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Differences in Nutrient Intake and Weight Changes in Malnourished Patients Received High Energy High Protein Diet With and Without Nutritional Support at RSUD dr. Doris Sylvanus Palangka Raya

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A B S T R A C T

Adequate and appropriate nutritional support for malnourished hospitalised patients plays an important role in reducing the effects of malnutrition in patients and improving patients' immunity to accelerate the healing process and shorten hospital stay. The purpose of this study was to investigate differences in nutrient intake and weight changes in malnourished patients received High Energy High Protein (HEHP) diet with and without nutritional support. This study was a quasi-experimental, pre-post-test design with a control group. In total, 40 malnourished hospitalised patients at RSUD dr. Doris Sylvanus Palangka Raya were allocated to either an intervention (HEHP diet + nutritional support 2 x 100 ml of milk) or a control (usual HEHP diet) group evenly. Data were collected at baseline and within three days of intervention. The changes in patients' weight, energy and protein intake between the control and intervention groups were assessed using two independent sample t-test. Of 40 malnourished patients, mean BMI and age were 16,7 ± 1,4 and 31,2 ± 9,3 years respectively with an even sex distribution of 50% each. The average energy and protein intake of the intervention group were 2129,64 ± 392,20 kcal and 104,85 ± 31,76 grams respectively while in the control group were 1894,58 ± 544,45 kcal and 82,80±26,76 grams respectively. The intervention group experienced weight gain by 1.11 kg within 3 days. In contrary, the control group had slightly increased in weight by 0.32 kg. No significant difference was found in energy intake (p = 0,054). However, there were significant differences found in protein intake (p = 0,022) and changes in weight (p = 0,048). The results show that additional nutritional support use of milk into the usual HEHP diet for malnourished patients is an effective option for improving protein intake and weight gain.

Keyword: Nutritional support; Nutrient intake; Weight changes

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1. INTRODUCTION

Malnutrition is one of the major problems commonly occurs in hospitalised patients and faced by hospitals worldwide not in developing countries but also developed countries. Malnutrition prevalence in hospitals was reported to range from 20% to 50%.[1–4] Based on data obtained from RS Cipto Mangunkusumo (RSCM) Jakarta, the prevalence of malnutrition in digestive surgery patients was 45.9% in 2009, while data obtained from RS Hasan Sadikin in Bandung, 71.8% of malnourished inpatients. Data obtained from RS Kariadi Semarang according to the results of nutrition screening using Subjective Global Assessment (SGA) found 47% of patients were severely malnourished.[3,5,6]

Malnutrition may occur at hospital submission due to underlying clinical condition which affects the patient's food intake, increasing requirement, change metabolism and cause malabsorption. At the same time, the impact of malnutrition faced by the hospital includes increasing longer hospital stay, mortality rate and hospital costs.[2,5,7] A previous study demonstrated that 75% of medical inpatients experienced

declining nutritional status compared to the nutritional status at initial hospital submission.[6]

Inadequacy of energy and protein intake is the main cause of incidence malnutrition. High Energy High Protein (HEHP) diet commonly use in nutrition management for undernourished inpatients. A regular HEHP diet provided at RSUD dr. Doris Sylvanus is an additional one animal-based protein during lunchtime and varied commercial HEHP milk serving. For example, patients may receive of milk in range 1 x 100 ml, 1 x 150 ml, 1 x 200 ml, 2 x 100 ml, 2 x 150 ml, and 3 x 100 ml. The various serving of milk appears because there is no standard regarding providing appropriate nutritional support. Optimal nutritional support is believed as one of the appropriate approaches to improve inpatient's nutritional status and prevent adverse effects of malnutrition in patients. Thus, the purpose of this study was to investigate differences in nutrient intake and weight changes in malnourished patients HEHP diet with and without nutritional support.

2. METHODS

The quasi-experimental study design was adopted, with an intervention group and a control group with pre- and post-tests. The total number of samples included in this study were 40 patients at RSUD dr. Doris Sylvanus Palangka Raya with age 17-45 years and BMI <18.5. The control group received the usual care of High Energy High Protein (HEHP) diet while the intervention group received the HEHP diet with additional nutritional support. The nutritional support provided was commercial HEHP milk formula given twice a day @ 100 ml every day for three days with energy and protein content of 220 kcal and 10 grams respectively. Besides, the nutritional support labelled with information regarding nutrition value, serving recommendations and consumption time.

Patients' anthropometric data including weight and height were obtained from measurements using a digital body scale and a microtoise. Baseline data obtained by interview and 24-hour food recall. The three-days' food intake from hospital obtained by interviewing and using Comstock method. Patients' total energy and protein intake assessed from food intake from the outside hospital, hospital, nutritional support and parenteral nutrition. Data on changes in patients' weight were taken from the difference of baseline data of body weight and the last weighing of the third day.

A univariate analysis conducted to identify the distribution of each research variables such as the average intake of energy and protein and weight changes in both groups. Furthermore, a bivariate analysis conducted to examine the differences statistically in the average energy and protein intake and weight changes between groups. Two independent t-test used in this study.

3. RESULTS AND DISCUSSION

3.1 Characteristics of study participants

During the study period, 40 patients were eligible and all agreed to participate. Characteristics of the samples are shown in Table 1.

Table 1. Characteristic Frequency Distribution of the Samples

Characteristics	Intervention n (20)	Control n (20)
	n (%)	n (%)
Gender		
Male	10 (50%)	10 (50%)
Female	10 (50%)	10 (50%)
Age		

17 – 25	7 (35%)	6 (30%)
26 – 35	6 (30%)	3 (15%)
36 – 45	7 (35%)	11 (55%)
Diagnosis		
Internal disease	7 (35%)	2 (10%)
Surgery	7 (35%)	10 (50%)
Respiratory infection	6 (30%)	8 (40%)
Types of Diet Consistencies		
Pureed diet	6 (30%)	6 (30%)
Soft diet	6 (30%)	6 (30%)
Normal diet	8 (40%)	8 (40%)
	Mean ± SD	Mean ± SD
BMI (kg/m^2)	16,5 ± 1,6	16,8 ± 1,3
Weight (kg)		
Initial weight	41,75 ± 5,04	45,35 ± 6,95
Final weight	45,58 ± 5,38	45,66 ± 6,99
Height (cm)	159,35 ± 6,27	164,02 ± 9,22

According to Table 1, the sex distribution in each group is equal to 50% male and 50% female. The age group in the intervention group was distributed evenly while in the control group, the age group of 36-45 was slightly higher (55%) within the group. Malnutrition may occur in any age group. Susetyowati, et al reported that malnutrition was not directly related to age however happened due to an underlying disease that can affect food intake, increase requirements, change metabolism and malabsorption.[8] A study by Kusumayanti, et al also found that there were no significant differences in malnutrition status based on sex and age group.[6]

The disease distribution on table 1 listed internal disease including dengue haemorrhagic fever (DHF), vomiting, and fever. Surgical diseases consist of diagnoses of mild brain injury, moderate brain injury, soft tissue tumour (STT), benign prostatic hyperplasia (BPH), with preoperative treatment. Respiratory infection/disease consists of pulmonary TB and asthma. Infectious and non-infectious diseases affect patients' nutrition status depending on the progression of the disease, chronic or acute, which may affect the length of hospital stay as a result.[6,9,10]

The consistencies of the diets varied between the intervention and the control groups. The discrepancy in the consistencies of the diets based on the condition and severity of the patients' disease. The consistencies of the diets statistically influenced the occurrence of malnutrition in hospitalised patients due to patient's preferences.[6] When patients received hospital food according to their disease condition which was less preferred affected the food intake. Furthermore, the difference in food consistencies might affect the nutritional value of the diet. Hospital food intake was assessed by interviewing and using Comstock method.

3.2 Energy Intake

Energy intake is the amount of nutrient consumed through daily food consumption to obtain energy used to perform daily physical activities. Patients' total energy intake assessed from food intake from the outside hospital, hospital, nutritional support and parenteral nutrition. Patients' energy requirement was calculated individually according to the clinical condition of the patients. Energy requirement equation is 45 kcal/kg ideal body weight (IBW).[11]

Table 2. Energy Intake Level of Malnourished Patients With and Without Nutritional Support

Nutrient Intake	Intervention	Control	p-value
	Mean±SD	Mean±SD	
Baseline energy intake (kcal)	1379,75±328,06	1191,23±284,65	
Baseline percentage energy intake level (%)	70,24±17,65	57,68±20,48	
Final total energy intake (kcal)	2192,64±392,20	1894,58±544,55	0,054
Energy requirement (kcal)	1988,30±290,19	2143,01±373,65	
Percentage energy intake level based on energy requirement (%)	111,95±22,07	90,29±29,09	
Energy content of standard hospital food (kcal)	2071,52±177,67	2291,52±177,67	
Percentage energy intake level based on hospital standard (%)	95,69±15,37	91,70±25,63	

Based on Table 2 above, it can be seen that the average total energy intake for three days in the intervention group is higher than the control group, 2192,65 kcal and 1894,58 kcal respectively. Two independent samples t-test revealed there was no significant difference in average energy intake between groups, p-value = 0,054 (p > 0,05). Food provided by hospitals is a source of energy intake for malnourished patients. According to energy intake provided by hospital food, in particular, showed that there was a huge difference between the intervention and the control group, 1711,26 kcal and 1516,51 kcal respectively. Lack of patients' energy intake is caused by not consuming the food that has been provided.[5]

Not all patients complied with only consuming hospital food. Approximately 30-35% of patients stated consuming food from the outside of the hospital. It was smaller than the previous study that approximately 60,3% of patients consuming food from the outside of the hospital.[12] There were several reasons why patients preferred food from outside of the hospital including food brought by the family visiting them, food preferences, economically adequate and hospital food served late. Food from outside the hospital contributed to the patients' total energy intake approximately 6% in the intervention group and 8% in the control group. During hospitalisation, there is a possibility of the contribution of food from outside the hospital to the patients' total energy intake. Energy intake derived from food outside the hospital should be approximately under 20%.[12]

Moreover, parenteral nutrition also contributed to increased energy intake in malnourished patients. The average energy intake from parenteral nutrition in the control group was greater at 213 kcal than the intervention group at 133 kcal. Both groups received similar parenteral nutrition, for example, dextrose 5% and amino fluid but few patients in the control group also received hydromal that contains 220 kcal per 500 ml. Additional of parenteral nutrition to malnourished patients may improve patients' energy intake and contribute to the patients' total energy intake.

3.3 Protein Intake

Protein intake is the amount of protein that consumed through daily food consumption besides carbohydrate and fat requires mainly for body tissues and structures. Protein deficiency may cause interference with the intake and transportation of nutrients in the body. Patients' total protein intake determined from a total of food intake from the outside hospital, hospital, nutritional support and parenteral nutrition. Patients' protein requirement was calculated according to dietary requirements for HEHP diet, 2 grams/kg body weight.[11]

The HEHP diet provided by RSUD dr. Doris Sylvanus Palangka Raya to malnourished patients generally add animal-based proteins such as one boiled egg at lunchtime. The nutritional support provided during this study was commercial HEHP milk formula given twice a day @ 100 ml every day for three days with energy and protein content of 220 kcal and 10 grams respectively. In addition to that, information for patients regarding nutrition value, serving recommendations and consumption time were added onto the nutritional support packaging.

Table 3. Protein Intake Level of Malnourished Patients With and Without Nutritional Support

Nutrient Intake	Intervention	Control	p-value
	Mean±SD	Mean±SD	
Baseline protein intake (grams)	62,83±27,74	47,85±13,89	
Baseline percentage protein intake level (%)	95,69±15,34	91,70±25,63	
Final total protein intake (grams)	104,85±31,76	82,80±26,32	0,022*
Protein requirement (grams)	88,36±12,89	95,24±16,60	
Percentage protein intake level based on protein requirement (%)	120,395±36,79	88,97±31,72	
Protein content of standard hospital food (grams)	102,91±3,21	92,91±3,21	
Percentage protein intake level based on hospital standard (%)	101,81±30,14	89,24±28,47	

**p-value < 0,05*

Based on Table 3 above, it can be seen that the average total protein intake for three days in the intervention group is higher than the control group, 104,85 grams and 82,80 grams respectively. Comparing to protein requirements showed that there was a considerable discrepancy in the percentage of protein intake level between the intervention and the control groups. Despite the protein requirement of the control group was higher, the percentage of protein intake level in the intervention group was higher at approximately 120% of requirement while in the control group was approximately 89%. The control group's protein requirement was higher because of the difference in patients' initial body weight. The initial weight in the control group was 45,35 ± 6,95 while the initial weight of the intervention group was 41,75 ± 5,04.

Bivariate analysis was conducted to investigate the difference between the intervention and the control groups. Two independent samples t-test revealed there was a significant difference in average protein intake between groups, p-value = 0,022 (p < 0,05). This study was in line with a study of a single-blinded randomised controlled trial study on 84 participants at nutritional risk reported that protein-supplemented food improved participants' protein intake.[13] Similarly, oral nutritional supplement significantly increased nutrient intake particularly protein intake.[14]

Food provided by hospitals is the main source of protein intake for malnourished patients. This study reported that approximately more than 85% of protein intake came from the diet, parenteral nutrition and nutritional support particularly for the intervention group. Parenteral nutrition in the intervention group contributed less than in the control group, namely 4% and 13% respectively. Patients received parental nutrition were severely undernourished and poor oral intake. The parenteral nutrition provided was amino fluid which contains 30 grams of protein per 1000 ml. In spite of inadequate protein intake from the diet, providing nutritional support and parenteral nutrition containing high protein beneficially improve total protein intake. Furthermore, a randomised controlled trial using parenteral nutrition showed that a higher amount of amino acid associated with increasing patients' protein intake.[15]

3.4 Changes in Patients' Weight

Bodyweight is one of the parameters that describe body mass. Body mass is very sensitive to sudden changes, for example, due to infectious disease, decreased appetite or decreased amount of food consumed. This study has investigated the difference in weight change between the intervention and the control group.

Table 4. Average Weight Changes and Weight Distribution Among Malnourished Patients With and Without Nutritional Support

Weight	Intervention	Control	p-value
	Mean±SD	Mean±SD	
Average weight changes (kg)	1,11±1,67	0,31±0,48	0,048*
	n=20 (%)	n=20 (%)	
Weight gain	19 (95%)	16 (80%)	
Weight stable	1 (5%)	-	
Weight loss	-	4 (20%)	

**p-value < 0,05*

The weight changes among malnourished patients are shown in Table 4. It is estimated that the intervention group experienced a higher weight gain than the control group. The average weight changes in the intervention group were 1,11 kg followed by 0,31 kg in the control group. The difference in average weight gain in those two groups was 0,78 kg. Further statistical analysis was conducted to investigate the difference between the intervention and the control groups. Two independent samples t-test revealed there was a significant difference in average weight changes between groups, p-value = 0,048 ($p < 0,05$). This study was consistent with previous studies which revealed the effect of nutritional support on weight changes. A systematic review and meta-analysis investigating nutritional support and its effect in malnourished medical inpatients demonstrated that nutritional support increases not only bodyweight but also energy and protein intake.[16]

Appropriate and adequate nutritional support including parenteral nutrition affects weight changes of undernourished medical patients. Of 20 patients in the intervention group, 95% experienced increased body weight, 5% having weight stable and none of them reported weight loss. In contrast, 20% of patients in the control group reported weight loss and approximately 80% experienced weight gain. Loss of patients' weight might be caused by underlying patients' clinical condition. Several clinical conditions contributed to weight loss were post-surgery, anemia and tuberculosis. Surgery is one of the causes of weight loss due to postoperative stress, fasting, and increased metabolism. In spite of being categorised as a non-infectious disease, anemia has a greater risk of malnutrition. Moreover, one of the clinical manifestations of tuberculosis is weight loss and anorexia. It is in accordance with the previous study revealed 10% of tuberculosis patients experienced weight loss regardless receiving HEHP diet.[17]

4. CONCLUSION

In conclusion, this present study investigated the differences in nutrient intake and weight changes in malnourished patients received HEHP diet with and without nutritional support. The study demonstrated that providing additional nutritional support into regular HEHP diet was significantly beneficial in increasing protein intake and body weight. Understanding the profit of nutritional support provides important evidence to allow for an individualised intervention to minimise the risks of developing complications due to clinical conditions. Thus, our results suggest that nutritional support use of commercial HEHP milk along with regular HEHP diet in undernourished patients is an

effective option for reducing morbidity associated with malnutrition and shorten hospital stay.

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