Original Article

Assessment of Nutritional Intervention Measures on Health status of malnourished children admitted in Nutritional Rehabilitation Centre of Central India

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ABSTRACT

Background: Children with severely acute malnutrition (SAM) require much needed attention to overcome the complications and to achieve normal growth and development. Nutrition rehabilitation centre (NRC) provides facility based care to SAM children. As proportion of SAM is high, it is necessary to know the effect of nutritional intervention given at NRCs. So, present study was conducted to assess the effectiveness of nutritional intervention measures on children admitted in NRCs.
Methodology: A longitudinal study was conducted in 100, 1-59 months of children by using non-probability sampling method at Nutrition rehabilitation Centre from Feb 2020 to July 2020. Data was collected in the form of socio-demographic profile, anthropometric parameters like weight for height, mid-upper-arm circumference, and height for age etc. by using predesigned and pre-tested proforma.
Results: 66% children had developed complications while 34% had no complication. Out of 66 children, maximum i.e. 42% had developed pneumonia. Out of total 100 admitted patients, 2 patients died during treatment and 4 patients were lost to follow up after 2nd follow-up visit. Nutrition and treatment given at nutrition rehabilitation centre found out to be statistically significant (unpaired t test) ($p<0.0001$).
Conclusion: NRCs provide better place for growth and development of malnourished children.

Keywords: severe acute malnutrition, anthropometric parameters, nutritional intervention, growth, development.

INTRODUCTION:

Childhood under nutrition is an important public health and development challenge in India. Under nutrition encompasses stunting (chronic malnutrition), wasting (acute malnutrition) and deficiencies of micronutrients (essential vitamins and minerals). Nutritional status will influence the growth, development and morbidity among children and ultimately affect the strength and productivity of future generations. Besides increasing the risk of death and disease, under nutrition also leads to growth retardation and impaired psychosocial and cognitive development.

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To support the growth and development of children, Government of India is providing nutritional education and supplementary nutrition through many programs like ICDS, Midday meal scheme etc. But these programs were not sufficient to deal with severe malnutrition which needs tertiary level of prevention measures such as disability limitation and rehabilitation to prevent further complications.

The prevalence of Severe Acute Malnutrition (SAM) in under 5 children has increased from 6.4% in 2005-06 to 7.4% in 2015-16.[1] Inappropriate feeding practices are still believed to account for at least one-third of causes of malnutrition, and contribute significantly to morbidity and mortality, among children under five.[2]

Nutrition Rehabilitation Center (NRC) is a unit in a health facility where children with Severe Acute Malnutrition (SAM) are admitted and managed. Children are admitted as per the defined admission criteria and provided with medical and nutritional therapeutic care. In addition to curative care, special focus is given on timely, adequate and appropriate feeding for children; and on improving the skills of mothers and caregivers on complete age appropriate caring and feeding practices.

The main functions of NRCs were 1. To provide clinical management for severe acute malnutrition. 2. To promote physical and psychosocial growth of severe acute malnutrition children. 3. To build capacity of mothers and care givers in appropriate feeding and care practices. 4. To identify social factors that contributed to SAM. 5. Demonstration and practice by doing on the preparation of energy dense child foods using locally available, culturally acceptable and affordable food items. 6. Follow-up of children discharged from the facility.[3]

Based on this back ground the present study was conducted to study the effectiveness of nutritional intervention measures on children admitted in Nutritional Rehabilitation Center in central India

Methodology:
A facility based longitudinal study was conducted at Nutritional rehabilitation Centre, attached to tertiary medical college in central India. Children fulfilling the WHO criteria for SAM, between the age group of 1month to 59 month, were included in the study by non-probability sampling method after applying inclusion and exclusion criteria and taking informed consent from parents from Feb 2020 to July 2020. Presuming dropout rate of 10%, sample size was calculated to be 100. Permission from institutional ethics committee was taken prior to start of study. A semi-structured questionnaire was prepared in accordance with the study objective.

Data was collected in the form of age, sex, criteria for admission, immunization status, response to the treatment, duration of stay in the hospital, Weight at the time of admission, extent of weight gain, or weight loss. Outcome of the child was noted in terms of-
   A) Discharges which could be of two types a) recovered i.e. after gaining 15% of weight gain during 14 days stay in NRC b) not recovered i.e weight gain is less than 15%
   B) Defaulters i.e. away from in-patient care for two consecutive days and meets the admission criteria
   C) Referrals and
   D) Death.
   Children's then followed-up till 4 visits after discharge (15 days, 1 month, 3month and 6 month).
   Data was entered using Microsoft-Excel 2010 Software. All the response was tabulated and Graphical representation was made wherever necessary. Data was analyzed by using SPSS Software version 16.0

Results:
Table 1 illustrates that maximum i.e. 83 malnourished children belongs to 6-24 Months age group. Out of this, 42 were from 6-12 months and 41 were from 12-24 months age, suggesting weaning is a crucial period for development. About 53% children's belong to joint family and 70% were from below poverty line. Huge proportion of malnourished children belongs to scheduled caste (48%) and scheduled tribe (35%) indicating that these are still the backward classes of our society and government should develop some nutritional strategy for such individuals. More than half i.e. 52% of the respondents were educated to a lower level suggesting mother's education has a big role in children's nutritional status. 19% individuals had a family history of malnutrition in their siblings. In our study, 70% malnourished children were reported from urban area and 30% were from rural area.

Fig. 1 depicts that nearly half i.e. 44 children were referred from paediatric ward of hospital as malnourished children followed by 22 and 5 each from Anganwadi worker and ASHA and CTC respectively whereas 11 children's were taken by their parents self to NRC admission.

Fig 2 illustrates that 66% participants had complications while 34% individuals had not developed complications. Out of 66 individuals, maximum i.e. 42% had developed pneumonia, 21% had AGE, 15% had Fever. Similarly, 6% had fever with AGE and pneumonia with pedal oedema each, 5%, 3%, 2% had fever with oedema, AGE with cerebral palsy and pneumonia with megaloblastic anaemia respectively.

Table 2 demonstrates that out of total 100 admitted patients, 2 patients died during treatment and 4 patients were lost to follow up after 2nd follow-up visit. Nutrition and treatment given at nutrition rehabilitation centre found out to be statistically significant (unpaired t test) (p<0.0001).

Table 3 demonstrates that out of total 100 admitted patients, 2 patients died during treatment and 4 patients were lost to follow up after 2nd follow-up visit. Nutrition and treatment given at nutrition rehabilitation centre found out to be statistically significant from 2nd follow-up visit (unpaired t test) (p<0.0001).

Table 1. Socio demographic Profile of study Participants.

Parameter		Number	Percentage (%)
Age (in Months)	< 6	0	0
	6-12	42	42
	12-24	41	41
	>24	17	17
Total		**100**	**100**
Family Type	Nuclear	43	43
	Joint	53	53
Total		**100**	**100**
Socio-economic Status	BPL	70	70
	General	30	30
Total		**100**	**100**
Category	Scheduled Caste	48	48
	Scheduled Tribe	35	35
	Other Backward Class	8	8
	Others	9	9

		Total	100	100
Mother's Education		Illiterate	15	15
		Primary	37	37
		Secondary	39	39
		Higher Sec.	9	9
		Total	100	100
Family History		Present	19	19
		Not Present	81	81
		Total	100	100
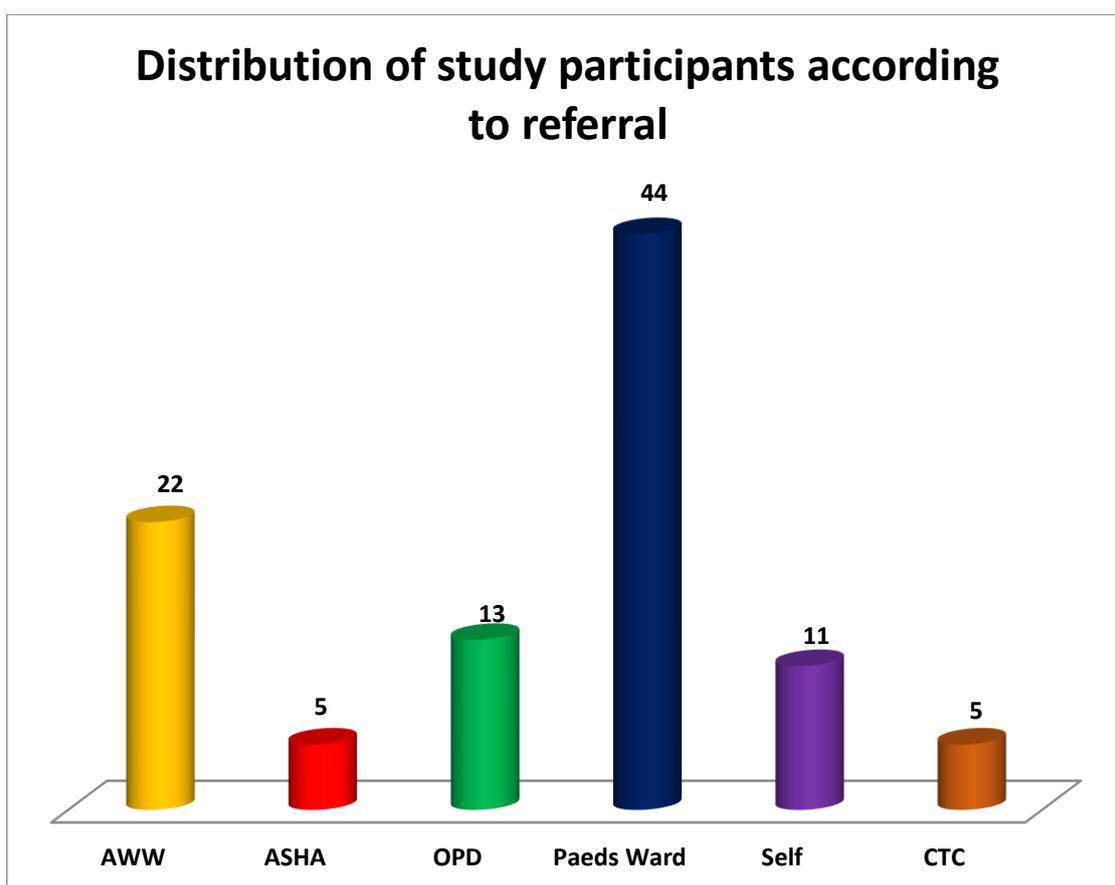
Fig.1 Distribution of study participants as per referral.
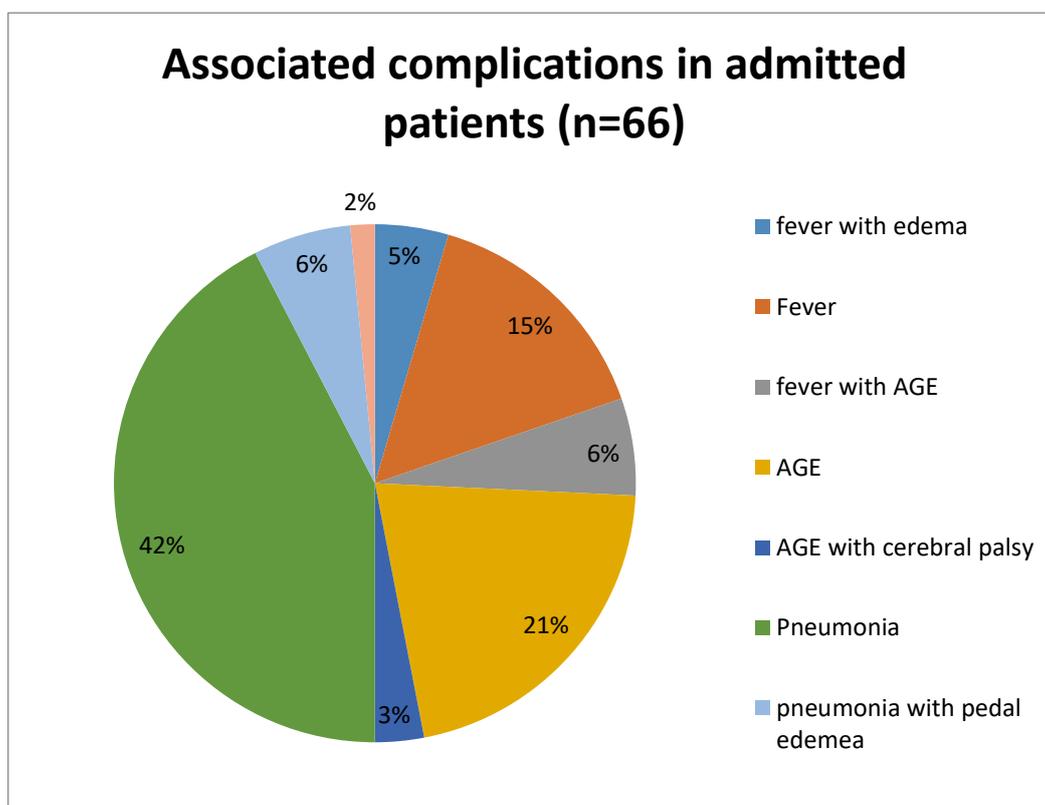
Fig 2. Associated Complications in admitted participants.

Table 2. Association of weight for age between admission, discharge and follow-up visits.

Variables	No. Of Children	Mean wt. $\pm$ Std Deviation	Test of Significance		
At Admission	100	6.60 $\pm$ 1.98			
At Discharge	98	7.69 $\pm$ 2.52	df= 196	t value= 2.83	p value= 0.0051
1st F/Up	98	7.69 + 2.52	df= 196	t value= 3.44	p value= 0.0007
2nd F/Up	98	7.89 + 2.45	df= 196	t value= 4.144	p value= 0.0001
3rd F/Up	94	8.04 + 2.49	df= 192	t value= 4.578	p value= 0.0001
4th F/Up	94	8.24 + 2.49	df= 192	t value= 5.1759	p value= 0.0001

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Table 3 Association of MUAC between admission, discharge and follow-up visits.

	No. Of Children	Mean MUAC. ± Std Deviation	Test of Significance
Admission	100	11.28 ± 0.80	
At Discharge	98	11.32 ± 0.79	df= 196 t value= 0.35 p value= 0.7238
1st F/Up	98	11.45 ± 0.81	df= 196 t value= 1.49 p value= 0.1389
2nd F/Up	98	11.52 + 0.75	df= 196 t value= 2.1768 p value= 0.03
3rd F/Up	94	11.66 + 0.71	df= 192 t value= 3.49 p value= 0.0006
4th F/Up	94	11.86 + 0.65	df= 192 t value= 5.52 p value= 0.0001

Discussion:

Gulrukh Hashmi et al [4] conducted a study in Gulbarga India among NRC children, Majority of the admitted children (41.77%) was in 12-23 months age group. 88(51.76%) were females and 82(48.24%) were males. Socioeconomic stratification according to modified B G Prasad classification showed that majority of the children (56.47%) belonged to class V i.e. lower class .31.76% children belonged to Hindu religion,28.24% belonged to SC/ST category,17.65%belonged to OBC category. A study conducted by B. Rama Rao et al [5] at Visakhapatnam depicts 20% of the children were less than 12 months of age and 34.7% were in the age group of 13–24 months. 48% percent were female and 52% were male children. This study finding is consistent with present study. Mayadhar Panda et al [6] conducted a Study in Odisha among SAM children, they found that, Of the total 353 admitted SAM children during three years, 170 (48.16%) were girls while183 (51.84%) were boys. majority (89%) of the SAM children were within 24 months. Their study findings are similar to present study. In Odisha study 135 (38.24%) of the admitted children were from SC, 53 (15.01 %) were from ST, and the remaining major portion 165 (46.75 %) were from general category. In the year 2014 majority (42%) belonged to lower SES class, in year2015 majority(30.1%) belonged to lower middle SES class and in year 2016 majority(38%) belonged to lower middle class. This study finding are similar to present study. A study on children with under-nourishment, conducted by Paul GP et al [7] revealed that, majority of the SAM cases (94.5%) were from back ward castes (SC, ST, OBC).In their study 58.2% were males and 41.2% were females. these study findings are consistent with present study. In a similar study by Mulla et al [8] majority of SAM children belong to age group less than 2 years, female gender, and caste wise OBC, SC and ST category. A study conducted by Vinod Narkhede et al [9] depicts that Majority of children belong to 0-12 months age group (32.1 %), followed by 13-24 months (22.0%). out of 404 children studied 206 (51.0 percent) were males and 198 (49.0 percent) were females. Anuradha r et al [10] conducted a study in which among 105 undernourished children's mother 10% were illiterate mothers, 28% were educated up to primary school, 40%were educated up to middle school and

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22% were educated up to high school & above. Ahmed E et al [11], reported a higher proportion of children suffering from PEM belongs to illiterate parents and especially that of illiterate mothers.

In our study 70% subjects were from urban area, this could be because of more awareness in urban area and a problem of accessibility to rural area. Mayadhar Panda et al [6] conducted a Study in Odisha in which Majority 277 (78.47%) of SAM children belonged to rural areas.

A study conducted by B. Rama Rao et al [5] at Visakhapatnam depicts most of the children (58%) were referred to NRC by ASHA. One third of children admitted in NRC directly without any referral. Mayadhar Panda et al [6] conducted a Study in Odisha in which 300 (85%) SAM children were referred by medical officers. In a similar study by Mulla et al [8] ASHAs (accredited social health activists) played a key role in referring them to MTC (malnutrition treatment centre). Results were not similar to our study which could be because of geographic diversity of study area.

Mayadhar Panda et al [6] conducted a Study in Odisha in which Bilateral oedema was recorded in 12 (17.9%) admitted children during 2014-2015, 22 (17.9%) children in 2015-2016 and in 37 (22.7%) children during 2016-2017. Nishant R. Bhimani et al [12] carried out a study in Gujarat in which when the children were assessed at the time of admission for the associated medical conditions, it was found that majority (32.29%) were suffering from diarrhoea with dehydration, 18.75% had oedema, 17.71% were having anorexia, 9.37% were having high grade fever, 6.25% had persistent vomiting, 4.17% were suffering from tuberculosis and 3.13% had pneumonia. Hari S. Meshram et al [13] conducted a study in Aligarh in which they observed that 90% SAM children had anaemia, 61% had diarrhea and 30% had pneumonia, Vitamin D deficiency features were found in 30% cases. 10% had UTI & 10% Otitis Media. Tuberculosis was diagnosed in 13% of cases. Celiac disease, Hypothyroidism and HIV were not found to be major co morbid conditions. AGE and pneumonia were the common complications with our study.

A study conducted by B. Rama Rao et al [5] at Visakhapatnam reveals the mean weight of children was increased significantly from the time of admission (8.24±2.48) to the time of discharge (8.90±2.47). There was no difference in height of children and Mid Upper Arm Circumference of children at time of admission and discharge (t = -0.942, p=0.349). In the present study it was observed that there was significant weight gain since from admission to the discharge and from discharge to third follow up. The same result was also found in various other studies conducted by Gunjan Taneja et al., Colecraft et al., Savadago et al., Gaboulaud et al. (3,4,5,6,). In a similar study conducted by Taneja et al [14] 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 (t=14.552, p<0.001) and for boys (t=9.904, p<0.001) and girls (t=10.475, p<0.001) separately. Nishant R. Bhimani et al [12] carried out a study in Gujarat in which the overall mean weight at admission was found 8.30 kg with standard deviation of 2.09 kg and the mean weight at the time of discharge was 8.97 kg with standard deviation of 2.16 kg. Average weight gain among 141 boys was 6.63 g/kg/day and among girls was found 7.60 g/kg/day. Out of total 280 children, 103 (36.79%) children had weight gain as per the standard criteria (8 gm/kg/day).

Neeraj Pal Singh et al [15] conducted a study among NRC patients in which they observed that there was a statistically significant difference found between mean. Weight at admission and mean weight at discharge for all children (t=4.133; p<0.001), for males it was t=2.96 p=0.003 and for females t= 2.842 p<0.005. Siddharam G. Ningadalli et al [16] conducted a study in Karnataka which showed that the mean weight at admission was 6.27±2.15 Kg and mean weight at discharge was 6.78 ± 2.28 Kg. The total mean weight gain was 0.51 Kg and this difference was found to be statistically significant. Present study findings are similar to above mentioned studies.

Mayadhar Panda et al [6] conducted a Study in Odisha in which There was significant improvement in the mean weight (kg) and mean MUAC (cm) at discharge was in comparison to the weight and MUAC of the children at admission and this difference in increase in the mean weight and MUAC were found to be statistically significant. In a similar study conducted by Taneja et al [14] revealed that mean MUAC at admission was 11.32±1.18 cm and at discharge was 11.94±1.38 cm. The difference was observed to be statistically significant (t=9.548, p<0.001) which was found similar to our study. Neeraj Pal Singh et al [15] conducted a study among NRC patients in which they observed that The mean MUAC at admission was 11.84±0.66 cm and at discharge was 12.30±0.725 cm. The difference was observed to be statistically highly significant

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(t=12.54, p<0.001). Siddharam G. Ningadalli et al [16] conducted a study in Karnataka which showed that the mean mid upper arm circumference (MUAC) at admission was 11.07± 1.22 cm and at the time of discharge it was 11.30±1.21 cm. The total MUAC increase was 0.23cm and this difference was found to be statistically significant and similar to present study.

Conclusion:
66% children had developed complications. Out of 66 children, maximum i.e. 42% had developed pneumonia. Out of total 100 admitted patients, 2 patients died during treatment and 4 patients were lost to follow up after 2nd follow-up visit. Nutrition and treatment given at nutrition rehabilitation centre found out to be statistically significant (unpaired t test) (p<0.0001). NRCs provide better place for growth and development of malnourished children. Regular growth monitoring is necessary for identification of reversal of malnutrition. Similarly, mothers should be highly motivated for taking care of health, hygiene and diet of children. For these things, Integrated child development service (ICDS) needs to be further strengthened. As well as functioning of NRCs need to be closely monitored for large no. of children to attain targeted weight gain.

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