Original Research Article

COMMUNITY-BASED MANAGEMENT OF SEVERE ACUTE MALNUTRITION (CMAM) PROGRAMME IMPLEMENTATION EXPERIENCE IN TRIBAL STATE OF INDIA: A MIXED METHOD EVALUATION

Sahil Nayan Rajnish[1], Neeraj Kumar[2], Kumari Asha Kiran[3], Manisha Kujur[4], Rajesh Kumar Sinha[5], Shalini Sunderam[6]

[1]Senior Resident, Department of Community Medicine, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India
[2]Junior Resident, Department of Community Medicine, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India
[3]Additional Professor, Department of Community Medicine, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India
[4]Associate Professor, Department of Community Medicine, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India
[5]Associate Professor, Jaipur Institute of Management, Jaipur, Rajasthan, India
[6]Professor & HOD, Department of Community Medicine, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India

ABSTRACT

Background: The prevalence of severe acute malnutrition (SAM) among children is notable, with current treatment occurring primarily at Malnutrition Treatment Centres (MTCs) that cater to complicated cases. This study examines community health workers' (CHWs) understanding of community-based management of acute malnutrition (CMAM), particularly during the COVID-19 pandemic.

Materials and Methods: A mixed-method evaluation analyzed outcomes and identified challenges for the CMAM program, which screened children for SAM in 2021.

Results: The study found that despite COVID-19 disruptions, 66.7% of children showed significant improvement in their nutritional status after 12 weeks of treatment, with 9.8% fully recovering and 56.9% moderately improving. However, 33.3% remained in the severe acute malnutrition category. The experience highlights the importance of interdepartmental coordination, training frontline workers, and community mobilization for effective outcomes. Effective linkage between outpatient and inpatient care is crucial, as well as ensuring optimal supply and distribution of nutrient-dense food and medicines. The pandemic and implementation challenges hindered the program's effectiveness, emphasizing the need for improved strategies and resources.

Conclusion: The study emphasizes the importance of inter-departmental collaboration, frontline worker training, and community mobilization for effective treatment outcomes. However, challenges in food and medicine supply hindered the program's effectiveness, highlighting the need for improvements in scaling up.

Keywords: CMAM, WHZ, CHW, Locally Prepared Nutrient Dense Food, Anganwadi Centres.

INTRODUCTION

An estimated 12.9% of children aged less than 5 years in West Singhbhum, Jharkhand are suffering from severe acute malnutrition (SAM) at any point of time.[1] Research has shown that children suffering from SAM are at increased risk of both morbidity and mortality. Currently the Government of India provides inpatient care in Malnutrition Treatment Centres (MTCs). West Singhbhum has five functional MTCs with a bed capacity of 60, but this is not adequate to cover the entire caseload of SAM children; neither is it necessary to admit all children with SAM to the MTCs. Only 15% of SAM

cases, those with accompanying medical complications, require inpatient care and the rest can be treated as outpatients. Last, it is not always feasible for families to access or stay at the MTCs for the required time due to the opportunity costs involved.

The community-based management of acute malnutrition (CMAM) model was endorsed by the World Health Organisation in 2007,[2] and has since been rolled out across multiple countries worldwide. This model has been shown to be one of the most cost-effective public health interventions to save lives among children under five years of age.[3] It focuses on making services accessible to the greatest extent possible, providing therapeutic food and care, to recover children with SAM. The model focuses on early identification of cases and provision of treatment, at the community level. With almost 0.3 million children already suffering from SAM in the state, Covid 19 pandemic posed yet another impending challenge affecting women and children disproportionately and making them vulnerable to multiple marginalization & deprivation. The Integrated Child Development Services (ICDS) program, which provides some of the important nutrition promotion services like growth monitoring, supplementary nutrition to children, pregnant and lactating women, health and nutrition counselling and pre-school education was badly disrupted due to COVID-19 pandemic and subsequent lockdowns. Other government routine health and nutrition promotion services also got disrupted as most of the frontline health and nutrition workers such as Auxiliary Nurse Midwives (ANMs), Anganwadi Workers (AWWs) and Accredited Social Health Activists (ASHAs) were deployed and engaged in COVID-19 emergency response and activities.[4]
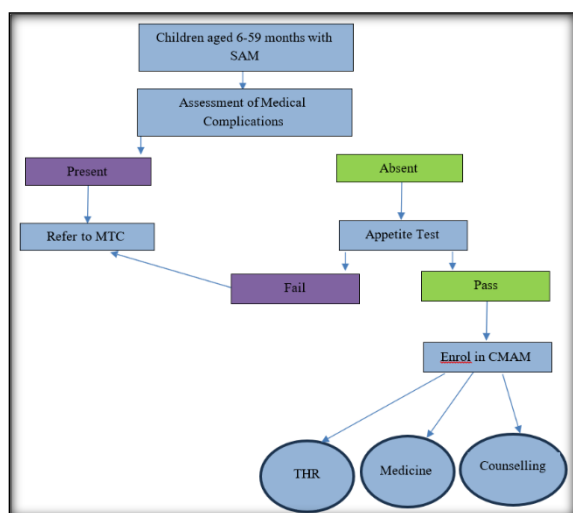

Figure 1: Management of Children with Severe and Acute Malnutrition (SAM) in Community-based Management of Acute Malnutrition (CMAM) programme.

During the COVID-19 time, when the services were being delivered in an increasingly challenging contexts owing to the pandemic, the government of Jharkhand implemented Community Based Management of Acute Malnutrition (CMAM) intervention in West Singhbum district. The intervention included screening for identification of children with SAM using weight for height z-score <-3 (WHZ<-3) criteria by community health workers (CHWs). Identified SAM children were further screened for any medical complication and assessment of appetite to identify complicated and uncomplicated cases of SAM. All complicated cases were referred to the nearest Malnutrition Treatment Center (MTC) for inpatient treatment, while all uncomplicated cases were enrolled in the CMAM program at the Anganwadi Center (AWC). Services under the CMAM program included providing locally prepared nutrient dense food, medicines such as antibiotics, deworming drugs and micronutrient supplements, providing counselling to caregivers on infant and young child feeding (IYCF) practices, water, sanitation and hygiene practices, family planning and parenting practices and fortnightly follow ups to track growth of enrolled children [Figure 1].

To date CMAM program has been tested in India but with limited experience of implementing such services through the Government system.[5] With a view to build this evidence base, in 2021, the Government of Jharkhand gave permission (vide letter number 1054 dated 15.07.2021) to conduct an observational study in West Singhbhum, Jharkhand state. We conducted an observational study with the objective to assess anthropometric outcomes among enrolled children, capture knowledge of the community health workers about the program and documenting compliance, challenges and learning in implementing the program. The study would help the state in future scaling up of the CMAM program in other parts of the state.

MATERIALS AND METHODS

Study Design and Sampling
This was an observational study with the mixed methods design in two blocks, of West Singhbhum District, Jharkhand. Children aged 6-59 months with WHZ <-3 criteria and with no medical complications and those who had passed the appetite test were included in this study. The study consisted of quantitative follow ups of 102 enrolled children at two time points (on admission and at discharge/12th week, whichever is earlier) and also included qualitative evaluation with 12 CHWs (ANMs and AWWs) and 10 mothers/caregivers through in-depth interviews.

For the quantitative study, the primary outcome of the study was cure rate (defined as WHZ >= -2) at 12 weeks compared to the baseline. As several studies of CMAM intervention in India reported the cure rate ranging from 46.7 to 57.4% [5-9], for the sample size calculation, we therefore chose the

expected cure rate of 50% with the CMAM intervention and expected cure rate with existing government nutritional interventions, without CMAM intervention, of 25% to estimate the effect size of 25% (50–25%). Using the significance level of 5%, with 80% power to detect the effect size of 25%, a design effect of 1.5 and accounting for 20% attrition due to loss of follow up, the sample size calculated for the study was 100.

Data Collection: Under the quantitative follow ups, both at the enrolment stage as well as at discharge/12th week, the data collection included anthropometric measurement: weight, length/height, details of the child and other socio-economic variables. For anthropometric measurements, a digital weighing machine with a sensitivity of 10g for measuring weight and a wooden infant- cum-stadiometer for measuring length/ height were used. Length and height were measured to the nearest 0.1cm and weight to the nearest 0.01kg. Weighing equipment were calibrated using standard calibration weights and infant-cum-stadiometer were calibrated using calibration rods. All the field investigators were trained on anthropometric measurement techniques, calibration of equipment and mobile based data collection. Data collection was done using mobile application through Kobocollect platform.

The study was jointly conducted by Rajendra Institute of Medical Science (RIMS), Jharkhand, Kalawati Saran Children's Hospital (KSCH), New Delhi and UNICEF, India. Quality control visits were conducted by an independent monitoring team constituted from RIMS, KSCH and UNICEF for 10% of surveys and interviews.

Data Analysis: Narrative analyses of the qualitative interviews with mothers of enrolled children with SAM and CHWs were conducted after transcribing their interviews. For quantitative analyses, the anthropometry Z-scores were calculated using the WHO 2006 growth references.[10] Descriptive statistics were assessed to establish the markers of household-level and anthropometric characteristics at the baseline. Anthropometric outcomes were compared between the enrolment and discharge/12th week, whichever was earlier. Bivariate associations of age, sex and scheduled caste/scheduled tribe (SC/ST) status with outcomes were assessed. Data were entered in MS Excel and analyzed using IBM SPSS 20.0.

RESULTS & DISCUSSION

Baseline Characteristics of Enrolled Children
Children aged 6-23 months who were enrolled in the study were 65.7%. Remaining children were from the age-group of 24-59 months. Enrolment of male children was slightly more (57.8%) than female children (42.2%). Mothers of around 59% children were uneducated. The proportion of scheduled caste/scheduled tribe children was 87.3%. Around 35% children had prior episode of illness in the last 2 weeks. Mean weight of enrolled children was 6.9 Kgs, mean height/length was 73.8 cm and mean WHZ was -3.42 [Table 1].

Table 1: Baseline Characteristics

	n =102 (%)
Age Group	
6-23m	67 (65.7)
24-59m	35 (34.3)
Gender	
Male	59 (57.8)
Female	43 (42.2)
Mother's Education	
No Education	60 (58.8)
1-5 years	21 (20.6)
6-8 years	12 (11.8)
9-10 years	7 (6.9)
More than 10 years	2 (2.0)
SC/ST	89 (87.3)
History of Illness in the last 2 weeks	36 (35.3)
Mean Admission Weight; mean (SD)	6.9 (1.58)
Mean Admission Height; mean (SD)	73.8 (9.0)
Mean Admission WHZ; mean (SD)	-3.42 (0.45)

Changes in Nutritional Status: Among enrolled children, 9.8% children achieved full recovery while 56.9% children became MAM after treatment. 33.3% remained SAM even after their treatment under the CMAM program [Table 2].

Table 2: Nutritional Status at

	N=102
12th Week	(%)
Normal	10 (9.8)
MAM	58 (56.9)
SAM	34 (33.3)

Association between age, sex, caste/tribe status and recovery status discharge/12th week after treatment

It was found that the recovery (non-SAM) status was significantly (p-value<0.001) more among children from scheduled caste/scheduled tribe (SC/ST) community compared to non- SC/ST community. No significant associations were observed between age or sex with the recovery status at discharge/12th week after treatment [Table 3].

Table 3: Bivariate association of age, sex and caste/tribe status with SAM and Non-SAM status at discharge/12th week after treatment

Characteristics	Categories	Non-SAM	SAM	chi-square ($\chi 2$) statistic, p value
Age	6-23 mo; n(%)	45 (67.2)	22 (32.8)	0.02, p-value=0.88
	24-59 mo; n(%)	23 (65.7)	12 (34.3)	
Sex	Female; n(%)	13 (30.2)	9 (20.9)	0.50, p-value=0.48
	Male; n(%)	20 (33.9)	7 (11.9)	
ST/SC	Yes; n(%)	32 (36.0)	10 (11.2)	12.74, p-value<0.001
	No; n(%)	1 (7.7)	6 (46.2)	

Knowledge assessment of CHWs on different components of CMAM program and constraints faced by stakeholders during its implementation

Knowledge Assessment of AWWs and ANMs on different components of the CMAM program showed that all AWWs and ANMs were aware about child undernutrition and its causes. AWWs were aware about all three forms of undernutrition viz. underweight, wasting and stunting, whereas all ANMs had heard only about underweight as form of undernutrition and only two ANMs, had heard about wasting as another form of undernutrition. Regarding identification criteria of SAM, it was found that all AWWs were able to state WHZ, oedema and MUAC criteria to identify children with SAM while all ANMs mentioned weight and MUAC criteria for their identification. This shows that ANM need further orientation on correct criteria for SAM identification and z-score calculation.

Regarding screening for identifying children with SAM, it was observed that all AWWs were able to demonstrate the key steps of correctly taking weight, height/length and calculating z- score. By contrast, it was found that ANMs only use MUAC tape (MUAC < 11.5cm) to identify cases of SAM. The reason cited by ANMs for not correctly measuring weight, height/length and calculating z-score was that it was not their primary responsibility as responsibility of conducting anthropometric assessment and identification of SAM lies with the AWWs during Village Health Sanitation and Nutrition Days (VHSND).[6-8]

All AWWs were able to explain the process of conducting appetite test and shared that before conducting the test, the child should be empty stomach. If the SAM child is able to consume at least 80% of the given food only then it can be said that s/he has passed the test and can be enrolled in the CMAM program. They were also aware that if the child fails the appetite test, then s/he will be referred to MTC. However, the ANMs were not aware about assessment of clinical complications in SAM children and how to conduct appetite test. Since the ANMs conduct both appetite test and medical assessment of identified SAM children, their clarity on these two assessments becomes very important before deciding whether the child needs in- patient treatment or can be managed in the CMAM program.[9,10]

Majority of the AWWs had clear knowledge about admission criteria for in-patient management of SAM in MTC and out-patient management in the CMAM program. However, it was observed that the ANMs needed more clarity on cases of SAM with medical complications needing in-patient management while uncomplicated SAM cases can be managed in CMAM program. However, in practice, it was found that no medical assessments or appetite tests of identified children with SAM were being conducted due to lack of knowledge of ANMs for conducting these assessments.

For nutritional management of children enrolled in the CMAM program, locally prepared nutrient dense food was to be provided to them. However, the qualitative evaluation with mothers and CHWs showed that during the year 2021, the AWCs received supplies of food ration for only three out of twelve months. Also, as per the provision, children with SAM were supposed to receive blended nutrient dense ready-to-eat food but they only received raw rice and pulses in Chaibasa Sadar block and additionally bengal gram in Khunpani block. This was due to disruption in supply of nutrient dense food due to the COVID-19 pandemic. CHWs shared that regular supply of blended nutrient dense ready-to-eat food could have improved their attendance during the follow up sessions and could have reduced intra household distribution of food items, if they were provided with clear message.

It was found that neither ANMs nor AWWs had complete knowledge about names and doses of medicines to be provided to children with SAM enrolled in the program. While the ANMs were able to name a few medicines like Amoxicillin, IFA Syrup, Multivitamin and Albendazole, AWWs could only mention IFA syrup. The ANMs shared that most of the time, all these medicines were out of the stock due to disruption in supplies and also shared that there was no special provision of these medicines for children with SAM enrolled in the program.

On counselling services, it was found that the sessions were mostly unstructured and without using any counselling aids. In most of the cases, CHWs

only discussed about providing healthy diet to children using locally available food and personal/overall hygiene. CHWs did not demonstrate to mothers/caregivers on how to cook nutrient dense food using locally available food items. In light of this, it is necessary to build the capacities of the CHWs on skills and techniques for providing effective counselling on child nutrition. All AWWs were aware about the weekly follow ups which need to be conducted for children enrolled in the program. However, in practice, follow ups were not being organised for all children on regular basis. Also, monthly follow ups by ANMs need to be strengthened as they were not aware about what needs to be done during such follow ups of the enrolled children with SAM.

On the parameter of discharge criteria (WHZ >= -2), AWWs shared that a child may be discharged from the program if s/he achieves WHZ > -3. ANMs were also not very clear about the discharge criteria. As per the protocol, ANMs should discharge the children enrolled in the program, once they reach the discharge criteria and after re-confirming. So, it is important for ANMs to have clear understanding of the discharge criteria.

Programme strengths
• Delivered through health system - The intervention was delivered through the government health and ICDS system and achieved good outcomes considering it was a new intervention and CHWs were unfamiliar with the protocol. Also, the study was conducted during the COVID-19 pandemic.
• Creating a resource pool- During the program, a pool of local resource persons was created who further trained the CHWs from the block. A few of them also involved in the providing handholding support in the field for effective implementation of the program. Similar approach can be adopted when the program can be scaled up in the state.

Programme challenges and lessons learned
Screening
• Skills of CHWs - Due to the low level of skill of CHWs, some children were incorrectly categorized as SAM, MAM or Normal. This was corrected during supportive supervision visits by UNICEF and RIMS. However, this will require close monitoring and supervision during program scale up through the Government system.
• Screening coverage- It was found that AWWs were not screening all children aged 6-59 months in their catchment areas. Hence, for effective coverage in the program, it would be important to cover all eligible children in the growth monitoring drive for desirable impact.

Take-Home Ration (THR) and Medicines
It was observed that there were disruptions in supply and distribution of THR and medicines to the enrolled children. Regular supply and distribution of THR for nutritional management of children is very important for the success of the program. Also, evidence shows that provision of some of the essential medicines to uncomplicated SAM children enrolled in the CMAM program are important for better outcomes.[11] Hence, in the event of scale up of the program, there needs to be a way to ensure enough stock of THR and medicines at AWCs for effective management of enrolled children in the program.

Community sensitization and mobilization
Strong community mobilization is essential for successful implementation of the CMAM program. During the program, community sensitization and mobilization were found weak. Due to this, the success of the program was limited. When the CMAM program would be scaled up, it would be imperative to enable effective community sensitization and mobilization for improved implementation and sustainability of the programme.

ICDS and health convergence
• Interdepartmental convergence was critical; each Department had its own set priorities, so building a synergy was a challenge. Convergence across departments and linkage of services is essential. Also, during the program scale up, ensuring a continuum of care is essential. Facility based management of SAM delivered by MTCs and the ICDS scheme delivered by AWCs need to be linked effectively with the CMAM program.
• Linkage with the public distribution scheme (PDS) - The literature shows,[12] a strong link between food insecurity and child undernutrition. West Singhbhum district is highly food insecure. It was found that some of the families whose children were in the CMAM program, were not linked with the PDS scheme of the government. Considering the potential gains to reducing malnutrition of linking these additional families in the PDS scheme, the district and block administration should take necessary steps to link them with the scheme.

Technical Assistance: It is critical to build the capacities of frontline workers and improve the supportive supervisory mechanisms of existing health and ICDS systems. Mentoring by a Medical College would bring in additional value to improve field implementation. For implementing the program at scale, government can develop partnership with apex Medical College in the State, preferably with Preventive and Social Medicine (PSM) Department for regular capacity building of the field functionaries and providing other technical support for its effective implementation.

Limitation: The study's limitations include a small sample size (102 children), a short follow-up duration of 12 weeks, variability in community health worker training, and potential biases from self-reported compliance. Additionally, COVID-19-related supply chain disruptions, weak community engagement, cross-sectional data limitations, and

unaccounted confounding factors may affect the results.

CONCLUSION

This CMAM program demonstrated that it is possible to implement the model in India using existing government run health and nutrition platforms and frontline workers. The experience demonstrated the importance of convergence of government departments and the provision of technical support by a center of excellence to ensure programme quality.

Future implementation should focus on developing the skills of frontline workers in service delivery and reporting, as well as the development of a strategy to effectively mobilize the community around the issue of acute malnutrition to ensure appropriate engagement with the programme. Effective linkage between outpatient and inpatient care is essential to provide a complete continuum of care for a child suffering from SAM which provides an optimal environment to achieve recovery.

The disruption caused by the COVID-19 pandemic and implementation challenges limited the effectiveness of the programme. It is necessary to closely explore issues of programme quality as well as better understand the issue of supply, distribution and consumption of locally prepared nutrient dense food and medicines, which was observed to be sub-optimal.

In conclusion, this experience demonstrated the feasibility of delivering a CMAM programme through existing government platforms and frontline workers.

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