

Research Article

Studying the effectiveness of mixed models of community based and institutional based interventions for management of severe acute malnourished children

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ABSTRACT

Background: Children with severe acute malnutrition (SAM) have nine times higher risk of dying than well-nourished children. Child malnutrition can be managed by community based approach (80-85% SAM children) and institution based approach (10-15% SAM children). The objective of the study is to know the effectiveness of the mixed interventions to improve the nutritional status of the children (0-6 yrs), to decrease the prevalence of malnutrition in the children attending ICDS in Rajkot city for combating child malnutrition.

Methods: A baseline survey of total registered 26578 children was carried out at 330 anganwadis and 701 SAM children were identified till the end of June 2014. A model of mixed interventions i.e. i) Community based management consisting of special food program, monthly health checkup and treatment and health education to parents, ii) Institution based management of SAM children with complication was planned and implemented since July 2014.

Results: 701 children were identified as SAM at the beginning of the intervention while 160 children were SAM at the end of March 2015. The difference in the proportion of SAM children before and after intervention was statistically significant. An improvement of 80.9% in the status of SAM children was seen among boys while 74.1% was seen among girls.

Conclusion: Convergence of Health and ICDS activities, high risk approach, community based and institutional management and community awareness in combating the malnutrition showed significant effect. This model can be replicated elsewhere and sustainability may be ensured for long term results.

Keywords: Community based management of severe acute malnutrition, Food programme, Nutritional intervention, Medical intervention for severe acute malnutrition

INTRODUCTION

Childhood malnutrition is an important public health challenge because malnourished children have significantly higher risk of mortality and morbidity. Children with Severe Acute Malnutrition (SAM) have nine times higher risk of dying than well-nourished children.¹

The modest decline of under nutrition levels between the last two rounds of the National Family Health Survey

(NFHS) is well known and India continues to remain off-track from the Millennium Development Goal (MDG-1) target. The third National Family Health Survey (NFHS-3) reported 6.4% under-five children in India as severely wasted and 19.8% as wasted, translating to about 8.1 million children with severe acute malnutrition (SAM).²

The efficacy of hospitalized management of SAM children in Africa (compared with conventional treatment) is well established.^{3,4} This led to Nutritional

Rehabilitation Centers (NRC) / Child Malnutrition Treatment Centers (CMTC) emerging as the strategy of choice in India for institutionalized management of malnourished children. More recently, the global consensus is shifting towards community-based management of acute malnutrition for uncomplicated cases of SAM (estimated to be about 85% of all SAM cases). This is also based on African experiences of treating acute malnutrition by large scale use of ready to use therapeutic foods (RUTF) in community settings.^{5,6} Efforts are ongoing in India to frame guidelines for community-based management of acute malnutrition.⁷

Programmatic response to SAM

The main strategy for treatment of severe malnutrition (all such cases being *assumed and labelled* as 'SAM') in India has primarily been facility-based; a number of Nutrition Rehabilitation Centers (NRC) / Child Malnutrition Treatment Centers (CMTC) have been set up across the country, especially in high priority states under the National Rural Health Mission (NRHM).⁸ However there is emerging evidence of these models meeting with poor success in these states. Furthermore, standardized inpatient management of SAM has been associated with worse outcomes than has management in the community, which is attributable partly to the risk of children with SAM acquiring serious infections from other hospitalized patients and partly because of families' lack of acceptance of hospital-based care.^{9,10}

Towards community based management

There is renewed thinking on facility-based treatment, with opinion gradually veering towards Community- Based Management of Acute Nutrition (CMAM) as a cost-effective high-impact model. Hospital-based management of SAM lasts for 2-3 weeks (plus follow-up) and involve substantial burden including opportunity costs and social dislocation; CMAM offers an attractive alternative to these challenges. CMAM comprises of three key elements: (i) ready-to-use therapeutic food (RUTF), (ii) community engagement and mobilization, and (iii) screening for malnutrition in communities.^{11,12} There are three treatment modalities: (i) inpatient management at the stabilization center established near target communities, (ii) outpatient management, and (iii) supplementary feeding; the appropriate choice is dependent on the severity of malnutrition and its associated complications. Community based treatment can be integrated with existing health service system like ICDS.

As per NFHS III, the proportion of underweight children in Gujarat remained at 47%, while in the urban areas (overall) it was 39.2%.² Since July 2014, Rajkot Municipal Corporation has focused on this issue and planned to fight with child malnutrition in 'Mission Mode'. The basic concept of the project is to develop an effective model to cope with malnutrition in light of emerging evidence.

Objectives of the programme

The project pursues three specific objectives: 1) To improve the nutritional status of the children (0-6 yrs) of urban slum in Rajkot city by convergence of Health and ICDS (Integrated Child Development Scheme) department. 2) To develop an effective model to fight with malnutrition by combining the community-based & institution-based nutritional and medical interventions, and 3) To develop the 'nutrition-culture' in families - parents by increasing awareness regarding nutrition through intensive IEC-BCC.

METHODS

Study Area

The project was initiated in Rajkot city, situated in the heart of Saurashtra region of Gujarat state, under the Health and ICDS department, Rajkot Municipal Corporation (RMC). According to Census 2011, the total population of Rajkot city was 12,86,995 which gives it a ranking of 27th city in India (out of total 497 cities).¹³ Rajkot city has been divided by the RMC into three zones for administrative purposes: Central, East and West zone. A total of 330 Anganwadi Centers (AWCs) and 19 Urban Health Centers (UHCs) are located within the limits of Rajkot Municipal Corporation and spread across these three zones. One CMTC has also been in operation since August 2014.

Overview of the programme

Currently, no single model is available for effectively combating the acute malnutrition. Based on the emerging evidences, a two prong approach was used; 1) Facility based management at CMTC for SAM children who present with complications and 2) Community based management at AWC for SAM children without any complications. It has been evident that only 10-15% of SAM children develops complications and requires inpatient management, whereas remaining 80-85% of SAM children who do not develop complications can be taken care of on an outpatient basis in the community itself.¹⁴ Community based care would complement the services delivered through indoor institutional care and create scope for the majority of children to be provided care in the community setting itself thus reducing the demand on resources and health facilities.

Road map to mission

As per June 2014 report of ICDS department of RMC, 701 out of total 26578 children were identified as SAM in a total of 330 AWCs. For developing an effective strategy to combat this level of severe acute malnutrition, a series of sessions were held with all stakeholders viz. Municipal Commissioner, District Education Officer, Nutrition experts, faculties of Community Medicine department, Health and ICDS officials, NGOs and their views were

taken. A gap analysis report was prepared in the month of June 2014 and a road map to mission was prepared and shared with all concerned officials.

To push the agenda, a series of actions were taken; i) preparation of action plan was followed by urgent release of fund to the sum of Rs. 10 lakh to RMC for the purpose of utilizations towards combating malnutrition, ii) sensitization trainings were held for Medical officers of Urban Health Centers (UHCs), Anganwadi workers (AWWs), Accredited Social Health Activists (ASHAs), Auxiliary nurse midwife (ANM), and iii) a baseline survey of 26578 children was carried out at 330 Anganwadis and 701 SAM children were identified till the end of June 2014.

Identifying the SAM children

Within the existing health infrastructure, ANMs and ASHAs were trained in the use of Salter scales (precision to 100 g) and locally produced height boards (precision to 0.1 cm) to record weight and height/length, respectively, and as a way of monitoring progress throughout treatment. Salter scales were regularly calibrated and replaced as per manufacturer guidelines. Children admitted to the program were a mixture of those screened in the community and referred by ASHAs and those visiting the sites to seek health care for other reasons. On admission, information on caste, which is a form of social stratification used in India, was also recorded.

Table 1: Criteria for diagnosis of complicated severe acute malnutrition.

Category	Description of symptom
Appetite	<ul style="list-style-type: none"> Poor appetite or refusal or inability to eat test dose
Medical complications	<ul style="list-style-type: none"> Intractable vomiting Severe dehydration Infection (detected by a pediatrician or by medical officer as per FIMNCI protocol) Pitting edema on both legs or body Fever >39°C or hypothermia
Nutritional profile	<ul style="list-style-type: none"> < -3 SD weight for height and/or MUAC <11.5 cm Severely underweight child (red classification of WHO growth chart) Underweight child showing serious growth faltering (declining trend of growth line between two consecutive measures)

Once a child was newly diagnosed with SAM, his or her details were entered into a register, and health education was provided to the caregiver while an ANM or ASHA

repeated anthropometric measurements, took the child's vital signs, and performed a basic triage including a standardized appetite test to determine the child's ability and willingness to eat (Table 1). The purpose of this test is to provide the child with a small amount of food to see if a child with severe wasting has the desire and strength to eat; if this is not the case, the child is considered to have anorexia, and, therefore, be at higher risk of complications, and thus is admitted directly for inpatient care in the CMTC. All children were examined by a Medical Officer for complications that might require either admission into the CMTC or additional medication beyond that provided during the systematic initial treatment.

Community based management

All SAM children are being provided special food 5 times a day for continuous 1 month as per state INC (Intensive Nutrition Campaign) guidelines (Nutritional Intervention) as detailed in Table 2. The quantity provided depended on the child's weight. Simultaneously micronutrient drugs, protein powder and protein biscuits were also provided to the caregivers of SAM children. Besides, a centralized kitchen was also established where raw material was stored separately in store room; food was cooked and packed in a hygienic environment and finally transported to all AWCs so that quality supplementary food was made available to all the children in anganwadis.

Table 2: Nutritional intervention for community based management (as per Mission Balam Sukham guidelines).

Timing	Food items	Quantity	Calorie (kcal)
08:30 am	Rab made from Bal Bhog (with milk)	1 bowl (100 gms)	350
11:30 am	Regular meal routinely provided at Anganwadi	As per the daily routine	1050
01:30 pm	According to State INC guidelines	100 gms	1400
03:00 pm	Boiled Sweet Potato/ Green Peas/ Gram/ Mung dal (any one from these on alternate Days) and Banana / Seasonal Fruits	20 gms	6 month - 3 year : 300 3 year - 6 year: 450
05:00 pm	Shiro, Upma, Muthiya made from amylase fortified flour used with vegetables and local available ingredients	100 gms	1180

Inpatient based management - establishment of Child Malnutrition Treatment Center (CMTC)

A CMTC with 10 beds, one Medical officer, one visiting pediatrician and a trained counselor was established. SAM child & her mother are admitted here for 21 days and treatment with special food plan is provided. Admission into the 24-h CMTC unit could occur at the initial presentation or any point during the community-treatment phase. All children who presented with one or more conditions listed in Table 1 were admitted directly to the CMTC and provided 24-hour medical care and nutritional treatment until their clinical condition stabilized enough for transfer (or return) to community based management. Within the CMTC, children were treated according to the standard inpatient-treatment protocol for SAM. ¹⁴ The protocol divides the treatment of complicated cases into the following phases as shown in Table 3: a stabilization phase is used to restore metabolic function and stabilize clinical status by using frequent feeds of WHO-standard F75 milk; a transition phase of increased energy intake within the same volume of feed is used to restore lost tissue and reduce risk of refeeding syndrome and fluid overload; and rehabilitation phase is used to promote weight gain by increasing nutritional intake and re-integration into the social environment before transfer to the community by using F100-equivalent local foods.¹⁴

Table 3: Summary of inpatient treatment protocol used in CMTC.

Treatment phase	Treatment	Duration
Stabilization phase	8 meals/d (every 3 h), starter F-75 diet 100 kcal/kg/day 130 ml/kg/day F-75 diet	1-2 days
Transition phase	8 meals/d (every 3 h), starter F-100 diet 100 kcal/kg/day 130 ml/kg/day F-100 diet	2-3 days
Rehabilitation phase	Ready to use local cooked meal >200 kcal/kg/day	16-18 days

Criteria for exits from CMTC ¹⁴

To be discharged as cured, children had to meet the discharge criteria on 2 consecutive visits. The following discharge criteria were used; i) child has completed antibiotic treatment, ii) child has good appetite (120-130 kcal/kg/day), iii) child shows promising weight gain (at least 5 g/kg/day for three consecutive days) on exclusive oral feeding, iv) child does not have edema and v) child is immunized up to date.

Child was referred to NRC (Nutritional Rehabilitation Center) in case of failure to respond to the treatment and management at CMTC.

Community information, education, and communication strategies

Medical Officers, Health Workers and Anganwadi Workers have been keeping continuous touch with parents of those children and making efforts for behavior change communication (BCC), Counseling and health education. IEC was also carried out through various celebrations at Anganwadis, parents meetings, distribution of leaflets, and banners. Awareness rallies were also conducted by Health department of RMC in Rajkot city.

Supportive Supervision by officials

Intense monitoring and supportive supervision was carried out officials of health department every monthly. Feedbacks were obtained from health workers as well as caregivers of the child. Simultaneous benefits from other Government schemes were also provided viz. Kasturba Poshan Sahay Yojna, Rashtriya Baal Swasthiy Karyakram, Mukhyamantri Amrutam Yojna etc.

Data Management and Analysis

Data was entered in MS Excel 2007 and appropriate statistical tests were applied.

RESULTS

A total of 26,578 children aged 6 months to 6 years were registered in all 330 anganwadi centers in Rajkot city. 16084 (60.5%) were boys and 10494 (39.5%) were females. A total of 701 children were identified as SAM children at the end of June 2014.

Of the children identified as SAM, 382 (54.5%) were girls, which was a proportion substantially higher than the proportion of girls registered at anganwadis (39.5% girls). 319 (45.5%) of the identified SAM children were boys against proportion of boys registered at anganwadis (60.5% boys)

701 children were identified as SAM at the beginning of the intervention while 160 children were SAM at the end of March 2015. The difference in the proportion of SAM children before and after intervention was statistically significant (p < 0.01).

Overall, there was an improvement of 77.2 percent in the status of SAM children after the intervention measures. Of the 160 children that were SAM at the end of intervention, 61 (38.1%) were boys whereas 99 (61.9%) were girls. An improvement of 80.9% in the status of SAM children was seen among boys while 74.1% was seen among girls. The difference in the improvement after intervention among boys and girls was statistically significant (p < 0.05%) as seen in Table 4.

Age wise distribution of SAM children shows that 14.1% children belonged to the age group of 6 - 11 months,

50.1% belonged to 12 - 35 months and 35.8% belonged to 36 -59 months age group (Table 5). An improvement of 96.0%, 74.6% and 73.3% was seen among the age groups 6 - 11 months, 12 - 35 months and 36 - 59 months respectively.

Table 4: Effect of programme on the status of malnutrition of the SAM children.

	Children diagnosed as SAM		Total	SEP Z value	p value
	Male	Female			
Before intervention (%)	319 (45.5)	382 (54.5)	701 (100.0)	28.55	< 0.01
After intervention (%)	61 (38.1)	99 (61.9)	160 (100.0)		
Percentage improvement	80.9	74.1	77.2	2.17	< 0.05

Table 5: Age wise distribution of admission and outcome status of SAM children.

	Children diagnosed as SAM			Total
	0 - 11 months	12 -35 months	36 - 59 months	
Before intervention (%)	99 (14.1)	351 (50.1)	251 (35.8)	701
After intervention (%)	4 (2.5)	89 (55.6)	67 (41.9)	160
Percentage improvement (%)	96.0	74.6	73.3	77.2

Mean increase in the weight of the children after the onset of intervention shows upward trend when presented graphically (Figure 1). Average of mean increase in the weight of all SAM children was found to be 340 gms/month.

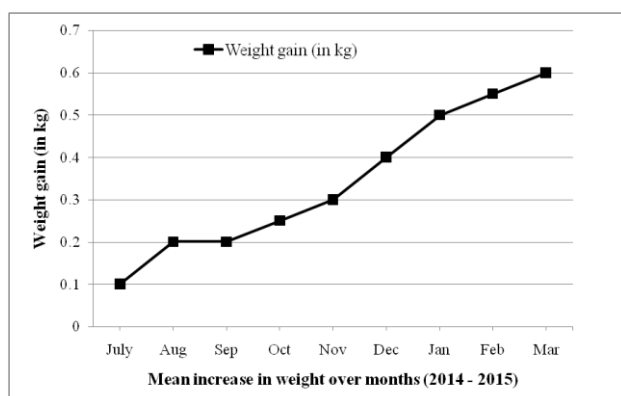


Figure 1: Mean increase in weight of over time for children diagnosed as SAM.

The number of SAM children decreased significantly after the onset of intervention ($p < 0.01$) from July 2014 till March 2015 (Figure 2).

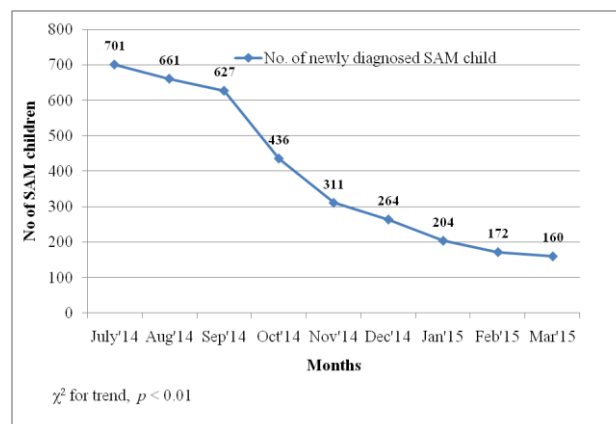


Figure 2: Number of children newly diagnosed as SAM over time from onset of intervention (July 2014) till March 2015.

DISCUSSION

As home to nearly one-third of the world’s children with SAM, India’s approach to treating SAM has relied almost exclusively on inpatient care, whereas the community-based approaches shown to be effective and feasible in African settings have not been well tested, studied, or implemented in India. This article describes the outcomes of 701 children with SAM treated with both community program (through ICDS) and inpatient care (through CMTC) in Rajkot city.

Our findings suggested that this holistic approach was an effective strategy, which led to cures for 77.2% of children who completed the treatment. Demographic data showed a disproportionate share of girls (54.5%) in children admitted to the program. That 64.2% of children admitted into the program were less than 3 y of age has major public health implications for the prevention and reversal of acute malnutrition and also suggests that active case-detection strategies may benefit from focusing on this age group.

As shown in Figure 1, weight followed the upward trend throughout recovery and was most rapid in the early stages of admission as noted in other studies.¹⁵

Because of the high burden of SAM seen in India, the current strategy of inpatient treatment programs alone is unlikely to provide care for all of these SAM children at higher risk of death. A 2012 study of 93 children treated in the state of Madhya Pradesh concluded that, although the compulsory 14-days inpatient stay succeeded in improving the condition of admitted children, the improvement was not sustained after discharge. Perhaps more crucial was the supposition that even if all 175 dedicated inpatient nutritional facilities were running at full capacity, it would take 15.5 years to provide this

treatment method to the 1.3 million children in the state suffering from SAM.¹⁶

An additional 2013 study in Madhya Pradesh described the outcomes of 2740 children randomly sampled from the 44,017 children treated for SAM in 2010. This program model admitted all children for 14 day of inpatient care in Nutrition Rehabilitation Centers and discharged them to a community program in which Ministry of Health frontline workers monitored their progress and ensured that they benefited from the Integrated Child Development Services Supplementary Nutrition Program. No priority was given to admitting children with complicated SAM, and discharge was automatic after 60 days of community follow-up. Overall, the program reported a 0.4% overall mortality rate with a 32% default, and 43.9% discharged as recovered rates. The mean weight gain was 2.7 g/kg/d. The mean weight gain during the community-treatment phase was 1.6 g/kg/d.¹⁶

Limitation of the Study

Intra-observer or inter-observer variation bias may have been introduced during classification of children by Anganwadi workers.

CONCLUSION

Effective utilization of combination of strategies i.e community based management and inpatient based management showed significant improvement in the status of SAM children. This holistic model has the capacity to be adopted into an existing government capacity, if adequate institutional support is provided. This will require a significant investment by policymakers to develop state specific sustainable models of care that provide sufficient coverage and capacity to treat the large burden of children with SAM that exist in the country. Proportion of girls who were SAM is higher than that of boys which needs to be addressed. Leveraging of new technologies i.e. use of centralized kitchen was used as an effective tool to increase the quality of food.

Future directions

To cater the burden of SAM children, one more CMTC establishment has been proposed. Intensive follow up of children and their parents would ensure the sustenance of the weight gained during the intervention phase. Strong political commitment and support would go a long way for effective utilization of this programme. A cost-effective analysis that compares this combination approach with current hospital based model of care would be a useful next step to procure more evidences for future planning strategies.

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