

ORIGINAL RESEARCH ARTICLE

Outcome Evaluation of Community Management of Severe Acute Malnutrition in Some Selected Outpatient Therapeutic Programme Centres of Katsina State, Nigeria

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ABSTRACT

Severe acute malnutrition remains a major public health problem, especially in developing countries. In this study, a retrospective and on-site assessment of the effectiveness of the community management of acute malnutrition (CMAM) program in four (4) Outpatient Therapeutic Programme (OTP) centres of Katsina and Daura Local Government Areas of Katsina State was carried out from January 2021 to December 2021. Assessment of CMAM performance indicators, anthropometric indices, oedema, the biochemical and haematological status of children with severe acute malnutrition (SAM) and a follow-up assessment of probable relapse 8 weeks after discharge was carried out. The result indicated that both the treatment (87.90% and 94.44% at Katsina and Daura OTPs respectively) and geographical coverage (20.00% at both Katsina and Daura OTPs) in the present study were higher than the values for the retrospective study. Outcome measures of CMAM in the Katsina OTPs showed a cure rate of 95.0% and 97.3% in the retrospective and current studies, respectively. While in Daura OTPs, the cure rates were 86.8% and 93.52% respectively for the retrospective and the present study. Result for the growth performance and recovery indices have shown higher percentages in normal range values for mid upper arm circumference, weight for height and Oedema among the SAM children at the point of discharge over the values at the admission. In fact, all the children that presented with oedema in both OTPs at admission did not have oedema at the point of discharge. In addition, there was a significant improvement in biochemical and hematologic indices in SAM children at discharge compared to the values at admission ($p < 0.05$). Findings of the study have indicated a good performance of CMAM program in OTP centers of Katsina and Daura Local Government Areas of Katsina State as prescribed by the SPHERE standard.

ARTICLE HISTORY

Received September 2, 2022

Accepted September 27, 2022

Published on September 30, 2022

KEYWORDS

CMAM, Performance, Malnutrition, Outpatient Therapeutic Programme, SAM



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INTRODUCTION

Malnutrition simply refers to a deficiency, excess, or imbalance in a person's energy and nutrient intake. About 45% of deaths in children under five are due to malnutrition, and most of these occur in low- and middle-income countries (WHO, 2021).

Each year, more than 2.5 million children under the age of five in Nigeria are affected by severe acute malnutrition (SAM), or extremely low weight-for-height (wasting), a condition that if untreated would lead to nearly half a million deaths (Tuffrey *et al.*, 2021).

Severe acute malnutrition is a life-threatening condition requiring urgent treatment. Until recently, children with severe acute malnutrition are referred to hospital to receive therapeutic diets along with medical care (WHO, 2022). Consequently, this has resulted in low coverage and high mortality, as most cases are identified only at a later stage and often suffer from complication (Se-Eun Park, *et al.*, 2012).

The advent of ready to use therapeutic food (RUTF) and a community-based approach, community management

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How to cite: B. Usman; C.O Orushagbemi, and Safiya A.T. (2022). Outcome Evaluation of Community Management of Severe Acute Malnutrition in Some Selected Outpatient Therapeutic Programme Centres of Katsina State, Nigeria. UMYU Scientifica, 1(1), 227 – 233. <https://doi.org/10.56919/usci.1122.029>

of acute malnutrition (CMAM), has made it possible to treat the majority of children in their homes (UNICEF, 2013). It is as cost-effective as other highly effective public health interventions, such as oral fluid therapy, vitamin A supplementation for acute diarrhoea and antibiotic therapy for acute respiratory infections (Se-Eun Park *et al.*, 2012).

In the Northern part of Nigeria, there is increasing number of children suffering from severe acute malnutrition (NDHS, 2013). The objective of this study was therefore to examine the effectiveness of Community Management of Acute Malnutrition (CMAM) in four (4) Outpatient Treatment Program (OTP) centers in Katsina and Daura Local Government Areas of Katsina State. This will provide baseline data on whether therapeutic diets and management practices in children effectively reduce the burden of severe acute malnutrition. It is also important to observe whether nutritional changes in children with severe acute malnutrition occur within the designated outpatient treatment program (OTP). Also, knowledge of the relationship between therapeutic diet and the management of severe acute malnutrition will enrich the existing data on CMAM in Nigeria.

MATERIALS AND METHODS

Study area

The study was carried out in Katsina State. Four (4) Outpatient Therapeutic Programme (OTPs) centers were randomly selected from Katsina and Daura senatorial district of the state.

Study population and sample size

The study population consists of children aged 6-59 months with severe acute malnutrition without complications who were enrolled in a selected OTP in January 2021. Sample size was calculated based on the formula as described by Pourhoseingholi *et al.* (2013).

$$n = Z^2 P (1-P)/d^2 \text{ (Pourhoseingholi et al., 2013)}$$

Z= statistics for a level of 95% confidence interval= 1.96

P= assumed prevalence= 0.5,

d= precision (5%)

$$n = \frac{(1.96^2) \times 0.5 \times (1-0.5)}{(0.05)^2}$$

$$n = 384.14$$

The calculated sample size was 384.14; hence a total of 435 children were recruited and used for the study. A total of 435 SAM children admitted at the OTPs were recruited and participated in the study based on informed consent obtained from their parents.

Ethical Clearance

The methodology and ethics of this study were revised and approved by the Postgraduate board of the School of postgraduates Studies, Kogi State University Nigeria and the Katsina State Ethical Committee of State Ministry of Health.

Study design

The study involves both retrospective and Prospective-longitudinal studies where data for determining key performance indices were collected. For the retrospective study, OTP data such Age, MUAC, weight, sex, oedema, and drugs administered were collected.

While in the prospective-longitudinal study, fresh OTP data from severely acutely malnourished children were collected including weight, MUAC, height, sex, PCV, and Hb.

Assessment of Relapse

A follow-up examination for possible recurrence was performed 8 weeks after discharge (Elia and Stratta, 2000).

Determination of Access and Coverage of the CMAM Programme

Treatment, geographical, point and period coverage were the indices used in assessing the access and coverage of the CMAM programme (CMAM, 2012).

Evaluation of OTP performance indicators

OTP performance indices are measurable values that demonstrate the effectiveness of OTP centers. The indices measured were cure rate, death rate, default rate and the non-recovery rate (CMAM, 2012).

Assessment of Biochemical and Haematological Indices of SAM Children at Admission and Discharge in Katsina OTPs

Some biochemical and haematological parameters such as glucose, serum albumin, hemoglobin concentrations and packed cell volume were assessed in children with SAM both at the points of admission and discharge using the methods as described by Young (2001).

RESULTS

The percentage coverage of the CMAM programme in Katsina and Daura OTPs as presented in table 1 showed that the treatment coverage in the retrospective study was 77.76% and 90.55% at Katsina and Daura OTPs respectively while in the present study, the treatment coverage data was 87.90% and 94.44% for Katsina and Daura respectively. This shows a significantly ($p < 0.05$) higher treatment coverage in Daura OTPs than in Katsina. Moreover, there was 16.60% and 20.00% geographical coverage for both the retrospective and present study at Katsina and Daura OTPs respectively, more so Daura shows significantly ($P < 0.05$) higher geographical coverage than Katsina.

The performance indicators of CMAM programme in Katsina and Daura OTPs are presented in table 2. In Katsina OTPs, there was 95.0% and 97.3% cure rate for the retrospective and present study. In Daura OTPs, the cure rates were 86.8% and 93.52% respectively for the retrospective and present study. There was no significant

($p > 0.05$) difference between Katsina and Daura OTPs concerning performance indicators in the retrospective and present on-the-spot study. Although, in the present on-the-spot, study no death and defaulter was recorded in Katsina OTPs while in Daura, the death rate and default rate was 1.54% and 2.93% respectively.

Table 1: Percentage Coverage of CMAM Programme in Katsina and Daura OTPs

% Coverage	Katsina		Daura	
	Retrospective Coverage	Present Coverage	Retrospective Coverage	Present Coverage
Treatment	77.76 ^a ± 9.30	87.90 ^a ± 2.17	90.55 ^b ± 5.25	94.44 ^b ± 2.44
Geographical Point	16.66 ^a ± 0.00	16.66 ^a ± 0.00 ^a	20.00 ^b ± 0.00	20.00 ^b ± 0.00
Period	97.32 ± 1.94 ^a	97.41 ^a ± 0.99 ^a	90.53 ^a ± 2.89	90.51 ^b ± 0.49
	98.02 ± 1.57 ^a	98.20 ^a ± 0.19 ^a	96.83 ^a ± 0.90	92.01 ^b ± 1.99

Values with different superscripts along the row per are statistically significant at $P < 0.05$

Table 2: CMAM Performance Grade in Katsina and Daura OTPs

Performance Indicator (%)	Katsina		Daura	
	Retrospective study	Present study	Retrospective study	Present study
Cure rate	95.00 ^a ± 1.40	97.38 ^a ± 1.23	86.88 ± 5.05 ^a	93.52 ± 1.85 ^a
Death rate	0.33 ^a ± 0.47	0.00 ^a ± 0.00	3.78 ± 1.62 ^a	1.54 ± 0.62 ^a
Default rate	1.51 ^a ± 2.14	0.00 ^a ± 0.00	9.46 ± 6.07 ^a	2.93 ± 1.07 ^a
Non-recovery rate	0.33 ^a ± 0.47	0.00 ^a ± 0.00	2.66 ± 3.79 ^a	0.00 ± 0.00 ^a

Values with different superscripts along the row per are statistically significant at $P < 0.05$

Growth and Recovery Performance of SAM Childre at Katsina and Daura OTPs

Growth and recovery performance of SAM children at Katsina and Daura OTPs at admission and discharge as presented in Table 3 have shown that the LGA average percentage of SAM children with MUAC below the normal value reduced from 84.0% at admission to 8.5%

at discharge. For WFH, the LGA average percentage of children below normal value also decreased from 79.5% at admission to 8.0% at discharge. Regarding oedema, all the children (3.0%) of both OTPs presented with oedema at admission did not have oedema against discharge.

Table 3: Growth and Recovery Performance of SAM Children at Katsina and Daura OTPs at Admission and Discharge

Growth Recovery Parameters	Percentage of Children below normal range					
	Katsina OTP n= 209		Daura OTP n = 226		LGA Average n=435	
	Admission (%)	Discharge (%)	Admission (%)	Discharge (%)	Admission (%)	Discharge (%)
MUAC	86	6.0	82	11	84.0	8.5
WFH	89	5.0	70	11	79.5	8.0
Oedema	3.0	0.0	3.0	0.0	3.0	0,0

Key: MUAC = Mid-upper Arm Circumference; WFH= Weight for Height

Biochemical and haematological status of Children with SAM at Katsina OTP

Results of the biochemical and haematological status of children with SAM at admission and discharge in Katsina OTP are presented in Table 4. The table shows values

within the normal range at admission and discharge. From the results, the percentage of severely malnourished children with glucose concentration within the normal range was 17% at the point of admission and 90% at discharge, showing 73% increase in children with

normal glucose concentration at discharge. Percentage of severely acute malnourished children with PCV within the normal range was 7% at admission and 86% at discharge, indicating that 79% of the children were cured at discharge. Serum albumin concentration was 17% at admission and 83% at discharge, indicating 66% of children recovered. The anaemic status of the children at admission and discharge in Katsina OTP centre is presented in Figure 1. Approximately, 6% of SAM children had normal haemoglobin levels at admission, and 65% of them had normal Hb levels at discharge. Mildly anaemic patients were 14% at admission and 20% at discharge. In patients with moderate anaemia, it was 20% on admission and 10% at discharge, whereas in patients with severe anaemia, it decreased from 60% at admission to 5% at discharge.

For Daura OTPs, the biochemical and haematological status of the severely acute malnourished children at admission and discharge are presented in Table 5.

Glucose concentration was 4% at admission and 93% at discharge. The percentage improvement was 89.0%. PCV was 7% at admission and 86% at discharge, the percentage improvement was 79%. Serum albumin was 10% at admission and 80% at discharge; the percentage improvement was 70%. There was generally an improvement in the biochemical and haematological parameters at the point of discharge.

Figure 2 shows the percentage distribution of SAM children by anaemic status at admission and discharge from the Daura OTP centres. Of 30 admitted SAM children, 2.0% of SAM children had a normal Hb concentration on admission, but 60% of them were normal. There were 18% of children with mild anaemia at admission and 25% at discharge. Patients with moderate anaemia were 10.0% at admission and 11% at discharge, while severe anaemia decreased from 70% at admission to 4.0% at discharge.

Table 4: Biochemical and Haematological Status of SAM Children Katsina OTPs

Biochemical/Haematological indices	Percentage of SAM Children Within Normal Range		
	At Admission %	Discharge %	% Improvement
Glucose	17.0	90.0	73.0
PCV	7.0	86.0	79.0
Serum Albumin	17.0	83.0	66.0

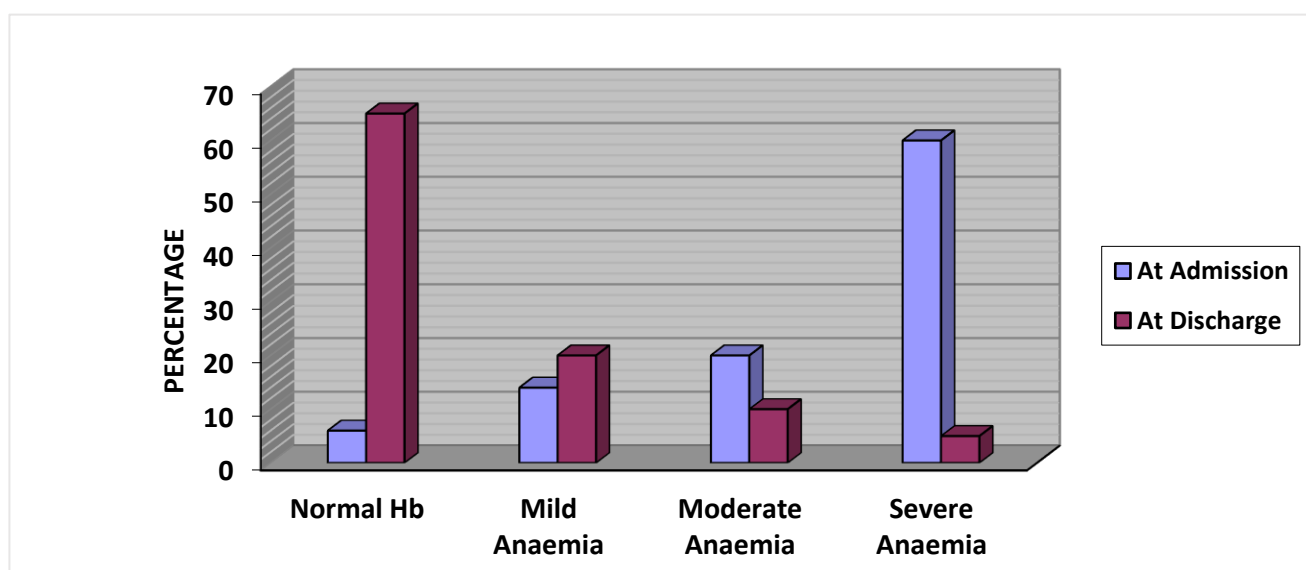


Figure 1: Anaemia Status during Admission and Discharge for SAM Children at Katsina OTP Centers

Table 5: Biochemical and Haematological Status of SAM Children Daura OTPs

Biochemical/Haematological indices	Percentage of SAM Children Within Normal Range		
	At Admission %	Discharge %	% Improvement
Glucose	4.0	93.0	89.0
PCV	7.0	86.0	79.0
Serum Albumin	10.0	80.0	70.0

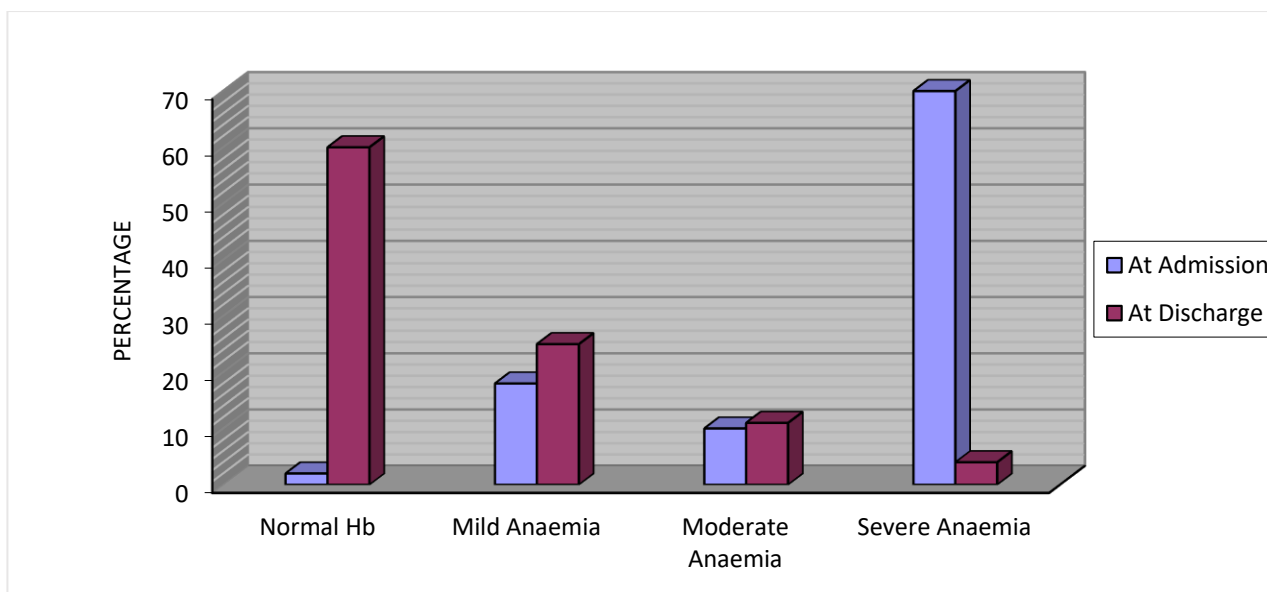


Figure 2: Anaemia Status during Admission and Discharge for SAM Children in Daura OTP Centers, in Percentage

Relapse Rate

Table 5 shows the findings on the rate of relapse among SAM children eight (8) weeks after discharge at the chosen OTPs in Katsina. Based on the LGA average and MUAC, 10% of the former SAM children at the OTP who were followed up in their communities relapsed with a MUAC value of <11.5cm.

Table 6: Percentage Relapse among SAM Children Eight (8) Weeks after Discharge at Katsina OTPs

Growth and Recovery Parameters	Katsina OTP n=57	LGA Average n=110
MUAC	17.5	10
WFH	5	5
Oedema	0	0

Figure 3 shows the mean weekly changes for MUAC of children with severe acute malnutrition attending Katsina and Daura OTP centres. From at the graph, a steady rise and/or improvement in the weekly mean MUAC values was depicted for the SAM children. This indicates an observable increase in MUAC values throughout the 8 weeks.

Figure 4 shows mean weekly changes for the weight of children with severe acute malnutrition attending Katsina and Daura OTP centres. From the figure, there was an indication of a notable increase in the weekly mean values of the SAM children’s weights.

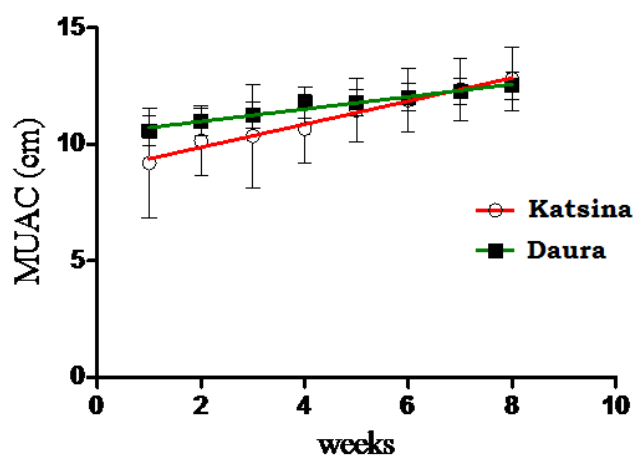


Figure 3: Mean Weekly Changes in MUAC of Children with SAM Attending Katsina and Daura OTPs.

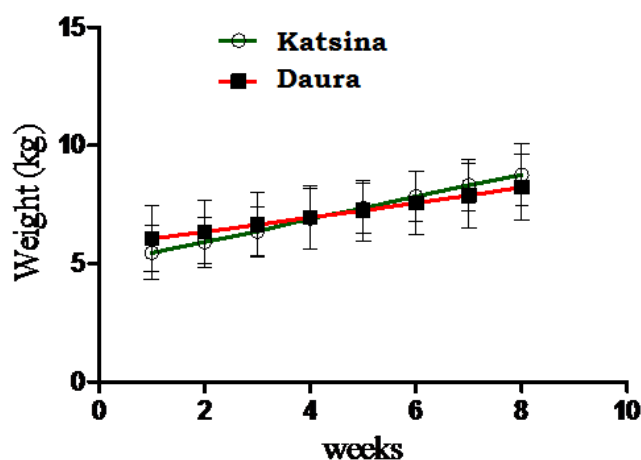


Figure 4: Mean Weekly Changes in Weight of Children with SAM Attending Katsina and Daura OTPs.

DISCUSSION

CMAM is an effective means of treating malnourished children in communities. Recent research suggests that it is equally as cost-effective as other significant public health programs including vitamin A supplementation, antibiotic treatment for acute respiratory infections, and oral rehydration therapy for acute diarrheal illnesses (Se-Eun Park, *et al.*, 2012). One could say that the CMAM program's coverage in Katsina and Daura OTP centers is adequate given that all of the CMAM coverage indices in the current study were found to be within the acceptable range of the SPHERE standards on minimum acceptable levels of coverage for the management of acute malnutrition for rural areas. The retrospective and current studies showed more than 50% values for the treatment, points, and period coverage regarding the management of acute malnutrition. Similar observations were recorded in a study conducted in 2014 an outpatient therapeutic centre in Batsari Local Government Area of Katsina State (Bello *et al.*, 2017). Moreover, a report on community management of acute malnutrition in Katsina State, Nigeria, 2010-2013 showed remarkable performance and CMAM remains an effective means in treating SAM (Yakasai *et al.*, 2017).

In the present study, we observed 20.0% Geographic coverage in both Katsina and Daura OTPs. In evaluating a CMAM program, geographic coverage, which is more often reported in the literature, could be an indicator of program effectiveness; If geographic coverage is high, services can reach the target population and be the best step to ensure that all other coverage indicators are high and that program effectiveness is achieved (Abdullahi *et al.*, 2021).

Compared to our findings, several studies on the assessment of CMAM programme have reported a very low Geographic coverage such as 5.8% in Kaduna State (Abdullahi *et al.*, 2021). Moreover, CMAM coverage of less than 30% was reported in two surveys conducted in Ghana (CMAM FORUM, 2020; Ghana Health Service, 2013).

Moreover, the performance indicators of CMAM in Katsina OTPs (97.3%) and Daura OTPs (93.5%) cure rates were higher than the 77.8% cure rate reported in Primary Health Care, Baban Dodo Zaria Local Government Area, Kaduna State (Abdullahi *et al.*, 2021).

Data collected on the growth and recovery performance of SAM children at the Katsina and Daura OTPs at admission and discharge had shown a considerable increase in the nutritional status of the SAM children since all the data reveal significantly ($p > 0.05$) fewer children at the moment of discharge who had MUAC and WFH below the normal range than when they were admitted. Furthermore, none of the SAM children developed oedema when they were released. This clearly

demonstrates the effectiveness of the CMAM program as a whole.

The improvement in the SAM children's nutritional status and the effectiveness of the CMAM program being implemented at OTP centres in the Katsina and Daura Government Area are further supported by the percentage change in the level of anaemia, albumin concentration, and other data among the SAM children at the time of discharge compared to the point of admission.

CONCLUSION

Findings from the study have indicated that CMAM in OTP centres of Katsina and Daura Local Government Areas of Katsina State was reasonably acceptable as prescribed by the SPHERE standard.

Community mobilization and screening activities should be intensified in order to identify children that need treatment, home visit and follow-up cases.

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