

# A prospective observational study to evaluate the efficacy of facility-based management in malnourished children at NRC, district Meerut

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## ABSTRACT

**Background:** Scarcity of suitable food, lack of purchasing power of the family as well as traditional beliefs and taboos about what the baby should eat, often lead to a sufficient balanced diet, resulting in malnutrition. In children, malnutrition is synonymous with growth failure. Malnourished children are shorter and weigh less than they should be for their age and height. **Materials and Methods:** The present study was conducted from September 2017 to November 2017. 112 malnourish children, aged 6-60 months who were admitted to NRC during the study period at district hospital Meerut were assessed. Checklist based on operational guidelines on facility based management was used. Data was analyzed in Microsoft Excel and Epi info. **Result:** In the studied population, there were 45 males and 67 females, out of which highest representation was from the age group of 13 to 24 months. 67% of studied population belonged to schedule caste. The average weight gain during the stay at the center was  $9.92 \pm 5.43$  g/kg/day. The average duration of stay at NRC was  $12.01 \pm 1.61$  days. Only 30% of mothers had appropriate knowledge regarding therapeutic diet and only 50% of the mothers know about the preparation of nutritious food from locally available foods. **Conclusion:** Targeted supplementary nutrition and therapeutic nutrition with specific micronutrients when provided to malnourish children for 14 days by Nutrition Rehabilitation Center can be helpful to improve their nutritional status. There is need to scale up community awareness and community participation for NRCs.

**Keywords:** Malnutrition, nutrition rehabilitation center, under fives

## Introduction

Reduction in child malnutrition is another millenium development goals related to an improvement in child welfare. National data on underweight provided under National Family Health Survey 4 (NFHS-4; 2015–16)<sup>[1]</sup> revealed underweight prevalence rate to be around 35.8%. In Meerut according to NFHS-4, 35.2%, 18.8%, and 35.3% of the children were underweight, wasted, and stunted, respectively.

Scarcity of suitable food, lack of purchasing power of the family as well as traditional beliefs and taboos about what the baby should eat, often lead to an insufficient balanced diet, resulting in malnutrition.

In children, malnutrition is synonymous with growth failure. Malnourished children are shorter and weigh less than they should be for their age and height.

The response to malnourish children in Uttar Pradesh is led by the National Rural Health Mission. Currently, this response relies on a network of nutrition rehabilitation centers (NRCs), where children with severe acute malnutrition (SAM) receive

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therapeutic care following protocols of the World Health Organization (WHO 2009 guidelines)<sup>[2]</sup> and the Indian Academy of Pediatrics (IAP).<sup>[3]</sup>

The objective of the analysis presented here is to assess the effectiveness of NRCs in providing therapeutic care for children with SAM in Uttar Pradesh and to inform the future design and implementation of programs for the provision of care for children with SAM in Uttar Pradesh and in India.

## Objectives

1. To study the effect of nutritional interventional measures undertaken at NRCs in improving the nutritional status of admitted children through review of select anthropometric indicators at the time of admission and discharge and during their stay at the centers
2. To find out knowledge, attitude, and practices of mothers of the admitted children regarding the feeding practices followed at NRCs during their stay at the centers.

## Facilities at nutrition rehabilitation center

At the center, medical and nutritional therapeutic care (appropriate antibiotics, deworming tablets, iron supplementation, and micronutrients) is provided to the admitted children. Severe malnourished children are recognized by the medical officer at outpatient department (OPD) and in their respective localities by the Anganwadi workers (AWWs) or Accredited Social Health Activist and are brought to the centers by the AWWs/ASHA. At NRCs, the children are admitted and nutritionally rehabilitated for a minimum period of 14 days<sup>[4]</sup> using therapeutic feeding diets (F-75, F-100, and lactose-free diet), which are prepared using locally available foodstuff. If needed, the children are medically rehabilitated as per the IAP protocol for severe malnourished children.<sup>[3]</sup> Supervised feeding of therapeutic diets is done by the NRC staff and medical intervention is provided by the doctor in charge and the nurses at the centers. Though designated for severe malnourished children, moderate and mild malnourished children are also admitted if there are associated medical complications. Anthropometric indicators (weight, height, and mid upper arm circumference [MUAC]) are monitored to observe the effect of interventional measures on the health status of the admitted children. Anthropometric assessment of the children is done by the NRC staff using standard validated measurement techniques. Weight of the children is taken using electronic weighing scales length using length boards and MUAC measured by an MUAC tape designed by UNICEF and based on Shakir's tape for measuring MUAC. The mothers of the children are made to stay at the centers where counseling sessions focusing on health and nutrition aspects are conducted for them. The mothers are also provided hands-on training on composition and preparation of the therapeutic diets and given compensation for daily wage loss as per guidelines during their stay at the NRCs.<sup>[5,6]</sup> A sum of Rs. 50 per child along with food is allocated/day during their stay at the centers and to the mother compensating for her wage loss.<sup>[7]</sup>

Children were discharged from the NRC after a minimum period of 14 days when they met the following discharged criteria:

- 1) The child was active or alert.
- 2) The child had no signs of bilateral pitting edema, fever, and/or infection.
- 3) The child had completed all age appropriate immunizations.
- 4) The child is gaining at least 8–10 g/kg/day.
- 5) The mother has improved understanding of correct feeding practices at home.

## Materials and Methods

The present study was conducted at NRC located at district hospital, Meerut from September to November 2017. The study was conducted on a sample size of 112 children aged between 6 and 60 months admitted to the NRC during the study period. The study design was prospective; wherein 112 children were recruited to assess the nutritional status during the period of stay using anthropometric indicators at NRCs. Weight at the time of admission and at the time of discharge and daily weight gain in grams per kilogram (g/kg) were recorded and calculated to see if it was in accordance with the available guidelines.<sup>[4,8]</sup> Appropriate statistical tests were applied to ascertain any significant difference between the mean weights at discharge and the mean weight at admission for the study group. In addition, the MUAC and grades of malnutrition at admission and discharge were also recorded and the average duration of stay at the center was studied to establish any difference among the different age groups. A predesigned and pretested semi-structured interview schedule was used to interview the mothers of the admitted children on awareness regarding government programs focusing on nutrition, basic concepts of nutrition, etiologies of malnutrition, and the preparation of which focused on the composition and preparation of therapeutic diets at the centers. The data were entered into Microsoft Excel spreadsheet and analyzed using SPSS version 17. Statistical tests such as *t*-test and  $\chi^2$  test were applied wherever needed.

## Results

The study group included 45 males and 67 females. A total of 41.1% of the children were in the age group of 7–12 months (20 males and 26 females) followed by 24.1% in the age group of 13–24 months (8 males and 19 females) [Table 1]. A total of 67% of the study population belonged to the scheduled caste (SC) group and 24% to the other backward class (OBC), 7% in general, and 2% in scheduled tribes (ST). A total of 30% of the admitted children were above poverty line and 70% were below poverty line. A total of 56% of the admitted children were referred by OPD/Child Malnutrition Center/MO, 34% by AWW and 10% by ASHA workers [Figure 1].

### Effect on selected anthropometric indicators (weight, height, and MUAC) of the admitted children during their stay at the NRCs

A total of 112 children were included in the analysis; 45 (40.18%) males and 67 (59.82%) females were analyzed for effect of nutritional interventional measures on anthropometric indicators.

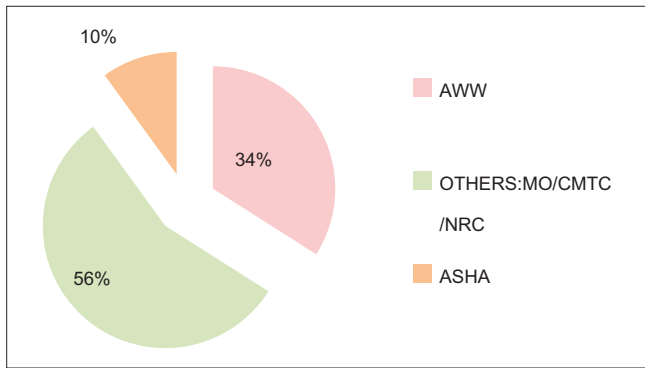


Figure 1: Sources of referral at NRC

The overall mean weight at the time of admission for these children was 8.458 ± 3.11 kg and 9.15 ± 2.14 kg at the time of discharge. A statistically significant difference was observed between the mean weight at discharge and the mean weight at admission for the study group ( $P < 0.05$ ) [Table 2]. The overall average weight gain for the study group during their stay at the center was 9.92 ± 5.43 g/kg/day; the average weight gain being 8.79 ± 5.30 g/kg/day for males and 11.04 ± 5.39 g/kg/day for females. An average weight gain of at least 8 g/kg/day is considered to be adequate for a child during stay at the nutritional rehabilitation center. At the time of admission, 96 (85.71%) children were severely malnourished (z score ≤ 3 SD), while 16 (14.29%) children suffered from moderate or mild malnutrition (z score ≤ 3 SD to ≤ 2 SD). A total of 43 (38.39%) children were still severely malnourished (z score ≤ 3 SD), while 69 (61.61%) children were suffering from moderate or mild malnutrition (z score ≤ 3 SD to ≤ 2 SD) at discharge. Chi-square test was applied and the difference between children severely malnourished at the time of discharge as compared with admission was observed to be statistically significant ( $\chi^2 = 53.2557, P < 0.001$ ) [Table 3].

### Effect on MUAC and mean duration of stay at NRC

MUAC data were analyzed for 112 children. At the time of admission, 76 (67.86%) children were severely malnourished (MUAC < 11.5 cm), while 30 (26.78%) children suffered from moderate or mild malnutrition (MUAC 11.5 cm to < 12.5 cm) and 6 (5.36%) were normal (MUAC > 12.5 cm). A total of 38 (33.93%) children were still severely malnourished (MUAC < 11.5 cm), while 55 (49.11%) children were suffering from moderate or mild malnutrition (MUAC 11.5 cm to < 12.5 cm) and 19 (16.96%) were normal at the time of discharge. Chi-square test was applied and the difference between children severely malnourished at the time of discharge as compared with admission was observed to be statistically significant ( $\chi^2 = 26.7796, P < 0.001$ ) [Table 4]. The average duration of stay at the NRCs was 12.01 ± 1.61 days, for male children it was 13.73 ± 1.89 days and for female children it was 10.23 ± 1.30 days.

### Knowledge and awareness among mothers of beneficiaries at the center regarding feeding practices at NRCs

A total of 65% of the mothers of the admitted children know about the personal hygiene methods and 35% do not know about

Table 1: Age and sex distribution of studied underfives

Age in months	Male (n=45)		Female (n=67)		Total (n=112)	
	No	(%)	No	(%)	No	(%)
7-12	20	(44.4%)	26	(38.8%)	46	(41.1%)
13-24	08	(17.7%)	19	(28.3%)	27	(24.1%)
25-36	03	(06.7%)	05	(7.5%)	08	(07.1%)
37-48	02	(04.5%)	12	(17.9%)	14	(12.5%)
49-60	12	(26.7%)	05	(7.5%)	17	(15.2%)
Total	45	(100%)	67	(100%)	112	(100%)

Table 2: Effect on mean weight of children

Age in months	Mean of weight kg±SD		Paired t test
	On admission	On discharge	
7 to 12	5.65±1.90	6.26±2.00	$P < 0.05$ (S)
13 to 24	6.29±2.40	6.83±2.52	$P < 0.05$ (S)
25 to 36	8.08±1.22	9.05±1.39	$P < 0.01$ (S)
37 to 48	9.57±2.31	10.2±0.98	$P < 0.05$ (S)
49 to 60	12.7±3.01	13.4±2.86	$P < 0.01$ (S)

Table 3: Effect on weight for height (w/h) z score

W/H (Z score)	Number of children	
	On admission	On discharge
Severe acute malnutrition ≤ 3 SD	96 (85.71%)	43 (38.39%)
Moderate acute malnutrition ≤ 3 SD to ≤ 2 SD	16 (14.29%)	69 (61.61%)
Total	112 (100%)	112 (100%)

$\chi^2 = 53.2557, P < 0.00001$  (hs)

Table 4: Effect on muac (mid upper arm circumference)

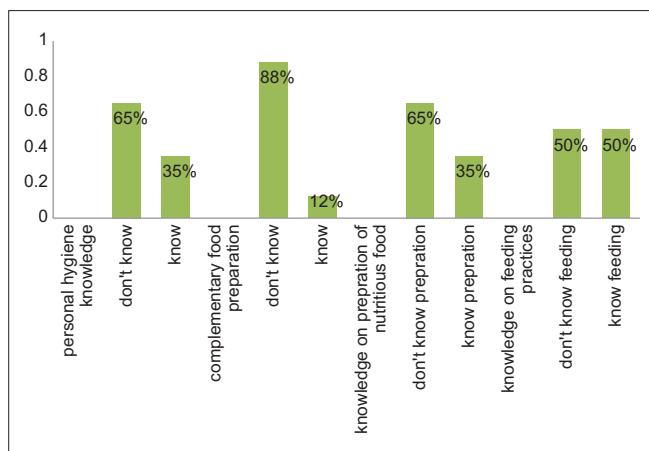
MUAC (CM)	Number of children (%)	
	On admission	On discharge
Severe acute malnutrition < 11.5	76 (67.86%)	38 (33.93%)
Moderate acute malnutrition 11.5 to < 12.5	30 (26.78%)	55 (49.11%)
Normal > 12.5	06 (5.36%)	19 (16.96%)
Total	112 (100%)	112 (100%)

$\chi^2 = 26.7796, P < 0.0001$  (HS)

the personal hygiene methods. A total of 88% of the mothers do not know about the complementary food preparation and 12% know about complementary food preparation. A total of 65% of the mothers had no knowledge about the therapeutic diet and 35% know about the therapeutic diet. A total of 50% of the mothers had the knowledge about preparation of nutritious food from the locally available foods and 50% had no knowledge. Though majority of mothers had proper information regarding the time interval of feeds at the NRCs, just 5% had correct knowledge (the correct constituents and correct method of preparation) about F-75 diet and 1% about F-100. None of the mothers had any knowledge about the lactose-free diets [Figure 2].

## Discussion

This study shows that most of the studied under five children admitted to the NRC were in marginalized population. The



**Figure 2:** Levels of knowledge among mothers/beneficiaries attending NRC

findings are in accordance with that of NFHS-IV, which states that children belonging to the SC, ST, and OBC mothers have the highest rates of malnutrition.<sup>[1]</sup>

Weight has been taken as the main anthropometric measure for assessing the efficacy of nutrition interventional measure taken at NRC. Improvement in weight of admitted severe malnourished children from severe-to-moderate and from moderate-to-mild/normal has the most significant effect in reducing the under five mortality. The increase in mean of weight at discharge from that on the time of admission is statistically significant. Colecraft *et al.* in a study at four day care NRCs also reported a significant increase in weight for age for the admitted children.<sup>[9]</sup>

Overall average weight gain for the present study group was  $9.915 \pm 5.43$  g/kg/day, which is comparable to results observed by Savadago *et al.* in a study at Burkina Faso who reported an average weight gain of  $10.18 \pm 7.05$  g/kg/day.<sup>[10]</sup>

Bangladesh comparing inpatient, day care, and home-based treatment for severe malnourished children observed an average weight gain of 11 g/kg/day for the inpatient group.<sup>[11-13]</sup> Shah observed that 40% of patients gained weight between 5 and 10 g/kg/day.<sup>[14]</sup>

MUAC is very easy to measure and hence should be used appropriately and judiciously for monitoring children at the NRCs. Based on the MUAC criteria, at the time of admission, 67.86% children were severely malnourished and only 5.36% were normal. At the time of discharge, 33.93% children were still severely malnourished, but there was a significant increase in the number of normal children from severely or moderately malnourished, that is, 16.96% children were normal at the time of discharge. The similar results were observed in a study done by Taneja *et al.* where the number of children suffering from severe malnutrition decreased from 91.4% to 46.24%.<sup>[15]</sup>

In the present study, the mean duration of stay was  $12.01 \pm 1.61$  days, which is similar to the finding done in a

study by Singh *et al.* where mean duration of stay of under five children was  $13.2 \pm 5.6$  days.<sup>[16]</sup> The median duration of stay at NRC should be 14 days, which is much less than earlier programs for children with severe protein energy malnutrition (range from 6 weeks to 8 months).<sup>[14,11,12]</sup> The short duration of stay not only decreases costs but also minimizes the absence of mothers from their homes, which has important implications at the society level. Effectively, the duration of stay needs to be balanced between the chances of cross exposure to infection and the readiness of the mothers to effectively manage their children at home.

The mothers of the severely malnourished children attending the center had limited knowledge regarding the personal hygiene, basic concepts of nutrition, complementary food preparation, preparation of nutritious food from the locally available foods and the composition and preparation of therapeutic feeds given at the center. Mothers are specifically kept and guided by the NRC worker about the effective care of their children. They were taught about the preparation of the healthy and nutritious diets from locally available and cheap foods. Beghin in his critical assessment of 21 NRCs across six Latin American countries found nutrition education to be lacking at most of the centers he visited.<sup>[14]</sup>

An important area of concern is the amount of money paid to the mothers during their stay at the center. The present amount of Rs. 50 per day is much less as compared with the minimum daily wages presently paid through the labor schemes of the Government of India. The compensation amount given to the mothers for the daily wage loss and lack of provision of food to the accompanying children was an important issue raised by the mothers of the admitted children. These factors can adversely affect the compliance of mothers at the centers. Providing food separately to the mothers and accompanying children should be undertaken and it should not be deducted from the compensation for the daily wage loss.

## Conclusion

Targeted supplementary nutrition and therapeutic nutrition with specific micronutrients when provided to malnourish children for 14 days by NRC can be helpful to improve their nutritional status. There is need to scale up community awareness and community participation for NRCs.

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Nil.

## Conflicts of interest

There are no conflicts of interest.



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