

Screening and Management of Maternal Malnutrition in Nutritional Rehabilitation Centers as a Routine Service: A Feasibility Study in Kalawati Saran Children Hospital, New Delhi

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Abstract

Background: In India, Nutrition Rehabilitation Centers (NRCs) established at public health facilities provide residential medical nutrition therapy for severe acute malnutrition (SAM) children with complications. A large proportion of their mothers are also malnourished. NRCs do not provide services to such mothers as part of routine practice. However, technical algorithm for delivering Maternal Nutrition (MN) services in facility settings is available. **Objectives:** To test the practical feasibility of layering the MN services in NRC as a routine service. **Methods:** The MN services were delivered by a nutrition counselor using a triage approach (assess, classify, supplement/counsel/treat). All mothers received diet, micronutrients, and group counseling, those at nutritional risk received individual counseling and SAM mothers also received catch-up diet during their stay. Program data were collected from mothers during January 1 to August 31, 2019 at the NRC in Kalawati Saran Children Hospital. To gain operational insights, a structured interview with nutrition counselor was conducted. **Results:** Out of 168 mothers, 8% were found to be pregnant and 89% were at nutrition or medical risk. The prevalence of short stature was 18%, severe/thin 21%, overweight/obese 34%, and anemic 72%. Feedback from the nutrition counselor indicated no operational challenges, however, further efforts to ensure that mothers keep coming back for follow-up visits is needed. **Conclusion:** The findings indicated that existing staffs were able to deliver the MN services within the time, cost, and regime of the routine NRC. This paper provides four recommendations for layering the MN services in NRCs.

Keywords: Maternal health, maternal nutrition services, severely acute malnourished children

INTRODUCTION

Under the Ministry of Health and Family Welfare, nutrition rehabilitation centers (NRCs) have been set up in India to provide facility-based management for children under-five suffering from severe acute malnutrition (SAM) with medical complications.^[1] Currently, India has 1151 functional NRCs where SAM children stay for 7–14 days along with their mothers/caregivers and receive medical and nutritional therapeutic care. A large proportion of mothers/caregivers of the children admitted to the NRCs is also malnourished and suffers from medical complications. Often times, some already pregnant.^[2-4] Recent studies showed that 5% of the mothers in NRC and 3.5% of urban poor mothers (25–60 months) in

India are also suffering from SAM (body mass index [BMI] <16 kg/m²).^[4,5] There is compelling evidence linking severe acute malnutrition and childhood stunting to maternal factors such as very low BMI (BMI <16 kg/m²), short stature (height <145cm), and short inter-pregnancy interval.^[6-10]

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However, there is little experiential and programmatic evidence of assessing, classifying and managing maternal malnutrition in India as a part of routine NRC service as such a protocol is not a part of the NRC services, although the management of adult malnutrition in facility settings in India has a package which are used in tuberculosis wards.^[11]

This is a follow-up study of previous study by two authors of this paper^[4] wherein a package and algorithm were developed in 2 phases for providing simple few services to mothers at NRC during their stay through additional staffs. The first phase of the study was conducted between September 2016 and November 2017 and involved profiling the nutritional status of mothers. Phase 2 involved developing, contextualizing, pretesting and presenting of a maternal service package to the Government of India (GoI). Briefly, the maternal nutrition (MN) service package^[12] included the following; (i) Assessment of nutritional status, clinical signs & symptoms, blood pressure, blood sugar, haemoglobin estimation; (ii) classification of risk category (nutrition risk/medical risk) based on the assessment; (iii) provision of nutrition health education and counseling (group based/individual need based) and interventions, referral and treatment of medical illnesses as per national guidelines. However, the services were not tested for their practical feasibility at routine NRC settings. We tested the practical feasibility of delivering the services in routine NRCs by nutrition counselor who is already a part of the existing government system.

METHODS

The MN services were delivered as part of routine NRC service from January 1, 2019, to August 31, 2019 at the NRC located in Kalawati Saran Children's Hospital (KSCH), Lady Hardinge

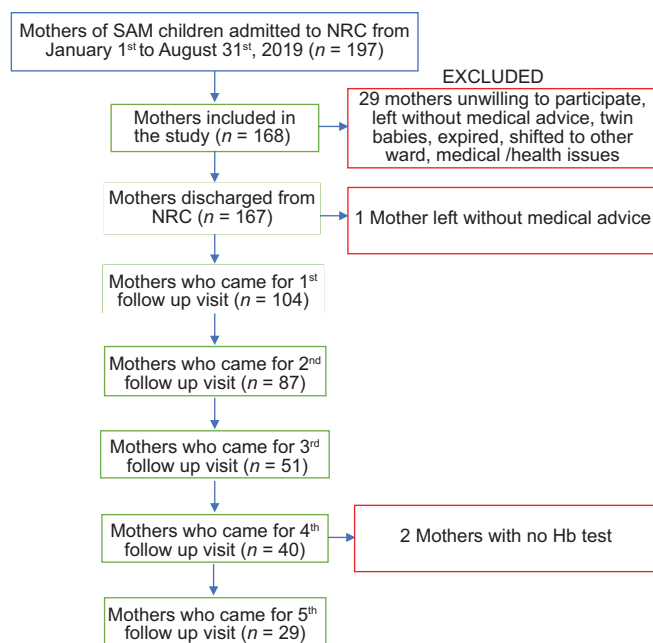


Figure 1: Number of mothers attending follow-up sessions at the Nutrition Rehabilitation Centre

Medical College, New Delhi. One hundred and sixty-eight mothers of SAM children admitted from January 1, 2019, to August 31, 2019, were registered by a nutrition counselor to avail the MN services [Figure 1]. Written informed consent was obtained from each mother, prior to registration. The details of the services provided to the mothers are depicted in Figure 2. Information were captured by the nutrition counselor at the time of admission, discharge, and follow-up visits. During admission, in addition to general mother profile, details on clinical and nutritional status, precounseling health and nutrition knowledge-level (using a 38-point scored questionnaire) were also assessed. At the time of discharge, weight, height, and MUAC measurement along with post counseling knowledge-level assessment were conducted. Five follow-up visits to the NRC within 4 months of discharge were recommended for both the mother and child. Weight and MUAC were measured during every follow-up until 5th follow-up, and hemoglobin estimation of anemic mothers at admission was done on 12th week, i.e., 4th follow-up visit. This study utilized the maternal data from the NRC records to assess uptake of services by mothers.

Primary data collection

Qualitative data were collected in the month of November 2019 by the nutrition researcher to identify operational challenges/barriers and enabling factors influencing implementation of the package. To identify operational barriers and enabling factors influencing implementation of the package, the trained nutrition counselor was interviewed using a structured questionnaire. The questions included details on: (1) Availability of health work force, logistics, drugs, supplies, and recording register; (2) time taken to deliver MN services; (3) training received on MN services as per MN package guidelines;^[11] (4) adequacy of skill/knowledge regarding calibration of equipment, anthropometric techniques and clinical examination (questions 1–3 were graded as: “Poor” if the nutrition counselor had inadequate knowledge; “good” for adequate knowledge but lack of practical skills; “very good” for both adequate knowledge and practical skills); and (5) what worked and what did not in the routine services. As per operational guidelines on facility-based management of children with severe acute malnutrition,^[11] additional one time and recurrent activities were identified for MN package for NRC. The total cost was estimated using target as per MN Guidelines^[11] and unit cost as approved by GoI (Record of Proceeding, Delhi 2020-21) and website of SECA.

Anthropometric and biochemical measurements

The data on anthropometric and biochemical measurements were taken from the NRC records. Weight was measured using SECA weighing scales (model 874, Germany) with at least 100 g gradation. Height was recorded using UNICEF SECA stadiometer (model 216, Germany) with 0.1 cm gradation and MUAC using MUAC tape (procured from UNICEF supply department) with a gradation of 0.1 cm. Neck circumference (NC) was measured using SECA ergonomic circumference measuring tape (model 201). BP was checked

using Omron BP machine (HEM-8712, Japan). Blood sample was collected from consenting mothers for hemoglobin and fasting blood glucose estimation using Erba Sysmex KX-21 auto-analyzer and Dr. Morepen Combo Pack of BG-03 glucose meter, respectively. Women were classified as severely thin/thin (BMI <16 kg/m²/16–18.49 kg/m²) or anemic (non-pregnant <11 g/dl/pregnant <12 g/dl) following the standard WHO cut offs.^[13,14] For classification of overweight/obesity, WHO Asia-pacific classification of overweight (BMI 23–24.9 kg/m²) and obesity (BMI ≥25 kg/m²) were used.^[15] Wasting and severe wasting were defined using MUAC cut off of <23 cm and MUAC <19 cm respectively as an alternate for BMI.^[11] MUAC 26–30 or >30 cm, and NC ≥34 or ≥36.5 cm were considered overweight or obesity.^[16,17] Ethical approval for this study was obtained from the Ethics Committee for Human Research of Lady Hardinge Medical College and Associated Hospitals, New Delhi.

Statistical analysis

Descriptive statistics were computed using SPSS v. 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows. Version 22.0. Armonk, NY: IBM Corp). We present the data for all mothers, stratified in two categories - pregnant and nonpregnant.

RESULTS

A total of 168 mothers were registered for the MN services. Mean age of the mothers was 26.1 ± 4.2 years and 13 (7.7%)

mothers were also pregnant. Thirty eight percent of mothers never attended school, majority were unemployed (84.5%) and 57 (33.9%) had 3 or more children. Adoption of family planning methods was poor (31.5%). The prevalence of young mothers was 1.2% (age <20 years), maternal low stature (height <145 cm) was 18%, and mild-to-moderate anemia was 66% and severe anemia was 6.6%. According to BMI and MUAC classifications, 17% and 30% of the mothers were thin, 2.4% and 4.9% were severely thin, 17% and 24% were overweight, 17% and 7.8% were obese, respectively [Table 1].

All the mothers were provided hospital diet, group-based nutrition education and counseling for 5 days a week (micronutrients and anemia; diet diversity; personal hygiene and sanitation; breastfeeding, family planning; and non-communicable and communicable diseases), micronutrient supplementation and deworming as per national guidelines. Eighty-nine percent who had any one nutritional or medical risk received additional interventions such as bedside individual need based counseling (young, short, thin, overweight/obesity and anemia), referral and treatment of medical illnesses as per national guidelines. Nine mothers (5.4%) severely thin mothers (either with MUAC or BMI) received 350 ml of catch diet (the composition of catch up diet is cow’s milk/toned dairy milk [treated buffalo milk] 315 ml, sugar 26.2 g and vegetable oil 7 g which has 350Kcal, 10.1g of protein and 14.7 g of lactose) as per the protocol. Out of 168 mothers, 104 mothers received services at 1st follow-up, 87 at 2nd, 51 at 3rd,

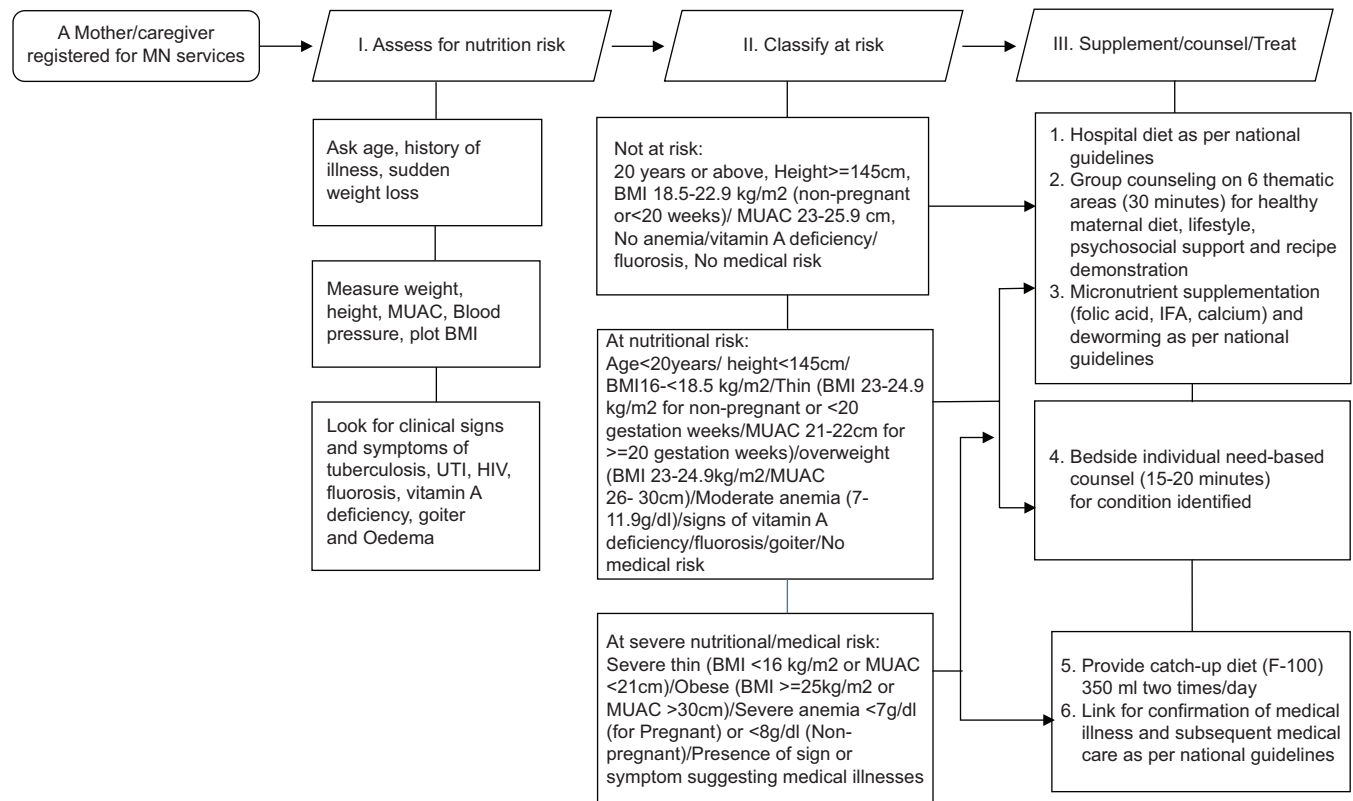


Figure 2: Flow of the maternal nutrition services at Nutrition Rehabilitation Centre

Table 1: Sample characteristics

	Nonpregnant, n (%)	Pregnant, n (%)
Total (n=168)	155	13
Age (years)		
Mean age±SD	26.1±4.2	26.1±4.0
Young (age <20 years)	1.3	0
Education qualification		
Never attended school/illiterate	36.1	53.9
<10 th grade	42.6	38.5
10 th grade or above	21.3	7.7
Employment status		
Employed	14.2	30.8
Unemployed	85.8	69.2
Number of living children		
One	29.0	30.8
Two	37.4	30.8
Three or more	33.6	38.5
Use of family planning methods		
No	67.7	76.9
Yes	32.3	23.1
At risk (nutrition/medical risk)	89	84.6
Anthropometry		
Short (height <145 cm)	18.7	7.7
Severe thin (BMI<16 kg/m ²)*	3.9	22.2
Thin (BMI 16-18.49 kg/m ²)*	17.4	11.1
Severe thin (MUAC <19cm)	1.3	15.4
Thin (MUAC 19-22.9 cm)	29.7	38.5
Overweight (BMI 23-24.9 kg/m ²)*	18.1	0
Obese (BMI ≥25 kg/m ²)*	18.1	0
Overweight (MUAC 26-30 cm)	25.2	7.7
Obese (MUAC >30 cm)	8.4	0
Mild anemia (Hb 11-11.9 or 10-10.9) (g/dl)	35.5	7.7
Moderate anemia (8-10.9 or 7-9.9) (g/dl)	32.3	38.5
Severe anemia (Hb <8 or <7) (g/dl)	5.8	15.4
Signs and symptoms suggesting of nutrient deficiency/medical illness		
Night-blindness/Bitos's spot	3.9	0
Distinct brown discoloration/white chalky opacities or patches/pitting of tooth/knocked knees/bowed legs	11	7.8
Palpable/neck swelling	6.5	0
Cough or blood in sputum	0.7	0
Burning or itching sensation during urination/foul smelling vaginal discharge	7.7	0
History of recurrent or prolonged illness	1.9	0
High blood pressure (≥120/≥80) (mmHg)	23.9	15.4
Raised fasting blood sugar (≥100 or ≥95) (mg/dl)	23.2	7.7

*BMI in pregnant women is calculated for only <20 weeks' gestation. n: Sample size, SD: Standard deviation, BMI: Body mass index, MUAC: Mid upper arm circumference

40 at 4th and 29 mothers at 5th follow-up visits, respectively. A significant change in the mean knowledge score ($P < 0.01$) was observed at discharge (25.3 ± 0.54) as compared to admission (12.3 ± 0.42). Out of 40 mothers who came for the 4th follow-up, the prevalence of anemia declined from 72.5% at admission to 50% during 4th follow-up.

Findings from the qualitative survey of nutrition counselor indicate that the MN package was useful in assessment, classification, and management or referral of beneficiaries. Services were delivered without any challenges and no identifiable gaps with respect to available health work force, logistics, drugs and supplies, and trainings were reported. Existing nutrition counselor was able to screen and classify one mother within 30–35 min, provide group counseling to mothers in about 30–45 min and individual counseling to one mother who is at risk in about 15–20 min [Table 2]. All equipment such as weighing machine, stadiometer, MUAC tape, nonstretchable tape, and BP monitor were available and fully functional at the time of the interviews. Supply of essential micronutrient supplements such as iron folic acid tablets, calcium tablets, albendazole tablets, and dry rations necessary for recipe demonstration and catch up diet were fully stocked. The overall one-time cost for procuring anthropometric equipment and printing of counseling toolkits was 30,619 Indian Rupee (INR) [Table 3]. The recurrent cost which includes pharmacy supplies and kitchen supplies was 13,925 INR which is likely to vary depending on number of severely thin women identified [Table 3]. Adequate space for counseling session was available in the NRC and sessions were conducted using dialogue cards and at-risk cards. Data recording and reporting and monitoring structure of maternal indicators were integrated into the existing NRC reporting structure. Laboratory tests of the mothers were performed and referral was done in the presence of signs/symptoms in-house. The MN training session was integrated with existing training sessions/calendar for SAM Treatment Unit/NRC. Knowledge of service provider regarding calibration, anthropometric techniques, and clinical examination was “very good.” However, feedback from the service provider indicated that funding was a challenge as there is no operational and financial guidelines to implement MN services, specifically. In addition, further efforts are needed to ensure that mothers keep coming back for follow-up visits. Out of 168, 38% (63) did not come back for any follow-up visits and only 17.4% (29) completed all 5 follow-up visits.

DISCUSSION

To the best of our knowledge, this paper presents for the 1st-time, a study of operational evaluations of delivering MN services in a routine NRC. Our primary objective was to gain insights into the ground realities and challenges in implementing the MN services, understand stakeholder perspectives and improve facility-based service delivery. The study shows that over half the mothers of SAM children were themselves malnourished –20% being thin and 34% being

Table 2: Time taken to deliver maternal nutrition services

Services	Time taken per person (min)
Nutrition assessment	
Weight	10-15
Height	
MUAC	
Neck circumference	
Blood pressure	5
Look for signs and symptoms	10
Classification	5
Total time taken	30-35
Total time taken for group counseling (12 mothers)	30-45
Total time taken for individual counseling (one at risk mother)	15-20

MUAC: Mid upper arm circumference

Table 3: Budget estimate for delivering maternal nutrition services (10-12 bedded Nutrition Rehabilitation Centre)

Item	Unit cost (INR)	Total cost (INR)
One-time cost expenditure		
Measuring equipment		
Stadiometer *		
Weighing machine	19,220	19,220
Adult MUAC tape	789 (50 tapes)	789
Nonstretchable tape for MUAC	2735	2735
Omron blood pressure machine	1875	1875
Counseling materials (colour print)		
Dialogue cards (5 themes)	5000	5000
At risk cards	1000	1000
Total cost		30,619 INR
Recurrent expenditure		
Pharmacy supplies @		
IFA (2500/year)	0.2	500
Calcium (1000/year)	1	1000
Albendazole (250/year)	1.7	425
Kitchen supplies (dry ration for recipe demonstration and F100) #	1000	12,000
Total recurrent expenditure (/year)		13,925 INR

*: Already included in the budget estimate of NRC, @: Recommended to be provided from government supplies, #: Will vary, depending on no of severely thin women IFA: Iron folic acid, INR: Indian rupee, MUAC: Mid upper arm circumference, NRC: Nutrition Rehabilitation Centre

overweight/obese. The findings were similar to those from a multi-center trial in India^[1] and a Bhopal-based study,^[2] emphasizing the need for identification of health risks among mothers of SAM children in order to address the public health burden. Furthermore, around 90% of the mothers were at-nutrition or medical risk and a third of the households had dual burden of malnutrition; the child being undernourished and the mother being overweight/obese. There is thus an urgent need for consolidated efforts to ensure that mothers of SAM children receive adequate nutritional care.

For the smooth delivery of the MN services, additional ward equipment required were only weighing machine, adult MUAC tape and non-stretchable tape in addition to stadiometer which was already available in the NRC setup. Other additional supplies required were pharmacy and kitchen supplies. The overall yearly additional cost for these was around 14,000 INR. In addition to routine counseling provided for SAM children, women received mother-focused group and individual nutrition education and counseling, which required only about 30 min and 15 min of additional time, respectively. This provides grounds for the understanding that NRCs could be a potential platform for successfully layering MN services. However, only one NRC was considered in this study due to which the findings cannot be generalized.

CONCLUSION

Facility-based NRCs represent a missed window of contact with mothers to advice, inform, support them receive services to address double burden of malnutrition, anemia, and comorbidities which were common among mothers. The evidence from the qualitative survey indicated that existing staff were able to execute the services within time cost and regime of the NRC. This was a useful intervention, well accepted by the mothers and could be an efficient platform for identifying and treating mothers at-risk. Furthermore, the study reports the challenges in ensuring greater participation from mothers during follow-up visits. Given the evidence from this study, we have the following suggestions: (1) allocation of additional funds to NRCs for procuring anthropometric equipment, micronutrient supplies, deworming tablets, and printing counseling toolkits; (2) inclusion of 30 min group based nutrition on 6 themes and 15 min individual counseling for mothers on five topics, along with the regular counseling sessions; (3) incorporation of 1 day training on delivery of the MN service package in facility-based NRCs; and (4) inclusion of monthly/quarterly reporting and monitoring of the MN status into the current NRC reporting structure.

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Conflicts of interest

There are no conflicts of interest.

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