

Original Article

NUTRITIONAL SUPPORT TO CRITICALLY ILL PATIENTS - A COMPARATIVE STUDY BETWEEN BRANDED AND HOMEMADE PREPARATIONS

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ABSTRACT:

We have evaluated the effectiveness of nutritional support to critically ill patients undergoing treatment in ICU. We provided commercially prepared branded food in one group and compared this, with those of homemade preparations. Fifty adult critically ill patients getting treatment in ICU aged between 20 to 60 years having no diabetes, hypertension, ischaemic heart disease and chronic renal failure, were scheduled for providing enteral nutritional support. They were randomly allocated into two groups. Group A (n=25) received commercially prepared branded food containing balanced food consisting of protein, fat, and carbohydrate in calculated proportion. The aim was to provide 2500 Kcal of energy per day for an average adult in his/her critical state. Group B (n=25) received homemade food preparations in proper proportion of those of group A and of equal calories. The purpose of the study was to assess, formulate and compare the efficacy, tolerability and cost effectiveness of homemade prepared food with commercially formulated branded food in maintaining nutritional status of critically ill patient in ICU. Patient's nutritional assessment was done before the commencement of nutritional support, Nutritional assessment was repeated weekly for successive two weeks. Group A showed better result than Group B, significant improvement has been observed also in group B and the differences between two groups are statistically not significant Both the methods of nutritional support were adequate and effective in maintaining the nutritional status. Considering the poor socio-economic environment in an under developed country like Bangladesh, a less costly homemade preparation can be an effective alternative over the branded food.

INTRODUCTION:

Nutrition is defined as science of food and its relationship to health. It is not a single science but a duster of sciences related to the production and utilization of food.' Critical illness evoke a constellation of metabolic changes in the host inducing a transitory "ebb" phase followed by a hyper metabolic 'flow' phase. Magnitude of the change is proportional to the extent of insult or illness. Those changes require an extra amount of energy in addition to basic metabolic requirement to maintain the nutritional status of the host if this basic and extra amount of energy cannot be provided, the patient may show diverse systemic functional impairments. It is dear that nutrients are needed for protein synthesis, for organ function and to sustain life².

It is common for patient requiring intensive care to need nutritional support. It must follow the same rules as any other form of treatment with careful appraisal in each patient of the likely benefit or harm to be expected from it³. Critical illness is usually accompanied by anorexia or inability to eat because of impaired consciousness, sedation or incubations through upper airway. They are also metabolically stressed by the severity of their illness, injury or major surgery. So without nutritional support there is rapid loss of body weight and muscle mass Hence provision of adequate nutritional support in such patient is must requirement in Bangladesh, here may be two types of enteral food available for critical patient one commercially prepared branded food and another is homemade preparation maintaining proper nutrition, and equal calories.

This prospective randomized study was designed to assess, formulate and compare the efficacy, tolerability and cost effectiveness of homemade prepared food with commercially formulated

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branded food in maintaining nutritional status of critically ill patient in ICU.

MATERIALS AND METHODS:

We performed a randomized study on fifty critically ill patients of both sex, aged between 20-60 years in intensive care unit requiring nutritional support along with treatment. The study was performed at BSMMU, Dhaka in one calendar year. Patients with having hypersensitivity to artificial food, who can continue oral food intake, chronic renal failure, diabetes mellitus, ischemic heart disease and hypertension, were excluded from the study. Feeding was given through nasogastric tube. Total feeding procedure was explained to patient or their relatives and written consent were taken from them.

Nutritional assessment of each patient was done before commencing the nutritional support. It was done by taking dietary history-dietary habit, recent omission or inclusion of any food item, recent development of excessive vomiting, diarrhoea or any other form of gastric upset. Patient's nutritional requirement was assessed basing on their bodyweight and age, also considering the increasing requirement of calorie for the hypercatabolic state due to critical illness. As such an average requirement of an adult of average body weight was considered to 2000 Kcal using the Harris Benedict's equation. Another 500 Kcal was allotted for their hypercatabolic state. Patients were randomly allocated into two groups. Group A contained 25 patients, was considered to be control group, who had fed Revit R' (a branded food). The amount of food powder was taken to achieve 2500 Kcal and preparation of the feed was done according to the instruction provided. Group B contained 25 patients was considered to be case or study group. The energy requirement was calculated like control group. Composition of homemade preparation was advised by the dietitian of BSMMU, selecting cheap, easily available food items in our country. Selection of food items such as chicken, beef, mutton, pulse, egg white etc. as protein source, rice powder, glucose, sugar as carbohydrate source and soyabean oil, mustard oil, butter etc. as fat source were done.. A feed composition was designed to provide a same caloric value as that of control group (2500 kcal). There were no fixed food composition and had relaxation of change depending on the availability, and patient's financial condition. But the food composition was always containing essential nutrients in all the cases. Both the groups were fed 10 times (feeds) per day roughly 200-250 ml/feed through easily accessible nasogastric tube.

Nutritional assessment of all the patients was done before commencing the study. Every patient was gone under thorough clinical examination. About body weight, a clinical assessment of bodyweight which was correlated with the patient's expected bodyweight depending on his/her age and height. Other anthropometric parameters like triceps skin fold thickness, mid arm circumference and mid leg circumference were observed and recorded in both groups at the start of feeding and for successive two weeks in each subsequent follow up. Laboratory investigations like Hb%, lymphocyte count, serum total protein and serum albumin were also observed and recorded at the start of nutritional support and for successive two weeks in each subsequent follow up. Complications during nutritional support like, vomiting, diarrhoea and constipation also observed and recorded in both groups. The daily average cost of both feeding regimens in both groups were also calculated and recorded.

RESULTS:

Patient's demographics were similar and fairly comparable in both groups and the differences were statistically not significant (Table-1). Monitoring of patients nutritional status or the improvement of the status could be better comparable if the patients were of same disease. In this study it had been seen that the type of the cases studied was tried to be almost similar, brain tumour (operated) and head injury got the priority (Table-n).

Pre support anthropometric measurements like triceps skin fold thickness, mid arm circumference and mid leg circumference were seen to in the lower limit in both groups and the differences between two groups were statistically not significant (Table-111). Pre support laboratory investigations like Hb%, lymphocyte count, serum total protein and serum albumin in both groups were observed near lower limit. Differences of these laboratory values between two groups were statistically not significant (Table-III).

Table-I
Demographic data

Parameters	Group A (N=25)	Group B (N=25)
Age	36.92 ± 1.98	36.34 ± 2.1
Sex (Male / Female)	21/4	20/5
Height	157.0 ± 1.52	156.5 ± 1.76
Expected Body Weight (Kg)	56.3 ± 1.48	53.2 ± 1.51

Values are mean ± SEM

No significant differences between groups.

Table- II
Types of cases studied

Name of disease studied	Group A	Group B	Total
Brain tumour OP effective of (ICSOL)	7	7	14
Head Injury	6	5	11
Chronic obstructive pulmonary disease(COPD)	3	4	7
Guillain Barre Syndrome (GBS)	2	2	4
Bronchial carcinoma	1	1	2
Cerebral malaria	1	1	2
Viral encephalitis	1	1	2
Meningitis	1	1	2
Oral malignancy	1	1	2
Hydrocephalus	1	1	2
Disseminated intravascular coagulation (DIC)	1	1	2

Table –III
Comparison of pre support parameters of patient between two groups

Groups	Triceps skin fold thickness (mm)	Mid arm circumference (cm)	Midleg circumference (cm)	Hb% (gm/dl)	Lymphocyte count(%)	Serum total protein (gm/dl)	Serum albumin (gm/dl)
Group A	12.58 t 0.04	26.32 ±1.96	36.42 t 2.2	8.8 ±0.4	12.2t2.3	5.1 t0.22	2.6t0.02
Group B	12.6 t 0.05	26.28	± 2.20	36.38	± 2.5	8.6	± 0.3
ResultStudents	NS	NS	NS	NS	NS	NS	NS

Values are mean ± SEM

NS - No significant difference

Table –IV
Comparison of pre and post support parameters of patient after completion of nutritional] support in group A

Groups	Triceps skin fold thickness (mm)	Mid arm circumference (cm)	Midleg circumference (cm)	Hb% (gm/dl)	Lymphocyte count(%)	Serum total protein (gm/dl)	Serum albumin (gm/dl)
Presupport	12.58± 0.04	26.32 ±1.26	36.42 t 2.2	8.8 ± 0.4	12.2t2.3	5.1 t0.22	2.6t0.02
Postsupport	12.6t0.05	26.80	36.81 t2.02	10.0 t0.7	21.5t1.2	6.2t0.21	3.2t0.02
15 After days							
Result							
Students 't'test(unpaired)	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01

Values are mean ± SEM

P<0.01 - Statistically significant

P<0.001 - Statistically highly significant

Table -V

Comparison of pre and post support parameters of patient after completion of nutritional support in group B

Groups	Triceps skin fold thickness (mm)	Mid arm circumference (cm)	Midleg circumference (cm)	Hb% (gm/dl)	Lymphocyte count(%)	Serum total protein (gm/dl)	Serum albumin (gm/dl)
Pre support	12.6±0.05	26.28±2.2	36.38±2.5	8.6±0.3	11.8±2.1	5.2±1.89	2.7±0.01
Post support after 15 days							
Students 't' (unpaired)	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01

Values are mean ± SEM

P<0.01 - Statistically significant

P<0.001 - Statistically highly significant

Table -VI

Comparison of post support parameters of patient after 15 days between two groups

Groups	Triceps skin fold thickness (mm)	Mid arm circumference (cm)	Midleg circumference (cm)	Hb% (gm/dl)	Lymphocyte count(%)	Serum total protein (gm/dl)	Serum albumin (gm/dl)
Group A	12.6±0.05	26.8±2.28	36.81 ±2.02	10.0 ± 0.7	21.5±1.2	6.2 ± 0.21	3.2 ±0.02
Group B	12.63±0.03	26.68±2.22	36.68±2.4	9.9 ± 0.5	20.6 ± 1.2	6.3 ± 0.18	3.3 ± 0.04
Result							
Students 't' test(unpaired)	NS	NS	NS	NS	NS	NS	NS

Values are mean ± SEM

NS- No significant difference

In control group A, branded food was fed and the results were recorded (Table-IV). Values of biceps skin fold thickness, mid arm circumference and mid leg circumference showed significant (P<0.01) improvement after 2nd week from pre support values. Laboratory investigations -Hb% and lymphocyte count showed improvement from pre support recordings to recordings after 2nd week and improvements were statistically highly significant (P<0.001). Serum total protein and serum albumin showed improvement and the difference between pre support values and values after 2nd week were statistically Significant (P<0.01).

In study group B, homemade food was fed and pre support and post support (after 2^{weeks}) values were recorded (Table-V). Values of triceps skin fold thickness, mid arm circumference and mid leg circumference showed significant (P<0.01).

improvement after 2nd week from pre support values. Laboratory investigations - Hb% and lymphocyte count showed improvement from pre support recordings to recordings after 2nd week and improvements were statistically highly significant (P<0.001)- Serum total protein and serum albumin showed improvement and the difference between pre support values and values after 2nd week were statistically significant (P<0.01).

After 2nd week both groups showed improvement in patients by feeding regimens by increasing anthropometric parameters and laboratory findings. Values showed a better improvement in group A than group B but differences were statistically not Significant (Table-VI).

Incidence of complications like vomiting, diarrhoea and constipation during nutritional support was less in both groups and differences between two

groups were statistically not significant. None of the patients of both groups showed any complications associated with tube insertion, tube itself or due to feed content. Cost status of feeding regimen in both groups were calculated: group A showed 750 taka/day and group B showed 150 taka/day. Statistics showed it was 5 times costly in group A than group B.

DISCUSSION:

The accelerated catabolism associated with acute illness or injury may further exacerbate tissue loss superimposed upon weight loss. Malnourished persons are depressed and suffer from muscle wasting and respiratory muscles including diaphragm, impairing respiratory function and deare secretion. Malnutrition also reduces respiratory drive^{3,4}, impaired immune functions and increased rate of infection^{5,6,7}. Acute illness and malnutrition may impair the digestive and barrier function of the gut Both the functions may be protected by enteral feeding not by pererderal nutritional support^{3,8}, and more than 48 hours starvation may also impair vasoconstrictor responses to cold and reducing heat conseivation⁹.

Nutritional support is an obvious life support for critically ill patients. The aim of nutrition al support for critically ill patient proposed by American Society for Perenteral and Enteral Nutrition has included^{2,10} (1) detection and correction of preexisting malnutrition, (2) prevention of progressive protein energy malnutrition, (3) optimizing patient's metabolic state and, (4) reduction of morbidity and time of convalescence.

Method of support may vary considering the nature of critical illness. It should be done by a team which includes concerned physician, clinician nutritionist, dietetic and cook. The method of nutritional support to critically ill patients in different hospital of Bangladesh is in primitive state. We are running short of concerned specialist manpower, resources and lack of organized way of providing nutritional support. So, present trend is that either clinician prescribes a branded preparation or patient's party prepares a homemade food regimen at their own with proper calculation about patient's energy requirement Patient in ICU, stay is usually for a short time so total duration of nutritional support was considered to be 15 days in this study. Regarding selection of cases post operative neurosurgical patients and patients with head injury got priority.

Pre support parameters were thoroughly assessed obtaining details of the dietary history, physical examination, anthropometry and laboratory investigations. Amongst the anthropometric measurements, body weight was scheduled to be given due importance. But considering the clinical state of patient lying flat on the bed or on ventilator and non availability of the weighing bed it could not be done properly and monitoring of body weight was discontinued. Among other anthropometric parameters, triceps skin fold thickness mid arm circumference and mid leg circumference were observed. Triceps skin fold thickness representing the body fat", mid arm circumference, mid leg circumference represent skeletal muscle mass and fat. Considerable changes may occur with progress of disease, but nutritional support can improve the condition. In group A, significant improvement had occurred with the provision of nutritional support after IS days although no such changes were marked after initial 7 days. Similar changes were marked in group B, which confirmed the theoretical basis.

At the start of this study, laboratory findings showed significant deterioration of Hb%, lymphocyte count, serum total protein and serum albumin. Almost all the findings were below or near acceptable limit in respect to the patient's age and sex. Decrease in Hb%, serum total protein and serum albumin may be a reflection of the metabolic response to trauma and injury (increase protein catabolism). Reduction in lymphocyte count may be due to immunosuppressant factors. These deteriorations reflect critical illness. In group A highly significant improvement had occurred in Hb% and lymphocyte count with nutritional support. Similar highly significant improvement was observed in group B where nutritional support was provided with homemade preparations. Serum total protein and serum albumin were showed significant improvements in both groups after 15 days of nutritional support. Patients of both groups showed clinical improvements in respect to their muscle power and sense of well being which signified the adequacy and effectiveness in maintaining the nutritional status and these revealed homemade preparations are equally adequate and effective like branded food. So under developed country like Bangladesh, nutritional status can be maintained satisfactorily selecting

common, cheap, easily available food items, which can reduce the huge expenditure of the patient in ICU. The homemade preparation adopted in this study can be applicable to other cases in future. Some untoward incidences like diarrhoea, vomiting, constipation developed in both groups but they were not significant. Avoidance of complication could be possible with caution. Regarding cost effectiveness homemade preparation was less costly (5 times) than that of branded formula. In poor socio-economic country like Bangladesh cost of treatment is definitely a matter of consideration.

CONCLUSION:

Patients undergoing treatment in ICU remain in a critical state of their health where nutritional support can ensure a good organ function or can prevent their functional impairment. In this study nutritional support to critical patients was provided with branded food in one group and homemade preparation in another group. Both groups showed almost equal improvement in nutritional status. Both the methods were adequate and effective in maintaining nutritional support of the critically ill patients. Branded food items are costly and not easily available but easier to prepare. On the contrary homemade preparations were cheap, easily available and prepared from common food items. To bring out a successful outcome both the methods of nutritional support can be recommended but considering the poor socio-economy of Bangladesh homemade preparations can be preferred.

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