

# A Study to Evaluate the Effect of Nutritional Intervention Measures on Admitted Children in Selected Nutrition Rehabilitation Centers of Indore and Ujjain Divisions of the State of Madhya Pradesh (India)

Gunjan Taneja, Sanjay Dixit, AK Khatri, Veena Yesikar, Deepa Raghunath, Sanjay Chourasiya

Department of Community Medicine, MGM Medical College, Indore, India

## ABSTRACT

**Background:** The state of Madhya Pradesh has 1.3 million severely malnourished children. Nutrition rehabilitation centers (NRCs) were started in the state to control severe malnutrition and decrease the prevalence of severe malnourished children to less than 1% among children aged 1–5 years. **Materials and Methods:** The present study was conducted from November 2008 to October 2009; 100 children admitted to seven different NRCs in Indore and Ujjain divisions of Madhya Pradesh were observed during their stay at NRCs and the follow-up period to analyze the effect of interventional measures on select anthropometric indicators. Mothers of the children were interviewed on health issues and therapeutic feeding practices at the NRCs using a predesigned and pretested interview schedule. **Results:** The study group consisted of 48 boys and 52 girls; 60% were between 13 and 36 months of age. 93 children were analyzed for anthropometric indicators following a dropout rate of 7%. A statistically significant difference was obtained between the weight of children at admission and discharge ( $t=14.552$ ,  $P<0.001$ ); difference of mid upper arm circumference (MUAC) at admission and discharge was statistically significant ( $t=9.548$ ,  $P<0.001$ ). The average weight gain during the stay at the centers was  $9.25 \pm 5.89$  g/kg/day. Though the number of severe malnourished children decreased from 85 to 43 following the stay at NRCs ( $\chi^2 = 44.195$ ,  $P<0.001$ ); 48.78% of the children lost weight within 15 days of discharge from the NRCs. Dropout rates of 9.89%, 23.07%, 42.65%, and 61.76% for the study group were obtained during the follow-up period of 6 months for the four follow-up visits conducted 15 days, 1, 3, and 6 months after discharge. The mothers of the children lacked adequate information on health issues and composition and preparation of therapeutic diets at the centers. **Conclusion:** The NRCs were effective in improving the condition of admitted children, but the effects were not sustained following discharge due to high drop-out rate and lack of adequate parental awareness. There is an urgent need to link these centers with community-based models for follow-up and improve health education measures to maintain the gains achieved.

**Keywords:** Nutrition rehabilitation centers, severe acute malnutrition, therapeutic feeds

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## Introduction

The state of Madhya Pradesh has the largest number of malnourished children in India; 6 million children under five are malnourished including 1 million moderately malnourished and 1.3 million severe malnourished children.<sup>(1)</sup> To combat this menace, the Government of Madhya Pradesh initiated the bal sanjeevni drive in the

### Address for correspondence:

Dr. Gunjan Taneja, 9, Bharatpuri, Purulia Road, Ranchi, Jharkhand, India. E-mail: [gunjan\\_mgm@yahoo.co.in](mailto:gunjan_mgm@yahoo.co.in)

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year 2001 with support from United Nations Children Fund (UNICEF) aimed at identifying and treating malnourished children. To prevent deaths among severe malnourished children identified under the drive, the Government further started the Nutrition rehabilitation centers (NRCs) under the Bal Shakti Yojna with support from UNICEF. The objectives of the programme are to control malnutrition among the children aged 1-5 years in the state and to bring down the percent of severe malnourished children to less than 1%.<sup>(2)</sup>

The first of such centers was set up in 2007 and in a short span of 2 years the number of such centers has increased to 175. The inputs being put in the NRCs have to be adequately analyzed to evaluate whether the desired objectives are being fulfilled. The present work tries to analyze the effect of the NRCs in improving the health and nutritional status of severe malnourished children admitted at the centers by studying the effect of the interventional measures on the admitted children and the effect of health education measures undertaken at the centers.

### Objectives

1. Evaluate 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. Follow-up the study group after discharge to check the compliance level among beneficiaries to recommended follow-up visits and assess the effect on nutritional status through review of select anthropometric indicators following discharge.
3. Ascertain the awareness and knowledge amongst mothers of the admitted children regarding the practices followed at NRCs during their stay at the centers.

### Functioning of NRCs

At the centers nutritional and medical intervention (appropriate antibiotics, deworming tablets, iron supplementation, and micronutrients) is provided to the children. Severe malnourished children are recognized in their respective localities by the Anganwadi Workers (AWWs) and brought to the centers by the AWWs. An incentive of Rs 100 is provided to the AWW for counseling of the mother to stay at NRC for 14 days at the time of admission. At NRCs, the children are admitted and nutritionally rehabilitated for a minimum period of 14 days<sup>(2)</sup> using therapeutic feeding diets (F-75, F-100 and lactose free diet) prepared using locally available foodstuff. If needed the children are medically rehabilitated as per the Indian Academy of Pediatrics (IAP) protocol for severe malnourished

children.<sup>(3)</sup> Supervised feeding of therapeutic diets is done by the NRC staff (Feeding Demonstrators and Cooks) 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 (Seca: GMBH and company; model number 3341321008), length using length boards (Seca: GMBH and company; model number 2101821009), 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>(4)</sup>

A sum of Rs. 90 per child is allocated/day during their stay at the centers. Out of this, Rs. 25 is to be spent for the food of the child and Rs. 65 to be handed over to the mother compensating for her wage loss.<sup>(4)</sup>

The children are discharged after a minimum period of 14 days, provided the child does not show any obvious signs of infection or edema, has received the stipulated amount of micronutrients, is gaining at least 8-10 g/kg/day, and the mother has improved understanding of correct feeding practices. The children are again brought to the center by the AWWs on the designated follow-up dates at 15 days, 1 month, 3 months, and 6 months following discharge from the NRCs wherein the AWWs are paid an incentive of Rs. 100 for bringing the child for each follow-up visit. The mother also receives a sum of Rs. 65 to compensate for her daily wage loss. The same anthropometric measurements are taken on the follow-up visit and the child treated for medical conditions; the child is also readmitted if needed.

### Materials and Methods

The present study was conducted in seven NRCs located across six districts in Indore and Ujjain divisions of the state of Madhya Pradesh from November 2008 to October 2009 [Figure 1]. At the time of initiation of the study, Indore and Ujjain divisions had 48 functional and





## Effect on selected anthropometric Indicators of the admitted children during stay at the NRCs

### Analysis of the admitted children based on weight

A total of 93 children were included in the analysis: 45 (48.39%) boys and 48 (51.61%) girls were analyzed for effect of nutritional interventional measures on anthropometric indicators as 6 children (3 boys and 3 girls) did not stay at the centers for the entire duration of 14 days and 1 girl was referred to another health care setting. 37.63% were in the age group of 13–24 months and 21.51% in the age group of 25–36 months. The overall mean weight of admission for these children was  $6.51 \pm 2.04$  kg; for boys  $6.89 \pm 1.96$  kg and for girls  $6.15 \pm 2.08$  kg. The mean weight at discharge for the study group was  $7.16 \pm 2.13$  kg; for boys  $7.49 \pm 2.08$  kg and for girls  $6.86 \pm 2.16$  kg. A statistically significant difference was observed between the mean weight at discharge and the mean weight at admission for the study group ( $t=14.552$ ,  $P<0.001$ ) and for boys ( $t=9.904$ ,  $P<0.001$ ) and girls ( $t=10.475$ ,  $P<0.001$ ) separately [Table 2].

The average weight gain for the study group during their stay at the centers was  $9.25 \pm 5.89$  g/kg/day; for boys the average weight gain being  $8.29 \pm 5.20$  g/kg/day and for girls  $10.14 \pm 6.39$  g/kg/day. An average weight gain of at least 8 g/kg/day is considered to be adequate for a child during stay at the residential therapeutic centers.<sup>(5)</sup> 50 children (20 boys and 30 girls) had an average weight gain of  $>8$  g/kg/day, while 43 had a weight gain of  $<8$  g/kg/day [Table 3].

At the time of admission, 85 (91.4%) children were severely malnourished (Grades III and IV), while 08 (8.6%) children suffered from moderate or mild malnutrition (Grades I and II).<sup>(7)</sup> 43 (46.24%) children were still severely malnourished (Grades III and IV), while 50 (53.76%) children were suffering from moderate or mild malnutrition (Grades I and II) at discharge. McNemar's chi-square test was applied and the difference between children severely malnourished at the time of discharge as compared to admission was observed to be statistically significant ( $\chi^2=44.195$ ,  $P<0.001$ ) [Table 4].

### Analysis of the admitted children based on MUAC

MUAC data were analyzed for 75 children. Six children were not included because of default, one child had been referred to another health care facility and MUAC was

not measured in children less than 6 months (seven in number). Further 11 children from one particular study center were not included in the analysis as the center staff did not measure MUAC at discharge.

The mean MUAC at admission was  $11.32 \pm 1.18$  cm and at discharge it was  $11.94 \pm 1.38$  cm. The difference was observed to be statistically significant ( $t=9.548$ ,  $P<0.001$ ). The mean MUAC for the boys at admission was  $11.33 \pm 0.98$  cm and at discharge it was  $11.87 \pm 1.01$  cm, which was statistically significant ( $t=6.876$ ,  $P<0.001$ ). Similarly for girls the mean MUAC at admission was  $11.31 \pm 1.38$  cm, at discharge it was  $12.01 \pm 1.33$  cm, the observed difference being statistically significant ( $t=6.723$ ,  $P<0.001$ ).

### Duration of stay at the NRCs

The average duration of stay at the NRCs was  $13.81 \pm 2.73$  days, for boys it was  $14.73 \pm 1.98$  days and for girls it was  $14.13 \pm 1.20$  days. 86 (92.47%) of the children in the study group had stayed at the NRC at the centers for at least 14 days. No statistically significant difference was observed among the different age groups with respect to duration of stay at the centers ( $F=1.208$ ,  $P=0.312$ ).

### Analysis of follow-up data

From the 93 children for which initial anthropometric data were analyzed, 2 children were excluded because of readmission on the first follow-up visit; thus, a total of 91 children were included for the follow-up analysis. Since there was no uniformity amongst the different study centers regarding the recording format for anthropometric indicators during follow-ups, only weight of the children at the various follow-ups was included in the final analysis. For the third and fourth follow-ups, 9 children from one center were excluded as the center had shifted over to the new follow-up pattern of 2 months duration.<sup>(8)</sup> One NRC closed down during the study duration; so the 13 children admitted to this particular center did not receive the third and fourth follow-ups and hence were excluded from the final analysis for the last two follow-ups; a child was excluded as the child was transferred to another hospital setting. Thus, a total of 68 children were analyzed for the last two follow-ups [Table 5].

**Table 2: Mean weights at admission and discharge (n=93)**

Age group (months)	Mean wt admission (overall) kg	Mean wt admission (boys) kg	Mean wt admission (girls) kg	Mean wt discharge (overall) kg	Mean wt discharge (boys) kg	Mean wt discharge (girls) kg
0–6	$2.78 \pm 0.69$	1.45	$3 \pm 0.352$	$3.28 \pm 0.81$	1.60	$3.56 \pm 0.36$
7–12	$4.84 \pm 0.72$	$4.82 \pm 0.99$	$4.86 \pm 0.53$	$5.42 \pm 0.78$	$5.17 \pm 0.98$	$5.58 \pm 0.61$
13–24	$6.38 \pm 0.92$	$6.58 \pm 0.82$	$6.21 \pm 0.98$	7.02	$7.14 \pm 0.90$	$6.89 \pm 1.09$
25–36	$7.15 \pm 0.92$	$6.92 \pm 0.83$	$7.49 \pm 0.99$	$7.90 \pm 0.90$	$7.67 \pm 0.86$	$8.26 \pm 0.89$
37–48	$9.55 \pm 1.20$	$9.47 \pm 1.38$	$9.77 \pm 0.68$	$10.36 \pm 1.34$	$10.18 \pm 1.48$	$10.87 \pm 0.85$
49–60	$10.83 \pm 1.06$	11	$10.75 \pm 1.49$	$11.32 \pm 1.05$	11.5	$11.24 \pm 1.46$

\*A statistically significant difference was observed for weight at discharge and the weight at admission for the study group ( $t=14.552$ ,  $P<0.001$ ) and for boys ( $t=9.904$ ,  $P<0.001$ ) and girls ( $t=10.475$ ,  $P<0.001$ ) separately

Of a total of 91 children available for analysis for the first two follow-up visits, 82 children reported for the first follow-up visit and 70 for the second. Similarly of the 68 children available for analysis for the third and

**Table 3: Age wise distribution for the average weight gained (n=93)**

Age group (months)	Boys (g/kg/day)	Girls (g/kg/day)	Overall (g/kg/day)
0-6	10.81	13.87 ± 5.06	13.43 ± 4.76
7-12	10.40 ± 6.80	12.06 ± 5.52	11.38 ± 5.93
13-24	7.49 ± 4.83	8.81 ± 5.23	8.21 ± 5.02
25-36	9.67 ± 3.75	10.39 ± 10.40	9.96 ± 6.94
37-48	6.35 ± 6.27	8.65 ± 2.55	6.97 ± 5.48
49-60	2.84	3.23 ± 1.04	3.10 ± 0.77
Overall average	8.29 ± 5.20	10.14 ± 6.39	9.25 ± 5.89

**Table 4: Severely malnourished children at the time of admission and discharge (n=93)**

Grade of malnutrition	Admission	Discharge
Mild or moderate malnutrition (Grades I and II)	8	50
Severe malnutrition (Grades III and IV)	85	43

\*A statistically significant difference was obtained as regards the number of severely malnourished children at the time of discharge as compared to time of admission. ( $\chi^2=44.195$ ,  $P<0.001$ )

**Table 5: Age and sex wise distribution of children at the different follow-ups**

Age (months)	I <sup>st</sup> follow-up (n=91)			II <sup>nd</sup> follow-up (n=91)			III <sup>rd</sup> follow-up (n=68)			IV <sup>th</sup> follow-up (n=68)		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
0-6	01	04	05	01	04	05	00	01	01	00	01	01
7-12	05	09	14	03	10	13	01	09	10	00	04	04
13-24	14	18	32	12	12	24	05	08	13	03	07	10
25-36	10	07	17	09	06	15	07	00	07	05	00	05
37-48	08	03	11	07	03	10	04	03	07	03	02	05
49-60	01	02	03	01	02	03	00	01	01	00	01	01
Total	39	43	82	33	37	70	17	22	39	11	15	26
Dropout rates at each follow-up visit		9.89%			23.07%			42.65%			61.76%	

**Table 6: Proportion of children with weight gain and weight loss at each follow-up visit**

Children at each follow-up visit	Weight gained	Weight lost	No change in weight	Proportion gained weight (%)	Proportion lost weight (%)
1 <sup>st</sup> follow-up (n=82)	36	40	6	43.90	48.78
2 <sup>nd</sup> follow-up (n=70)	45	16	9	64.29	22.86
3 <sup>rd</sup> follow-up (n=39)	26	11	2	66.67	28.21
4 <sup>th</sup> follow-up (n=26)	23	3	0	88.46	11.54

**Table 7: Details of follow-up visits with mean weight and proportion of children with weight loss at each follow-up visit**

Particulars	I <sup>st</sup> follow-up (n=82)	II <sup>nd</sup> follow-up (n=70)	III <sup>rd</sup> follow-up (n=39)	IV <sup>th</sup> follow-up (n=26)
Mean weight (overall)	7.41 ± 1.61 kg	7.58 ± 1.98 kg	7.76 ± 1.66 kg	8.53 ± 1.65 kg
Mean weight (boys)	7.83 ± 2 kg	7.97 ± 1.83 kg	8.37 ± 1.48 kg	9.23 ± 1.35 kg
Mean weight (girls)	7.03 ± 1.99 kg	7.23 ± 2.07 kg	7.30 ± 1.67 kg	8.01 ± 1.71 kg
Loss of weight (boys)	15	9	7	1
Loss of weight (girls)	25	7	4	2
Mean weight loss (overall) (amongst those who had lost weight)	0.35 ± 0.26 kg	0.29 ± 0.23 kg	0.18 ± 0.13 kg	0.22 ± 0.20 kg
Mean weight loss (boys)	0.36 ± 0.25 kg	0.36 ± 0.26 kg	0.15 ± 0.10 kg	0.44 kg
Mean weight loss (girls)	0.34 ± 0.27 kg	0.20 ± 0.16 kg	0.23 ± 0.15 kg	0.11 ± 0.07 kg

\*No statistically significant difference was observed between the loss of weight for boys and girls at each follow-up visit as compared to weight at previous follow-up visit

fourth follow-up visits, 39 children reported for the third and 26 children for the fourth visit. Dropout rates of 9.89%, 23.07%, 42.65%, and 61.76% were obtained for the four follow-up visits conducted 15 days, 1 month, 3 months, and 6 months from the day of discharge as per recommended guidelines. This dropout rate at each follow-up visit was found to be statistically significant ( $\chi^2=61.106$ ,  $P<0.001$ ). If calculated from the baseline data of 100 children, the dropout rates would be 18%, 30%, 61%, and 74% for the four follow-ups.

Though there was an increase in mean weight of the children who returned for the follow-up visits, it was offset to a certain extent by the loss of weight experienced by some children in the study group. The loss of weight was maximum immediately, following the period of discharge as 48.78%, had lost weight on the first follow-up visit, a progressive increase in proportion of children gaining weight was noted in children who turned up for all the four visits [Table 6]. Table 7 outlines the mean weight at each follow-up visit and also provides details on the proportion of the children (mean weight loss) who had lost weight during each follow-up visit as compared to the weight during the previous follow-up visit.

## Knowledge and awareness among mothers of beneficiaries at the centers

### Awareness regarding community programmes on nutrition and concepts of nutrition

Though 36% of the mothers were aware of the existence of NRCs, most of them were ignorant about the actual name of the center. 3% had heard about the Bal Shakti Programme, 7% had some knowledge about the various types of nutrients and their importance, 2% correctly knew about the preparation and use of Oral Rehydration Solution (ORS), while 23% had inadequate knowledge about its use. 6% of the mothers had proper knowledge about the clinical symptoms of vitamin A deficiency.

### Awareness regarding etiology of malnutrition

92% of the mothers had no knowledge about the etiologies of malnutrition. Inadequate diet and poor quality of food were considered to be the main reasons responsible for malnutrition by 4% mothers each with repeated infections and lack of immunization being the other contributing factors.

## Knowledge regarding therapeutic feeding practices at NRCs

56% of the mothers said that they had been taught the preparation of the therapeutic diets at the centers. Though majority of mothers had proper information regarding the time interval of feeds at the NRCs, just 4% had correct knowledge (the correct constituents and correct method of preparation) about F-75 diet and 2% about F-100. None of the mothers had any knowledge about the lactose-free diets [Table 8].

Mothers also raised concerns about the reimbursement provided at the NRCs, the unavailability of daily diets for them at the centers, and the absence of provision of food to the accompanying siblings of the admitted child.

## Discussion

The study findings show that a major proportion of the admitted children belonged to the marginalized population groups. The findings are in accordance with that of NFHS-III, which states that children belonging to the SC, ST, and OBC and that those with illiterate mothers have the highest rates of malnutrition.<sup>(9)</sup>

An initial dropout rate of 7% was noted in the present study. In a study in Burkina Faso among 1322 children dropout rates of 8.5% were noted.<sup>(10)</sup>

Weight has been taken as the main anthropometric measure as an improvement in weight of severe malnourished children has the most significant effect in reducing the mortality among them. The study findings reveal a statistically significant difference between the mean weight at discharge and the mean weight at admission for the entire study group ( $t=14.552$ ,  $P<0.001$ ) and for boys ( $t=9.904$ ,  $P<0.001$ ) and girls separately ( $t=10.745$ ,  $P<0.001$ ). 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>(11)</sup>

The average weight gain for the entire study group was  $9.25 \pm 5.89$  g/kg/day, which is comparable to results observed by Savadago *et al.* in a study at Burkina Faso which reported an average weight gain of  $10.18 \pm 7.05$  g/kg/day;<sup>(10)</sup> findings reported by a set of studies in 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>(12-14)</sup>

A recovery rate of 53.76% (children with average weight gain of more than 8 g/kg/day) was observed amongst the study group; recovery rate of 52.7% using the above international standards was obtained by Gaboulaud *et al.* in a study comparing therapeutic feeding centers (TFC) care, TFC plus home-based care, and only home-based care amongst 660 children in the TFC group.<sup>(15)</sup>

The difference between MUAC at discharge and at admission was found to be statistically significant for the entire study group ( $t=9.548$ ,  $P<0.001$ ), for boys ( $t=6.876$ ,  $P<0.001$ ) and girls ( $t=6.723$ ,  $P<0.001$ ). MUAC is very easy to measure and hence should be used appropriately and judiciously for monitoring children at the NRCs.

Though the number of children suffering from severe malnutrition decreased from 91.4% to 46.24%, the difference being statistically significant ( $\chi^2=44.195$ ,  $P<0.001$ ), 43 children were still in the high risk group at the time of discharge. Appropriate criteria must be designed which specifically adopt a target weight for

**Table 8: Knowledge regarding therapeutic feeding practices at NRCs (n=100)**

Therapeutic feeding practices	Correct	Partly correct	Incorrect	Don't know
Types of feeds provided	02	00	04	94
Composition of the feeds				
F-75	04	26*	01	71
F-100	02	22*	01	75
Lactose free diet (diarrhoea cases)	00	00	05	95
Time interval between feeds				
Feeding intervals (first 3-4 days)	90	00	08	02
Feeding intervals (after 3-4 days)	62	00	35	03

\*Only had a vague idea about the constituents used without any definitive quantitative knowledge of the constituents

each child with the child being discharged once the target weight is achieved provided the child has been appropriately rehabilitated with nutritional and medical measures.

The median duration of stay at the centers was 14 days, which is much less than earlier programmes for children with severe Protein Energy Malnutrition (range from 6 weeks to 8 months).<sup>(16-18)</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 study findings reveal increasing drop outs rates with each successive follow-up. A comprehensive review by Ashworth *et al.* comparing inpatient, outpatient, and home-based care and home-based care alone in Bangladesh revealed a dropout rate of 23% for the inpatient group over a 12 month period, the highest in the three groups.<sup>(12-14)</sup> The low compliance during follow-up visits limits the overall success rate of the programme. Effective measures are needed to improve the compliance rates for follow-up visits. Community mobilization needs to be done and the community should be made aware of the functioning of the centers. Creating a network of outreach workers from the NRCs or selecting volunteers on the lines of the Revised National Tuberculosis Control Programme (DOTS provider) from different localities who can monitor the follow-up dates of the discharged children and help the AWWs in decreasing the number of drop outs.

The mothers attending the centers had limited knowledge regarding the basic concepts of nutrition, the Government Health Programmes on nutrition and the composition and preparation of therapeutic feeds at the centers. Mothers are specifically kept at the centers so that they can so that they can be integrated into the effective care of the children and are taught the preparation of the therapeutic diets from locally available material. Surprisingly, this fact is often ignored and at the centers and much attention is paid to the improvement in nutritional status of the children, which is essentially considered to be the criteria of the success of the programme. Beghin in his critical assessment of 21 NRCs across 6 Latin American countries found nutrition education to be lacking at most of the centers he visited.<sup>(19)</sup>

44% of the mothers said that they had not been taught the preparation of the therapeutic diets. This is clearly reflected in the fact that 48.78% of the children had lost weight within 15 days of discharge. The period immediately following discharge is most important as

mothers find it difficult to comply with the intervention strategies taught at the center, which indirectly lowers the compliance to follow-up visits. Educating the AWWs on the feeds prepared at the centers can help the mothers when they go back to their homes and help maintain the growth achieved at the centers. The loss of children during follow-up visits can only be reduced to a certain extent and hence nutrition education measures must be stressed upon during the initial stay at the centers. Counselling sessions focusing on the general health education measures should be undertaken to prevent malnutrition and mothers should be mandatorily made to prepare the therapeutic diets at the centers.

Most of the mothers in the study belonged to poor socioeconomic background. This limits the accessibility to even cheap locally available food, as outlined by earlier studies,<sup>(11)</sup> hence providing some sort of assistance in the form of adequate ration to the mothers used in preparing of the therapeutic feeds lasting till the next follow-up can be initiated, alternate arrangements of providing that ration to Anganwadi Centers of the areas can be done from where the feeds can be distributed to the mothers of the affected children. Often in our society mothers do not enjoy the rights to decide what to feed in the family, hence involving fathers and other caregivers of the family in the programme should be undertaken.

An important area of debate is the amount of reimbursement paid to the mothers during their stay at the centers. The present amount of Rs. 65 per day is much less as compared to the minimum daily wages presently paid through the labour schemes of the Government of India. In addition, mothers at some centers had to be provided food from sources other than the hospital mess. The amount spent on food was deducted from the compensation provided for the daily wage loss; also 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 so as to prevent food sharing between the mothers and the accompanying siblings. If food is to be made available from outside sources the amount incurred should not be deducted from the compensation for the daily wage loss.

Available literature also points toward the inherent weaknesses in the set up: Limited inpatient capacity and lack of enough skilled staff to treat the large number of children needing care.<sup>(20,21)</sup> The state of Madhya Pradesh has at present 1.3 million severe malnourished children<sup>(1)</sup> with 175 operational NRCs. Available guidelines state establishing 20 bedded NRCs at district level and 10 at block level.<sup>(8)</sup> Assuming all the centers to be 20 bedded the number of children treated every month works out



to be 40 (20 children for 14 days each). Thus in one year the number of children who can be treated at the centers comes as 84,000. To treat the entire 1.3 million children it would take approximately 15.5 years, assuming no failure or readmission rates. If the 1 million moderately malnourished children are also included in the purview, it would take another 12 years to achieve the objective.

Thus NRCs cannot be the only tool to combat malnutrition; the study results show that the NRCs have had a positive impact on the selected anthropometric indicators of severe malnourished children but lag behind in the educational aspect and ensuring proper follow-up visits. Linking of NRCs with the community-based Core Model of Management of severe malnourished children needs to be put into place as soon as possible.<sup>(22,23)</sup> This model is the current protocol envisaged by the World Health Organization and provides a framework for an integrated Public Health response to curb malnutrition, treating most patients with severe malnutrition at home with inpatient care being reserved for those with acute complications, thereby minimizing the cost to families and maximizing access to treatment.<sup>(24)</sup>

However, establishment of such a model of treatment would require large resource mobilization both in terms of money and human resource with special emphasis on training aspects along with the motivational issues involved. A delicate balance needs to be achieved between both the modalities of treatment, and until the community-based model is put in place NRCs will continue to act as a major tool to adequately and effectively address the glaring issue of malnutrition in the state of Madhya Pradesh and the country.

The study is prone to observer bias as it is based on secondary data. Selection bias was introduced in the study because of the purposive sampling used to recruit the study children. The study has its limitations in that it was conducted in a limited group of subjects and was restricted to a few districts of the state. Studies with bigger sample size selected from NRCs across the state of Madhya Pradesh will give a more composite view of the actual effect of the NRCs in checking the prevalence of malnutrition in the state.

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## References

1. Chaudhury M. Madhya Pradesh: Epicentre of hunger. NDTV. Available from: [http://www.ndtv.com/news/india/madhya\\_pradesh\\_epicentre\\_of\\_hunger.php](http://www.ndtv.com/news/india/madhya_pradesh_epicentre_of_hunger.php). [Last accessed on 2009 Aug 20].
2. Bal Shakti Yojna. Government of Madhya Pradesh, Innovative Schemes and Programme Interventions under NRHM, Department of Public Health and Family Welfare, Bhopal. Available from: <http://www.mp.gov.in/health/nrhm/Innovative-nrhm.pdf>. [Last accessed on 2009 Aug 20].
3. Bhatnagar S, Lodha R, Choudhury P, Sachdev HP, Shah N, Narayan S, *et al.* IAP guidelines 2006 on hospital based management of severely malnourished children (adapted from the WHO Guidelines). *Indian Pediatr* 2007;44:443-61.
4. Bal Shakti. Guidelines for Management of severely Malnourished Children at Nutrition Rehabilitation Centers. Government of Madhya Pradesh. New York, USA: UNICEF; 2008.
5. Golden M, Grellety Y. Guidelines for the Integrated Management of the severely malnourished. (Draft copy) 2008.
6. Agarwal A. Social classification: The need to update in the present scenario. *Indian J Community Med* 2008;33:50-1.
7. Park K. Textbook of Preventive and Social Medicine. Preventive Medicine in Obstetrics, Pediatrics and Geriatrics: Growth Charts used in India. 20<sup>th</sup> ed. Chapter; Jabalpur: Banarsidas Bhanot; c2009. p. 470-1.
8. Secretariat health Services; Government of Madhya Pradesh: Guidelines to improve services in functioning of Nutrition Rehabilitation Centers. No R.C.H/09/5734; 30.06.09.
9. International Institute of Population Sciences. National Family Health Survey -3. Mumbai: IIPS, ORC Macro; 2005.
10. Savadogo L, Zoetaba I, Donnen P, Hennart P, Sondo BK, Dramaix M. Management of severe acute malnutrition in an urban nutritional rehabilitation center in Burkina Faso. *Rev Epidemiol Sante Publique* 2007;55:265-74.
11. Colecraft EK, Marquis GS, Bartolucci AA, Pulley L, Owusu WB, Maetz HM. A longitudinal assessment of the diet and growth of malnourished children participating in nutrition rehabilitation centres in Accra, Ghana. *Public Health Nutr* 2004;7:487-94.
12. Khanum S, Ashworth A, Huttly SR. Controlled trial of three approaches to the treatment of severe malnutrition. *Lancet* 1994;344:1728-32.
13. Ashworth A, Khanum S. Cost-effective treatment for severely malnourished children: What is the best approach? *Health Policy Plan* 1997;12:115-21.
14. Khanum S, Ashworth A, Huttly SR. Growth, morbidity, and mortality of children in Dhaka after treatment for severe malnutrition: A prospective study. *Am J Clin Nutr* 1998; 67:940-5.
15. Gaboulaud V, Dan-Bouzoua N, Brasher C, Fedida G, Gergonne B, Brown V. Could Nutritional Rehabilitation at Home Complement or Replace Centre-based Therapeutic Feeding Programmes for Severe Malnutrition? *J Trop Pediatr* 2007;53:49-51 Available from: <http://msf.openrepository.com/msf/bitstream/10144/21177/2/gaboulaud.pdf>. [Last accessed on 2009 Sep 15].
16. Schneideman I, Bennett FJ, Rutishauser IH. The Nutrition Rehabilitation Unit at Mulago Hospital-Kampala: Development and Evaluation, 1965-67. *J Trop Pediatr Environ Child Health* 1971;17 Monograph 13, 25-34. (54).
17. Beghin ID, Viteri FE. Nutritional rehabilitation centres: An evaluation of their performance. *J Trop Pediatr Environ Child Health* 1973;19:403-16.
18. Kadam DD, Kulkarni RN, Subramaniam P. Anthropometric and socio-economic profile of children referred to nutritional rehabilitation centre. *Indian Pract* 2001;54:476-85.
19. Beghin ID. Nutritional rehabilitation centers in Latin America: A critical assessment. *Am J Clin Nutr* 1970;23:1412-7.
20. Gueri M, Andrews N, Fox K, Jutsum P, St Hill D. A supplementary feeding programme for the management of severe and moderate malnutrition outside hospital. *J Trop Pediatr* 1985;31:101-8.



21. Brewster D. Improving quality of care for severe malnutrition. *Lancet* 2004;363:2088-9; author reply 2089.
22. Collins S. Community-based therapeutic care- a new paradigm for selective feeding in nutritional crises: Humanitarian Policy Network paper 48. London: Overseas Development Institute; 2004.
23. Grobler-Tanner C, Collins S. Community therapeutic care (CTC): A new approach to managing acute malnutrition in emergencies and beyond. Washington DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development; 2004.
24. Guerrero S, Mollison S. Engaging communities in emergency

response: The CTC experience in Western Darfur. In: Humanitarian Policy Network, ed. *Humanitarian Exchange*. London: Overseas Development Institute; 2005. p. 20-2.

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