

# Improvement of Protein Energy Malnutrition by Nutritional Intervention with Moringa Oleifera among Anganwadi Children in Rural Area in Bangalore, India

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## Abstract

**Introduction:** Protein energy malnutrition (PEM) is a major public health problem in developing countries.

**Aims and Objectives:** The study was conducted with the objectives of a) identifying children with Protein Energy Malnutrition, b) to give nutritional intervention in the form of Moringa Oleifera powder to the children for 2 months and c) to reassess the nutritional status after the nutritional intervention at the end of 2 months.

**Materials and Methods:** A before and after study was conducted in the rural field practice area of Vydehi Institute of Medical Sciences and Research Centre, Bangalore, India on sixty children, thirty in the intervention group and thirty in the control group. Nutritional Intervention was given in the form of Moringa oleifera leaf powder 15 g twice daily for two months. Reassessment of the nutritional status was done following the intervention.

**Results:** It was found that 70% children with grade II PEM improved to grade I, and 60% children with grade I PEM had shown significant ( $P < 0.01$ ) improvement in their nutritional status.

**Conclusion:** Moringa Oleifera is a good malnutrition combatant and needs to be promoted in the community.

**Keywords:** PEM, Nutritional Intervention, Moringa oleifera

## INTRODUCTION

Protein energy malnutrition (PEM) develops in children whose consumption of protein and energy is insufficient to satisfy the body's nutritional needs. While pure protein deficiency can occur when a person's diet provides enough energy but lacks the protein, in most cases the deficiency will be dual. PEM may also occur in persons who are unable to absorb vital nutrients or convert them to energy essential for healthy tissue formation and organ function. Malnutrition is a major factor in causing infant mortality in the tropics and sub-tropics. Current treatment for children involves the use of special formulated foods which are either labelled as F-100 or F-75 which is expensive and not sustainable in the long term.<sup>1</sup>

Experts have shown that the drumstick tree (Moringa oleifera) has improved the nutritional status of children with PEM. This tree grows abundantly in developing countries including India especially in the rural areas, where prevalence of malnutrition is high.

For children 1-3 years of age the daily requirements of calcium, 75% iron requirements and half of protein can be obtained in 100grams of fresh Moringa leaves. It is also rich in potassium, copper and B complex vitamins. Studies in (Senegal) as well as Indian medical research have proved the leaf powder to be effective in reducing nutritional deficiency such as vitamin A and protein deficiency.<sup>2,3</sup>

In depth studies regarding the nutrients have clearly shown that Moringa oleifera can be used as a food additive with

multiple purposes for enriching the protein, fatty acid, mineral and vitamins in human feed formulations.

The Moringa leaves are an excellent source of vitamin A, the raw leaves are rich in vitamin C and they also have vitamin B and other minerals. These vitamins and minerals are required for body building, energy as well as blood coagulation and production. The Moringa leaves rank among the best of perennial tropical vegetables as a source of nutrients and vitamins.<sup>6</sup>

Dr. Martin Price in his book *“The Moringa Tree”* reported the results of the administration of Moringa in various developing nations for treating the Protein Energy Malnutrition.

Moringa, added on a daily basis to a child’s food, has thoroughly demonstrated its ability to bring about rapid recoveries from moderate malnutrition. While successfully treating malnutrition is good, preventing it is much better.<sup>4,8</sup>

Moringa oleifera tree has probably been one of the most underutilized tropical crops. Leaves of *M. oleifera* could serve as a valuable source of nutrient for all age groups. In some parts of the world for example Senegal and Haiti, health workers have been treating malnutrition in small children, pregnant and nursing women with Moringa leaf powder (Price, 1985).

In developing tropical countries, Moringa trees have been used to combat malnutrition, especially among infants and nursing mothers. Three non-governmental organizations in particular Trees for Life, Church World Service and Educational Concerns for Hunger Organization advocate Moringa as natural nutrition for the tropics.<sup>9</sup>

As there are few studies in India on nutritional supplementation with moringa oleifera and its effect among children suffering from protein energy malnutrition, the following study was taken up with the objectives of 1) to identify children with Protein Energy Malnutrition, 2) to give nutritional intervention in the form of Moringa Oleifera to the children for 2 months and 3) to reassess the nutritional status after the nutritional intervention at the end of 2 months.

## MATERIALS AND METHODS

This study was conducted from 1 June-31 July 2013. Children with grade I and grade II protein energy malnutrition were identified and they participated in the study. Out of them 30 children were categorized as intervention group and 30 as control group. Severely sick children and children with chronic problems like congenital heart disease, asthma or

renal problem and children with severe malnutrition of grade III and grade IV were excluded from the study.

All of them were de-wormed with Albendazole at the beginning of the study. Moringa leaves were harvested and dried at a low temperature (not under direct sunlight) ensuring the nutrients remained intact in the leaf tissue. Once dried, Moringa leaves were pulverized into a fine powder-like consistency, making them easy for usage. The Moringa leaf powder was added to salads, steamed vegetables, porridges or included in soups, curry, gravy, chapati, dosa or rice. Twice a day 15 g of Moringa leaf powder was added in the child’s diet by the mother for a period of 2 months.

The intervention group was administered 30 grams of dry Moringa leaf powder in their diets every day. Every tenth day the weight was recorded for each of the intervention and control group. The weights of these children at the start of the study were compared with their weights at the end of the study after 2 months. Comparison was made between the recorded weights of the intervention and control group individuals.

Statistical analysis was done based on proportions and McNemar’s modified Chi square test to find out if there was any significance in the weights of the children following nutritional intervention with Moringa leaf powder in their diets.

## RESULTS

As depicted in Table 1, there was an improvement after the intervention with Moringa leaf powder in the intervention group as compared to the control group.

More than 40% improvement in weight was obtained in 3 children belonging to intervention group though none in the control group showed this much improvement.

30 to 40% improvement in weight was obtained in 9 children belonging to intervention group though none in the control group.

**Table 1: Weight improvement between intervention and control group children**

% improvement	Percentage improvement in weight	
	Intervention group	Control group
>40%	3	0
30-40%	9	0
20-30%	10	2
10-20%	5	10
<10%	3	18

20 to 30% improvement in weight was obtained in 10 children in intervention group and 2 children belonging to control group.

10 to 20% improvement in weight was obtained in 5 children of the intervention group and 10 children belonging to control group.

Less than 10% gain in weight was seen in 3 children belonging to intervention group and 18 children belonging to control group.

In the intervention group, out of 17 children with grade II PEM, 9 children showed minimum of 28% weight gain when compared to their initial weight at the start of the study. 52% in the intervention group improved from grade II to grade I protein energy malnutrition after intervention with Moringa leaf powder.

9 children out of 13 children identified as having grade I PEM, in the intervention group showed remarkable improvement in weight gain of around 30% after daily consumption of Moringa leaf powder.

In the intervention group, for each of the age group between 2 and 5 years, the average weight improved significantly ( $P < 0.01$ ) as seen in Figure 2.

## DISCUSSION

Moringa leaves are small, thick and tear-drop shaped. They grow rapidly as the plant matures and are easily available. Moringa leaf powder contains 8 essential amino acids for proper protein synthesis. It is rich in flavonoids, stacked with nutrients, anti oxidants and vital proteins, vitamins and various phenolics. As one of the rare trees whose leaves

can be eaten as vegetables, the Moringa's nutrients are easily absorbed and no allergy has been reported.<sup>3,4</sup>

Most of the nutrients of the Moringa tree are in its dry leaves, which can be made into a powder that can be added to the regular diet in order to add essential nutrients.

In this study, the results observed after administration of Moringa leaf powder after 60 days, was that 70% children with grade 2 PEM improved to grade I, and 60% children with grade 1 PEM had shown significant improvement in their nutritional status.

Therefore Moringa leaf powder will be a good supplementation for combating PEM in under 5 children.

As Moringa is accessible to mothers at little or no cost, malnourished children treated with it tend to recover more rapidly than those whose mothers are obliged to follow the "modern" approach which involves purchasing expensive milk powder, cooking oil and sugar.

The major advantage of using Moringa leaves in this study is the fact that it is a local resource. Moringa leaves also are rich in vitamins and minerals such as, B-complex vitamins, vitamin C, calcium, potassium, magnesium, selenium, zinc and amino acids namely arginine and histidine which are especially important for infants.

The present study is akin to the studies conducted in West Africa. In 1996, the Church World Service office in Dakar began studying the potential of the Moringa oleifera tree to combat the problem of malnutrition, on a pilot project, Moringa products added on a daily basis to a child's food had thoroughly demonstrated its ability to bring about rapid recoveries from mild and moderate malnutrition.<sup>9-11</sup>

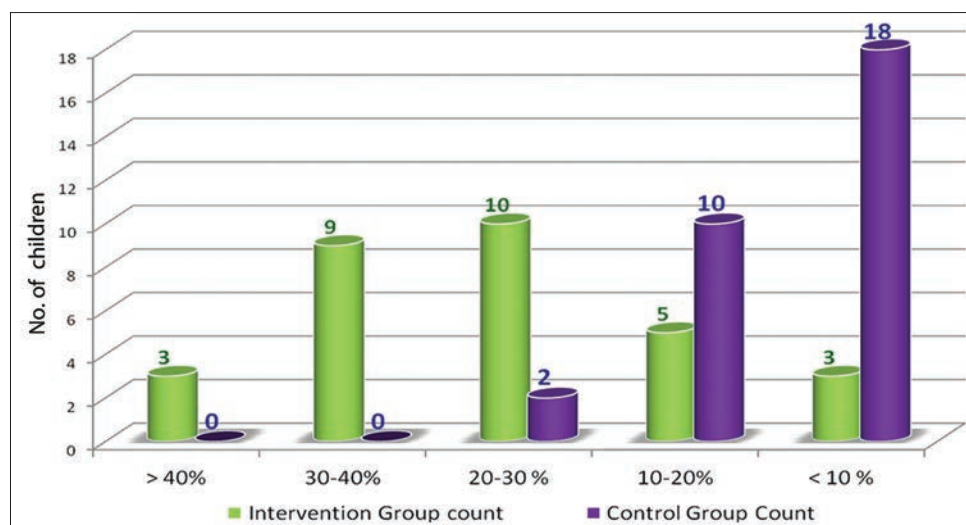


Figure 1: Percentage improvement of weight among intervention and control groups

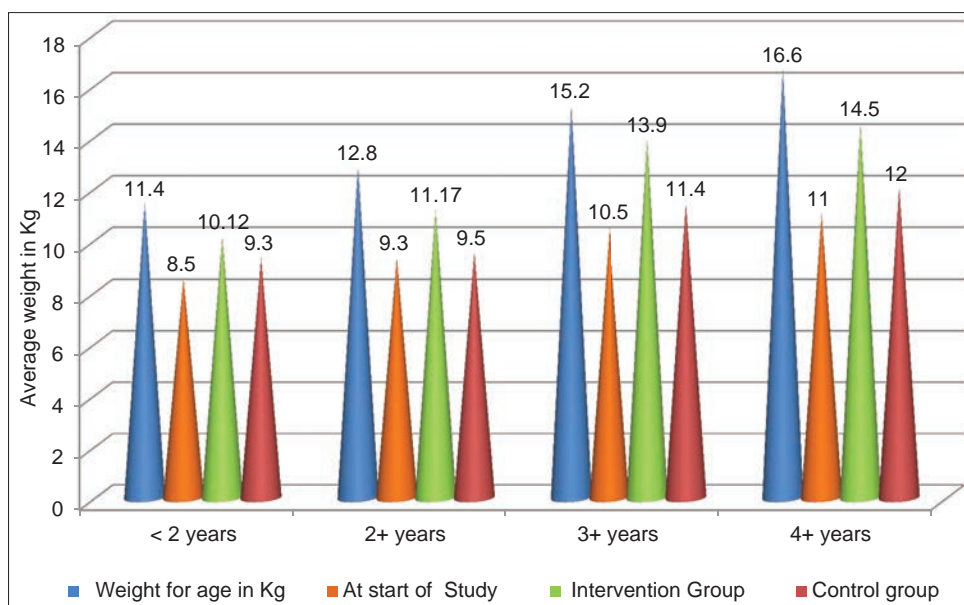


Figure 2: Age wise weight improvement among intervention and control group

## CONCLUSION

Nutritional intervention with Moringa oleifera leaf powder showed significant weight gain among children with grade I and grade II protein energy malnutrition.

The Moringa leaf powder can be effectively utilized for treatment of PEM by spreading the awareness about the nutritional value of Moringa oleifera to mothers of children with PEM.

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