Research in Health Science
ISSN 2470-6205 (Print) ISSN 2470-6213 (Online)
Vol. 1, No. 1, 2016
www.scholink.org/ojs/index.php/rhs

An Experience at a Tertiary Level Hospital NRC in Management of Severe Acute Malnutrition in Children Aged between 6-59 Months Adopting World Health Organization Recommendations

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Abstract

Objectives: To study the outcome indicators of a nutritional rehabilitation center and to assess its performance.

Design: Retrospective case study.

Period: One year period from Jan 2014 to Dec 2014.

Methods: Data of 254 children aged between 6-59 months with severe acute malnutrition admitted in nutritional rehabilitation center at department of pediatrics, Gandhi hospital, was analyzed retrospectively. Identification and treatment of severe acute malnutrition was done according to world health organization recommendations.

Results: The recovery rate, death rate, defaulter rate, mean (SD) weight gain & mean (SD) duration of stay in the nutritional rehabilitation center were 51.42%, 3.54%, 28.57%, 8g/kg/day, 14.2 days respectively.

Conclusions: Nutritional rehabilitation centers are effective in management of severe malnutrition and also in decreasing the case fatality rates.

Keywords

NRC—Nutritional Rehabilitation Center, SAM—Severe Acute Malnutrition

1. Introduction

Childhood undernutrition is an important public health and development challenge in India. Undernourished children have significantly higher risk of mortality and morbidity. Besides increasing the risk of death and disease, undernutrition also leads to growth retardation and impaired psychosocial and cognitive development. Undernutrition is associated with high rates of mortality and morbidity and is an underlying factor in almost 1/3rd to 1/2 of all children under 5 years who die each year of preventable causes. Strong evidence exists on synergism between under nutrition and child mortality

due to common childhood illness, including Diarrhea, Acute Respiratory Infections, Malaria and Measles. Globally, 17.3 million children, or 2.6% of the pre-school aged children were malnourished in 2012 (WHO, 2014). In India, 5 million children die every year due to direct or indirect influence of malnutrition with a national prevalence of severe wasting of 6.8%, or approximately 8.4 million children (WHO, 2014), India is home to about 1/2 of the world's share.

India's, 2014 GHI (Global Health Index) fell to 17.8. It remains in the serious category and ranked 120th among 128 countries. With data on child undernutrition from 2009-2013, India ranks highest out of all countries with respect to annual incidence of deaths of children below 5 years. According to 2014 GHI, Andhra Pradesh and Telangana comes under serious category (prevalence rate of 10.0-19.9%) (India, GHI, 2014).

The WHO/UNICEF manual, "The Operational Guidelines on facility based management of Severe Acute Malnutrition (SAM) is composed of ten steps in two phases: the stabilization phase and the rehabilitation phase" (Minister of health and family welfare, government of India, 2011).

1) The stabilization phase requires up to seven days and involves restoring homeostasis while treating medical complications.

2) The rehabilitation phase includes rebuilding wasted tissues and may take several weeks.

Inpatient care demands many qualified and trained staff, plus a vast number of inpatients beds. In facilities where sufficient beds and qualified staff are available, compliance with the manual can guarantee a decrease in fatality rates during non-emergency and emergency interventions.

It is widely accepted with NRHM assistance that SAM is an important preventable and treatable cause of morbidity and mortality in children below five years of age in India. A number of state governments have taken the lead and are in the process of scaling up the establishment of NRCs with the intention to improve the quality of care given to children with SAM and to reduce child mortality. In view of this, the present study was done at NRC attached to tertiary care hospital (Gandhi Hospital) in secunderabad, Telangana state, to explore and retrospect the outcome indicators of the SAM children admitted in NRC with the following objectives.

Objectives: 1) To review and consolidate the cases admitted in NRC. 2) To study the acceptable levels of care given at NRC to the SAM Children. 3) To assess the NRC functioning by means outcome indicators.

2. Materials and Methods

The data of all the children with SAM admitted in the NRC analyzed retrospectively in the department of pediatrics of Gandhi Medical College in secunderabad, Telangana state from January 2014 to December 2014. Children aged 6-59 months having SAM were admitted in the NRC if fulfilling the following criteria: (a) bilateral pitting edema and/or, (b) weight—for-height < -3SD and/or, (c) mid arm circumference < 115mm.

All patients who were admitted in the NRC were treated according to the recommendations given by

World Health Organizations (WHO). The first step in the management of children with SAM was to triage according to the presence of emergency signs (airway, breathing, circulation, coma, convulsion and dehydration) and provide individualized treatment for the initial stabilization. Following this, the child was shifted to NRC and was managed as per the standard protocol. Dehydration was managed using low osmolality ORS (resolmal-rehydrating solution used in malnutrition) with added potassium supplements (20meq/l).

At NRC the children were subjected to appetite test to decide type of feeds for initial management. Appetite test was done by giving desired amount of therapeutic food (15g for the child weigh < 4kg, 25g for > 4-7kg, 35g for 7-10kg) to the child and looking for its complete consumption in 2hrs. Babies from 7-12mths were given 30-35ml/kg of catch-up diet. If they finished 3/4th of the offered amount of feed, they were labelled appetite test passed. As per WHO recommended F-75 (starter diet) and F-100 (catch up diet) was used, composition of which is available in guidelines (WHO, 2014; Gera, 2010). The children who passed appetite test were directly given F-100 diet while those who failed, had pedal edema and or had complication were given F-75 diet. After stabilization, when the appetite started improving and edema started decreasing, they were shifted to the transition phase in which F-100 was started without increasing the volume of feeds. Gradually, the volume of feeds was increased and the patients were shifted to rehabilitation phase with F-100 diet, therapeutic food and some home-based foods like khichdi (without salt), halva, banana and biscuits. Therapeutic food was prepared mixing 1200g milk powder, 600g coconut oil and 1120g sugar. Children were closely monitored for the complications like hypoglycemia, hypothermia, shock, dehydration and CCF. They were also screened for infections. All admitted children received age appropriate preventive/therapeutic dose of vit A, twice Recommended Dietary Allowance (RDA) of multivitamin supplements, folic acid (5mg on the first day, then 1mg/d) and injection magnesium sulphate (50%) @0.3ml/kg a maximum of 2ml IM once, there after 0.2-0.3ml/kg mixed with feeds during the entire period of stay in the NRC. During rehabilitative phase when weight gain has started and diarrhea has resolved, iron was added @3mg/kg/d.

Monitoring each child's progress was done daily by recording 24h dietary intake, disappearance of edema, calculating the weight gain (g/kg/d) and any fresh symptoms/sign. Other parameters like length/height and mid arm circumference were recorded every week. The patients were discharged when they fulfilled the discharged criteria as per WHO guidelines: 15% weight gain from the day of admission and/or free of medical complications, and/or disappearance of edema or on request of subject to; good weight gain (> 10g/kg/d) for 3 consecutive days, being free of complications and the caregivers having been trained enough to give diet and supplements at home. The patients were followed-up 2 weekly after discharge in the outdoor department of NRC for 4 times until cured. The outcome and output indicators of NRC were determined after 4 follow-ups.

3. Results

During the period of twelve months from Jan 2014 to Dec 2014, a total of 254 under 5yrs with severe malnutrition requiring inpatient care were admitted in the NRC with mean age of presentation being 1yr 8 months. There were 130 males (51.18%) and 81 females (31.8%). Table 1 depicts outcome of children admitted with SAM according to their demographic profile.

Out of 254 children admitted, 72.02% of children were in the age group 6-24 months. More than two third of patients had primary as a cause for their malnutrition. However, a slight increase in age group of 25-59 months had a secondary cause for malnutrition.

Emergency signs were present in 50.39% (128/254) of the children admitted at the time of admission and as many as 13.3% (34/254) required ventilation for revival. Acute respiratory tract infections 33.36% (85) was found to be the most common co-morbid disease associated with SAM. Followed by DIARRHEA 18.89% (48) was next co morbid condition. Being a tertiary center 57 (22.47%) cases were admitted for chronic illness involving CNS, CVS, renal and hematological system in the ward and shifted to NRC. 8 cases had TB and 2 cases had RVD. Anemia was diagnosed in 25 cases (9.8%). A case of diphtheria and three cases of laboratory confirmed typhoid were admitted. Table 3 shows data of children with various co-morbid conditions that were admitted in our NRC.

The average weight gain of all children with SAM was 8.09 (2.32) g/kg/day and their average length of stay in NRC was 14.04 (1.23). Maximum weight gain was seen in 6-24 months group.

A total of 204 children (80.3%) were discharged after treating complications irrespective of their achieving target weight gain (15%), out of which 125 (68.3%) and 71 (100%) belonged to 6-24 months and 25-59 months group respectively. Total of 126 children (51.42%) were cured out of 254 children admitted. Proportion of children of children discharged from NRC who completed 4 follow-ups is depicted in Table 4. Case fatality rate was 9 (3.54%), out of which 4 died in hospital and 5 died at home after discharge from hospital. Number of children who defaulted were 70 (28.57%).

Overall outcome indicator after follow-ups were; cured rate126 (51.42%), defaulter rate 79 (28.57%), death rate 9 (3.54%), relapse 1 (0.3%) and non-responder 39 (15.35%). Overall outcome indicator after follow-ups were; cured rate 126 (51.42%), defaulter rate 79 (28.57%), death rate 9 (3.54%), relapse 1 (0.3%) and non-responder 39 (15.35%).

Table 1. Demographic Profile and Outcome of Children Admitted with Sam in NRC

Age Group	N (%)	Male/Female	Cause of malnutrition		Case fatality rate N (%)	Discharge rate N (%)
			Primary N (%)	Secondary N (%)		
6-24 months	183 (72.04)	96/44	122 (66.66%)	61 (33.33%)	6 (3.2%)	125 (61.2%)
25-59 months	71 (27.95)	34/37	40 (56.33%)	37 (52.11%)	3 (4.2%)	71 (100%)
TOTAL	254	130/84	162 (63.77)	98 (38.58)	9 (3.54)	204 (80.3%)

Table 2. Programme Performance Indicator in NRC

Outcome	All Children N = 254	6-24 months N = 183	25-59 months N = 71
Deaths (during stay)	4 [1.54%]	3 [1.6%]	1 [1.4%]
Deaths (after discharge)	5 [1.9%]	3 [1.6%]	2 [2.8%]
Total deaths	9 [3.54%]	6 [3.2%]	3 [4.2%]
Discharge/Recovery rate	204 [80.1%]	125 [61.2%]	71 [100%]
Referred	2	2	0
Cure rate	126 [51.42%]	94 [74.60%]	32 [26.4%]
Secondary failure (Non responders)	39 [15.35%]	18 [9.8%]	21 [29.5%]

Exits include cured, defaulter, relapse, non-responder and excludes death and medical transfer.

Death rate number of children deaths/total admission.

Defaulter rate defaulter/total exits.

Cured rate who attained target weight gain [15%]/total no of exits.

Recovery rate irrespective of target weight gain and/free of medical complications divided by total exits.

Secondary failure not attained target weight gain (15%) at end of the program me.

Table 3. Co-Morbid Condition

Comorbid Conditions	No of children (n)	Percentage
ARI	85	33.46%
DIARRHEA	48	18.89%
ANEMIA	25	9.8%
TUBERCULOSIS	8	3.14%
SEPSIS	3	1.18%
CHRONIC ILLNESSES CNS	28	11.02%
CVS	20	7.87%
HAEMATOLOGY	8	3.14%
RENAL	5	1.9%
DIPTHERIA	1	0.38%
FEBRILE SEIZURES	4	1.57%
MENINGITIS	3	1.18%
OTHERS	8	3.15%

Table 4. Follow Up Data of Children Discharged from NRC

Total Admissions	Total Discharge	6-24 Months	25-59 Months
254	204	149 [73%]	55 (27%)
Completed 1st follow up	160 (62.99%)	123 [76.8]	37 [23.6]
Completed 2nd follow up	136 (53.54%)	105 [77.6]	31 [22.4]
Completed 3rd follow up	104 (40.9%)	76 [73.6]	18 [22.6]
Completed 4th follow up	93 (36.65%)	80 [86.4]	13 [13.4]
Relapse	1/254 (0.39%)	1	0
Attained target weight—after discharge		**(102/126) 80.95%**	
Attained target weight—at discharge		**(24/126) 19.15%**	
Secondary failure rate		**39 (15.35%)**	

Table 5. Overall Output Indicators of NRC

Indicators	Acceptable Levels	Study	Not Acceptable
Cured Rate	< 75%	51.42%	< 50%
Death Rate	< 5%	3.54%	> 15%
Defaulter Rate	< 15%	28.57%	> 25%
Weight Gain mean SD (g/kg/d)	>= 8g	8.09 (2.34)	< 8g
Length OF Stay IN NRC Mean SD (Days)	1-4wks	14.2 (9.4)	< 1—> 6

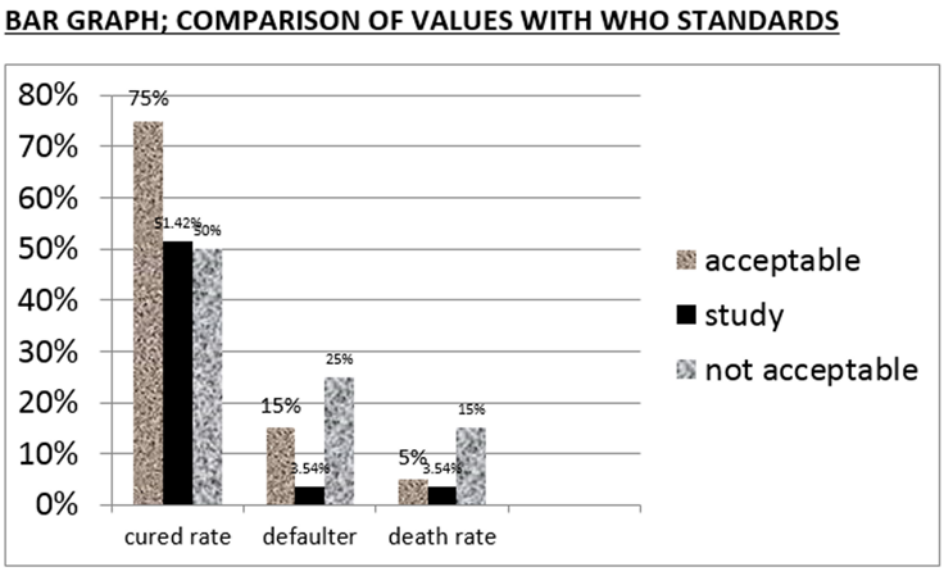

Figure 1. Relationship between Length of Stay and Weight Gain

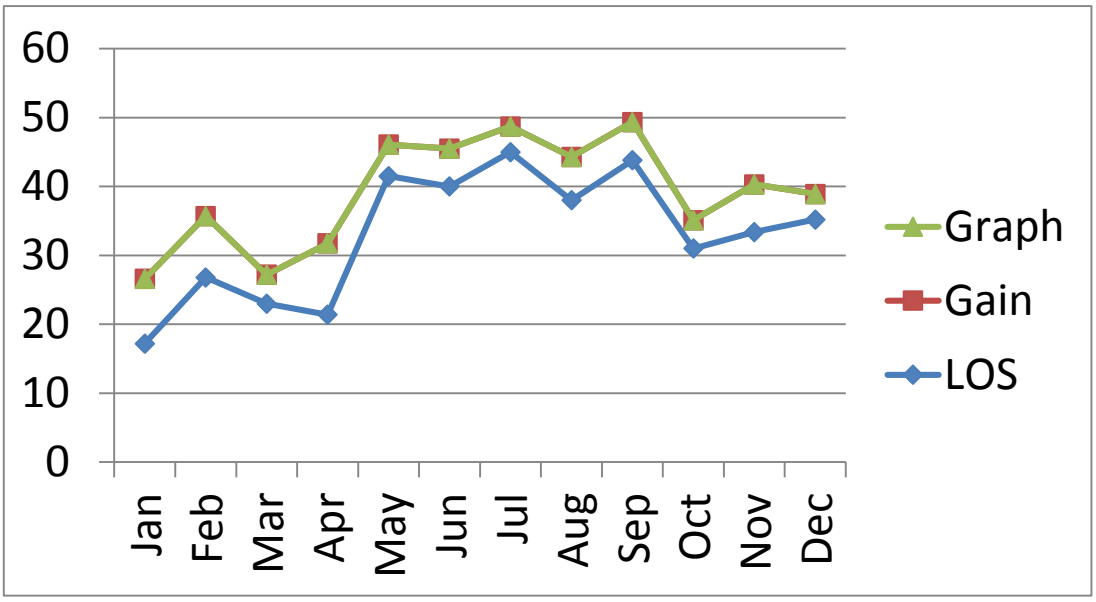

Figure 2. 4L-Length of Stay in Program Me Mean SD 33.025 (9.23), W-Weight Gain g/kg/d 8.09 (2.32) of Cured Children

4. Discussion

The present study were conducted in a ward established as Nutritional rehabilitation center using standardized WHO, adapted by government of India with guidelines for facility based management of children with SAM. In the present study output indicators were within acceptable range except for the defaulter rate which was high 28.52% (above 25% not acceptable).

Overall the case fatality rate was 3.35% which is important as the primary objective of NRC is to reduce fatality rates among children with SAM. A comparatively higher rates were seen in 3 different hospitals of Bangladesh (Ahmed et al., 2013) which observed 13.7% and Thiruvananthapuram medical college (Elizabeth, 2014) 5.9%, Praveen et al. (2016) 3.5%. The factors which contributed to the successful management were triaging the patients, identification and prompt management of emergency signs. Good quality care given by skilled personnel. Out of 9 deaths, 4 deaths occurred at hospital since they were brought in critical stage and 5 deaths occurred at home.

Defaulter rate was fairly high 28.54% not within acceptable range (< 25%), similar higher rates were seen in Singh et al. (2013) 47% unlike Bangladesh (Ahmed et al., 2013) 21.4% and Praveen et al. (2016) 13%. This is because we discharged many patients due to personal and social reasons. This led to high number of incomplete follow-ups and many of them lost follow up due lack of motivation by field level health workers. This may be the reason for less cure rate in our study. Discharged patients were not seen by peripheral health workers ASHA/ANW, which could have increased the follow up. This highlights the importance of community-based program for the management of SAM without medical complication and for those who are to be followed up after NRC care should be in place to complement the services of NRCs.

Out of 254 nearly 162 (63.7%) of children were admitted with primary malnutrition and those with secondary cause was 98 (38. 8%). More than two third with primary malnutrition was in < 24mo of age groups highlighting the importance of optimal infant and young child feeding practices. Other studies also shared similar results (Praveen et al., 2016).

In our study acute respiratory infections 33.45% was major co-morbid conditions followed by diarrhea 18.89% unlike in other studies (Ashworth et al., 2013; Ahmed et al., 2013; Singh et al., 2013; Praveen et al., 2016). This being a tertiary center a significant group of children 48 (18.89%) were admitted for chronic illness involving CNS, CVS, RENAL and hematological condition who were screened and subsequently shifted to NRC. This group contributed to low cure rates and high rates of non-responders 48 (19.2%).

Average weight gain of the children at our NRC was mean SD (g/kg/day) 8.09 + 2.32g/kg body weight/day with average length of stay mean SD (days) of 14.6 + 9.2 days which was comparable to other studies and within the accepted level as per WHO standards (Minister of health and family welfare, government of India, 2011). Most of the children were admitted with complication and high prevalence of co morbidities (congenital heart disease, chronic underlying neurological diseases, thalassemia's, pneumonias, surgical problems) and intercurrent infections due to poor immune status during hospital stay which explains slow catch up growth and high nonresponders (19.4%). A graph depicting length of stay in the program me and slow weight gain of cured children shows linear relationship which is statistically significant with r factor value 0.64 (> 0.5 significant).

Early discharge from the NRC, before achievement of the target weight gain was common. The discharge rate was 204 (80.3%) comparatively lower than in other studies [Praveen et al. 84.1%]. There was high attrition rate from 1st follow up to last visit as only 35.43% Completed all the follow up visit. This once again emphasizes the need for community based therapeutic care to ensure the continuum care.

We conclude that NRCs are effective in reducing mortality related to malnutrition at the same time, NRCs should be attached with the Sneha shivirs, a community based health scheme (Sneha, 2003), a scheme for proper management and follow-ups. Bringing of SAM children to NRC by well trained peripheral health worker is important for optimum initiation of existing facilities at NRC's. Similarly measures to be taken by health workers to provide follow up and counseling services at the door step of the children with SAM.

Hospital based management requires care givers to stay with malnourished children during the treatment period, which usually lasts several weeks. This translates into a substantial burden and cost of illness if the care givers are involved in major family activities or if they are the principle source of income involved in time consuming labor such as agriculture. To circumvent the need for and the burden associated with hospital based management of malnutrition. If every NRC's is attached to community health centers and proper follow up by health worker is initiated, then NRC's will be VERY EFFECTIVE in reducing the burden of malnutrition in developing countries like INDIA.

Acknowledgements

I would like to express my gratitude to our Hod, Prof, Dr. J. V. Rao for his continuous support, guidance and material to bring out this article. My special thanks to Dr. Ramesh, unit chief and whole team of NRC.

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