Original Research Article

# Changes in Anthropometric Indicators Using Therapeutic Food (F75/F-100) Versus Traditionally Used Home Based Food in the Treatment of Severe Acute Malnourished Children - A Comparative Study

**Anand Shukla[1], Shalini Chauhan[2*], Piyush Anand[3]**

*[1]Associate Professor and HOD, Department of Paediatrics, Rajarshi Dashrath Autonomous State Medical College Society, Ayodhya, Uttar Pradesh, India*
*[2] Associate Professor, Department of Obstetrics and Gynaecology, Rajarshi Dashrath Autonomous State Medical College Society, Ayodhya, Uttar Pradesh, India*
*[3] Assistant Professor, Department of Paediatrics, Rajarshi Dashrath Autonomous State Medical College Society, Ayodhya, Uttar Pradesh, India*

**Received: 28-11-2021 / Revised: 24-12-2021 / Accepted: 03-01-2022**

## Abstract

**Background& Objective:** Shortage of suitable food, lack of purchasing power of the family as well as traditional views and taboos about what the baby should eat, often lead to a sufficient balanced diet, resulting in malnutrition. In children, malnutrition is synonymous with growth failure. Malnourished children are smaller and weigh less than they should be for their age and height. Aim of this study is to compare changes in anthropometric indicatorsbetween severe acute malnutrition (SAM) children of therapeutic food F75/F100 with traditionally used home based foods. **Methods:** This prospective and observational study was conducted in the Department of Pediatrics of G.S.V.M. Medical College, L.L.R. and Associated Hospitals, Kanpur. Logarithmic transformation was achieved by SPSS 20. Study was conducted between March 2011 to July 2011. Permission to perform the trial was obtained from Institutional Ethics Committee (IEC). **Results:** Weight gain was 7.525gm/kg/day±6.09 in hospitalized patient, whereas 1.013 gm/kg/day ±2.43 was weight gain in home treated patients. Height increase was more although statistically insignificant in hospital treated patients than in home treated patients. Increase in mid arm circumference in hospital treated was found to be highly significant. No significant increase in mid arm circumference was noticed between one at 14 days to one measured at 21 and 28 days in both the groups. **Conclusion:** Conclude that treatment of SAM is more effective and successful than home based therapy.

**Keywords:** Therapeutic food, home based food, Severe Acute Malnutrition



## Background

Decrease in child malnutrition is another millennium development goals related to an improvement in child welfare. National data on underweight provided under National Family Health Survey IV (2015–16)[1] revealed underweight prevalence rate to be around 35.8 %. NFHS-IV, 35.2 %, 35.3 %, &18.8 %of the children were underweight, stunted, and wasted respectively. Shortage of appropriate food, lack of purchasing power of the family as well as traditional beliefs and taboos about what the baby should eat, often lead to an inadequate balanced diet, resulting in malnutrition. In children, malnutrition is synonymous with development failure. Malnourished children are shorter and weigh less than they must be for their height and age. Malnourish children in Uttar Pradesh is controlled by the National Rural Health Mission(NRHM). Presently, this response relies on a network of nutrition rehabilitation centers (NRCs), where children with severe acute malnutrition (SAM) receive therapeutic care following protocols of the World Health Organization (WHO 2009 guidelines)[2] and the Indian Academy of Pediatrics (IAP)[3]. Incidence of SAM, which is one of the main factors contributing to infant and under five mortality, is about 6.4 %[4]. The frequency of under-5 children in India suffering from SAM is, thus, a staggering 80 lakh child. It is not likely to admit so many children in paediatric wards since India does not have adequate hospital beds for offering inpatient care to all SAM children. Hence, only children of SAM with complications are admitted. These children have to be discharged from the hospital after 2-3 weeks of hospitalization after 15 % weight gain from his original admission weight[5]. Their remaining recovery has to take place at home. It has been reported that the rate of weight gain at home is less than satisfactory[6,7]. In Africa, Ready to Use Therapeutic Food (RUTF) which is a lipid-based formula with milk powder, electrolytes, micronutrients and offer same nutrients as F-100 has been used with remarkable success for home-based management of SAM patients[8]. According to WHO guidelines for management of SAM patients in NRC[5], LTF is used along with F-100-a Milk formula with high protein-energy content is used in rehabilitation phase of SAM. Earlier F-75 is given in stabilization phase, during hospitalization for nutritional rehabilitation of severely malnourished children[5]. Aim of this study is to compare changes in anthropometric indicatorsbetween SAM childrenof therapeutic food F75/F100 with traditionally used home based foods.

## Method

The present prospective and observational study was conducted in the Department of Pediatrics of G.S.V.M. Medical College, L.L.R. and Associated Hospitals, Kanpur. Study was conducted between March 2011 to July 2011. Consent to perform the trial was obtained from Institutional Ethics Committee (IEC).

The cases of SAM were identified and selected from Pediatric O.P.D. and I.P.D. Follow WHO rules. SAM patients with problems need hospitalization and those without problem can be treated either at hospital or at home. Those patients who were stable and not willing for admission in the hospital were assigned for home-based therapy.

*Correspondence
**Dr. Shalini Chauhan**
Associate Professor, Department of Obstetrics and Gynaecology, Rajarshi Dashrath Autonomous State Medical College Society, Ayodhya, Uttar Pradesh, India
**E-mail:** shalinichauhan80@gmail.com

Hospital admitted patients received F75/F100 for four to eight weeks, whereas other group received management of SAM with traditionally home-based food. Home based food was advised to provide 150kcal/kg/day and 2-3 gm/kg/day of proteins. A diet chart was provided using energy dense foods like khichdi, paratha, curd-rice Dalia, banana enriching them with oil, jaggery. Energy dense feeding was gradually increased so as to provide approximately 150-220 kcal/kg/day and proteins 4-5 gm/kg/day. Mother was given advice about the type of food, quantity of food, and feeding frequency. No external support for procuring or making food for families were provided. Multivitamin supplements were continued for 8 weeks. Mother was advised to give happymotivating environment and to contain the child in playful activity.

The hospitalized patients were fed under continuous supervision and regularly monitored whereas patients undergoing home based rehabilitation were called for regular follow up. Frequency of follow up visits was one visit every 7 days or earlier if required due to any arising complication. At each and every visit dietary intake was recorded by recall-method, and detailed general physical and systemic investigation was done. Mother was counselled about type, quantity and frequency of food to be given. Any medical problem identified during follow up visits were treated. Anthropometry examinations were repeated at follow up visits while blood examination comprising of Hb %, serum protein, albumin and serum electrolytes and other investigations as and when indicated were repeated at every 2 weeks interval.

Patient were also observed for any morbidity. Days of fever in that week were noted from temperature charts (presence of at least one spike of temperature>99 degree Fahrenheit was considered as day of fever). Similarly days of diarrhoea, cough vomiting, respiratory distress etc. were noted. Total morbidity score was calculated by adding up all morbidity days in that week. Score of three was considered significant and child was considered significant and given score 1, score 2 was given for 6 morbid conditions. The child was said to have recovered if weight for height/length was 90 % or more. A weight gain of>5gm/kg/day was defined as an acceptable weight gain[9,10].

**Inclusion Criteria**

- Patient between ages 6 to 60 months with SAM,
- Weight for height below, 3 standard deviation (SD or Z scores) of median WHO growth reference (2006).
- Visible severe wasting
- Presence of bipedal edema
- Mid upper arm circumference below 11.5 cm

**Exclusion Criteria**

- Children having other chronic systemic diseases incriminated as a cause of severe malnutrition, including cerebral palsy, congenital heart disorders, chronic haemolyticanaemias, malignancies, known metabolic disorders, known malabsorption syndromes, chromosomal malformations, or chronic renal and hepatic disorders.
- Patient identified to be HIV Positive

**Statistical Analysis**

To compare whether there is any statistically significant difference in different anthropometric parameters like weight, height, weight/height etc. analysis of Variance technique has been used. The One way Analysis of Variance (ANOVA)was applied on thus transformed variable for cases of home and hospital therapy. One way ANOVA for Weight Gain in different Follow ups were applied for Hospital patients and Home Patients.

A significance level of 5 % was used for all of the statistical tests.

**Results**

This study comprised of 84children who met the WHO criteria for SAM from the paediatric OPD & IPD of L.L.R. Children Hospital, Kanpur. Of these 38 children were assigned to receive traditional home based therapy & 46 to receive Hospital based therapy with F-75/F-100.

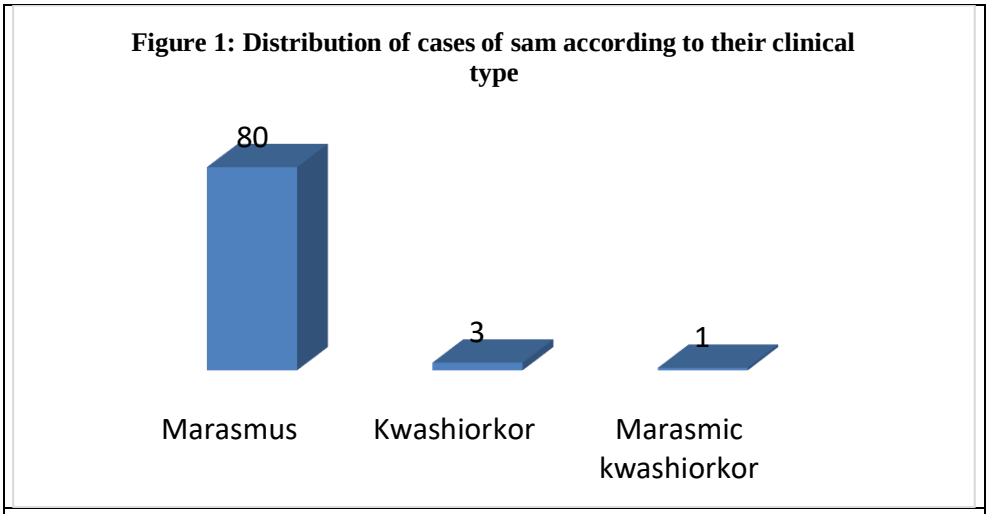


**Figure 1. Distribution of Cases of SAM According to their Clinical Type**

Figure 1 shows that the distribution of cases of SAM according to their clinical type out of 84 cases of severe PEM, (80) 95.24 %cases were of marasmus, (3) 3.57 % were of Kwashiorkor and (1) 1.19 %cases were of marasmic kwashiorkor.

| Various Follow Up | Hospital | Home | *P*-value |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| Wt. At first visit | 5.57 ± 2 | 6.04 ± 2.2 | 0.31 |
| Wt.at 7 days | 5.675 ± 2.01 | 6.12 ± 2.2 | 0.33 |
| Wt.at 14 days | 5.81 ± 1.99 | 6.14 ± 2.21 | 0.47 |
| Wt.at 21 days | 6.276 ± 1.873 | 6.16 ± 2.23 | 0.80 |
| Wt at 28 days | 6.546 ± 1.9 | 6.17 ± 2.24 | 0.41 |

**Table 1. Mean and Standard Deviation of Weight (Wt.) of Patients Treated in Hospital and at Home at Various Follow Up**

Table 1 shows that the mean and standard deviation of weight of patients treated in hospital and at home at various follow up, in which mean weight of hospitalized patients increasesin every follow up done at 7 days interval. Though there is increase in mean weight of home treated patients however increment was small as compared to those treated at hospital.

**Table 2a: Anova table for weight gain in different follow ups of hospital patients**

| | Sum of Squares | Df | Mean Square | F | P Value |
|---|---|---|---|---|---|
| **Between Groups** | 1.119 | 4 | .280 | 2.862 | .024 |
| **Within Groups** | 22.001 | 225 | .098 | | |
| **Total** | 23.120 | 229 | | | |

**Table 2b: Anova table for weight gain in different follow ups of home patients**

| | Sum of Squares | Df | Mean Square | F | P Value |
|---|---|---|---|---|---|
| **Between Groups** | .015 | 4 | .004 | .025 | .999 |
| **Within Groups** | 28.691 | 185 | .155 | | |
| **Total** | 28.706 | 189 | | | |

Table 2a and 2b shows that weight gain at different follow ups is statistically significant (P=0.024).The above table shows that statistically significant weight gain was not evident in patient receiving home based therapy with P value of 0.999.

| | | Sum of Squares | Df | Mean Square | F | P Value |
|---|---|---|---|---|---|---|
| **Between Groups** | Hospital | 1.119 | 4 | .280 | 2.862 | .024 |
| | Home | .015 | 4 | .004 | .025 | .999 |
| **Within Groups** | Hospital | 22.001 | 225 | .098 | | |
| | Home | 28.691 | 185 | .155 | | |
| **Total** | Hospital | 23.120 | 229 | | | |
| | Home | 28.706 | 189 | | | |

**Table 2. Anova Table for Weight Gain in different Follow Ups of Hospital and Home Patients**

| Various Follow Up | Hospital | Home | *P*-value |
|---|---|---|---|
| | Mean ± sd | Mean ± sd | |
| Ht. At first visit | 68.73 ± 9.19 | 75.59 ± 11.29 | 0.00 |
| Ht.at 7 days | 68.73 ± 9.19 | 75.59 ± 11.29 | 0.00 |
| Ht.at 14 days | 68.88 ± 9.08 | 75.6 ± 11.29 | 0.00 |
| Ht.at 21 days | 69.87 ± 8.7 | 75.72 ± 11.28 | 0.00 |
| Ht at 28 days | 70.63 ± 8.7 | 75.79 ± 11.27 | 0.02 |

**Table 3. Mean and Standard Deviation of Height (Ht.) of Patients Treated in Hospital and at Home at Various Follow Up**

Table 3 shows that the mean and standard deviation of height of patients treated in hospital and at home at various follow up, in which above chart shows that mean height was static in first 14 days with marginal increase thereafter. In home therapy height remained static in first 2 weeks followed by marginal increase thereafter.

**Table 4a: Anova table for height gain in different follow ups of hospital patients**

| | Sum of Squares | df | Mean Square | F | P Value |
|---|---|---|---|---|---|
| **Between Groups** | .031 | 4 | .008 | .480 | .751 |
| **Within Groups** | 3.585 | 225 | .016 | | |
| **Total** | 3.616 | 229 | | | |

**Table 4b: Anova table for height gain in different follow ups of home patients**

| | Sum of Squares | df | Mean Square | F | P Value |
|---|---|---|---|---|---|
| **Between Groups** | .000 | 4 | .000 | .003 | 1.000 |
| **Within Groups** | 3.891 | 185 | .021 | | |
| **Total** | 3.892 | 189 | | | |

Table 4a and b shows that the above chart shows that increase in height in patients was not significant with P value of 0.751.The above table shows that there was no statistically significant height gain was not evident in patient receiving home based therapy with P value of 1.0.

| | | Sum of Squares | df | Mean Square | F | P Value |
|---|---|---|---|---|---|---|
| **Between Groups** | Hospital | .031 | 4 | .008 | .480 | .751 |
| | Home | .000 | 4 | .000 | .003 | 1.000 |
| **Within Groups** | Hospital | 3.585 | 225 | .016 | | |
| | Home | 3.891 | 185 | .021 | | |
| **Total** | Hospital | 3.616 | 229 | | | |
| | Home | 3.892 | 189 | | | |

**Table 4. Anova table for height gain in different follow ups of hospital and home patients**

| Various follow up | Hospital | Home | *P*-value |
|---|---|---|---|
| | Mean ±sd | Mean ±sd | |
| MUAC at first visit | 10.22 ± 1.34 | 9.97 ± .80 | 0.31 |
| MUAC at 7 days | 10.22 ± 1.38 | 9.97 ± .80 | 0.32 |
| MUAC at 14 days | 10.24 ± 1.33 | 9.95 ± .79 | 0.24 |
| MUAC at 21 days | 11.25 ± 1.32 | 10.23 ± 1.03 | 0.00 |
| MUAC at 28 days | 11.82 ± 1.2 | 10.42 ± 1.06 | 0.00 |

**Table 5. Mean and Standard Deviation of MUAC of Patients Treated in Hospital and at Home at Various Follow Up**

Table 5 shows that the mean and standard deviation of mid arm circumference of patients treated in hospital and at home at various follow up, in which above chart sshows increase in mean mid arm circumference of patients treated in hospital Increase was noted to be substantial. In home therapy table shows there was increase in mid arm circumference of home treated patients but increase was not as much as that in hospital treated patients

**Table 6a: Anova table for MUAC gain in different follow ups of hospital patients**

| | Sum of Squares | df | Mean Square | F | P Value |
|---|---|---|---|---|---|
| **Between Groups** | .933 | 4 | .233 | 13.906 | .000 |
| **Within Groups** | 3.776 | 225 | .017 | | |
| **Total** | 4.709 | 229 | | | |

**Table 6b: Anova table for MUAC gain in different follow ups of home patients**

| | Sum of Squares | df | Mean Square | F | P Value |
|---|---|---|---|---|---|
| **Between Groups** | .060 | 4 | .015 | 1.903 | .112 |
| **Within Groups** | 1.448 | 185 | .008 | | |
| **Total** | 1.507 | 189 | | | |

Table 6a and b shows that the mid arm circumference of hospitalized children have significantly increased from basal values with p value of 0.00. While there was no significant increase in MUAC values of patients treated at home with P value (.112).

| | | Sum of Squares | df | Mean Square | F | P Value |
|---|---|---|---|---|---|---|
| **Between Groups** | Hospital | .933 | 4 | .233 | 13.906 | .000 |
| | Home | .060 | 4 | .015 | 1.903 | .112 |
| **Within Groups** | Hospital | 3.776 | 225 | .017 | | |
| | Home | 1.448 | 185 | .008 | | |
| **Total** | Hospital | 4.709 | 229 | | | |
| | Home | 1.507 | 189 | | | |

**Table 6. Anova Table for MUAC Gain in different Follow Ups of Hospital and Home Patients**

**Discussion**

Malnutrition occurs when the quantity of one or more macronutrients available to body tissues is inadequate to sustain optimal bodily functions[11], and this is usually accompanied by numerous micronutrient deficiencies. Malnutrition is a broad concept that includes a variety of clinical conditions such as kwashiorkor, marasmus, marasmic kwashiorkor, wasting or stunting, and micronutrient deficiencies. Malnourished children have a higher risk of illnessanddeath. Treating highly malnourished children in hospitals is not required in rural situations, and home-basedtreatment may be improved. Home treatment can be food prepared by the carer, such as flour porridge, or commercially manufactured food such as ready- to- use therapeutic food[12]. In present study mean weight gain in patients treated at hospital was more than those treated at home. When weight gain of patients treated at hospital was statistically. While on similar analysis of patients treated at home, found that there was no significant weight gain. Average weight gain in hospitalized patient was found to be 7.525gm/kg/day±6.09 (SD), whereas those receiving home therapy had average weight gain of 1.013gm/kg/ day±2.43 (SD). Bangladesh comparing inpatient, day care, and home-based treatment for severe malnourished children observed an average weight gain of 11 g/kg/day for the inpatient group[13-15]. Shah observed that 40 % of patients gained weight between 5 and 10 g/kg/day[16]. Which is comparable to results observed by similar studies, that overall average weight gain for group was 9.915 ± 5.43 g/kg/day[17], Savadago et al. in a study at Burkina Faso who reported an average weight gain of 10.18 ± 7.05 g/kg/day[18]. Rastogi et al., reported their prospective study that improvement in weight of admitted severe malnourished children from severe-to-moderate and from moderate-to-mild/normal has the most significant effect in reducing the underfivemortality. The increase in mean of weight at discharge from that on the time of admission is statistically significant[17]. Colecraft et al. in a study at four day care nutrition rehabilitation centers also reported a significant increase in weight for age for the admitted children[19]. Mean height gain in hospital treated patients was more as compared to those treated at home. However, height gain in hospital treated patient was statistically not significant when analysed by ANOVA (P=0.751, F=0.48).When mean increase in height of patients treated at home were analysed by ANOVA technique of statistical analysis, the result was found to be insignificant (P=1, F=003).This finding is similar to the findings of another co-workers Mamidi et al[20], who stated that catch up growth in height in the first few weeks of rehabilitation is usually not seen.When mid arm circumference of hospitalized patients were analysed by ANOVA technique, it was found that increase in mid arm circumference values were statistically highly significant(P=.000,F=13.91).hen mid arm circumference of patients treated at home was analysed by ANOVA technique, the results were found to statistically insignificant (P=.112, F=1.903).The comparable results were observed in a study done by Taneja et al. where the number of children suffering from severe malnutrition decreased from 91.4 % to 46.24 %[21]. While no difference in MUAC gain during the first four weeks of the intervention period between the two groups (MD - 0.11 mm/day; 95 % CI - 0.22 to 0.01; n = 173) observed by Manary et al[11].

**Conclusion**

There was significant increase in weight of hospitalized patient receiving F75/F100 at 28 days of follow up. Height increase was more although statistically insignificant in hospital treated patients

than in home treated patients. Increase in mid arm circumference in hospital treated was found to be highly significant. Study conclude that treatment of SAM is more effective and successful than home based therapy.

**References**


1. Rchiips.org. National Family Health Survey. [online] 2018. [Last accessed on 2020 Jun 11]. Available from: http://rchiips.org/NFHS/Factsheet_NFHS-4.shtml.
2. World Health Organization (WHO) Guidelines for Inpatient Treatment of Severely Malnourished Children. Geneva, Switzerland: WHO; 2003.
3. Bhatnagar S, Lodha R, Choudhury P, Sachdev HP, Shah N, Narayan S, et al. IAP Guidelines 2006 on hospital based management of severely malnourished children (adapted from the WHO guidelines) 2018. [Last accessed on 2020 Aug 29]. Available from: https://www.popline.org/node/192613.
4. Kapil U, Sachdev HPS. Management of children with Severe Acute Malnutrition: A nutritional priority. Indian Paediatr. 2010;47:651-53.
5. WHO Guidelines for Management of Severe Acute Malnutrition (SAM) Children at Nutrition Rehabilitation Center, National Rural Health Mission Department of Health and Family Welfare Government of Gujarat (GoG) Year: 2012.
6. Manary MJ. Local production and provision of Ready-To-Use Therapeutic Food (RUTF) spread for the treatment of severe childhood malnutrition. Food Nutr Bull. 2006;(27):83-89.
7. Singh AS, Kang G, Ramachandran A, Sarkar R, Peter P, Bose A. et al. Locally made RUTF for the treatment of severe acute malnutrition. A Randomized Controlled trial. Indian Paediatr. 2010;47:679-86.
8. Ciliberto MA, Sandige H, Ndekha MJ, Ashorn P, Briend A, Ciliberto HM, et al. Comparison of home-based therapy with ready-to-use therapeutic food with standard therapy in the treatment of malnourished Malawian children: a controlled, clinical effectiveness trial. Am J Clin Nutr. 2005(81):864-70.
9. Nrhm.gujarat.gov.in. 2018. [Last accessed on 2020 Jun 11]. [online] Available from: https://nrhm.gujarat.gov.in/images/pdf/nrc_guidelines.pdf.
10. WHO, United Nations children's fund (UNICEF). WHO child growth standards and the identification of severe acute malnutrition in infants and children; a joint statement by the world Health Organization and the UNICEF. Geneva, Switzerland: 2009.
11. Manary MJ, Ndekha MJ, Ashorn P, Maleta K, Briend A. Home-based therapy for severe malnutrition with ready-to-use food. Archives of Disease in Childhood 2004;89(6):557-61.
12. 12.Schoonees A, Lombard M, Musekiwa A, Nel E, Volmink J. Ready-to-use therapeutic food for home-based treatment of severe acute malnutrition in children from six months to five years of age. Cochrane Database Syst Rev. 2013;2013(6):CD009000.
13. Beghin ID, Viteri FE. Nutritional rehabilitation centres: An evaluation of their performance. J Trop Pediatr Environ Child Health. 1973;19:403–16.
14. Kadam DD, Kulkarni RN, Subramanium P. Anthropometric and socio-economic profile of children referred to nutritional rehabilitation centre. Indian Pract. 2001;54:476–85.
15. Beghin ID. Nutritional rehabilitation centers in Latin America: A critical assessment. Am J Clin Nutr. 1970;23:1412–7.
16. Schneideman I, Bennett FJ, Rutishauser IH. The Nutrition Rehabilitation Unit at Mulago Hospital. Kampala: Development and Evaluation, 1965-67. J Trop Pediatr Environ Child Health. 1971:17.
17. Rastogi S, Maheshwari C, Raghav SK, Muzammil K. A prospective observational study to evaluate the efficacy of facility-based management in malnourished children at NRC, district Meerut. J Family Med Prim Care. 2018;7(6):1341-1345. doi:10.4103/jfmpc.jfmpc_157_18
18. Savadogo L, Zoetaba I, Donnen P, Hennart P, Sondo BK, Dramaix M. Management of severe acute malnutrition in an urban nutritional rehabilitation center in Burkina Faso. Rev Epidemiol SantePublique. 2007;55:265–74.
19. Colecraft EK, Marquis GS, Bartolucci AA, Pulley L, Owusu WB, Maetz HM. A longitudinal assessment of the diet and growth of malnourished children participating in nutrition rehabilitation centres in Accra, Ghana. Public Health Nutr. 2004;7:487–94.
20. Mamidi RS, Kulkarni B, Radhakrishna KV, Shatrugna V. Hospital based nutrition rehabilitation of severely undernourished children using energy dense local foods. Indian pediatrics. 2010 Aug 1;47(8):687-93
21. Taneja G, Dixit S, Khatri AK, Yesikar V, Raghunath D, Chourasiya S. A Study to Evaluate the Effect of Nutritional Intervention Measures on Admitted Children in Selected Nutrition Rehabilitation Centers of Indore and Ujjain Divisions of the State of Madhya Pradesh (India) Indian J Community Med. 2012;37:107–15.


**Conflict of Interest: Nil Source of support: Nil**