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EFFECTIVENESS OF HOME-BASED PROTEIN-RICH NUTRIENT SUPPLEMENTATION IN THE MANAGEMENT OF MALNUTRITION: A SINGLE CASE STUDY

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Abstract: India faces a mix of undernutrition, overnutrition and micronutrient deficiency. Despite the decline in the NFHS-5 data on stunting, wasting and underweight over 73 million children under the age of 5 years are affected, along with high rates of micronutrient deficiencies. Ayurveda has described diseases (resulting from inadequate or over nutrition) along with their aetiology and treatment. Malnutrition refers to deficiencies, excesses or imbalance in person's intake of energy and/or nutrients. Karshya, Phakka, Balshosha and Parigarbhika- these diseases mentioned in Ayurveda Samhitas, can be correlated with malnutrition. Agni is the primary cause of all of these illnesses as malnutrition results from a hindered Agni. Most of these disorders' treatment modalities are based on Deepana Pachana, Bhrimhana and Srotoshodhana. The case was handled using an Ayurvedic regimen, which included Deepan Pachana, Bhrimhana Chikitsa and homemade protein-rich nutrients. Prakriti, along with the dietary history of the patient, was taken at the time of registration. After careful examination, the patient was suggested a home-based protein rich nutrient. Regular follow ups were conducted every two months to assess the changes. The weight increased from 11kg to 13kg, height from 88.5cm to 94cm and MUAC from 13cm to 13.4 cm, respectively, thus showing progressive gains in the parameters. The constant values of head and chest circumference indicate that after a certain age group, these parameters show gradual but slower growth. The ayurvedic approach to the prevention and treatment of Balshosha involves enhancing a child's Agni and immune system through a healthy diet and the use of herbal remedies.

Keywords: Aahar, Ayurveda, Home based Interventions, Nutrition counselling and Protein Energy Malnutrition.

Introduction:

Nutritional indicators of a population are key to overall health and human resource development, especially in childhood, where children have specific biological, psychological and nutritional needs that ensure their survival and healthy development. According to recent statistics, an estimated 114.2 million (~8- 8.5%) of the Indian population consists of children under the age of five years. (National Family Health Survey(NFHS-5: 2019-2021) Data : Children Under five years , 2021)

Malnutrition remains a major health challenge in developing countries particularly children under the age of five. India continues to have the largest number of children suffering from malnutrition globally. (Shashi Jain, 2016)

Malnutrition is an umbrella term that includes three broad spectrums- under nutrition (wasting, stunting and underweight); inadequate macro and micronutrients; overweight, obesity and diet related non-communicable diseases. It is sometimes used in correlation with Protein Energy Malnutrition (PEM). (Sangeeta Sharma, 2021) In the present study we will deal with only the undernutrition aspect. In Ayurveda, undernutrition is termed as Karshya, an Aptarpanjanya Vyadhi. It is referred to a class of deficiency and degenerative diseases caused by under nutrition, lack of sleep (Ratrijagarana), improper depletion therapies (Apatarpana) which initially aggravate the Vata Dosha leading to Balahani (loss of immunity) due to Dhatu Kshaya and ultimately death. Children suffering from malnutrition often experience difficulties in developing motor skills and neuromuscular coordination. (V. Radhika Rani, 2023), (Rushikesh Tikole, 2013)

According to recent data from the National Family Health Survey (NFHS-5:2019-2021), as shown in Table 1, it has come to light that nutritional indicators in children under 5 years have seen a significant decline over the years, registering a reduction in stunting from 38.4% to 35.5% and wasting from 21% to 19.3%. Undernutrition indices have also projected a decline over the decade. (National Family Health Survey(NFHS-5: 2019-2021) Data : Children Under five years , 2021)Despite this decline in the NFHS-5 (2019-21) data, over 73 million children under the age 5 years are still affected along with high rates of micronutrient deficiencies. Estimates of child malnutrition will help to determine whether the world is on track to achieve the Sustainable Development Goals- specifically, target 2.2, to "to end all forms of malnutrition by 2030", which falls under **Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.** (National Family Health Survey(NFHS-5: 2019-2021) Data : Children Under five years , 2021), (Malnutrition in Children- UNICEF, 2015)

In an interventional study conducted by etal. on children with moderate acute malnourishment, it was indicated that giving children Super Cereal Plus formulated for target group, showed 50% higher mean weight gain per kilogram of body weight compared to the group receiving only nutrition counselling. A similar study involving caregiver's roles in preparing home based nutritional supplementation showed a remarkable increase in the nutritional status, highlighting the importance of home-based nutritional interventions involving caregiver's roles, which encourage healthy dietary habits in children, leading to a decrease in cases of malnutrition. (Islam, 2020)

A study conducted by **Khanna etal.** on children at risk of malnutrition concluded that anthropometric measurements showed a gradual increase over time when the group received oral nutritional supplements along with diet counselling compared to the group that only received diet counselling. It was thus concluded that timely intervention is the key for growth catch up. (Deepti Khanna, 2021)

The aim of the present study is to assess the impact of home-based Protein rich intervention on the treatment of malnutrition in children.

Materials and Methods:

An interventional study was carried out in the Out Patient Department (OPD) of the Kaumarbhritya/Balroga department of Sir Sunderlal Hospital on a 2year 10month old female patient, brought to the hospital by the care givers with complaints of not gaining weight and height, accompanied by generalized weakness and lethargy. The patient also complained of a loss of appetite over the past two months. Medications taken previously did not show any significant improvement; as a result, the child was brought to the hospital.

The child underwent a general examination, which included an anthropometric examination along with Prakriti assessment. The anthropometric measurements included growth and development parameters. Physical growth was assessed using weight, height, chest circumference, head circumference and mid upper arm circumference. **Swa Angula Pramana** is an Ayurvedic anthropometric system in which body dimensions are expressed in terms of the individual's own **Angula** (finger breadth). The Indian Academy of Paediatrics reference data was used to calculate the physical growth of the child. (Bhupeshwari Patel, 2016) Prakriti assessment was done with a pre designed assessment questionnaire which would later help in designing the personalised diet plan of the patient. It would help in determining the qualities of the particular prakriti and also help in deciding the food items that have to be included and excluded in the child's diet.

After the initial examination, the child was diagnosed with Mild Acute Malnutrition as shown in Table 1. After written informed consent was obtained from the parents, the physical growth and developmental milestones were recorded at baseline and then every two months over a time span of eight months.

Table 1: ***Data Showing Anthropometric Indices at Baseline and at the end of Intervention***

Parameters	**Baseline**	**Last follow up**
Weight	11kg	13kg
Height	88.5cm	94cm
CC	48cm	50cm
HC	48cm	48cm
MUAC	13cm	13.4cm
Prakriti	Pitta Kapha	
Diagnosis	Mild Acute Malnutrition (78.5%)	Normal (88%)

Nutrient intake estimation was done using the Three-Day 24-hour Dietary Recall method, where the complete dietary history of the child was registered. A detailed description of each and every food item was taken. In the case of home-made food, the recipe, the weight of each item used in the recipe and the cooking methods were recorded, and in the case of packaged food items, every detail, right from the brand name to the product details, was recorded. The parent was explained how to quantify the items using common kitchen utensils such as glasses, spoons and bowls. Based on the data collected, energy, macronutrient and micronutrient intake were estimated, taking into consideration the recommended intake and then compared to the Recommended Dietary Allowances (RDA) according to the Indian Council of Medical Research in unison with the National Institute of Nutrition for the targeted age.

The following table highlights a detailed timeline of follow-up, history and the outcome of the patient.

Table 2: Timeline of the Interventional Study

Timeline	Plan of treatment
May 2025	After initial examination and dietary history, the patient was advised a diet plan and supplementation for 2 months
August 2025	The advice continued. The growth and development parameters were assessed as follow up and changes were observed.
November 2025	After two months follow up was carried out and further changes were seen.
February 2026	All the parameters according to age were assessed and significant changes were seen after the intervention. The patient was advised to follow the supplementation as guided.

After the initial examination was concluded, the patient was treated using a comprehensive method, which included both Ayurvedic Regimen and Modern Nutrition Science. The principles are mentioned in table 3. They include Agnivardhana (stimulation of digestive fire) and Brimhana (nourishment of the tissues) therapy, along with deworming medication. Aahar modification included a personalised diet plan.

Table 3: Plan of Intervention

Procedure	Medication	Dosage	Duration	Mode of Administration
Agnivardhana	Chitrakadi Vati	½ Vati	Twice a Day	Oral
Brimhana	Ashwagandha and Vidadi Kand Churna	1/4th tsp. with milk	Twice a Day	Oral
Deworming Medication	Vidanga Churna	1/4th tsp. with milk	One time at night	Oral
Aahar	Protein supplement along with diet plan suggested		For the study duration	Oral

Therapeutic Intervention:

Along with the diet plan suggested, a protein supplement was added to the diet of the child. The diet plan was suggested once at the time of registration, as mentioned in table 4, and later, during the follow-up sessions, the food habits were assessed. The protein supplement added along with the diet was initially recommended for two months, and after follow-ups, it was recommended to continue the same. The total period for which the study was conducted was eight months, with follow-ups continuing every two months. The items in the protein supplement are mentioned in the table below.

Table 4: Diet and Supplementation Details

Intervention	Details of the Intervention

Diet	The child was seen to have **Pitta Kaphaja Prakriti**. The diet suggested included nourishing yet light foods thus avoiding heavy mucus including foods and overly heating and spicy ingredients. For example; **Morning Breakfast:** A soft steamed Idli or dosa with ghee or Oats porridge with milk or Suji upma **Mid-Morning Snack:** It can include fruits of any kind that the child prefers. Care should be taken not to serve it with any dairy product. When the child was given banana, it was taken care that it was fully ripe and only seasonal fruits were recommended. **Lunch:** De-coated pulses with roti or khichadi included with the pulses. A good portion of seasonal green vegetables like ivy gourd or pumpkin or green beans. Only seasonal vegetables to be given. **Evening Snacks:** Milk with turmeric and saffron. **Dinner:** Chapati or rice with curried vegetables. **The diet should exclude yogurt/curd, processed and packaged foods, cold drinks and ice creams and citrus fruits.** **Small amounts of jaggery or rock sugar (mishri) to be used.**
Supplementation	The supplement was given along with food and not as an independent food item. The supplement was in Powder form to be consumed with milk. The procedure is as follows: Take the following ingredients and dry roast and grind it into a course powder. They are: Semolina- 1 large cup Makhana- 100g Cashew Nuts- 1 small bowl (15g) Almonds- 1 small bowl (15g) Walnut- 1 small bowl (15g) Raisins- 4-5 raisins every time when we mix this powder with milk.

Result and Discussion: The target of the study was to achieve an overall gain in the physical growth and development of the patient, with respect to which the effect of the supplementation was observed and is depicted in the table given below.

Table 5: Significant Improvements in the objective and Subjective Parameters of Subject

Parameters	**At registration**	**1st follow up**	**2nd follow up**	**3rd follow up**
Weight	11kg	12kg	12.5 kg	13.4kg
Height	88.5cm	90.5cm	93cm	94cm
Chest Circumference	48cm	48cm	50cm	50cm
Head Circumference	48cm	48cm	48cm	48cm
Mid Upper Arm Circumference	13cm	13cm	13.2cm	13.4cm
Generalised Weakness and Lethargy	Present	Present but slightly less	Present but slightly less	No Weakness or lethargy
Appetite	Loss	Improved	Significant Improvement	Improvement

Similar studies related to nutrition affecting growth and development in cases of malnutrition was carried out on pre-school children among five Anganwadi centres in Ratlam District, where they were treated with a soy-poha ladoo as a supplement for addressing malnutrition. The results showed that the availability of local protein and iron rich supplements like soybean and poha had a significantly positive effect on the experimental group, with the control group also showing significant growth but at a much slower pace. (Barkha Sharma, 2018)

A study conducted by S.K. Roy etal. on 645 children with Moderate Acute Malnutrition whose caregivers were taught on how to cook a low-cost, home- based nutritional diet containing rice powder, egg, sugar and oil, showed that the proper nutritional counselling and adequate maternal care resulted in the complete recovery of the children from severe malnutrition. (S.K.Roy, 2022)

In the present study, the child's baseline diet included a higher percentage of packaged/junk food than home-cooked meals and a lower intake of nutrients than the age-appropriate recommendations. In regard to the anthropometric indices mentioned in the above table there was a significant improvement in the parameters, with a good progressive weight gain indicating the child's positive response to nutritional therapy. The constant indices of head circumference and chest circumference are because, after the age of two years, they gradually grow at a much lower rate. The Mid upper arm circumference growth is modest but consistent with the recovery from malnutrition.

The analysis of the dietary recall showed that the nutritional intake of the child was lower than the recommended intake for their age, as in Recommended Dietary Allowance. The intake revealed lower levels of protein and carbohydrates, along with significantly reduced vitamins and minerals, which were suggestive of the reasons for the reduced appetite and lethargy issues. Achieving a positive energy and protein balance were made possible through the introduction of a personalised, home-based protein-rich supplement and a structured meal plan that was adjusted in accordance with the child's Prakriti and the ICMR-NIN RDA.

Although a single case cannot demonstrate causality, the temporal relationship between the intervention and anthropometric gains suggests a possible benefit, especially considering the previous lack of response to specific medication. Furthermore, subjective changes, like increased appetite and decreased fatigue, corroborate the clinical perception of healing.

Discussion:

This single case study suggests that an integrative regimen grounded in Ayurvedic principles, combined with individualised nutritional counselling, may be beneficial in the management of mild acute malnutrition in young children. Targeting impaired Agni through Deepana–Pachana, supporting tissue building with Brimhana therapy, and prescribing a home-based, protein-rich diet tailored to the child's Prakriti and age-appropriate ICMR-NIN recommendations was associated with progressive improvements in weight, height, MUAC and clinical vitality over serial follow-ups. Given the absence of a control group, limited sample size and lack of biochemical assessment, these findings should be interpreted cautiously; however, they

indicate that culturally acceptable, low-cost, home-feasible dietary interventions, when integrated with Ayurvedic management, may offer a useful adjunct to existing paediatric nutrition protocols in resource-constrained settings. Further prospective, controlled studies with larger cohorts and comprehensive outcome measures are warranted to substantiate these observations and to delineate the role of Ayurvedic dietetics and Agni-focused interventions within standardised strategies for the prevention and treatment of childhood malnutrition.

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Disclosure of Interest

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Ethical Approval

Clinical Trials Registry- India, ICMR- National Institute of Medical Statistics

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