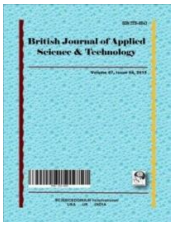

British Journal of Applied Science & Technology
9(6): 606-611, 2015, Article no.BJAST.2015.300
ISSN: 2231-0843

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Therapeutic Nutrition Evaluation and Management of Acute and Severe Malnourished Children

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJAST/2015/16589
Editor(s):
(1) Ming-Chih Shih, Department of Health and Nutrition Science, Chinese Culture University, Taiwan.
(2) Meng Ma, Anhui University, Hefei, Anhui, China and Icahn Institute for Genomics and Multiscale Biology, Icahn School of Medicine at Mount Sinai, New York, USA.
Reviewers:
(1) Florence N. Uchendu, School of Health Sciences, National Open University, Nigeria.
(2) Anonymous, Central University, Bilaspur, India.
(3) Girish C Bhatt, All India Institute of Medical Sciences(AIIMS), Bhopal, India.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=1141&id=5&aid=9644

Short Research Article

Received 7th February 2015
Accepted 12th May 2015
Published 8th June 2015

ABSTRACT

Severe Acute Malnutrition (SAM) is a major health problem in children between the age groups of 1-5 years of age. According to National Family Health Survey-3, more than 132 million children below 5 are suffering from SAM in our India. The facilities available in hospitals and other health services are not appropriate to combat this major health issue.

The present study was aimed to assess the impact of hospital diet on health status of 253 selected SAM children who were admitted for their rehabilitation in the nutrition ward of a private hospital in Raipur city. All the children were examined thoroughly and necessary investigations including weight, height, BMI, hemoglobin, chest x-ray, etc. were taken to assess the nutritional status of children. The overall results after the treatment show an increase in health status. The result reveals that out of 253 SAM children (39.5%) children had gained weight>10 g/kg/day. It can be proved that continuous follow-up parent's dietary counseling and monitoring of nutritional status will give better results for SAM children.

Keywords: SAM children; nutrition management; diet counseling.

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1. INTRODUCTION

Childhood is the fastest growing period of life; hence the satisfactory nutritional status during this period affects the future development of children. The deficiency of one or more nutrient in early childhood may contribute to the malnutrition in later age. Continuous deficiency of energy and protein in this period causes SAM (Severe Acute Malnutrition), which further results in physical as well as mental retardation. The disease caused by constant protein energy deficiency was firstly known as PCM (Protein Calorie Malnutrition) and now it is popular as PEM (Protein Energy Malnutrition) [1]. It has been observed that in developing countries sever acute malnutrition (SAM) among children below age 3 have lasting effects on their physical growth. Several studies on Kwashiorkor and Marasmus, reported that prolonged deficiency of energy or protein decreases physical growth and stamina [1]. The main cause of severe acute malnutrition is attribute lack of availability of food for the population [2]. All major relief agencies and 25 national governments had formally adopted this new model. Approximately 1 million cases of SAM were treated annually, with programs cases expanding by approximately 30% every year. As per NFHS-3 in India 45.9% children below 3 years of age are underweight .The main cause of under nutrition attributes to deficiency of calorie and protein in diets [3]. This insufficiency of food has become one of the primary causes of malnutrition among children. At the same time poor food hygiene status and recurring infection are also developing malnutrition [4]. Several studies held in India on PEM confirm that 47% children were found as underweight and 46% children were found stunted. Another study carried out in three agro-climatic zones of Punjab on prevalence of malnutrition among 1-5 year old children, reported 50.3% children were undernourished and weight for height criteria of 27% children were moderately and 6% were severely undernourished [5]. Nutrition and health are parallel to each other, as it is reported earlier that proper nutrition in early age enhances the health status of children, where as a diet deficient in one or more nutrient may interrupt the overall health of children. It is an acknowledged fact that nutrition plays an important role in the overall development of children. Balance diet in early childhood act as a base for future adulthood, where as a diet poor in nutrientsleads to several health problems like iron- deficiency anemia, Vitamin-A deficiency which leads to blindness (xerophthalmia), and deficiency in iodine, which causes iodine deficiency disorders and goiter [6]. Hence the present study was designed to assess the impact of special diet (as prescribed by NIN for SAM children) for hospitalized SAM children on their health status.

2. MATERIALS AND METHODS

The present study was carried out on 253 SAM children who were admitted for their rehabilitation in the nutrition ward of a private hospital in Raipur city. All the children were admitted to the hospital for lots of different types of problems and had poor nutritional status. At the time of admission, all the children were checked for primary deficiency symptoms of micronutrient imbalance, if the children had any symptoms of hypoxemia they were treated for that and thereafter the children were transferred to the nutrition ward for nutrition rehabilitation.

After the admission in nutrition ward, the children were examined for necessary anthropometric measurements which include Height, Weight and BMI. Height and weight were measured using standard techniques. The assessment of chronic energy deficiency was calculated by using BMI (Body mass index). BMI was calculated by measured values of body weight & height of each subject with the following formula.

$$\mathrm{BMI} = \frac{\text{Body weight (kg)}}{\text{Height (m)}^2}$$

All the children were weighed on an electronic weighing scale (SECA, Hamburg Germany), similarly height was measured using anthropometer. Actual weight and height measurements were further calculated for weight for height Z score (WHZ), Weight for age Z score (WAZ) and Height for Age Z score (HAZ). Hb estimation was done using standard method. All the above data was analyzed by using WHO Anthropometric (V_2 0.4) software.

The doctor clinically examined the child every morning given to appropriate treatment for the SAM Children. Any complaints noted by the care takers and nurses were noted in the case sheet. Temperature was recorded in every 8 hours and charts sheets were maintained regularly. Only those case sheets were selected where the child was less than 5 years of age. Following details were obtained from the case sheet Age, sex, Hb, and presence and absence of edema of the SAM children.

2.1 Diet

First week all SAM children were feed with 100 kcal/day then feeding was gradually increased up to 170-330 kcal/day. Children were additionally feed with 350 ml milk (Fortified with Soya milk) to increase the energy. Main food items included in a whole day menu were 250 gm of khichdi (rice and mixed dal in 2:1 ratio, vegetables and 2 small tea spoons of oil), 1-3 bread slice, 2 tea spoons of jam, 2 Boiled eggs, 2 bananas that provided around 170- 330 kcal/kg/day and 15 gm protein per day. Micronutrients and vitamins, like Iron, calcium and folic acid were provided to the children as supplements. Iron was given after children started weight gain similarly albumin was given to improve the appetite.

2.2 Statistical Analysis

All the results were statistically analyzed by using the SPSS software.

3. RESULTS

The mean age of the 253 SAM children was (25 months). All the children were belonging to low socio-economic group and their parents were from labor class. All the data are presented in Table 1 to Table 6.

Table 1 depicts the distribution of children as per edema. Among 253 SAM children, 15 (6 %) had edema in which 10 (66.66%) were male and 5 (33.33%) were females where as in rest of 238 (94%) children, 119 (50%) were male and (119) 50% were females.

Table 1. Distribution children according to sex

Particulars	Edema	Non-edema
Male	10	119
Female	5	119

Table 2 shows the general characteristics of children. It is apparent from this table that there is a wide array of complications among children. Out of 15 children with edema, 3 children were suffering from diarrhea, 2 were suffering from pneumonia, 5 with tuberculosis, 2 were under nourished and 3 were suffering from other diseases.

Table 3 shows the mean weight, height and Hb levels of both edemic and normal but SAM children. The result shows that mean weight (3.68±1.01) kg children with edema were lower than normal (7.62±3.42) kg but SAM children. Similar results were observed for Hb status as children with edema had Hb (8.6±5.6) g/dl and Hb level of children without edima was (10.5±7.2) g/dl.

Table 2. General characteristics of edemic and non-edemic children

Particulars	Edema present	Edema absent
Age in months(Mean)	36	24
Duration of stay in Nutrition (Mean)	28	26
Diarrhea	3	68
Pneumonia	2	3012
Under nutrition	2	14
Tuberculosis	5	7833
Other	3	4821

Table 3. Baseline data of children as per their anthropometric measurements

Particular	Edemic (Mean±SD)	Non-edemic (Mean±SD)
Weight in (kg)	3.68±1.01	7.62±3.42
Height in (meter)	89.31±1.38	75.4±1.42
Hbg/dl	8.6±5.6	10.5±7.2

Table 4 shows mean base line data of the 253 children. The mean age of all the children was 25 months. Baseline WHZ and HAZ scores were (3.9±1.2) and (3.5±1.4), (range 4.9±2.7) and (range 4.5±3.7), and baseline WAZ scores (5.2±0.3) and (5.2±0.6) respectively.

Table 5 shows the pre and post weight of SAM children. The weight gain among children with edema was better than children having no edema.

Table 6 depicts the rate of weekly weight gain (gm/kg/day) in children with and without edema. The mean rate of weight gain of samples was calculated for the total duration of the hospital stay, 5 g/kg/day. Out of non edemic 9.8% (25) of the children did not gain weight, 55.3% (140) of the children had poor catch up growth (<5-10 g/kg/day), 19.77% (50) of the children had moderate catch up growth (5-10 g/kg/day) and 15.0% (38) had rapid catch up growth (> 10 g/kg/day). The distribution of edema children according to their mean weight gain was 15(3.6±1.01) to (5.43±2.23). Where 238 children

of non-edema category showed decline in weight gain (7.62±3.42) to (6.42±2.45).

The calorie and protein intakes were calculated in a sub sample during nutrition rehabilitation. The mean calorie and protein intake of SAM childrenwas 178±54 kcal/kg/day and 4.1 + 1.9 g/kg/day respectively.

4. DISCUSSION

Recent studies on SAM children shows that children belonging to low socio economic status with poor hygienic condition consume low quantity of foods deficient in multi nutrients affect the health status of children. In our study and analysis we also found the similar results. The present study shows that the main cause of severe malnutrition among children is low purchasing power, low quality of food, poor hygiene and sanitation. These children can be treated with adequate diet and proper sanitation. They can be healthy after proper nutritional support. The overall result reflects that, in nutrition rehabilitation energy rich local food can be much beneficial in enhancing positive health. The Table 6 shows that the children with edema gained 5.43 gm/kg/day. Similar results were observed by other researchers [7-9].

A study on working mother's status and nutritional status of their children under the age of 5 in urban low- income community surabhaya, Indonesia conforms that mothers working status positively affect the nutritional status of children. The result reveals that weight of children of unemployed mother was significantly lower than the children of the employed mothers. The children of the employed mothers also stood significantly taller than the children of the unemployed mothers [10-14].

As per WHO recommend ations calories and proteins intake of SAM Children should be 170-330 kcal /kg/day. In present study the dietary pattern of NIN was followed for the feeding of SAM children and it was observed that there was gradual weight gain in nutrition rehabilitation phase. The final Mean calories and protein intake during Nutrition rehabilitation was (Mean+SD) 178±54 Kcal/kg/day and 4.1±1.9 g/kg/day respectively. Zinc and others micronutrients were also supplemented in our recommended diet. 350 ml Soya Milk based diets were found to be superiors. Soya added high protein value product, good for growth of serum albumin of SAM children. In the third week of treatment potassium, magnesium and iron was supplemented to the SAM children to correct the electrolyte balance. It can be concluded that WHO guidelines may be helpful in improving the rate of weight gain [8,1]. In present study, weight gain was 5g/kg/day when there was no morbidity; the overall weight gain in our study was 39.5% [15,16].

Table 4. Baseline scores for various measurements

Particulars	Edema (n=15)	Normal (n= 238)
Baseline WHZ score	3.9±1.2	3.5±1.4
Baseline HAZ Score	4.9±2.7	4.5±3.7
Baseline WAZ Score	5.2±0.3	5.2±0.6

Table 5. Distribution of children as per their mean weight gain

	Endemic (n= 15)		Normal (n=238)	
	Pre	Post	Pre	Post
Weight gain	3.68 ±1.01	5.43±2.23	7.62±3.42	6.42± 2.45

Table 6. Weight gain (g)/kg body in a five week with mean and SD

Weight (kg)	Base line Data	Weight gain in 1 week	Weight gain in 2 week	Weight gain in 3 week	Weight gain in 4 week	Weight gain in 5 week
Edema (15)	3.68±1.01	NA	3.75±1.02	4.0±1.09	4.84±2.2	5.43±2.23
Non edema (238)	7.63±3.42	7.75±3.43	7.23±3.21	7.47±3.75	7.66±3.55	6.42±2.45

In our study only one out of five stayed for >5 weeks. As all the SAM children belonged to low SES and hence were unable to stay for long duration in a hospital for the treatment. Parents of SAM children were daily wage workers so they were unable to stay for longer duration. With all the limitations we were able to achieve the weight gain up to 5 gm/kg/day as all the staff was supportive, well trained and experienced, so the records were well maintained. The present study was sustained only up to 28 days and sample size was limited up to hospitalized cases. We can conclude that as per the (WHO) guidelines nutritional management of severely undernourished children can be carried out to achieve the weight gain of >10 g/kg/day.

5. CONCLUSION

In conclusion, our results show that SAM (severe acute malnutrition) is prevalent among children under 5, belonging to low socio-economic group. Out of 253 SAM children 6% had edema. This shows positives relationship between protein calorie deficiency and edema. All though the percent of edema (6%) was not high. This situation is alarming with reference to malnutrition among children. The main purpose of the present study was to study the impact of RTE food on SAM children. It can be concluded that ready to eat food rich in protein and calorie with micronutrients can be supplemented to SAM children to overcome the problem of malnutrition in India. There is a need to study the impact of RTE (ready to eat food) under NRHM (national rural health mission) at regular intervals. All the hospitalized children should be continuously monitored and their parents should be counseled.

ACKNOWLEDGEMENTS

I acknowledge my sincere thanks to hospital staff without which I cannot accomplish this work. I am also thankful to parents and children for cooperating in treatment. I am thankful to my supervisor Dr. Abhaya Joglekar for her valuable suggestions and support.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=1141&id=5&aid=9644