were used to measure performance. Of all possible biases it is likely that the selection bias had a least impact if present. It is the measurement biases if present that could have impacted on these findings. Weight measurements for instance have been used as the best measure of children's growth worldwide. It is further recognised that weight measurements are also prone to accuracy and reliability challenges and this could be attributed in part to poor training of health care staff taking measurements regarding the readings on the recommended Salter scale[11]. However, evaluating the measurement tools was not part of this study making it difficult to estimate the effect of

Table 3:Logistic Regression Results for Children's Records

	Prevalence	Univariate	Multivariate
	Total(%)	OR (95% CI)	OR (95% CI)
Variable/outcome			
Health centre: All	(386) 85.8	0.93 (0.85-1.00)	**0.58 (0.37-0.89)**
Bauleni	(33) 89.2	1	
Chawama	(99)88.4	3.06 (0.861- 10.83)	
Chelstone	(6)75.0	**2.82 (1.12- 7.13)**	
Chilenje	(17)94.4	1.11 (0.192- 6.44)	
Chipata	(40)87.0	6.29 (0.738- 53.69)	
George	(31)76.9	2.47 (0.803- 7.59)	
Kamwala	(63)92.6	1.23 (0.44- 3.49)	
Kanyama	(33)80.5	**4.67 (1.46- 14.95)**	
Matero ref	(20)100.0	1.53 (0.53- 4.41)	
Mutendere	(18)75.0		
ⁿ"ᵐᵘⁿⁱ	(28)73.0	1.11(0.343- 3.59)	
Age: All	(367)85.9	1.04 (0.995-1.08)	1.24 (0.96-1.61)
6-11 months	(47)77.0	1	1
12-23 months	(237)88.1	0.57 (0.25-1.29)	0.00 (0.00-1.58)
24-59 months	(83)85.6	1.25 (0.63-2.46)	0.45 (0.00-81.7)
Breastfeeding: All	(77)76.8	**2.08 (1.17-3.69)**	1.87(0.18-18.9)
Yes	(76) 76.8	**1**	
No	(268) 87.3	**0.48 (0.27-0.85)**	
Sex :- All	(372)86.3	1.59 (0.91-2.77)	0.28 (0.03-2.43)
Female	(179)83.6		1
Male	(195)89.0	0.63 (0.36-1.10)	4.11 (0.17-99.3)
Support status-mother: All	(326)85.6	3.156 (0.41- 24.13)	
Alive	(308)85.1	1	
Dead	(18)94.7	0.32 (0.04-2.42)	
Distance to healthy facility	(302)86.0	1.01 (0.99- 1.03)	1.01 (0.96-1.06)
<10 minutes	(57)85.1	1	1
11-30 minutes	(168)86.6	1.13 (0.51-2.49)	1.86 (0.03-115.6)
31-60 minutes	(71)84.5	0.96 (0.39- 2.34)	24.5 (0.06-10519.1)
61-120 minutes	(6)100.0		
>120 minutes	()%		
Total people in hh:- all	(265)84.4	0.99 (0.87-1.13)	1.66 (0.78- 3.50)
<6 people	(158)84.9	1	1
6-12 people	(100)83.2	0.88 (0.47- 1.64)	0.31 (0.01-12.6)
>12 people	(8)88.9	1.42 (0.17- 11.7)	
Source of admission:- all	(315)85.1	**1.71 (1.063-2.754)**	**0.01 (0.00-0.30)**
Community	(100)80.0	1	1
Health facility	(176)86.7	0.31 (0.09- 1.08)	
Inpatient	(39)92.9	0.50 (0.14- 1.74)	
Readmission: yes	(22)10.4	0.50 (0.11-2.23)	
No	(189)86.6		
Appetite	(377)85.5	0.93 (.57- 1.54)	**.01 (.00-.67)**
Diseases	(364)85.8	0.57 (0.12- 2.81)	
Treatments	(57)80.3	1.31(0.39-4.40)	4.04 (0.02-714.5)

this bias on these findings. Other measurements such as length of stay of the child in the program, recovery rate, default and death rate were less likely to present with errors as they were measured from the weekly follow up and not reported by caretakers. Default rates were not well investigated in the program therefore, what may be reported as high default could be some death or self referral to inpatient or migration of families. It seems reasonable to assume that default rate may have been over reported and probably death rates and transfers under reported in this study. If this is true, the study may therefore have under estimated the performance of children. We further argue that selection bias may not be important explanation of the possible biases given that non response rate was only 3%. This argument is further supported by the fact that the records of children not included in the study were from homogenous group of the same age range and the social economic characteristics, and did not differ from those whose records were included.

Source of admission of children appear to be a major cause of poor performance (OR, 0.01, 95%CI 0 00-0.30) most likely due to poor health care seeking behaviour as majority (56.6%) of children were referred from health facilities indicating deteriorated health status which makes the process of recovery slow. This may even be worse for children referred from the community as health care may not yet be initiated. Furthermore it may not be surprising to see that poor appetite and source of admission were found to be associated with performance. Given that case finding is not frequently done in the communities and that in most cases children are discovered to be malnourished when they are sick with illnesses such as diarrhoea and ARI which worsens nutrition and appetite status of children, could partly explain this finding. This further underscores the importance of linking health facilities with community based programs and surveillance systems. One such community based program which can be monitored at community level is breasting feeding and associated practices.

In this study lack of breastfeeding was a risk factor of poor performance (OR 0.48; 95%CI 0.27-0.85) and this was not surprising given its significant role in child survival especially in reducing nutritional consequences, morbidity and mortality already known[12-19]. However, breastfeeding rate among children admitted to OTP was very low suggesting poor adherence to feeding recommendations despite several Infant and Young Child Feeding (IYCF) trainings already taken place in Lusaka district. While it is clearly known that breastfeeding reduces incidence of malnutrition, diseases[12-15,18] and mortality[16,17] if adhered to properly, it is unclear why it is not practiced always in communities. studies have

reported low family income, low maternal age, primiparity and mothers returning to work[20,21], beliefs among mothers and health care staff and routine hospital practices[22] as factors that may interrupt or hinder breastfeeding.

Furthermore, finding that age and support status of children was not associated with performance was rather surprising and unanticipated especially that the majority of children admitted were those in the age range 12-23 months. Other studies have demonstrated that this is the age when malnutrition is most likely to occur[23-25]. During this period rapid growth is accompanied by poor quality and unsafe complimentary feeds, hence most detrimental to growth rate. Linked to feeding issues is the general care of a child. During the period under study, care was determined by the presence of a mother at admission who was likely to provide the needed care promptly as this is important for child survival[26]. It would have been interesting to assess these associations with other important factors such as mother's or carer's educational level and income status, but data on these was not collected by the program. Nonetheless, the type of health facility that a family uses may be a proxy indicator of their social economic status but in this study all the eleven health facilities seemed to cater mostly for the low income groups in terms of OTP services hence differential effects may not be important factors in explaining findings.

The findings of this study are in line with the proximate determinant conceptual framework. We believe that attempt to address malnutrition in all its forms is a critical factor on all fronts that seek to reduce disease burden globally. However, it is important to remember that malnutrition results from inadequate food intake, poor food utilisation in the body and disease which are linked to food security, health seeking behaviour, environment conditions, quality of health services and many other factors, and that preventive and restorative programs must never address these individually. This raises important issues linked to structural complexities, contextual considerations, specific behavioural orientations as well as biological factors that must be known and addressed. It seems reasonable to conclude that the OTP program under consideration seems to be making attempts to understand these factors and that performance level being reported might be an indicator of high impact potentials for addressing severe malnutrition in low income countries. However, low breastfeeding late presentation of children to health care suggests structural problems and presence of poor health care seeking behaviour and child cares practices which have further potential to worsen malnutrition thus poor growth.

We conclude that the OTP of the IMAM program is an important public health intervention which has high potential to significantly contribute to the reduction of associated burden of severe malnutrition. However

planners and program officers need to understand the structural and behavioural challenges suggested which reflects presence of complex interactions and pathways needing further studies. The importance of this is that the program has potential child survival[6].

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