Evaluation of the outcome indicators of a Nutritional Rehabilitation Center in Eastern India

Mayadhar Panda[1], Sikata Nanda[1], Mangala Charan Murmu[2], Rama Chandra Giri[1], Lila Lalantika Debi[3]

[1]Department of Community Medicine, S.C.B. Medical College, Cuttack, Odisha, India, [2]Department of Pediatrics, S.C.B. Medical College, Cuttack, Odisha, India, [3]Nutritional Rehabilitation Centre, Sardar Vallabhbhai Patel Post Graduate Institute of Pediatrics, Cuttack, Odisha, India

Correspondence to: Sikata Nanda, E-mail: drkitusraban@gmail.com

ABSTRACT

Background: Under the National Rural Health Mission all over India, in March 2011, the concept of facility-based dietary management in tertiary care hospital, which is named as Nutritional Rehabilitation Center (NRC), was started with the establishment of NRCs at district level. **Objective:** Our aim was to evaluate the outcome indicators of facility-based management of severe acute malnutrition (SAM) children admitted in the NRC, to identify the gaps in the NRC management of SAM, and to propose recommendations to bridge the gaps. **Materials and Methods:** This study is a hospital-based snap short study which was conducted in NRC, Sardar Vallabhbhai Patel Postgraduate Institute of Paediatrics, Sishu Bhawan, S.C.B Medical College, Cuttack, from 2014 to 2017. Patients >1 month and <5 years of age with SAM admitted to the NRC were included in the study. **Results:** A total of 353 children were included in the study. Mean age of the children was 12.4 ± 11.8 months. 83.6% of the SAM children were within 24 months. Mean duration of stay in NRC among all the admitted (353 children) SAM children over 3 years was 12.78 ± 7.07 days and mean duration of stay in the NRC among all the discharge cases (246 discharged children) was 15.7 ± 5.86 days. Case fatality rate was 1.5% for the year 2014–2015 and no death was recorded during the year 2015–2016 and 2016–2017. Average daily weight gain was 12.5 ± 5.61 g/kg/day. **Conclusion:** Implementation of the World Health Organization feeding guidelines resulted in adequate weight gain of inpatient malnourished children with adequate health-care services at the NRCs.

KEY WORDS: Outcome Indicator; Severe Acute Malnutrition; Nutrition Rehabilitation Center

INTRODUCTION

As per the Global Nutrition Report 2014, "good nutrition is the bedrock of human well-being." For young children, good nutrition status averts death and equips the body to grow and develop to its full potential.[1] Malnutrition includes both undernutrition, which is mostly due to inadequate dietary intake, and overnutrition which is a manifestation of excessive consumption of energy and nutrients. Hence, malnutrition manifests in different forms such as undernutrition, overnutrition, and micronutrient malnutrition.[2]

According to the Global Nutrition Report 2016, nutrition is central to the Sustainable Development Goals. At least 12 of the 17 sustainable development goals contain indicators that are highly relevant for nutrition, reflecting nutrition's central role in sustainable development.[3] The World Health Organization (WHO) defines malnutrition as the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions.[4,5] The frequency of undernutrition cannot be easily estimated from the prevalence of commonly recognized clinical syndromes such as marasmus and kwashiorkor, because these constitute only the proverbial

tip of the iceberg, since cases with mild-to-moderate undernutrition are likely to remain unrecognized.[6]

The WHO and United Nations International Children's Emergency Fund (UNICEF) in their joint statement have recommended two major approaches to address children with severe acute malnutrition (SAM):[7] (i) Facility/hospital-based care for SAM children with medical complications and (ii) home/community-based care for SAM children without any medical complication. To fight with SAM, the collaboration of the WHO and UNICEFF developed the concept of facility-based dietary management which is accepted and adopted by the Government of India. The private medical colleges and tertiary hospitals were also encouraged to join hands to attain the goal of eliminating malnutrition (UNICEF, 2004).[8]

Nutritional Rehabilitation Center (NRC) is a unit in the health facility where SAM children are admitted as per the defined admission criteria and provided medical and therapeutic nutritional care as well as capacity building of mothers and other caregivers regarding appropriate feeding and caring practices for infants and young children as per SAM management guidelines by the WHO and Indian Academy of Pediatrics.[9] SAM places extraordinary challenges in the way of survival, growth, and development of the child under 5 years of age. Children with SAM are 9 times more likely to die than well-nourished children.[6] Facility-based management is provided to SAM children with medical complications. During the stay in NRC, along with medical and nutritional therapeutic care, mothers/caregivers are also provided counseling and support to address the reasons for poor nutrition and health in their child. Global guidance for SAM children with complications is to provide the in-patient child with F75 (75 kcal or 315 kJ/100 ml) or F100 (100 kcal or 420 kJ/100 ml) or ready-to-use therapeutic food as per their requirements.[7] The child is discharged when the following criteria are met: Edema has resolved; child has achieved weight gain of ≥15% and has satisfactory weight gain for 3 consecutive days (>5 g/kg/day); child is eating an adequate amount of nutritious food that the mother can prepare at home; and all infections and other medical complications have been treated.[8] After discharge, the child is followed up in the community to avoid relapse.[10] Taking into account the burden of SAM in Odisha, an attempt has been made to find out the status of NRCs with respect to outcome of SAM management with the following objectives.
1. To evaluate the outcome indicators of facility-based management of SAM children admitted in the NRC
2. To identify the gaps in the NRC management of SAM
3. To propose recommendations to bridge the gaps.

MATERIALS AND METHODS

Type of the Study

A hospital-based cross-sectional study of children with SAM admitted in the NRC was conducted to meet the objectives.

Place of the Study

The study was conducted at the NRC, Sishu Bhavan, Cuttack, Odisha.

Period of Study

The study duration was from May 2014 to March 2017.

Study Participants

SAM children admitted in the NRC were selected for the study.

Study Criteria

Children with SAM in the age of 1 month–5 years were admitted from the outpatient department or emergency or referred from other NRCs or hospitals were enrolled. The Institutional Ethical Approval was obtained, and informed consent was taken from the parents or caregivers.

Exclusion Criteria

Children having edema due to non-nutritional origin, for example, renal, hepatic, or cardiac causes were excluded. Children who left without completing the treatment protocol were excluded from the final analysis.

Study Tool

Informed consent from the parents/caregivers of the participants was taken before enrolment of children in the study. A pre-designed pre-tested pro forma was used for data collection. Interview schedule for the mothers was translated into Odia and again retranslated into English by language experts to rectify the discrepancies. Nutritional status by anthropometric assessment using standard methods was done. Classification of malnutrition was made according to the WHO guidelines. Anthropometric measurements including weight in kg and length/height in cm, weight for height Z score, mid-upper arm circumference, and edema were used to classify the grades of malnutrition. Children were weighed by the service provider everyday in the morning at the same time before their morning feed. The weight change was calculated daily in g/kg/day. A number of SAM children admitted to NRC, transfer to another health facility, bed occupancy rate, discharged from NRC, average length of stay, discharge rate, recovered and unrecovered, defaulter rate, and deaths were calculated.

Statistical Analysis

The data after collection and compilation were analyzed by Statistical Package for the Social Sciences (SPSS). Data were entered and analyzed using SPSS version 21. Categorical data were analyzed as proportions and percentages.

Table 1: Gender- and age-wise distribution of admitted SAM children *n* (%)

Variable	Year: 2014, number of SAM child (*n*=67)	Year: 2015, number of SAM child (*n*=123)	Year: 2016, number of SAM child (*n*=163)
Age (months)			
1–6	18 (26.9)	38 (30.9)	61 (37.4)
7–12	22 (32.8)	41 (33.3)	44 (27)
13–24	16 (23.9)	34 (27.6)	40 (24.5)
25–36	9 (13.4)	7 (5.7)	9 (5.5)
37–<60	2 (2.9)	3 (2.4)	9 (5.5)
Gender			
Male	34 (50.7)	71 (57.7)	78 (47.9)
Female	33 (49.3)	52 (42.3)	85 (52.1)

SAM: Severe acute malnutrition

Table 2: Status of SAM children admitted in the NRC, *n* (%)

Parameters	2014–2015	2015–2016	2016–2017
Total admissions	67 (100)	123 (100)	163 (100)
Transferred	11 (16.4)	12 (9.8)	43 (26.4)
Total exit=Total admission–total transferred	56 (83.6)	111 (90.2)	120 (73.6)
Total exits			
Death	1 (1.4)	0 (0)	0 (0)
Defaulters	9 (13.4)	14 (11.4)	17 (10.4)
Discharged	46 (68.7)	97 (78.8)	103 (63.2)
Total discharged			
Recovered	36 (53.7)	71 (57.7)	90 (55.2)
Non-recovered	10 (15.0)	26 (21.1)	13 (8.0)

NRC: Nutritional Rehabilitation Center, SAM: Severe acute malnutrition

Table 3: Assessment of weight gain among the SAM children discharged from NRC *n* (%)

Weight gain (g/kg/day)	(2014–2015)	(2015–2016)	(2016–2017)
Good (≥10)	8 (17.4)	63 (65)	62 (60.2)
Moderate (5–<10)	5 (10.9)	27 (28)	36 (35)
Poor (<5)	33 (71.7)	7 (7)	5 (4.8)
Total discharged	46 (100)	97 (100)	103 (100)

SAM: Severe acute malnutrition

RESULTS

Table 1 shows the distribution of admitted SAM children according to age and sex. Of 67 SAM children in 2014–2015, nearly half (50.7%) were males and rest were females. Similarly in 2015–2016, 57.7% were males, and in 2016–2017, about 52.1% were females.

Table 2 shows year-wise distribution of outcome status of the SAM children admitted in the NRC. In the year 2014–2015 of 67 admitted children, 46 (68.7%) children were discharged from the NRC, 9 (3.4%) children were the defaulters, 1 child was died, and 11 cases referred to intensive care unit for better management. 36 of the 46 discharged children were recovered with a weight gain of ≥15% at the time of discharge, whereas 10 cases did not have the target weight gain. Similarly in 2015–2016, among the children, 14 cases were the defaulters, 97 children were discharged, 71 children were recovered, and 26 children could not recover. 17 cases were the defaulters in the year 2016–2017 and 103 children were discharged. Among discharge cases, 90 were recovered having a weight gain of ≥15%, but 13 cases could not recover.

Table 3 depicts that, during 2014–2015, only 28.3% of SAM children had moderate-to-good average daily weight gain, whereas 71.7% had poor weight gain (<5 g/kg/day). In 2015–2016 and 2016–2017, 92.8% and 98% discharged cases, respectively, had moderate-to-good average daily weight gain.

Table 4 shows the outcome indicators of the NRC. In the year 2014–2015, of the 67 admitted SAM children, the death rate/case fatality rate was 1.4% which was within the acceptable range (<5% deaths). Defaulter cases are those SAM children who remained absent consecutively for 3 or more days in the NRC, and the defaulter rate was 16%, 12.6%, and 14.2% during the year 2014–2015, 2015–2016, and 2016–2017, respectively, and the defaulter rate was more than the WHO acceptable range in 2014–2015, whereas it was within the acceptable range (<15%) during the year 2015–2016 and 2016–2017. Recovery/cure rate was 64.3%, 64%, and 75% in 2014–2015, 2015–2016, and 2016–2017, respectively. Non-recovery/failure rate for the 3 years, i.e., 2014–2015, 2015–2016, and 2016–2017 was 17.9%, 23.4%, and 10.8%, respectively, which also found to remain within an acceptable range (<25%). The cure rate in the year 2016–2017 was found at par the acceptable range, i.e., >75%. Similarly average daily weight gain of the SAM children (in g/kg/day) was 12.9 ± 7.06, 12.2 ± 5.35, and 12.6 ± 5.11 in the year 2014–2015, 2015–2016, and 2016–2017, respectively; this was also found within the target range (≥8 g/kg/day).

Table 5 shows that, in the present study, the mean duration of stay in the NRC among the discharged SAM children

**Table 4:** Year-wise outcome/exit indicators of the NRC

Outcome/exit indicators				
Outcome/exit indicators=(outcome/total exit)	2014–2015 (Total exits=56)	2015–2016 (Total exits=111)	2016–2017 (Total exits=120)	Expected/ target
Recovery (cure) rate (total recovered/total exit) (%)	64.3	64	75	>75
Non recovery (failure) rate (non-recovered/total exit) (%)	17.9	23.4	10.8	<25
Defaulter rate (total default/total exit) (%)	16	12.6	14.2	<15
Death/case fatality rate (total death/total exit) (%)	1.4	0	0	<5
Average daily weight gain (g/kg/day)	12.9±7.06	12.2±5.35	12.6±5.11	≥8 g/kg/day
Average length of stay (mean±SD)	13.4±5.53	14.7±5.01	17.7±6.1	1–4 weeks

NRC: Nutritional Rehabilitation Center, SD: Standard deviation

Table 5: Duration of stay in the NRC among the discharged children (year wise), number of days of stay (%)

Duration of stay in NRC (days)	2014–2015	2015–2016	2016–2017
<7	3 (6.5)	4 (4.1)	1 (1)
7–14	30 (65.2)	63 (64.9)	37 (35.9)
≥15	13 (28.3)	30 (30.9)	65 (63.1)

NRC: Nutritional Rehabilitation Center
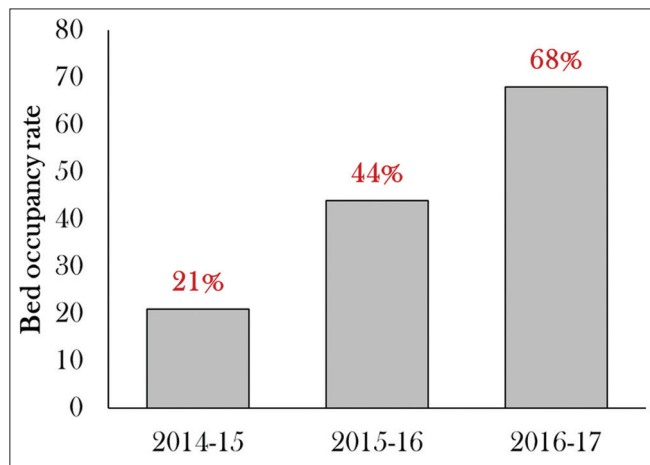
Figure 1: 1 year-wise comparison of bed occupancy rate of the Nutritional Rehabilitation Center

over the years 2014–2015, 2015–2016, and 2016–2017 was 13.4 ± 5.53 days, 14.7 ± 5.01 days, and 17.7 ± 6.1 days, respectively. Hence, during the year 2015–2016 and 2016–2017, there was an improvement in terms of average length of NRC stay, as majority of the SAM children stayed in the NRC for the required duration for the target weight gain. The overall average length of stay in the NRC taking into account all the admitted study participants over 3 years' period, i.e., 353 children was 12.78 ± 7.07 days, and mean duration of stay in the NRC among all the discharge cases during this period (246 discharged children) was 15.7 ± 5.86 days. 28.3% of cases stayed for >14 days, 65.2% of cases stayed for 7–14 days, whereas about 6.5% of cases stayed for >7 days in 2014–2015. 30.9% of cases stayed for >14 days, 64.9% of cases stayed for 7–14 days, whereas about 4.1% of children

stayed for <7 days in 2015–2016. 63.1% stayed for >14 days, and 35.9% stayed for 7–14 days in 2016–2017. This finding satisfies the WHO guideline of minimum duration of NRC stay.

Year-wise distribution of bed occupancy rate is depicted in Figure 1 that, in the year 2016–2017, it was found to be 68% in comparison to the previous 2 years. This shows better utilization of the existing health services which may be due to good level of knowledge and awareness among the frontline workers.

DISCUSSION

A total of 353 children were included in our study. Mean age of the children was 12.4 ± 11.8 months. 83.6% of the SAM children were within 24 months. Mean duration of stay in NRC among all the admitted SAM children (353 children) over 3 years was 12.78 ± 7.07 days and mean duration of stay in the NRC among all the discharge cases (246 discharged children) was 15.7 ± 5.86 days. The case fatality rate was 1.5% for the year 2014–2015 and no death was recorded during the year 2015–2016 and 2016–2017. Average daily weight gain was 12.5 ± 5.61 g/kg/day.

The average duration of stay at the NRCs was 13.81±2.73 days in the study by Taneja *et al*.,[11] 92.47% of the children in the study group had stayed at NRC for at least 14 days. However, in the study by Shukla *et al*.,[12] the average length of stay at the NRC was 7.17 ± 1.6 days as opposed to the WHO guidelines. Similarly, premature or early discharge was noticed in the study by Baruah[13] and Singh[21] where majority of the cases stayed with a mean duration of stay of 10 and 11 days, respectively. In three similar studies on admitted SAM children in NRC by Aneja *et al*.,[14] Ashraf *et al*.,[15] and Choudhary,[16] male preponderance of 55.5%, 53.7%, and 74.6% were found, respectively. However, more number of female cases, i.e., 78% and 54.7% were reported by Joshi[17] and Baruah,[13] respectively.

Regarding average daily weight gain, a similar result was reported in a study by Mathur *et al*.[18] where 76% children

had moderate-to-good weight gain. Similar findings also were reported by Baruah,[13] where 13.3% of cases had good weight gain while majority (78.7%) had moderate weight gain and 8% of cases had poor weight gain.

In a study by Tariq *et al.*,[19] recovery rate, death rate, and defaulter rate were 75.3%, 0.68%, and 1.36%, respectively, and the outcome indicators were in accordance with the WHO acceptable range. A study by Rawat and Marskole,[20] in Madhya Pradesh, found that 92% of SAM children were discharged; among them, 66.3% recovered/cured and 8% were the defaulters. High defaulter rate was observed by Singh *et al.*[21] in their study in Uttar Pradesh, which was about 45%. They found that, from among 51.7% discharged children, only 46.8% of SAM children were recovered. A similar study conducted by Taneja *et al.*[11] revealed that the overall mean weight of admission among the children was 6.51 ± 2.04 kg, for boys 6.89 ± 1.96 kg, and for girls 6.15 ± 2.08 kg. The mean weight at discharge of the study group was 7.16 ± 2.13 kg, for boys was 7.49 ± 2.08 kg, and for girls was 6.86 ± 2.16 kg. A statistically significant difference was observed between the mean weight at discharge and admission for the study group. Shukla *et al.* studied the association of SAM with infections in under-five children admitted to NRC in Central India and concluded that there is a strong association of SAM and infections. SAM and infections should be treated urgently to decrease morbidity and mortality.[12]

CONCLUSION

NRCs play a vital role in preventing deaths due to malnutrition. Barriers to utilization of NRC services can be a lack of awareness among parents about the importance of nutrition. Wage loss incurs while at the NRC and this acts as a deterrent in coming to the NRC for treatment or completing treatment for the full length of time. Other barriers include lack of proper transportation facility in remote areas. Special ambulances for transportation to and fro of the SAM children and special incentives for ASHA may be included in their scheme. Besides this, appropriate coordination between frontline workers and the beneficiaries is important and needs to be stressed upon.

ACKNOWLEDGMENTS

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