

# The Effect of a Balance Snack, Porridge (Haleem) on Malignancy Treatment-Related Weight Loss in Children

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## Abstract

**Background:** Adequate and appropriate food and nutrition during treatment of cancer plays an outstanding role in response to treatment, patient quality of life and the reduction of treatment cost. In this period, children are exposed to malnutrition because, they firstly need more substrate for treatment of this illness and second, they have fewer amounts of macro and micro nutrients storages. Several studies have shown that supplementation has anti cachectic effects in cancer patients.

**Objectives:** This study evaluated the clinical effects of a protein and energy dense nutritional supplement in a group of pediatric cancer patients receiving active chemotherapy treatment.

**Materials and Methods:** The study was a randomized controlled clinical trial. Seventy patients diagnosed with pediatric malignant disease and receiving intensive chemotherapy were included. Thirty-five patients received a nutritional supplement (Haleem) in addition to their regular food intake and thirty-five patients did not receive any supplementation. Patients are examined and their data (weight, height, albumin, pre albumin, globulin, total protein) recorded at baseline and after 45 days.

**Results:** At 45 days weight loss was significant in the control group ( $P < 0.001$ ). On the other hand we had weight gain in the treatment group ( $P < 0.001$ ). In addition, remission rate was significantly ( $P = 0.036$ ) higher in the treatment group as compared to controls.

**Conclusions:** In comparison to the result of the case and control groups, which does not receive any supplement, we found out that not only taking this kind of supplement prevented weight loss during the treatment, but also it caused weight increase in this group.

**Keywords:** Malnutrition, Cancer, Children, Meals

## 1. Background

In recent decades, the survival of children with cancer in developed countries has had an outstanding improvement. Studies show that in the United States, the death of children with cancer has decreased about 40 percent from 1975 to 1995 (1). In recent years, this statistic has been hope-inspiring since the rate of reduction of children's death has been about 80 percent. However, in developing countries, the rate of this reduction is much lower due to late diagnosis of the illness, lack of remedial facilities, and inappropriate care condition after curing of children (2). Adequate and appropriate food and nutrition during the treatment of cancer has an important role in response to treatment, patients' quality of life, and the reduction of treatment cost. About 5 to 50 percent of children and adolescents experience malnutrition at the time of diagnosis of the illness (3). During the treatment, this condition becomes worse and this rate increases to 40 to 80 percent (4). Mainly, children are more susceptible to malnutrition be-

cause at first, they need more substrate for the treatment of this disease and second, they have less storage of macro and micro-nutrients (5). At the same time, children have increased nutrient and energy requirement to achieve appropriate growth and development. An appropriate balance from protein reception and energy to get into well-proportionate growth with the age for children is necessary (6).

The challenge in the management of children with cancer is the investigation of their needs of nutrition so that we can cure malnutrition and prevent its bad effects. Short period results of this malnutrition are losing fat and muscle tissue; changing of body composition; decreasing tolerance and response to chemotherapy; and biochemical disorders such as anemia, decreasing of blood albumin and susceptibility to infection. On the other hand, its long period results are growth disorder, decreased quality of life, and the rise of other dangerous cancers (7).

The reduction of energy intake has an important role

in losing tissues in children with cancer. In these persons, we face with (1) increased nutrient requirement, (2) loss of energy because of gastrointestinal dysfunction in response to toxicity effects of cancer therapy, (3) excessive use of therapeutic sources from energy resources, (4) hormonal and metabolic changes, (5) unavoidable pain and stresses, and (6) disorders of the sense of taste and appetite (8, 9).

The existence of a large amount of anorexia in these children is the main reason of their loss of energy intake; therefore, it suits the condition of the loss of their body tissues. One of the justifiable reasons for this condition in children is the effect of cytokines on their appetite. It has been shown in animal models that neuropeptides such as proinflammatory cytokines released by tumors, immune cells, etc. affect food intake and energy metabolism in combination with other mediators (9, 10). These cytokines are transported across the blood-brain barrier and interact with brain endothelial cells which cause releasing compounds effects on appetite (11).

## 2. Objectives

The current study aims to investigate the effects of a supplement to reduce the malnutrition of children with cancer becomes crucial to improve the effect of treatment methods, decrease the time of hospitalization, and reduce the side effects of drugs and therapies on the child.

## 3. Materials and Methods

After the procedures were approved by ethics committee of Shiraz University of Medical Sciences subjects who referred to Amir Hospital were invited for participation in the study. In this randomized controlled trial we prepared 70 numbers from 1 to 70. After that, with a simple lot, they were divided by random 35 numbers into two groups. Then, one of the groups with random 35 numbers was chosen as the case group and the other one as the control group. Therefore, by registration of the patient in the hospital reception and taking a number based on the given numbers taken to both groups, the person was placed in one of the groups.

### 3.1. Inclusion and Exclusion Criteria

Each person was included in the case group if:

His or her cancer had been diagnosed and needed to be treated with chemotherapy period

He or she had been bedridden in a hospital at least for 5 days.

He or she had not used any food supplement

He or she was not on soft or liquid diet

He or she could tolerate the milk Haleem and chew, digest and absorb nutrients

He or she did not have an acute condition

It was a kind of hematologic illness

A part of GI system was not taken or this organ was not involved in cancer

His or her kind of cancer was among leukemia or malignant bone tumor

When his or her anthropometry information was put in the following formula, in the case of weight for height, he or she was in the moderate to severe state.

The patient was excluded from the study if he or she was discharged sooner than 5 days, did not have any tendency to use this supplement, suffered from any inflammation, diarrhea and nausea, or any other disturbance for this study; each bedridden patient based on his or her required energy determined based on EER formulas for three main meals and normal snacks was under the diet of the hospital. The purposes of this study was to add a balanced snack, like milk Haleem, which is high in carbohydrate and high protein to the hospital normal food of case group, and estimate the amount of weight loss and the improvement in blood factors of malnutrition during chemotherapy with the control group. Each member of the intervention group received this snack twice a day. This snack was taken to the patient based on his or her appetite provided that he or she ate it wholly between his or her main meals before the end of the day so that it did not affect the main meal. Each of the case group members used this between meals as long as he or she was bedridden at the hospital. This intervention was done during 45 days on the group. If the patient discharged sooner than this duration, the recipe was given to the patient's family and they were requested to give this snack according to the instruction for 45 days.

For cooking milk Haleem for each person we need: 180 grams, wheat, 2 dessert spoons of honey, a glass of milk, 2 dessert spoons of olive oil and 30 grams and chicken breast; its energy estimation is about 667 kcal. The administrator of the study regulated the necessary daily required calorie during bedridden time and after dismissing, if necessary, based on EER and double-labeled water formula for both groups. Moreover, she added the balanced snack besides the daily determined diet. The diet was scheduled for three main meals a day so that the patients could receive an equal amount of energy. In addition, we contacted the families of both groups daily to ensure about the way of giving the main between meal, its amount and its way of cooking.

Moreover, it was taken a 24-hour dietary report from both groups every 10 days to find out the difference in the amount of received energy between the two groups. Be-

fore starting the study, both groups took a blood pre-test of related factors to malnutrition such as total protein, pre-albumin, albumin and globulin. The last test which was the repetition of the above-mentioned tests took 45 days after starting the intervention. In addition to the tests, their weight was measured after 45 days again. It was expected that weight reduction decreases, the patients' weight increases as far as possible, and their response to cure improves. The anthropometric information was gained with SECA scales and stadiometer. Plasma total protein, pre-albumin, albumin and globulin, were measured based on photometric method (Autoanalyser BT1500).

Finally, the Data were analyzed in SPSS, version 16. Paired t-test was used for comparison of the measurements before and after the study.

#### 4. Results

In this 70-person study, after interference, the data were analyzed statistically. At the baseline there was no significant difference in the age, weight and height between the two groups. The average baseline age for intervention and control group was 11.97 and 12.34 years, respectively. In addition, the average weight of the intervention and control group at the beginning of the study was 32.25 and 31.6. The comparison of the changes of mean weight and malnutrition biochemical indexes before and after the interference in each group is shown in [Tables 1](#) and [2](#). As you see, after the intervention weight mean and biochemical indexes decreased in the control group significantly because of the effect of illness on appetite, the change of body metabolism, etc. But, on the other hand, it was seen that in the case group, the mean of biochemical indexes and weight was improved significantly and it was indicative of the positive effect of this kind of snack on the patients' condition.

#### 5. Discussion

In this research, the effect of a balanced snack on prevention of weight loss and improvement biochemical factors of malnutrition has been studied. Based on the conclusion, the use of milk Haleem has been effective on weight loss and malnutrition biochemical indexes of children with cancer. About 40 to 80 percent of children who are under chemotherapy suffer from extreme weight loss and malnutrition, which is attributed to the increased need of the body to energy and nutrients, the use of treatment resources from energy stores, reduction of child motivation because of the fear of the treatment environment and reduction of appetite for the negative effect of drugs on the

GI system. On the other hand, these patients need a lot of energy during this period for their growth. So, the increased need to energy intake from one hand and the reduction of tendency to energy intake on the other hand lead to weight loss and malnutrition in these patients. Therefore, finding a way to reduce this problem is very necessary.

Many studies have been conducted to find out a solution, but there has been no research done specially on cancerous children receiving chemotherapy. For example, in a research conducted in 2008, Bayram et al. (12) worked on reduction of weight loss due to treatment of cancer in children and the improvement of their level of lifestyle. They added a high caloric, high protein supplement to their diet. In their study, the intervention group just used the food supplement. Finally, the research entailed a significant reduction of weight loss and improvement of lifestyle. The findings of this research also agree with those of our study; however, the duration of this study was more than ours, but in the study of Bayram et al. (12) there was no discussion about the patients' control of daily amount of energy intake and other interfering factors.

In the other study, Bauer and Capra (13) aimed to find out a way for the effect of nutrition intervention on body mass, the increase of food intake and the quality of life by some steps such as giving high calorie and high protein supplement consisting of Eicosapentaenoic acid to cancerous adult patients with mal nutrition and were on chemotherapy. This intervention was done on eight persons during eight weeks. The result of this intervention was the positive significant effect of this supplement on the rise of protein and energy intake, improvement in nutritional status, and quality of life, and significant improvement in weight (13). The findings of this research confirm the results of our study; however, the samples of the research are less than ours and it has been done only with one group without any controls. However, the necessity of looking after the patients has confirmed the positive effects of this work.

Although a large number of studies have been done on improvement of malnutrition and the prevention of weight loss on cancers specifically (14, 15), most of them emphasized the use of Omega three to improve the inflammatory side effects which result from cancer. There has been an attempt in this study to add a large amount of olive oil, to respond to this need.

This research is one of the first studies which have found a way to cure weight loss and malnutrition of children with cancer. Most of similar studies are faced with various limitations: 1) Mainly, they have studied the adults, 2) they have used trade and special food supplements provi-

**Table 1.** Comparison of the Amount of Change in the Weight Mean and Biochemical Indexes of Malnutrition in Both Groups Before and After the Intervention<sup>a</sup>

Variable	Before Intervention	After Intervention	Changes	P Value
<b>Intervention</b>				
Weight	32.25 ± 6	33.24 ± 5	+ 0.98	< 0.001
Albumin	3.54 ± 0.07	3.7 ± 0.05	+ 0.16	< 0.001
Prealbumin	20.75 ± 1.6	28.37 ± 7.48	+ 7.48	< 0.001
Globulin	2.85 ± 0.11	3 ± 0.08	+ 0.19	< 0.001
Total protein	6.36 ± 0.09	6.77 ± 0.09	+ 0.4	< 0.001
<b>Control</b>				
Weight	31.6 ± 7	29.79 ± 7.2	-1.87	< 0.001
Albumin	3.6 ± 0.07	3.28 ± 0.05	- 0.33	< 0.001
Prealbumin	21.42 ± 1.9	16.4 ± 1.1	- 5.01	< 0.001
Globulin	2.94 ± 0.07	2.88 ± 0.1	- 0.06	< 0.001
Total protein	6.58 ± 0.09	6.15 ± 0.11	- 0.42	< 0.001

<sup>a</sup> Data are presented as Mean ± SD.

**Table 2.** Comparison of the Amount of Mean Change in the Weight and Biochemical Indexes of Malnutrition Between Groups

Variable	Intervention	Control	P Value
<b>Weight</b>	+ 0.98	- 1.87	< 0.001
<b>Albumin</b>	+ 0.16	- 0.33	< 0.001
<b>Prealbumin</b>	+ 7.48	- 5.01	< 0.001
<b>Globulin</b>	+ 0.19	- 0.06	0.021
<b>Total protein</b>	+ 0.4	- 0.42	< 0.001

sion of which is difficult for patients, 3) the number of their sample is limited, 4) the duration of interference is not reasonable and suitable, 5) confounding variables like the calorie of the received normal diet between the two groups has not been considered at all, 6) they have not worked on biochemical factors which show the malnutrition state.

In the present study, by introducing a nutrient, delicious, cost-effective and mushy snack there was an attempt to find a way that all the cancerous children can receive their daily need of food easily to grow, to resist the illness, and to improve the response to treatment.

As this between meal made of whole wheat, has a large amount of nutritional value; it is in a suitable level with respect to the amount of complex carbohydrates to provide a suitable energy and with respect to the effect of protein sparing effect of carbohydrate, by completing the energy of the body, it can guide the body to protect and build protein resources. On the other hand, since this kind of snack is full of protein and mineral sources, it has an important role in this work. During this study, the cancerous children who did not have any appetite to eat their main meals,

showed a good interest in the snack and ate it easily.

Based on the results of this study and similar studies, adding a kind of high calorie high protein supplement causes an improvement of malnutrition, control of weight loss, and rise in the quality of cancerous children's life. So, not only the use of this snack with omega 3 resources is recommended for the use of treatment centers of such children but also the use of this snack together with rich omega 3 resources is suggested for the future studies on the larger number of patients, cancerous adults and other illnesses whose side effects are malnutrition and weight reduction.

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### Footnotes

**Authors' Contributions:** Study concept and design: Mousa Salehi. Analysis and interpretation of data: Mousa Salehi, Shahrooz Bent Yaghoob. Drafting of the manuscript: Abbas Yousefinejad. Critical revision of the manuscript for important intellectual content: Shahrooz Bent Yaghoob, Mousa Salehi, Soheila Zareifar, Seyed Mohammadreza Hoseini Poya, Abbas Yousefinejad.

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