

Effect of nutritional intervention on anthropometric measurements of malnourished children at Nutritional Rehabilitation Center, Civil Hospital Ahmedabad under “Mission Balam Sukham” scheme

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ABSTRACT

Context: In Gujarat, 39.7% of children are underweight and 10.6% are severely wasted in under five years of age. Nutritional rehabilitation centers started by the Government of Gujarat under the “Mission Balam Sukham” program focused at providing an energy-dense diet and protein along with other nutrients to combat malnutrition in children by hospital admission. **Aim:** To estimate the effect of nutritional intervention on Anthropometric measurements of malnourished children at Nutritional Rehabilitation Center (NRC), Civil Hospital, Ahmedabad. **Settings and Design:** A hospital-based cross-sectional study was conducted at the NRC of B. J. Medical College, Civil Hospital, Ahmedabad, Gujarat. **Methods and Material:** It was a hospital-based cross-sectional study conducted at NRC, Civil Hospital, Ahmedabad from January 2017 till December 2017 (1-year duration). A total of 159 children, 0-5 years were admitted in NRC during this period and observed during their stay with three follow-up visits. **Statistical Analysis Used:** Z-test, one-way ANOVA on repeated measures test. **Results:** The majority of the admitted children were in the age group of 12-23 months. Overall mean weight at admission was 6.1 ± 1.7 Kg. The increase in mean weight at discharge was 6.5 ± 1.9 Kg. The mean weight on the third follow-up was 7.4 ± 1.9 Kg. Nearly 62.3% of severely malnourished children had improvement (cured) after treatment that was given during NRC admission. **Conclusions:** The present study confirmed the effectiveness of nutrition rehabilitation centers in the management of severe acute malnutrition.

Keywords: Dietary practices, mother’s knowledge, nutrients, Nutrition Rehabilitation Center, severe acute malnutrition

Introduction

Under-nutrition is one of the most common causes of morbidity and mortality in developing nations.^[1] Severe acute malnutrition (SAM) among childhood increases the risk of

frequency and severity of common infections and contributes to delayed recovery.^[2,3] According to NFHS-5, children under 5 who are severely wasted and underweight in Gujarat are 10.6% and 39.7%, respectively.^[4] The children suffering from acute malnutrition are enrolled as per the defined admission criteria are provided with medical interventions for complications and nutritional therapeutic diet at NRC.^[5] This study was conducted to estimate the effect of nutritional interventional measures on the children admitted at NRC, Civil hospital, Ahmedabad.

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Methods and Material

A hospital-based cross-sectional study was conducted at the Nutritional Rehabilitation Centre (NRC) of B. J. Medical College, Ahmedabad, and the data was collected for a total of 159, 0–5 years of children who were admitted at NRC from January 2017 to December 2017. The data of baseline, anthropometric details, the outcome of children at the time of admission, discharge (after 15% weight gain of the admission weight with the absence of associated illness), and three follow-up visits with a gap of 15 days apart were collected from the registers available at NRC.

Among the anthropometric measures, height, weight, and mid-upper arm circumference (MUAC) were measured. The height and weight of each child were compared with the WHO growth reference data for the particular age and sex and the Z score was calculated. Children below $-3SD$ were considered as SAM and from $-2SD$ to $-3SD$ was considered MAM.

The MUAC was used to classify malnutrition in children. Children with MUAC 11.5–12.5 and less than 11.5 cm were considered as mildly malnourished and severely malnourished, respectively. The effect of interventional measures taken in NRC on selected anthropometric measures was noted and analyzed. Analysis was performed by using Microsoft excel-2007. Statistical significance for comparisons was based on the z-test and one-way ANOVA on repeated measures test. All results were considered statistically significant at $P < 0.05$.

Ethical committee clearance was taken from the Institutional Ethics Committee and written consent was taken from the mother of each child after explaining the nature and purpose of the study maintaining confidentiality.

Results

The socio-demographic determinants of 159 admitted malnourished children were studied and it was found that of the total children 52% were male and 47.7% were female. The mean age of the malnourished children was 18.9 ± 12.7 months. The majority of the admitted children were from the 12–23 months age group (41.5%), belonged to the general caste (28.3%), and a very low socioeconomic class 5 (73%). Mothers of most of the admitted children were illiterate (42.7%) [Table 1].

Table 2 depicts the details of anthropometric measures (mean \pm SD height, weight, MUAC, and Z-score) of all admitted children on NRC admission, discharge, and on three follow-up visits at NRC. The mean (\pm SD) height on admission, discharge, and on 3rd follow-up was 71.3 ± 10 , 71.3 ± 10 , and 71.5 ± 11.4 , respectively. The mean (\pm SD) weight on admission, discharge, and on 3rd follow-up was 6.1 ± 1.8 , 6.5 ± 1.9 , and 7.36 ± 1.9 , respectively. The mean (\pm SD) MUAC on admission, discharge, and on 3rd follow-up was 10.4 ± 1.2 , 10.7 ± 1.2 , and 11.6 ± 1.3 ,

Table 1: Distribution of the admitted children according to socio-demographic determinants (n=159)

Variables	Frequency	Percentage
Age		
0-11	52	32.7%
12-23	66	41.5%
24-35	18	11.3%
36-47	14	8.8%
48-59	9	5.7%
Gender		
Male	83	52.2
Female	76	47.8
Caste		
General	45	28.3
SC	37	23.3
SEBC	8	5
ST	30	18.9
OBC	39	24.5
Mother's education		
Illiterate	68	42.7
Primary school	45	28.3
Secondary school and above	46	28.9
Socioeconomic class (Modified B.G. Prasad's scale, August 2018)		
Class 1 to 3 (>6870-3434)	05	3.1
Class 4 (1030-2060)	38	23.9
Class 5 (1030 and below)	116	73

respectively. The mean (\pm SD) z-score on admission, discharge, and on 3rd follow-up was -3.7 ± 0.7 , -3.3 ± 0.9 , and -2.1 ± 1 respectively.

Table 2 shows a significant increase in Mean \pm SD weight, Mean \pm SD MUAC, and decrease in Mean \pm SD z-score of all admitted children, which was found to be statistically significant ($P < 0.05$). There was not much gain in mean height (SD) in centimeter of admitted children on admission, on discharge, and on 3rd follow-up visit, which was found to be statistically insignificant ($P > 0.05$).

As per Table 3, the outcome of admitted SAM children in form of 15% weight gain of admission weight was also studied at the end of 3rd follow-up visit at NRC. It was studied that a total of 62.3% of children gained 15% weight of NRC admission weight and got cured. 22% of admitted children did not get cured, 14.5% of admitted children dropped out on follow-up visits, and 1.2% of children failed to respond because of associated medical complications. The difference in outcome of male and female malnourished children was found to be statistically insignificant ($P > 0.05$).

Discussion

In the present study, a total of 159 children were admitted at NRC. There was almost an equal distribution of male and female children similar to the studies conducted by Kalathia *et al.*,^[6] Bhandari and Choudhary,^[7] and Bhujade *et al.*^[8]

Table 2: Anthropometric measures of children on admission, on discharge, and on three follow-up visits at NRC

All admitted children (n=159)	On admission (n=159)	On discharge (n=159)	On 1 st follow-up (n=136)	On 2 nd follow-up (n=136)	On 3 rd follow-up (n=136)	F ratio/P
Mean (±SD) height of children in cm	71.3±10	71.3±10	71.3±10	71.2±11.4	71.5±11.4	0.51/0.72582
Mean (±SD) weight of children In Kg	6.1±1.8	6.5±1.9	6.7±1.9	7.04±1.9	7.36±1.9	391.6/<0.00001
Mean (±SD) MUAC of children in cm	10.4±1.2	10.7±1.2	11.0±1.2	11.3±1.2	11.6±1.3	325.0/<0.00001
Mean (±SD) z-score of children	-3.7±0.7	-3.3±0.9	-2.9±1	-2.6±0.8	-2.1±1	152.7/<0.00001

Table 3: Outcome of admitted children at the end of the 3rd follow-up visit (n=159)

	Frequency	Percentage	Z-score/P
Cured			
Male	47	29.6	0.60/0.274
Female	52	32.7	
Not cured			
Male	22	13.8	1.61/0.054
Female	13	8.2	
Drop out			
Male	13	8.2	0.65/0.258
Female	10	6.3	
Failure to respond			
Male	01	0.6	1/0.159
Female	01	0.6	
Total	159	100	

In the present study 32.7%, 41.5%, 11.3%, 8.8%, and 5.7% children were from age group of 0–11, 12–23, 24–35, 36–47, and 48–59 months, respectively. Rawat and Marskole^[9] also found similar age group distribution in their study. Maximum children were between the age group of 12–23 months. A similar detection was found in the studies conducted by Bhujade *et al.*^[8] and Taneja *et al.*^[10]

It was depicted in our study that the majority of the mothers were illiterate or educated up to the primary level. A similar finding was also seen in the study conducted by Khargekar *et al.*^[11] It was also comparable to the study conducted by Choedon *et al.*^[12] in which 38% of mothers never attended the school. It suggests that the highest proportion of severely wasted children were of illiterate mothers.

In the present study, 23.3%, 5%, 18.9%, and 24.5% of children belonged to SC, SEBC, ST, and OBC castes, respectively. A similar distribution was found in the study conducted by Rawat and Marskole.^[9] In the present study, the majority of the children were from lower socio-economic class (IV, V). A similar result was found in the studies conducted by Khargekar *et al.*^[11] and Kumar *et al.*^[13]

It was estimated in the present study that mean weight (SD) in kilogram of the entire study group on admission, on discharge, and on 3rd follow-up has gradually increased with improvement and it was found to be statistically significant ($P < 0.05$). Similar findings were found in the studies conducted by Rawat and Marskole.^[9] and Taneja *et al.*^[10] However, in 15 days, there was

no significant change in height in comparison to the weight on discharge. Although at the 3rd follow-up visit, there was a slight height gain in comparison with an increase in weight and it was found to be statistically insignificant ($P > 0.05$). The mean (SD) MUAC in centimeter of the entire study group on admission, on discharge, and on 3rd follow-up has gradually increased and shown improvement and it was found to be statistically significant ($P < 0.05$). A similar finding was also found in the study conducted by Gupta and Sharma,^[14] which suggests that after NRC admission, the treatment has led to improvement in the nutrition status of the children.

The mean (SD) z-score of the entire study group was -3.7 (0.7) and -2.1 (1) on admission and on 3rd follow-up, respectively, which shows z-score was shifted to above -3 on follow-up visits (good outcome) and it was found to be statistically significant ($P < 0.05$). A similar result was found in the study conducted by Gupta and Sharma,^[14] which indicates improvement in the nutrition status of malnourished children. Thus, in the present study at the end of 3rd follow-up visit, all anthropometric measurements have improved, which was found to be statistically significant ($P < 0.05$) (except for height). A similar finding was also found in the study conducted by Bhujade *et al.*^[8] in which all anthropometric measures showed statistically significant improvement.

As per guidelines given by the NRHM, Department of Health and Family Welfare, Govt. of Gujarat, a child suffering from SAM should be considered cured when the child has achieved 15% weight gain of the admission weight during discharge from NRC.^[5] In the present study, approximately 2/3rd of children out of 159 study subjects has gained more than 15% weight on 3rd follow-up. A similar finding was also found in the study conducted by Rawat and Marskole.^[9]

The overall impact of the nutritional intervention by NRC was observed to have a remarkable improvement in the outcome. This data came up with nearly 62.3% of severely malnourished children showed improvement (cured) after treatment that was given during NRC admission, but 22% of children were still suffering from severe malnutrition (not cured), 14.5% of admitted children dropped out on follow-up visits, and 1.3% children failed to respond because of associated medical complications. A similar result was found in the study conducted by Radhakrishna *et al.*^[15] On the contrary, in the study conducted by Singh *et al.*,^[16] half of children who were discharged from NRC could not recover from severe malnutrition.

Summary and Conclusion

Most of the mothers being illiterate and belonging to a very lower socioeconomic class in the study would have led to malnutrition among children. In the majority of the SAM children, mean (\pm SD) weight, MUAC, and z-score of different age group were almost improved on discharge and 3rd follow-up visit compared to the parameters measured at the time of NRC admission. Nearly 62.3% of severely malnourished children showed improvement (cured) after treatment that was given during NRC admission. Around 14.5% of admitted children dropped out on follow-up visits. Thus, the mothers/guardian should understand the importance of the follow-up visits at NRC. More focus should be given on their counseling part by making a strong bond between counselors and mothers/guardians of malnourished children to reduce dropout rates.

Recommendations

Primary care providers and family physicians can act as an interface between the community and the NRC. They can detect the malnourished children from the community and treat them and simultaneously can refer the SAM children to NRC for treatment. They can also provide nutritional education to mother/guardian of these children regarding the preparation of low-cost nutritious diet from locally available stuffs, enhancement of skills on child care, healthy breastfeeding and complementary feeding practices, early recognition of signs of malnutrition (stunting, wasting, pitting and pedal edema, etc.), and any infection/complication and can ensure early treatment and monitoring health and nutritional status of these children by readily available management and treatment of SAM children NRC guidelines.

At a grass root level, primary care providers and family physicians can ensure follow-up of SAM children and complete cure. The results of this study can be utilized for better continues care, follow-up on long-term basis, and complete treatment of these children.

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Declaration of patient consent

The authors certify that they have obtained all appropriate participant consent forms. In the form, the parents/guardians have given their consent for their children images and other clinical information to be reported in the journal. The parents/guardians understand that their children names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Original place where research study was conducted:

This research study was conducted at Nutritional Rehabilitation Center, Civil hospital Ahmedabad, Gujarat in year 2017. During that period of time Dr. Anjali Mall was Assistant Professor and Dr. Norma J Bhanat was resident doctor in Community Medicine department, B.J. Medical College, Civil hospital Ahmedabad, Gujarat.

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Conflicts of interest

There are no conflicts of interest.

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