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Social Science

EFFECT OF SUPPLEMENTATION OF ROASTED NUTRI MIX ON NUTRITIONAL STATUS OF UNDERNOURISHED CHILDREN AGED 9 TO 36 MONTHS.

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ABSTRACT Undernutrition during first thousand days affects the overall development of child. There are different strategies adapted to reduced child undernutrition. We therefore studied the effect of supplementation of food mix for 90 days on the nutritional status of undernourished children aged between 9- 36 months (n=50). Baseline data collected and children selected based on the inclusion and exclusion criteria. The anthropometric indicators used to study the improvement in the nutritional status of children. T test used to compare means of Z score from baseline and end point of the intervention. The nutritional status at the end of 90 days in terms of wasting, stunting was improved in the children from experimental group who completed the intervention. The wasting status of experimental group children was improved better than the control group (p 0.000, t 9.310). Providing supplementary mix prepared using locally available ingredient with minimal processing can be one of the best strategy to reduce child undernutrition.

KEYWORDS : Undernutrition, Wasting, Roasting, Weight, WAZ

INTRODUCTION

First 1000 days of life is a unique window of opportunity. It is a critical period between conception and 2 yrs of age. It is a period that sculpts the child's future across four main domains of growth and development that is physical, cognitive, and linguistic and socio- emotional. This is also critical age when undernutrition sets in. Sufficient nutrition during this period has profound impact on child's ability to grow and develop. Therefore, it is necessary to provide appropriate nutrition during these critical years of life. Undernutrition is a "syndrome of developmental impairment" (Martorell, 1999). According to NFHS 4 (2015-16) survey, in India 38.4% children have been reported to be stunted, 21% wasted and 35.7% underweight. Similar trends have been reported in Maharashtra, 34.4% stunted, 25.6% wasted and 36% underweight.

Undernutrition has short term and long term consequences, which affects child's overall development. It impairs immunity which includes cell mediated immunity and secretory IgA production(Ortiz et al, 2011). This in turn increases frequency of infections. Further, undernutrition delays motor and cognitive development of child. The achievement of motor skills is delayed in malnourished child as compared to normal child. For example, normal child sits alone at around 6 months of age while undernourished does this at around 8 months of age (Ortiz et al, 2011). Undernutrition during first 2yrs of life contributes to diminish physical and cognitive capacity, which in turn leads to increase school dropouts and affects productivity in adult life. If undernutrition sets in, it is important to reverse the condition.

Undernutrition has been categorized into Moderately Acute Malnutrition and Severe Acute Malnutrition. The burden of moderately acute malnourished (MAM) children is more than that of severely acute malnourished (SAM) children in least developed countries. It has been reported that MAM affects about one in ten children under five years of age in least developed countries (UNICEF, 2014). According to NFHS-4(2015-16), the prevalence of MAM in India was 21 % while prevalence of SAM was 7.5%. the burden of MAM is much greater than SAM. If not reversed condition, these children will slip into SAM. Therefore there is need to provide adequate nutrition to promote catch up growth.

In India, supplementary nutrition programme (SNP) forms base for combating undernutrition through integrated child development services. The aim of the programme is to bridge gap between recommended dietary allowance (RDA) and Acceptable Daily Intake (ADI) of children through supplementary feeding. The programme takes care of healthy as well as severely undernourished children. Along with supplementary nutrition programme, Nutrition Rehabilitation Centres (NRC) have been playing a prominent role in the management of SAM Children. Appropriate counseling of mothers in nutrition rehabilitation center about knowledge of nutrition and dietary practices may be provided potentially to prevent malnutrition among children[15]. However, it has been observed that these facilities do not cater to the needs of moderately malnourished children. There is less availability of low cost supplementary foods that accomplish the nutritional requirement of these children. In addition, lack of hygienic condition in slums and heavy workload of mothers further exacerbate the problem. Thus there is a need for low cost easily reconstitutable nutrient dense mixes which can be administered with minimum efforts and can meet the additional requirement of MAM Children.

Therefore, the present study was undertaken to develop low cost supplementary mix using locally available ingredients and to study the effect of feeding the mix on nutritional status of MAM Children.

METHODOLOGY

The study was approved by the Intersystem Biomedical Ethics Committee (ISBEC), Kasturba Health Society, Vile Parle (W). The study was conducted in 2 phases. In phase I, Mix was developed.

Preparation of Mix-The Nutri- Dense mix was developed by using locally available ingredients which are natural sources of micronutrients. These ingredients were subjected to heat treatment and mixed in appropriate proportion. Cereals and Pulse (2:1) were subjected to heat treatment at150^{0}c for 1 hour, while oilseed at 100^{0}c for 20 minutes and were ground to mesh size 0.1 cm in milling machine. To this mixture milk powder (2:1), vegetable powder (10:1) sugar and fat powder were added. The content were mixed thoroughly in homogenizer.

In order to prepare cost effective nutrient dense food mixes, locally available, low cost yet high in nutrients, cereals and or millets, pulses, nuts and oilseeds, fruits and vegetables were selected. The ingredients were procured from the local market. The fat powder was procured from chrestchem Limited and vegetable powder was procured from Aarkay Foods, Gujarat. The mix was prepared in batches in order to maintain its quality. The mix prepared in a batch was sufficient for 1 month.

Feeding Trial:

In Phase II feeding trial was conducted. The NGO Partner for the study was Center for Study of Social Change (CSSC). The locale of the study was slums under this NGO- Nehru Nagar, Golibar, Santacruz (E).

Before commencement of feeding trial, mothers were explained asked to sign the informed consent form in local language.

Screening of Children for Feeding Trial-

For selection of children for feeding trial, about 150 children were screened by anthropometric measurements. Weight and height and MUAC measurements of all children were taken using standard

techniques. Weight was measured using a digital baby weighing scale (Sknol T299) calibrated to the nearest 5g and with a maximum capacity of 20 Kg. Recumbent length (crown – heel length) was measured using an infantometer (Meditrine). The length was read to the nearest 0.1 cm. Mid upper arm circumference (MUAC) was measured to the nearest 0.1 cm with the help of a standardized flexible, non – stretchable measuring tape.

Children were enrolled for trial based on inclusion and exclusion criteria. Thus, those children who had WHZ score between -1 SD to -3 SD (Mild to Moderately Malnourished) were selected for the feeding trial. The Z score values were calculated by using WHO Anthro Software (Version 3.2.2). Data for control group were collected to compare the growth of experimental group.

Children were screened for any illness by MD pediatrician. 50 children from 9- 36 months age were selected for 90days intervention.

Supplementation- 50 Children were provided 100g of nutrient dense mix daily. The amount mix consumed by child was calculated by taking weight of packet containing leftover mix for each day .

Monitoring of Growth- Improvement in Nutritional status of the children were studied by measuring weight, height and MUAC every month with the used of standard techniques. The measurement taken at the end and beginning of the trail were used to determine improvement in nutritional status of children.

Data Analysis

The Zscore were computed using WHO Anthro Software version3.2.2. Data analyzed using IBM Satistical programme for Social Sciences version20.Frequencies and percentages were calculated to describe continuous variables. T test used to compare means of Z score from baseline and end point of the intervention.

RESULTS AND DISCUSSION-

Profile of the sample: The mean age of children was 23.46±7.43 months. The percentage of girls and boys were same (50%). Only one girl was below 1yr. 22% children were in the age group of 12 to 17.99 months. 28% children were in the age group of 18 to 23.99 children, While 48% children were in the age category of 24 to 36 months.

Nutritional Status of Children:

In the experimental group three forth (78%) of Children were mildly wasted while 22% children were moderately wasted. 21 boys and 18 girls were mildly wasted. Moderate wasting was observed in 7 girls and 4 boys. Mild wasting was observed among 79.2% children in the age group of 24 to 36 months. 19.6% children were mildly stunted, 33.3% children were moderately stunted and 31.4% were severely stunted. 25.5% were mildly underweight, 47.1% were moderately underweight and 19.6% were severely underweight.

At the end of the intervention due to dropout (dropout rate 60%) 31 children were remained. the wasting status of remaining children improved. The improvement in Nutritional status of children from experimental group ad control group depicted in table 1.

Table 1: Nutritional Status of Experimental and Control Group Children from 0 day to 90 Day

Z score Experimental Group	Zero Day (Mean± SD) (N=50)	30 Day (Mean± SD) (N=40)	60 Day (Mean± SD) (N=35)	90 Day (Mean± SD) (N=31)	p Value
WHZ	-1.43± 0.77	-1.36±1.33	-0.99±0.54	-0.67±0.56	0.000
HAZ	-2.36±1.33	-2.03±1..25	-2.13±1.27	-2.15±0.73	0.370
WAZ	-2.29±0.88	-2.06±0.79	-1.87±0.80	-1.80±0.78	0.005
Z score Control Group	Zero Day (Mean± SD)	30 Day (Mean± SD)	60 Day (Mean± SD)	90 Day (Mean± SD)	P Value
WHZ	-2.28± 0.77	-1.99±0.78	-1.98±0.77	-2.04±0.71	0.000
HAZ	-2.89±1.05	-2.69±1.31	-2.87±1.27	-3.22±0.79	0.004
WAZ	-3.17±0.92	-2.89±0.1.01	-2.96±1.03	-3.23±0.76	0.770

Weight for height of the children is indicator of wasting in children. Weight for Height Z score at zero day was -1.43± 0.77. The changes in the Z score Values for all Children illustrated in the Table 1. It was observed that the Z score for Weight for Height for children significantly (*t* Value: -4.607 *p* Value -0.00) improved from -1.43± 0.77 to -0.67±0.56. the improvement in Weight for Height Z score was more in the present study compare with the study conducted by Steenkamp et al; 2015(-1.43±1.10 to -1.29±1.08). The duration of trial 90 days, it was observed that in the present study the change in WHZ score after 90days was higher than control group (-2.28± 0.77to -2.04±0.71, *p* 0.000, *t* 9.310) and also higher than the study conducted by Stobaugh et al. 2016 (-1.85±0.73 to -1.08±0.86) and study conducted by Fabiansen et al, 2017 (-2.2±0.5 to -1.53±0.72). The difference in the Z score of Weight for Height from baseline to end of the study was 0.74 for experimental group and 0.24 for control group in present study while it was slightly higher 0.94 in the study conducted by Ackatia et al, 2015. In the present study indicated that supplementation for 90 days has helped to improve wasting status of children.

Height for age indicates stunting in children. In the present study it was observed that the stunting (HAZ -2.36±1.33 to -2.15±1.73) status of improved in experimental but it was not statistically significant. When compared with control group the improvement was statistically significant (*p* 0.000, *t- 6.820)*. It was observed that stunting status in the present slightly higher s than the observed in the study by Ackatia et al, 2015. Therefore, it is necessary to provide nutrients in adequate amount which helps achieving linear growth. This may be achieved by increasing duration of supplementation.

The weight for age predicts adequacy of nutrient intake. In the present study, it demonstrated that WAZ score improved from --2.29±0.88 to -1.80±0.78for experimental group and control group -3.21±0.54 to -3.23±0.76. The difference in the WAZ was statistically significant (*t* Value- 9.33 *P* Value -0.00).The improvement in Z score was higher in the present study than the study by Fabiansen et al, 2017 (-2.46±0.85 to -2.19±0.90).

Providing locally available supplementary food mix was one of the strategies to reduce child undernutrition. And also the ideal supplementary food mix must be nutrient dense, easily digestible, with suitable consistency and affordable (Prasad P. and Kochhar A., 2015). It has been reported that the Supplementation with Ready to use supplementary foods (RUSF) to MAM children in Ethiopia, helped to improve their nutritional status (Karakochuk et al., 2012). Study conducted by LaGrone et al. (2012) observed that supplementation with RUSF recovered 87.7% of enrolled MAM children in Malawi. In Abeche, Chad distribution of RUSF to general food distribution system helped to improve nutritional status of young children (Huybregts et al; 2012). Study conducted by Grellety et al. (2012) demonstrated that Short-term distribution of RUSF to children aged between 6 to 23 months and at risk of malnutrition in Niger had positive effects on anthropometric status of these children. Maleta et al., (2004) reported that effective food supplementation with RUTF to Malawian children, improved the nutritional status of malnourished children. In the present study, supplementary mix prepared considering all this factors in order to improve nutritional status of children.

Child undernutrition major health concern, globally different strategies used to reduce child undernutrition. The use of low cost locally available ingredients with the use of simple processing technique to prepared supplementary mixes for undernourished children was one of the best strategies to improve nutritional status. Also the use of cereal pulse combination helps to improve protein quality. And such mixes may be easily acceptable by children.

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