

Original Article

Performance of Nutrition Rehabilitation Centers: A Case Study from Chhattisgarh, India

Abstract

Background: High prevalence of malnutrition across India poses a significant obstacle to achieving desirable child health outcomes. For addressing childhood malnutrition, the government of Chhattisgarh during 2010–2014 established Nutrition Rehabilitation Centers (NRCs) in selected health units for the timely, adequate, and appropriate feeding of children, and for improving skills of mothers and caregivers on age-appropriate caring, counseling, and growth monitoring. This study examined the functioning of NRCs in three districts; assessed perception of mothers and carers of children admitted in the NRC; and assessed the perspectives of service providers. **Methods:** Four out of 46 NRCs were purposively chosen. Monthly performance reports of 2012–2014 were reviewed. Fifty mothers/carers of under-five children were interviewed; and ten in-depth interviews were conducted with the service providers. Descriptive statistics, co-relational, and regression models were used for data analysis; qualitative data were analyzed thematically. **Results:** Vacancy of staff ranged from 7.4% to 70%. The mean age of children during admission was 23.8 ± 6.2 months. The mean percentage weight gain was 11.6%, whereas the mean duration of stay in the NRC was 10.7 ± 3.5 days. Weight gain was directly related to the weight during admission. Follow-up visit and follow-up card issuing, counseling to mothers, special diet preparation, timely receipt of incentives, and training on diet preparation needed immediate attention. **Conclusions:** Regular review and supportive supervision could play a crucial role in improving the quality of services. The awareness level and expectation of mothers could be improved through NRC-based education and outreach services.

Keywords: Assessment, Chhattisgarh, malnutrition of children, Nutrition Rehabilitation Center

Introduction

Malnutrition refers to a pathological state of deficiency or excess of nutrients. Under-nutrition indicates a state wherein the weight for age, height for age, and weight for height indices are below-2 Z-score of the NCHS norms.^[1] Undernutrition is one of the most common causes of morbidity and mortality among children <5 years of age.^[2] Worldwide, over 5 million children below 5 years die every year due to it.^[3] Studies estimate that prevalence of underweight children is higher in India than in any of the other 40 countries including in Bangladesh and Nepal.^[4] The prevalence of underweight children in India (48%) is almost twice as high as those of 26 sub-Saharan African countries (25%). The proportion of underweight children of <5 years ranges from 20% in Sikkim and Mizoram to 60% in Madhya Pradesh. Further, more than half of young children are underweight in Jharkhand and Bihar. Chhattisgarh, Gujarat,

Uttar Pradesh, and Orissa are estimated to have about 40% underweight children.^[5] In Mizoram, Sikkim, and Manipur, more than one-third of children are stunted, whereas wasting is the most common in Madhya Pradesh (35%), Jharkhand (32%), and Meghalaya (31%).^[6] Such children are prone to develop severe acute malnutrition (SAM).^[2]

The prevalence of malnutrition in Chhattisgarh is estimated to be about 42% and about 45% of children of <5 years age are stunted in the state-a reflection of chronic under-nutrition. As per the coverage evaluation survey of 2009, about one-fifth of children (18%) are wasted, indicating acute under-nutrition; and 52% are underweight which takes into account both chronic and acute under-nutrition.^[7] SAM significantly increases the risk of case fatality rate in children suffering from diarrhea, measles, and pneumonia. Children who are severely wasted are nine times more likely to die than well-nourished

**Meenakshi Tandon,
Jawed Quereishi,
R Prasanna¹,
Ayyaj Fakirbhai
Tamboli,
Bhuputra Panda²**

National Health Mission,
Chhattisgarh, India,

¹Directorate of Health Services,
Chhattisgarh, India, ²Indian
Institute of Public Health,
Bhubaneswar, Odisha, India

Address for correspondence:
Dr. Bhuputra Panda,
E1/1, JSS Software Technology
Park, Infocity Road, Patia,
Bhubaneswar - 751 024,
Odisha, India.
E-mail: bhuputra.panda@iphb.org

Access this article online

Website:
www.ijpvmjournal.net/www.ijpm.ir
DOI:
10.4103/ijpvm.IJPVM_194_17

Quick Response Code:



This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Tandon M, Quereishi J, Prasanna R, Tamboli AF, Panda B. Performance of Nutrition Rehabilitation Centers: A case study from Chhattisgarh, India. Int J Prev Med 2019;10:66.

children. Revised estimates with the use of the new WHO Child Growth Standards in developing country situations has resulted in a 2–4 times increase in the number of infants and children falling below-three standard deviation (3SD) weight for height/length as compared to that of using the former NCHS reference.^[8]

The concept of Nutrition Rehabilitation Center (NRC) as an approach to address malnutrition and tackle SAM was proposed as early as in 1955.^[9] The key in this new procedure was that the child would recuperate on a diet using locally available food, and that the mothers of the children would come at periodic intervals to prepare their meals and feed and take care of them, and that the overall operation would be kept at the lowest possible cost.^[10] In India, this concept was widely propagated for treatment of SAM children. The main objectives of facility-based management of SAM were to provide clinical management and reduce mortality of children with SAM, particularly among those with medical complications; to promote physical and psychosocial growth of children with SAM; and to build the capacity of mothers and other caregivers inappropriate feeding and caring practices for infants and young children.

The government of India sponsored Integrated Child Development Scheme (ICDS) and Special Nutrition Programme provides a package of services, such as supplementary nutrition, immunization, health check-up, referral, and education services to mothers and children up to 6-years of age. The Balwadi nutrition program, supplementary nutrition program, World food program, CARE-assisted nutrition programs, Tamil Nadu, integrated nutrition project and UNICEF assistance for women and children are other examples of nutritional interventions in India to address the problem of undernutrition.^[11] Over the years, the modalities for the effective management of SAM children has shifted from client-centric treatment and counseling to a more holistic lifecycle approach. This approach targeted individuals during crucial periods of their lives (pregnancy, 0–2 years and 10–19 years age groups), with focus on case management, behavior change communication, and linkage formation.^[12]

The National Health Mission, earlier termed as NRHM, was launched in 2005 to provide accessible, affordable and quality healthcare to the rural population, especially the vulnerable groups. It aimed at establishing fully functional, community owned, decentralized health delivery systems at all levels as to ensure simultaneous action on a wide range of determinants of health such as water, nutrition, sanitation, education, and social and gender equality.^[13-15] The government of Chhattisgarh under the mission established and operationalized NRCs in 18 district hospitals in April 2010. The number of NRCs increased to 46 by April 2014. Each NRC is manned by one doctor/pediatrician, 4–10 staff nurses, 1–2 counselors, and 1 cook. In addition to

treatment, special emphasis is given to improving the skills of mothers and caregivers on complete age appropriate caring and feeding practices. Anganwadi workers (AWWs) or ASHA, also termed as *Mitanin* in Chhattisgarh, identify SAM children from the field. The protocols of Indian Academy of Pediatrics are used for management of children with SAM.^[16] There is a provisional incentive of international normalized ratio (INR) 100 for the field workers for counseling and motivating the mothers to stay for 2 weeks. Anthropometric indicators, such as weight, height, and mid-upper arm circumference are monitored to observe the health status of the admitted children. Mothers receive free food, hands-on training on composition and preparation of therapeutic diets, and INR 150 per day for daily wage loss. Children are followed-up on being discharged and again brought to the Center by the AWWs on the designated follow-up dates. The AWWs receive INR 50 for each follow-up visit for accompanying the child to the NRC. Children get readmitted, if necessary.^[17]

The functioning of such centers has not been studied in greater detail in the Indian context. There is a dearth of scientific literature on evaluation of the NRCs and the nature of its functioning in India in general and in Chhattisgarh in particular. This study aimed to assess the functioning of NRCs in three districts of Chhattisgarh; elicit the perception of mothers and carers of children admitted in the NRC; and assess the perspectives of service providers.

Methods

Operational definitions

An underweight child has a weight-for-age Z-score that is at least 2SD below the median in the World Health Organization (WHO) Child Growth Standards. A stunted child has a height-for-age Z-score that is at least 2SD below the median for the WHO Child Growth Standards. A wasted child has a weight-for-height Z-score that is at least 2SD below the median for the WHO Child Growth Standards. SAM is defined by very low weight-for-height/length (Z-score below-3SD of the median WHO child growth standards), a mid-upper arm circumference <115 mm, or by the presence of nutritional edema.^[2]

Study design, sampling, and data collection

We used a repeat time-series data analysis design and adopted a mixed methods approach for data collection. Both quantitative and qualitative information were collected using a structured questionnaire and nonparticipant observation. We selected four NRCs for this study purpose of which three were functional in DHs of Raipur, Mahasamund and Gariaband, and one at CHC Tildah Block. At first, three districts were selected purposively during sampling. In the next level, we selected one NRC that was functioning in the DH, from each of these three

districts. The fourth NRC was selected randomly from a list of NRCs that were functioning at CHC level as to obtain a holistic view of the nature of functioning of these NRCs at two tiers of service delivery institutions (DH and CHC), as also to assess differences in the patient admission, severity of illnesses, referrals, etc. if any, between DHNRC and CHCNRC. For a selection of mothers/carers, we selected fifty children aged 6–59 months who were admitted to the sample NRCs during the days of data collection, through systematic sampling. Ten service providers were selected on the basis of mutual convenience and willingness to participate in this study.

For assessment of the performance of the NRCs, we collected the monthly performance reports of 24 months, starting from April 2012 to March 2014. Each monthly report constituted a unit of observation. The interview schedule for mothers contained questions about services received from NRCs, awareness on government-funded nutrition programs, and the effect of hands-on training and counseling about hygiene and therapeutic diet preparation. Service providers were interviewed with the help of an interview guide that contained both structured and open-ended questions related to the services provided at NRCs, opportunities and challenges they faced while working in the NRCs and suggestions to improve functioning. Information about existing human resources, infrastructure, equipment, and drugs was collected through nonparticipant observation and administration of a checklist. The study was approved by an independent ethical committee of IIPH-Bhubaneswar. Permission was obtained from the government for data collection. Anonymity and confidentiality were maintained. Quantitative data were coded and entered into Microsoft Excel and exported to SPSS for analysis. Rates, ratios, proportions, mean, and standard deviations were calculated wherever suitable. Independent *t*-test was used for assessing equality of means of key performance variables by categories of health units (DH and CHC); linear regression model was used to identify predictors of weight gain in the NRC; we considered input indicators, such as, weight during admission, duration of stay, and socioeconomic factors as independent variables and weight gain as dependent variable in this model. Further, correlational analysis was used to find out variables having maximum correlation from among select three variables: age, weight gain, and duration of stay. $P < 0.05$ was considered to be statistically significant and that of < 0.001 as highly significant.

Analysis of interviews of mothers/carers' perceptions and that of service providers was done through systematic text condensation and thematic analysis. Further, response sorting was carried out to reflect key findings in a tabular manner. The main focus of mothers'/carers' interview was to explore their perception about the services being rendered at the NRCs and whether or not they were satisfied with those services. On the other hand,

focus of investigation for service providers was to assess their understanding about the services that they provide, their own competencies, and challenges they faced in discharging their duties.

Results

Performance of NRCs

Non-availability of sufficient number of human resources was found to be common across all four NRCs. For instance, only 70% of doctors, 7.4% of nursing staff, and 30% of attendants and cleaners were available across the four NRCs. Information, education, and communication materials were available in limited stocks in these institutions. Room heaters were not available in any of the sample NRCs. Out of the fifty essential medicines, 76% of those were found to be available in the NRCs. Children during admitted had a mean age of 23.8 months (standard deviation [SD] ± 6.2). The mean weight gain in our study sample was 11.6% for the duration of stay. A higher proportion of female children were admitted in the NRC as compared to males. Very less number of children had complications, such as edema or serious medical conditions. Data related to caste distribution of beneficiaries was not maintained properly [Table 1].

An independent *t*-test was conducted to compare means of key interval data among NRCs of DH and CHC. We found a higher number of children were admitted in the CHCNRC as compared to DHNRC. Similarly, a higher proportion of female children were admitted in CHCNRC. Higher proportion of children with edema and medical complications were admitted to CHCNRC as compared to DHNRC in the state [Table 2]. In the next level of analysis, we conducted linear regression to examine the association between mean weight gain and other contributing factors. The variables used in the linear regression model were as follows: average weight gain which was considered to be the dependent variable; and Medical complications, gender-male, weight during admission, scheduled caste, average duration of stay, scheduled tribe (ST), age of children during admission, gender-female, and general caste which were considered as the interacting variables. Results indicated that weight gain was directly related to weight during admission and the duration of stay in the NRC [Table 3]. We conducted Pearson Correlation of various clinical and nonclinical factors for children attending the NRCs and found that age during admission, weight gain, and duration of stay were positively related to one another [Table 4].

Perception of mothers/carers

Nearly 68% of respondents visited NRC for the first time, while 28% visited for the second time and 4% visited for the third time. Hundred percent of respondents said that they received 24 h care at the NRC, whereas 98% said that their children received treatment for all complications

Table 1: Key performance indicators of Nutrition Rehabilitation Centres, Chhattisgarh (2012-2014)

Indicator	n	Mean±SD
Age of children during admission	72	23.8±6.2
Weight during admission	60	7.0±1.0
Weight during discharge	60	7.8±1.2
Weight gain (%)	72	11.6±9.2
Duration of stay	72	10.7±3.5
Total children admitted	72	12.7±4.9
Male	72	5.6±2.4
Female	72	7.1±3.5
Scheduled caste*	72	1.7±2.2
Scheduled tribe*	72	4.3±3.0
Other backward castes*	72	6.1±4.3
General castes*	72	0.2±0.5
Edema	72	0.6±0.9
Medical complications	72	0.5±0.5

*Incomplete/inaccurate data. SD=Standard deviation

Table 2: Independent t-test for equality of means among Nutrition Rehabilitation Centres functioning in District Hospital and Community Health Centres, Chhattisgarh (2012-2014)

Variables	Mean±SD		P
	DHNRC (n=50)	CHCNRC (n=22)	
Age of children during admission	23.92±6.6	23.59±5.3	0.825
Weight gain	11.76±7.3	13.02±12.6	0.668
Duration of stay	10.90±3.4	10.45±3.8	0.644
Total children admitted	11.66±3.9	15.23±6.2	0.004*
Gender			
Male	5.30±2.2	6.27±2.7	0.150
Female	6.36±2.7	8.95±4.4	0.003*
Referral	0.00±0.0	0.00±0.0	NA ^a
Edema	0.06±0.2	2.00±0.0	<0.001*
Medical complications	0.30±0.4	1.00±0.0	<0.001*

^aP value cannot be computed because the SDs of both groups are 0,

*Significant P value. SDs=Standard deviations

during their stay. While relatively less proportion of respondents said that they had received the follow-up card and/or seen follow-up visit by AWW/ASHA after children were discharged from the NRC. Similarly, 76% respondents said their children received sensory stimulation from the service providers. Overall, 86% of service recipients were satisfied with all the services, although 100% mothers/carers said that they would recommend others to avail services from the government-sponsored NRCs [Table 5]. In the next level of analysis, we examined the factors responsible for improving the satisfaction of mothers/carers attending NRCs in Chhattisgarh. Only cases who said they were satisfied with the services were used in this analysis phase. We found that satisfaction was directly related to the treatment of medical complications, provision of sensory stimulation, regular social assessment, timely

follow-up consultation, issuing of follow-up card and a timely follow-up visit by the AWW or ASHA (*Mitanin*).

Opinion of service providers

A majority of service providers informed that they were providing 24-hours care to the children and their mothers/carers in NRC. This was corroborating with the responses of the mothers/carers. When asked about the frequency of sensory stimulation about three-fourth of service providers confirmed that they provided such services to the children. About three-fourth respondents maintained that they ensured social assessment. On the other hand, about four-fifth providers were confident of treating any types of medical complications. There were too many dissatisfying factors among the service providers about the functioning of NRCs. The key problems identified by the in-depth interview were found around themes of follow-up visit and follow-up card issuing, counseling to mothers, special diet preparation, delay in receipt of incentives, and training on diet preparation, maintenance of records, and timely submission of reports.

Discussion

The efficacy of outreach NRCs and review of successful programs was reported during early 90s.^[18,19] Recent systematic reviews have identified several limitations in the evidence base for assessing the effectiveness of interventions for treating young children with SAM, including a lack of studies assessing the different interventions; limited details of study methods used; short follow-up postintervention or discharge; and heterogeneity in participants, interventions, settings, and outcome measures affecting generalizability.^[20] The WHO advocates for management of children with malnutrition in the line of recommended strategies.^[21] However, our results indicate several gaps in the implementation of such strategies. For instance, the mean age of the children in our study was 23 months, but another study in a similar setting done in three typical rural clinics in southern Malawi found the mean age of 29 months. This may be indicative of the early onset of malnutrition in Chhattisgarh and the need to strengthen ANC, PNC, home visits, and ICDS interventions. Linking of NRCs with the community-based core model of management of severe malnourished needs to be implemented in letter and spirit. This model as envisaged by the WHO provides a framework for an integrated public health response to curb malnutrition, treat most patients with SAM at home, and that in-patient care is reserved for those with acute medical complications. However, our study points out that higher proportion of children with medical complications are admitted to CHCNRCs rather than at DHNRCs.

In this study, about 6 g/kg/day of weight gain was found for children who stayed for 10.7 days (SD ± 3.5) in these sample NRCs. Savadogo *et al.* in a study at Burkina Faso reported an average weight gain of 10.1 ± 7.0 g/kg/day.^[22]

A study in Bangladesh comparing inpatient, daycare and home-based treatment for severely malnourished children observed an average weight gain of 11 g/kg/day for the inpatient group. Another study of Southern Malawi reported weight gain of ~6 g/kg/day.^[2] In yet another study, the rate of weight gain was reported at 7 g/kg/day for marasmic and marasmic-kwashiorkor cases and 6 g/kg/day for kwashiorkor cases.^[23] Other studies have concluded that age and neuropsychomotor developmental status at the time of admission are critical factors in determining the duration of treatment.^[24]

We found the mean duration of stay at the centers was 10.7 ± 3.5 days, which is much less than earlier programs with severe protein energy malnutrition which ranged from 6 weeks to 8 months. The advantage of 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. However, the duration of stay needs to be balanced between the chances of cross-infection and the readiness of the mothers to effectively manage their children at home.

It is important to implement community-based therapeutic care for the management of children still malnourished at discharge from nutritional rehabilitation center,^[22,25] but the plan for developing NRCs does mention about the coordination and convergence for referral linkage of severely malnourished children with the help of community-based workers of women and child development (WCD) department. A major proportion of the admitted children belonged to the marginalized population groups and most literature on the subject implies that the long-term effectiveness of the NRC is affected by limiting factors at home and in the center itself.^[26] Therefore, one-time management of children at facility-based centers may not be a sustainable strategy need to be reinforced by regular follow-up visits by the community-based workers of both health and WCD department.

NRCs provide life-saving care for children with SAM; however, the protocols and therapeutic foods currently used need to be improved to ensure the full recovery of all children admitted.^[27] To sustain the benefits and prevent relapse, there is a need to integrate the services at NRC with the community-based therapeutic care to deliver a continuum of care from facility to doorstep and vice versa.^[28] Moreover, the political will committed policymakers and fiscal space energize the health system to promote equity.^[29,30] Thus, it is critical to establish an inter-departmental mechanism for better coordination and integration at the village level.

In recent times, the state government has committed to establishing 20 bedded NRCs at the district level and 10

Table 3: Linear regression for average weight gain and its predictors for children attending Nutrition Rehabilitation Centres Chhattisgarh

Variables	Estimate (95% CI)	P
Age of children during admission	-0.17 (-0.68-0.33)	0.491
Weight during admission	-3.45 (-6.06--0.84)	0.011*
Duration of stay	0.93 (0.11-1.77)	0.028*
Gender		
Male	3.55 (-9.56-16.65)	0.589
Female	4.64 (-8.73-18.01)	0.488
Scheduled caste	-5.61 (-18.85-7.62)	0.398
Scheduled tribe	-3.95 (-17.29-9.39)	0.554
Other backward caste	-2.97 (-16.16-10.21)	0.652
General caste	-9.59 (-23.61-4.43)	0.175
Edema	1.25 (-2.69-5.18)	0.526
Medical complications	-3.56 (-10.60-3.47)	0.313

*Statistically significant. CI=Confidence interval

Table 4: Correlation of key clinical and nonclinical factors in Nutrition Rehabilitation Centres, Chhattisgarh

Correlations	Type of health unit	Age during admission	Weight gain	Duration of stay
Type of health unit				
Pearson correlation	1	-0.024	0.063	-0.058
Significant (two-tailed)		0.839	0.599	0.630
n	96	72	72	72
Age during admission				
Pearson correlation	-0.024	1	0.118	0.496**
Significant (two-tailed)	0.839		0.323	0.000
n	72	72	72	72
Weight gain				
Pearson correlation	0.063	0.118	1	0.269*
Significant (two-tailed)	0.599	0.323		0.022
n	72	72	72	72
Duration of stay				
Pearson correlation	-0.058	0.496**	0.269*	1
Significant (two-tailed)	0.630	0.000	0.022	
n	72	72	72	72

**Highly significant, *Significant

Table 5: Perception of mothers/carers (n=50)

Variable	Response	Frequency (%)	Valid percent
First time visiting	Yes	34 (68.0)	68.0
Two time visitors	Yes	14 (28.0)	87.5
Three time visitors	Yes	2 (4.0)	12.5
24 h care	Yes	50 (100.0)	100.0
Treatment of complications	Yes	49 (98.0)	98.0
Counselling on care and hygiene	Yes	50 (100.0)	100.0
Appropriate feeding	Yes	49 (98.0)	98.0
Sensory stimulation	Yes	38 (76.0)	76.0
Social assessment	Yes	30 (60.0)	60.0
24 h water and power supply	Yes	37 (74.0)	74.0
Follow-up consultation	Yes	40 (80.0)	80.0
Follow-up card	Yes	25 (50.0)	50.0
Visit of AWW or ASHA	Yes	26 (52.0)	52.0
Satisfaction with services	Yes	43 (86.0)	86.0

AWW=Anganwadi worker, ASHA=Accredited social health activists

bedded at the block level. Assuming all the NRCs to be 20 bedded units and with 100% bed occupancy, the number of children who would receive care at an NRC every month would be 40 (20×14 days). The state of Chhattisgarh has at present 42% severe malnourished children being catered to by 46 NRCs. Thus, about 84,000 children could need nutritional rehabilitation, every year which the present health system may not be able to accommodate. Alternate models of home-based counseling, food demonstration and therapeutic management may be designed and piloted.

Conclusions

Admission of SAM patients was few in numbers. Very limited number of cases with edema or serious complication had been admitted. No deaths were reported in any of the NRCs, and there were no case of second referrals. The shortage of human resources, room heaters, medicines, and playground for children needed interventions at systemic level. Most of the admitted children were females and belonged to the ST and other backward castes. Timely submission of monthly reports, appropriate sensory stimulation, follow-up visits by the field workers needed immediate attention.

There is a need to recruit, train and place the nursing staff for optimal management of NRCs. The NRCs are over-occupied with patients, and hence, it is necessary to increase the bed capacity. Supply of equipment and consumables as per the guideline should be made to all NRCs as to improve the quality of services. Proper home visits by AWWs and ASHAs could be ensured through supportive supervision. Regular handholding of AWWs, ASHAs, and nurses could be helpful for skill upgradation. The habit of using data for the decision could be inculcated among the managerial

cader for better performance of NRCs. Cost-effectiveness analysis may be carried out to examine the unit cost and long-term sustainability of the centers.

Study limitations

The study was conducted in four out of 46 NRCs which may not represent the universe. Selection bias of districts and socially desirability of responses could play as limiting factors in generalizing the results. Incomplete data sets are considered as another limitation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Received: 29 Apr 17 **Accepted:** 6 Nov 17

Published: 17 May 19

References

- National Centre for Health Statistics. Centers for Disease Control and Prevention. Available from: <http://www.cdc.gov/nchs/index.htm>. [Last accessed on 2015 Jun 10].
- Collins S, Dent N, Binns P, Bahwere P, Sadler K, Hallam A, et al. Management of severe acute malnutrition in children. Lancet 2006;368:1992-2000.
- Kebede M, Alemu K, Destaw B. Prevalence of malnutrition and associated factors among children aged 6-59 months at Hidabu Abote District, North Shewa, Oromia Regional State. J Nutr Disord Ther 2013;1:1-15. doi:10.4172/2161-0509.T1-001.
- Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: Global and regional exposures and health consequences. Lancet 2008;371:243-60.
- Lim SL, Ong KC, Chan YH, Loke WC, Ferguson M, Daniels L, et al. Malnutrition and its impact on cost of hospitalization, length of stay, readmission and 3-year mortality. Clin Nutr 2012;31:345-50.
- Arnold F, Parasuraman S, Arokiasamy P, Kothari M. Nutrition in India. National Family Health Survey (NFHS-3) India 2005-06. International Institute for Population Sciences; 2009.
- UNICEF. I. Coverage Evaluation Survey 2009. UNICEF; 2010.
- de Onis M. WHO Child Growth Standards: Length/Height-for-Age, Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age. World Health Organization; 2006.
- Bengoa JM. Nutritional rehabilitation programmes. J Trop Pediatr Afr Child Health 1964;10:63-4.
- Begin ID. Nutritional rehabilitation centers in Latin America: A critical assessment. Am J Clin Nutr 1970;23:1412-7.
- Rawat NP. Indian experience on household food and nutrition security. Regional Expert Consultation of the Asia-Pacific Network for Food and Nutrition on Household Food Security with Respect to Desirable Dietary Pattern. Bangkok Thailand; 1994.
- Chaudhuri SN. CINI's approaches to intervention: An innovative strategy to combat malnutrition in India. Nutr Rev 2002;60:S102-8.
- Government of India. National Rural Health Mission – Meeting People's Health Needs in Rural Areas. Available from: <http://www.nipccd-earchive.wcd.nic.in/sites/default/files/PDF/>

- NRHM-FrameworkforImplementation-2005-MOHFW.pdf. [Last accessed on 2015 Apr 18].
14. Nandan D. National rural health mission: Turning into reality. Indian J Community Med 2010;35:453-4.
 15. Ministry of Health and Family Welfare G of I. National Rural Health Mission: Framework for Implementation (2005-2012). Available from: <http://www.jknrhm.com/Guideline/Frame-Work.pdf>. [Last accessed on 2011 Jan 12].
 16. Beghin ID, Viteri FE. Nutritional rehabilitation centres: An evaluation of their performance. J Trop Pediatr Environ Child Health 1973;19:403-16.
 17. Taneja G, Dixit S, Khatri A, Yesikar V, Raghunath D, Chourasiya S, et al. 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). Indian J Community Med 2012;37:107-15.
 18. Perra A, Costello AM. Efficacy of outreach nutrition rehabilitation centres in reducing mortality and improving nutritional outcome of severely malnourished children in Guinea Bissau. Eur J Clin Nutr 1995;49:353-9.
 19. Ashworth A. Community-Based Rehabilitation of Severely Malnourished Children: A Review of Successful Programmes. London: London School of Hygiene & Tropical Medicine; 2001.
 20. Picot J, Hartwell D, Harris P, Mendes D, Clegg AJ, Takeda A, et al. The effectiveness of interventions to treat severe acute malnutrition in young children: A systematic review. Health Technol Assess 2012;16:1-316.
 21. World Health Organization. Department of Child and Adolescent Health. Management of the Child with a Serious Infection or Severe Malnutrition: Guidelines for Care at the First-Referral Level in Developing Countries. World Health Organization; 2000.
 22. Savadogo L, Zoetaba I, Donnen P, Hennart P, Sondo BK, Dramaix M, et al. Management of severe acute malnutrition in an urban nutritional rehabilitation center in Burkina Faso. Rev Epidemiol Sante Publique 2007;55:265-74.
 23. Ibekwe VE, Ashworth A. Management of protein-energy malnutrition in Nigeria: An evaluation of the regimen at the kersey nutrition rehabilitation centre, Nigeria. Trans R Soc Trop Med Hyg 1994;88:594-5.
 24. Fernandes MB, López RV, de Albuquerque MP, Marchesano AC, Clemente AP, Martins VJ, et al. A 15-year study on the treatment of undernourished children at a nutrition rehabilitation centre (CREN), Brazil. Public Health Nutr 2012;15:1108-16.
 25. Rawat R, Marskole P. Study to evaluate the effect of nutritional intervention measures on children with severe acute malnutrition admitted in nutrition rehabilitation center at civil hospital Bairagarh, Bhopal, Madhya Pradesh. J Evol Med Dent Sci 2015;4:2937-42. Available from: http://www.jemds.com/data_pdf/4_riteshrawat-----vija.pdf. [Last accessed on 2015 Apr 20].
 26. Reneman L, Derwig J. Long-term prospects of malnourished children after rehabilitation at the nutrition rehabilitation centre of St. Mary's hospital, Mumias, Kenya. J Trop Pediatr 1997;43:293-6.
 27. Singh K, Badgaiyan N, Ranjan A, Dixit HO, Kaushik A, Kushwaha KP, et al. Management of children with severe acute malnutrition: Experience of nutrition rehabilitation centers in Uttar Pradesh, India. Indian Pediatr 2014;51:21-5.
 28. Singh P, Kumar P, Rohatgi S, Basu S, Aneja S. Experience and outcome of children with severe acute malnutrition using locally prepared therapeutic diet. Indian J Pediatr 2016;83:3-8.
 29. Thomas D, Sarangi BL, Garg A, Ahuja A, Meherda P, Karthikeyan SR, et al. Closing the health and nutrition gap in Odisha, India: A case study of how transforming the health system is achieving greater equity. Soc Sci Med 2015;145:154-62.
 30. Kumar B, Shrivastava J, Satyanarayana S, Reid AJ, Ali E, Zodpey S, et al. How effective is the integration of facility and community-based management of severe acute malnutrition in India? Public Health Action 2013;3:265-70.