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Community management of acute malnutrition in Rajasthan, India

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GAIN, UNICEF and other development partners supported the Community Management of Acute Malnutrition (CMAM) approach in Rajasthan. The authors would like to acknowledge Dr Abner Elkan Daniel, Child Development and Nutrition specialist, UNICEF India and Deepti Gulati, Head of Programmes, GAIN India for providing insight and technical expertise during the implementation of the CMAM programme described here.

INDIA

What we know: Community-based management of acute malnutrition (CMAM) is recommended by the World Health Organization for the large-scale management of children with severe acute malnutrition.

What this article adds: The CMAM approach was implemented through the government health system in 20 districts of Rajasthan in 2018 under the POSHAN II strategy. All children aged 6-59 months (375,5330) were screened for acute malnutrition; 10,344 of whom were identified as having uncomplicated severe acute malnutrition (SAM) and enrolled for community-based treatment using locally produced energy-dense nutrition supplement (EDNS). An independent evaluation of a cohort of 1,322 enrolled children showed that after eight weeks, 42.4% were discharged as cured, 4.1% defaulted, 53.5% were not recovered and continued treatment. At 12 weeks, 66.9% were discharged as cured, 8.1% defaulted and 25% were not recovered and referred for inpatient treatment. No children died. A qualitative study demonstrated no significant differences in socio-demographic characteristics in the households of cured, defaulted and non-recovered SAM children; common to most were a history of medical complications, low birth weight, lack of appetite and maternal undernutrition. Results demonstrate that SAM children without complications can be managed successfully in the community in India through the existing health system using locally made EDNS. A cost-benefit analysis is needed to inform further scale-up and research is required to understand potential linkages between CMAM and existing programmes tackling the underlying causes of undernutrition in India.

Background

Malnutrition in India

It is estimated that half of the world's wasted children (25.5 million out of 50.5 million children) live in India (Development Initiatives, 2018) and that malnutrition is the underlying cause of 68% of India's child deaths (Swaminathan et al., 2019). This is despite India's economic growth in recent years. Latest national estimates suggest that 38.4% of children under five years of age in India are stunted and 21% are wasted – much higher than the average across developing countries of 25% and 8.9% respectively (IIPS and ICF, 2017). Important drivers of child wasting in India are inadequate maternal nutrition, low birth weight (LBW) and poor infant and young child feeding. It is estimated that only 54.9% of infants in India are exclusively breastfed for six months, and only 9.6% of children aged 6-23 months receive an adequate diet (IIPS and ICF, 2017). The state of Rajasthan in the northwest of India has seen a substantial increase in wasting levels over the last two decades; from 11.7% in 1999 to 23% in 2016 (IIPS and ICF, 2017), with the prevalence of severe wasting standing at 8.7%. Given this, Rajasthan is a high-priority state for interventions to tackle this critical public health problem.

India's nutrition policy, developed in 1993, adopts a multi-sector approach to tackle the multiple causes of malnutrition under which numerous programmes and schemes have been developed and implemented at scale.¹ Most recently, POSHAN Abhiyaan (Proactive and Optimum care of

children through Social-Household Approach for Nutrition)² has been implemented by the Government of India (GoI). It is a multi-ministerial convergence mission to enable the integration of all nutrition-specific and nutrition-sensitive interventions with the vision of eliminating malnutrition in India by 2022 (de Wagt et al., 2019).

Treatment strategies to address severe acute malnutrition (SAM) in India

The growth of children under five years of age is monitored regularly by frontline health workers across India, including auxiliary nurse midwives (ANMs) posted at sub-centres and primary health centres and community-level Anganwadi workers (AWWs). Children identified as having moderate acute malnutrition (MAM) are provided with extra nutritional supplement packets through the national Supplementary Nutrition Programme (SNP). Those identified as having severe acute malnutrition (SAM) with or without medical complications are referred to the nearest malnutrition treatment centre (MTC) or nutrition rehabilitation centre (NRC) for medical care and nutrition therapy. The limitations of this system are the high cost of inpatient or facility-based management of SAM, low coverage, high opportunity

¹ Integrated Child Development Scheme (ICDS); Mid-Day Meal (MDM); National Health Mission (NHM); National Nutrition Mission (NNM); National Food Security Act (NFSA) 2013; Village Health Sanitation and Nutrition Committees (VHNSCs); Food Safety and Standard Authority of India (FSSAI); village health nutrition days (VHNDs); and malnutrition treatment centres (MTCs) or nutrition rehabilitation centres (NRCs).

² <http://nrhmrajasthan.nic.in/POSHAN.htm>

costs for families (in terms of travel, time away from work and household responsibilities) and lack of access to and acceptability of inpatient facilities in remote, rural populations. To address these limitations, steps have been made in India to test the utility of the World Health Organization (WHO)-recommended community management of acute malnutrition (CMAM) approach (WHO, 2013).

CMAM in India

CMAM was initially introduced in India in 1999 by Médecins Sans Frontières as an emergency response in Braul block of Darbhanga district, Bihar, following the Kosi floods. The CMAM programme, encompassing inpatient treatment for complicated SAM and outpatient treatment for uncomplicated SAM, achieved a cure rate of 57.4%, defaulter rate of 36.2%³ and a 0.8% mortality rate, demonstrating low mortality and high cure rates among non-defaulting children (Burza et al., 2015). In comparison, a 2013 study conducted in Madhya Pradesh (N=2,740) evaluated the model of 14 days compulsory inpatient treatment at an NRC for all identified SAM children, followed by treatment through the SNP under the national Integrated Child Development Scheme (ICDS) for 60 days. This programme achieved a cure rate of 43.9%, defaulter rate of 32%, non-recovery of 23.7% and a 0.4% mortality rate (Aguayo et al., 2013). Following this, development organisations have piloted CMAM in various states, including Maharashtra, Odisha, Jharkhand and Rajasthan.

In 2015 the Government of Rajasthan (GoR) National Health Mission (NHM) in partnership with the United Nations Children's Fund (UNICEF), Children's Investment Fund Foundation (CIFF), Global Alliance for Improved Nutrition (GAIN) and Action Against Hunger (ACF), implemented CMAM through the POSHAN strategy. The purpose was to treat SAM children with no medical complications in the community using the Medical Nutrition Therapy (MNT) Kit.⁴ POSHAN I was implemented between 2015 and 2016 across 10 high-priority districts and three tribal districts of Rajasthan. Around 234,404 children aged 6-59 months⁵ were screened and 9,640 children were identified as SAM and enrolled for treatment (according to criteria described in Table 1). Results showed that 88% of SAM children recovered after eight to 12 weeks of treatment

(GoR NHM, 2016). Based on these positive results, in November 2018 the CMAM approach (now called 'integrated management of acute malnutrition' (IMAM)) was scaled up under POSHAN II across 20 districts of Rajasthan, selected by the NHM Rajasthan due to their high burden of acute malnutrition.

POSHAN II partnership and funding

For the implementation of POSHAN II, the GoR NHM again collaborated with UNICEF, CIFF, GAIN, ACF and Tata trusts. The GoR NHM was responsible for the funding and management of sub-centres⁶ and other health facilities and human resources (district and state health officials and frontline health workers), and the development of state CMAM guidelines and protocols. UNICEF funded and facilitated the training of trainers and field-level training for frontline health workers and supplied equipment, including weighing scales, stadiometers/infantometers and mid-upper arm circumference (MUAC) tapes. GAIN (funded by CIFF) facilitated programme implementation, provided technical assistance and monitored the programme at the community level. GAIN also collaborated with the Indian Institute of Health Management Research (IIHMR), Jaipur to conduct an independent impact evaluation and identify the socio-cultural factors contributing to the success of POSHAN II. ACF (also funded by CIFF) was responsible for community mobilisation, advocacy, campaigning and media coverage. Tata trusts funded the procurement of energy-dense nutrition supplement (EDNS), made from locally available ingredients, from Indian companies Compact and Hexagon.

POSHAN II implementation and outcomes

Screening and identification of SAM

In POSHAN II, CMAM services were provided through health sub-centres (known in the programme as 'POSHAN centres') at block level through auxiliary nurse midwives (ANMs) and accredited social health activists (ASHAs; known as 'POSHAN praharis') frontline health workers. ASHAs are paid workers, remunerated under an incentive-based scheme. Both ANMs and ASHAS received quality training, including in the taking of anthropometric measurements, to enhance implementation quality. As POSHAN

praharis were already present and engaged in their respective communities, no additional community mobilisation activities were undertaken to support this CMAM programme.

POSHAN praharis carried out the screening process through active case-finding. Visits were made to all households with children aged 6-59 months⁵ to measure their MUAC. Children with MUAC <12.5 cm were taken to the nearest POSHAN centre for the ANM to measure the child's weight, height or length and MUAC. Children were also checked for bilateral pedal oedema and any medical complications. Later, the ANM, along with the mother or caregiver, conducted an appetite test for the child using energy-dense nutrition supplement (EDNS). If the child had bilateral pedal oedema and/or any medical complication and/or a failed appetite test, they were referred to the nearest malnutrition treatment centre (MTC), irrespective of anthropometric measurements. If the child's weight-for-height z-score (WHZ) was <-3 SD and/or MUAC <11.5 cm, the child was identified as having SAM. SAM children without medical complications and with adequate appetite were enrolled in POSHAN II for management. Children with MUAC between 11.5 and 12.4 cm and/or WHZ <-3 SD to <-2 SD were categorised as having moderate acute malnutrition (MAM) and referred to the nearest government Anganwadi centre (AWC) for treatment under the Integrated Child Development Scheme (ICDS) scheme and Supplementary Nutrition Programme (SNP). (Table 1).

Community management of SAM

All enrolled SAM children were given a dose of albendazole for deworming, amoxicillin (a broad-spectrum antibiotic) and a weekly supply of EDNS according to their weight. The mother/caregiver was advised to feed the child EDNS daily as per the prescribed dosage, along with regular home-based food. Children and their primary caregivers reported to their nearest POSHAN centre every Tuesday for an ANM to track their nutrition status (by measuring their weight, height and MUAC) and provide EDNS packets for the following week. At each visit, primary caregivers were counselled on the prevention of family sharing of EDNS packets, the continuation of breastfeeding for children ≤24 months, minimum meal frequency, handwashing practices and immunisations. Caregivers were

Table 1 Admission and discharge criteria in POSHAN I and POSHAN II

Anthropometric measurement	Enrolment criteria	Discharge criteria
MUAC	<11.5 cm (11.5 cm to <12.5 cm referred to Anganwadi centre)	≥12.5 cm
WHZ	<-3 SD (-3SD to -2SD referred to Anganwadi Centre)	≥-2 SD
WHZ and MUAC	<-3 SD and < 11.5 cm (11.5 cm < 12.5 cm and -3SD to -2SD referred to Anganwadi centre)	≥-2 SD
Medical complications	<12.5 cm and/or ≤-2SD with medical complications or bilateral pitting oedema referred to MTC	

³ Factors associated with the high defaulter rate in this programme were younger child age, distance from the programme, not being referred by health worker and seasonal trends.

⁴ Medical Nutrition Therapy (MNT) kit consists of energy-dense nutritional supplement (EDNS), antibiotics and albendazole used for the treatment of SAM children in POSHAN-II.

⁵ Infants under six months of age were not included in screening as they are screened during Village Health Sanitation and Nutrition Days conducted fortnightly in each village. If an infant under six months is identified as malnourished they are referred under current protocols to their closest primary health centre for consultation and treatment.

⁶ In Indian rural health systems, a sub-center is the peripheral and first point of contact between the community and primary health centre system, serving a population of 5,000 in plains and 3,000 in hilly regions.

advised to seek medical care or reach out to an ASHA immediately if the child became unwell. POSHAN praharis paid daily household visits to enrolled children during the treatment phase to ensure regular consumption of EDNS and to further counsel the mother/caregiver on adequate dietary intake and hygiene practices. The number of SAM children in each village under the care of a single POSHAN prahari was usually around four or five.

Once an enrolled child reached the discharge criteria (Table 1) they were observed for one further week to check that the improvement was sustained; if no deterioration was observed, the child was categorised as cured and discharged from the programme. In the follow-up phase, POSHAN praharis made home visits to all cured children every 15 days for four months to track their nutritional status and dietary intake. Children who did not recover after 12 weeks of treatment were referred to their nearest MTC for further investigation.

Programme outcomes

A total of 375,533 children aged 6-59 months were screened at home through house visits. Of these, 10,344 were identified as having uncomplicated SAM following further assessment and enrolled for treatment. After eight weeks of treatment, 43.1% children were discharged as cured, 10.6% defaulted, 46.3% had not recovered and continued treatment from nine to 12 weeks, and 0.1% died, demonstrating low default and death rates. The sex ratio of enrolled SAM children was 1,274 girls per 1,000 boys. The proportion of cured female children (44.8%) was higher than cured male children (40.8%). Mean weight gain of enrolled children after eight weeks was 3.2 g/kg/day, which is lower than international standards (Sphere, 2011) and some other programmes in India (Diop et al., 2003; Manary et al., 2004; Thakur et al., 2013), but higher than 2.8 ± 3.2 g/kg/d as reported by Ciliberto et al., 2006. After 12 weeks, 70.2% of enrolled children were discharged as cured, 12.2% SAM children defaulted, while 17.2% were not cured and referred to MTC for further treatment and only SAM children 0.1% died.

Independent impact evaluation of POSHAN II

Methodology

The Indian Institute of Health Management Research (IIHMR) conducted an independent evaluation of POSHAN II using a quasi-experimental research study design between December 2018 and February 2019. A cohort of SAM children aged 6-59 months was sampled at baseline, midline and endline. The baseline study was conducted during the identification and enrolment of SAM children; midline and endline studies were conducted after eight weeks and 12 weeks of treatment. A sample-size calculation was car-

ried out and children recruited accordingly from 70 POSHAN centres from five out of 20 programme districts. One district was selected at random from each of the five programme 'zones', reflecting different geographic, cultural and socioeconomic characteristics. A total of 1,322 SAM children were enrolled in the study (88.9% of target sample). The baseline study included 1,105 children (83.5% of enrolled children), the midline study covered 753 children (100% of target sample) and the endline study covered 1,091 children (82.5% of target sample). Ethical approval for the evaluation study was obtained from IIHMR University's Institutional Review Board.

Findings

The majority (47%) of enrolled SAM children were aged 12-23 months; 21.3% were aged 24-35 months; 14.3% aged 6-11 months; 10.2% aged 36-47 months; and 7.4% aged 48-59 months. A total of 69.1% (764) children were enrolled in the POSHAN II programme with weight-for-height z-score (WHZ) < -3 SD; 16.2% (179) with both WHZ < -3 SD and MUAC < 11.5cm; and 14.7% with MUAC < 11.5cm. At eight weeks, 42.4% (319) children were cured; 4.1% (31) children defaulted, and 53.5% (403) children had not recovered and continued treatment. After 12 weeks, 66.9% (730) children recovered; 8.1% (88) had defaulted, and 25% (273) had not recovered. At 12 weeks, SAM children enrolled with MUAC had shown a higher cure rate (72.2%) compared to children enrolled with WHZ (68.8%), followed by children enrolled with MUAC and WHZ (54.2%). Cure rates achieved after 12 weeks of treatment were favourable compared with international standards and other similar Indian studies (Table 2). Underweight was not an admission criterion to the POSHAN II programme but, given increasing attention to WAZ as an indicator of risk, the underweight profile of admissions to the study is included here. Of enrolled children, 79.5% (878) were calculated to be severely underweight (< -3SD weight-for-age z-score (WAZ)), 17.1% moderately underweight (< -2SD WAZ) and 3.4% (38) were not underweight.

Socio-cultural study of POSHAN II

A qualitative socio-cultural study was undertaken to understand the local context of SAM children and cultural practices at household level that may have influenced outcomes of the POSHAN

II programme. One programme block was targeted in each programme of the five studied districts during the post-treatment phase (after 12 weeks). In-depth interviews were conducted with 15 randomly selected mothers of cured, defaulted, and non-recovered SAM children. Focus group discussions (FGDs) with the same mothers were also conducted to understand differences of opinion. During in-depth interviews, the interviewer spent one whole day with the SAM child's family to understand household characteristics, socioeconomic status, availability of food, and cultural influence on food choices, eating habits and beliefs regarding food and nutrition. Data was collated and themes identified and analysed in detail.

Findings showed no significant differences in the socio-demographic characteristics of cured, non-recovered and defaulted SAM children. Non-recovered SAM children were found in families with a household earning of around Indian rupees (INR) 2,000 or less per month, as well as in families earning around INR 5,000 or more per month. Cured, non-recovered and defaulted SAM children were observed in families with a broad spectrum of socioeconomic status and tribal groups engaged in a range of occupations, including agricultural activity. No patterns were observed in the household food basket of families of cured, non-recovered and defaulted children. Most families of SAM children were vegetarians. Some families had a low or zero intake of green vegetables and fruits. In contrast, others had high dietary diversity, with food baskets that included roti, green vegetables (okra, bitter melon, bottle gourd, tinda and spinach), vegetables (potatoes and pumpkin), pulses (*urad dal*, *moong dal*, *chana dal* and *masoor dal*), curd, buttermilk, milk in the form of tea and (occasionally) rice.

Irrespective of socio-demographic characteristics and type of food basket, all SAM children had a troubled medical history (for example, vomiting, lack of appetite, diarrhoea and fever) and/or low birth weight and lack of appetite from birth. Notably, some mothers of non-cured and defaulted SAM children reported extremely low levels of haemoglobin (as low as 5.5 g/dL) during pregnancy and a history of stillbirths and/or previous child deaths. Despite low haemoglobin levels and poor dietary intake, most of these mothers did not believe that they were

Table 2 Comparison of POSHAN II outcomes with national and international standards (Sphere) (Aguayo et al., 2013; Burza et al., 2015; Sphere Project, 2011)

Indicators	POSHAN II	Indian studies	International standard (Sphere)	
			Acceptable	Alarming
1 Proportion of SAM children cured (%)	66.9	43 to 57	>75	<50
2 Proportion of SAM children defaulted (%)	8.1	32 to 38	<15	>15
3 Proportion of SAM children died (%)	0	0.4 to 1.1	<10	>25
4 Mean weight gain (gm/kg/day)	3.2	1.6 to 5.1	≥8	<8

⁷ Assuming 8.7% prevalence of SAM in rural areas (NFHS-4) with ~60% and ~80% recovery rate (POSHAN 1) after eight and 12 weeks of treatment, risk ratio of 2.0, 95% Confidence Interval (CI), 80% power and 10% non-response rate, it was estimated that 750 and 1,486 SAM children will be required for midline and endline study.

undernourished during pregnancy and lactation and were not aware that their nutrition during pregnancy could impact on their child. The mothers also did not recognise the importance of birth spacing to protect the health of their offspring and themselves.

Potential for the scale-up of CMAM in India

The first of its kind in India, POSHAN II is a CMAM programme implemented on a large scale to cover 10,344 SAM children across 20 districts of Rajasthan from November 2018 to June 2019. Programme outcomes suggest that SAM children without medical complications can be treated successfully using energy-dense nutrition supplement (EDNS) in the community. While the daily average weight gain was lower than international targets, we feel this reflects the Indian context and programme-based outcomes and could be improved through better counselling of mothers to help comply with feeding advice and supportive supervision during follow-up visits by accredited social health activists (ASHAs). The programme has been well integrated within existing health systems without the addition of a new cadre of health workers. In particular, the programme demonstrates the viability of linking CMAM programming with India's existing Integrated Child Development Scheme (ICDS) and Village Health Sanitation and Nutrition Day programmes for the screening, identification and treatment of SAM children in the community.

A significant challenge for scale-up will be the sustainability of funding, given the considerable expense of large-scale EDNS supplies. Based on the findings of the evaluation study, the Indian Institute of Health Management Research (IIHMR) recommends that the Government of Rajasthan (GoR) National Health Mission (NHM) should adopt the CMAM strategy in the medium term to address the high prevalence of SAM in the state of Rajasthan. IIHMR also recommends that an analysis of the CMAM strategy, underpinned by quality monitoring and evaluation, is undertaken to understand the cost-benefit of a government-funded CMAM

programme to address the issue of SAM in the long term. The success of a government-funded programme will depend on a robust management information system, training of the healthcare workforce, a recording and reporting mechanism, and significant resources and supply-chain management for EDNS.

Findings of the socio-cultural study suggest that LBW and poor maternal nutrition are important drivers of SAM that must be urgently tackled. More operational research is needed to identify possible linkages between the CMAM programme and other existing interventions to this end. The Maternal and Child Health Integrated Programme (MCHIP) is a landmark programme of the Government of India that adopts India's Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) strategy, aiming to provide comprehensive care at each key stage of the life course. Interventions of relevance under RMNCH+A strategy include the national iron+ initiative to address iron deficiency in adolescent girls; special newborn care units (SNCUs) where LBW infants receive treatment; close monitoring and follow-up of LBW babies by frontline workers; and an online tracking system for mothers and children. Collaboration with development partners such as UNICEF, CIFF, GAIN, ACF and Tata Trusts should also be explored by GoR NHM to support other interventions at critical stages of the life course to help prevent acute malnutrition.

National scale-up of CMAM is also recommended, based on the promising results from the Rajasthan experience. The central government can support this effort by promoting CMAM through the National Nutrition Mission (NNM) and releasing updated national CMAM guidance that is already in development. Once guidelines are in place, CMAM should be integrated into the training curriculum for medical professionals, nutritionists and frontline/community health workers. A capacity assessment of health and community-level systems is highly recommended to identify current capacity, access and barriers in the uptake of CMAM services in India.

Conclusion

POSHAN II in Rajasthan is the first large-scale CMAM/integrated management of acute malnutrition (IMAM) programme in India to be implemented for the treatment of severely malnourished children in the community. A decentralised approach, dovetailed with the existing healthcare system, enabled the strengthening of the current systems and improved access to and coverage of treatment services to SAM children. An independent evaluation study of POSHAN II demonstrated a cure rate of 66.9%, which confirms the success of the CMAM approach in this context. The experience of POSHAN II also provides reassurance that locally produced energy-dense nutrition supplement (EDNS) is safe and acceptable and rapidly improves the nutritional status of severely malnourished children.

The socio-cultural study findings suggest that maternal undernutrition, maternal perceptions of undernutrition, LBW child health may be key drivers of SAM in the state. Findings indicate an urgent need for multiple strategies to address the causes of child undernutrition, including social behaviour change communication (SBCC) at the household level, interventions to support infant and young child feeding (IYCF), and strategies to support nutrition during adolescence, pre-pregnancy and pregnancy to help prevent LBW. Issues related to the social determinants of childhood undernutrition should also be addressed.

Overall, the CMAM programme was implemented successfully at scale in Rajasthan and deserves to be integrated within primary healthcare services in this state and beyond. Successful implementation was dependent on a high level of political commitment and collaboration with partner agencies to provide technical and (critically) financial assistance. Integration of CMAM into the national health system in India to support national scale-up will require long-term funding for EDNS and capacity-building and supportive supervision of health workers at each level.

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