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The Change of Haemoglobin Levels in Hemodialysis Patient with The Provision of Nutritional Support

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ABSTRACT

Background : Hemodialysis patients are at risk of anemia, malnutrition, and gastrointestinal disorders. Because of those many nutritional problems, hemodialysis patients need to obtain nutritional support of protein sources, which can be filled with catfish (*Clarias sp.*) abon. **Objectives :** This study aimed to determine the change of hemoglobin level in hemodialysis patients with the provision of nutritional support. **Method :** This was a quasi-experimental with the pre-post test design. The study was conducted at Panembahan Senopati General Hospital in Bantul during January–December 2017. Catfish abon was given to the eligible patients approximately 0.36 g/kgBW/day for 21 days. Subjects were 32 routine hemodialysis patients whose age are >18 years. The dependent variable was hemoglobin level, while the independent variable was the provision of catfish abon. Data were analyzed using univariate and bivariate with paired T-test. **Results :** The average of pre and post intervention hemoglobin level were 9.24±SD g/dl and 9.50±SD g/dl respectively. There were no differences on average hemoglobin level of hemodialysis patient (p=0.208). **Conclusion:** provision of nutritional support increases the average of hemoglobin level during the intervention, although it does not statistically affect the hemoglobin level of hemodialysis patients.

1. Background

Malnutrition is the primary determinant of mortality and morbidity in maintenance of hemodialysis patients (1). Based on KDOQI (Kidney Disease Outcomes Quality Initiative) cut-off points using body mass index (BMI) as an indicator of protein energy malnutrition (PEM), 71% of hemodialysis patients can be classified as at risk of PEM (2). Aside from PEM which is known by anthropometric examination using body mass index, hemodialysis patients also experience anemia complications. Anemia is a common complication in chronic kidney disease (CKD) patients receiving hemodialysis (3).

Complications of PEM and anemia that occur in hemodialysis patients can be caused by the low intake of nutrients, such as energy, protein, and iron. Average intake of dietary energy (DEI) and protein (DPI) were low, with only approximately 15% achieving the recommendations according to KDOQI (4). Most of hemodialysis patients (75%) whose age are 60 and above 60 years old were unable to meet the minimum energy requirements of 35 kcal/kg/day. Besides most of them (84%) were also unable to meet their minimum energy recommendations of 30 kcal/kg/day. Moreover 67% of hemodialysis patients were unable to meet the minimum protein requirement of 1.2 g/kg/day (2). To achieve the increasing energy and protein needs of hemodialysis patients, nutritional support should be given. It can be fulfilled by giving catfish abon.

Catfish (*Clarias sp.*) is a local fish of Indonesia. Catfish has many advantages regarding its nutritional content, especially protein and iron. However, most of people still underestimate the nutritions contained by catfish because of the conventional processing. In this study, catfish were processed into catfish abon. By doing new processing, it was expected to increase patient's acceptance and intake.

Abon is one kind of food in Indonesia, a processed product of catfish. Catfish abon made by sauting – catfish meat that has been steamed before, mixing it with seasoning, then frying it until it's browned. Abon is a durable food product and can be used as a side dish. This study aimed to determine the hemoglobin level of hemodialysis patients by providing nutritional support of catfish abon.

2. Methods

This study was a quasi-experimental study with a pre-post design. Catfish abon was given to eligible subjects approximately 0.36 g/kg BW/day for 21 days. This research was conducted in the Hemodialysis Unit of Panembahan Senopati General Hospital, Bantul, during January–December 2017.

This study involved 34 subjects taken by purposive sampling. The patients undergoing hemodialysis in the Hemodialysis Unit of Panembahan Senopati General Hospital in Bantul who fulfilled the eligible criteria were considered as subjects. The inclusion criteria of this study included doing routine hemodialysis twice a week, >18 years old, willing to be subject and following all the research procedures, and not having catfish allergy. All patients having systemic oedema, diabetes mellitus and malignancy were excluded.

Measurement of hemoglobin level was done twice, in pre-intervention and post-intervention. All subjects were asked to record all food and beverages consumed every day in the food record questionnaire. To ensure that subjects consume catfish abon and record their food and beverages intake every day, the researcher controlled it by sending a Short Message Service (SMS) reminder to the subjects. The contents of the SMS were limited only for reminding subjects to eat catfish abon and record their all food and beverages intake whose sources are not from the abon regularly every day. The text did not contain material related to hemodialysis diet provided by the hospital nutritionist to avoid bias.

The independent variable of this study was the provision of catfish abon, which was defined as providing nutritional support formed of catfish abon as much as 0.36 g/kg BW/day for 21 days, determination of dietary requirement of subjects using post-hemodialysis weight. The dependent variable was the hemoglobin level, which was defined as the result of hemoglobin measurements of the pre-intervention and post-intervention. Laboratory tests to determine hemoglobin levels were carried out by standard procedures those were done in Panembahan Senopati General Hospital.

Data analysis was included univariate analysis to see the frequency distribution of each variable, and bivariate analysis with paired T-test to determine the effect of the provision of catfish abon to hemoglobin levels in hemodialysis patients. This study protocol was approved by Health Research Ethics Commission of the Faculty of Health Science, Universitas Respati Yogyakarta, No: 330.4/FIKES/PL/II/2017 dated February 15th, 2017.

3. Results and Discussion

In Panembahan Senopati General Hospital, routine hemodialysis patients come twice a week on a fixed schedule, Monday and Thursday, Tuesday and Friday, or Wednesday and Saturday. Hemodialysis procedure are divided into three shifts; shift I (at 07.00-11.00 Western Indonesia Time), shift II (at11.00-15.00 West Indonesia Time) and shift III (at 16.00-20.00 West Indonesia Time). Hemodialysis patients in Panembahan Senopati General Hospital are handle and conducted by a doctor, also assisted by 20 trained nurses.

Table 1. Characteristics of Subject (n = 34)

Characteristics of Subject	Category	n	Percentage (%)
Age	17 – 25 years	1	2,9
	26 – 35 years	4	11,7
	36 – 45 years	11	32,3
	46 – 55 years	9	26,4
	56 – 65 years	7	20,5
	≥ 65 years	2	5,8
Gender	Men	15	44,1
	Women	19	55,8
Education	Preliminary School	13	38,2
	Junior High School	5	14,7
	Senior High School	14	41,1
	University	2	5,8
Complications of disease	With complication	19	55,8
	No complication	15	44,1

This study involved 34 subjects, which were taken by purposive sampling. The characteristics of subject in this study included age, gender, education, and complications of disease (Table 1). Most of the subjects were adult (32.3%) and female (55.8%). Based on the level of education, most of the subjects were graduated from senior high school (41.1%), and the least were graduated from universities (only 5.8%). Based on the complications, there were more subjects with disease complications (55.8%) than subjects who had no complications (44.1%).

Complications of disease in this study were hypertension, gastrointestinal disorders (gastritis), gout and lupus.

Table 2 shows that in both of the pre-intervention and post-intervention conditions. Average hemoglobin level of the subjects was still below normal; 9,24±1,31 g/dl in the pre-intervention and of 9,50±1,28 g/dl in post-intervention. However, there was an increase in the average hemoglobin level in post-intervention compared with pre-intervention. The results of the normality test data with the Shapiro-Wilk test showed that the data were normally distributed with p-value=0.320 on pre-intervention and p-value = 0.648 on post-intervention. Therefore, bivariate analysis of changes in hemoglobin level of hemodialysis patients with the provision of nutritional support could be continued with paired T-test. The paired T-test results showed that provision of nutritional support did not significantly affect the hemoglobin level of hemodialysis patients, with p-value = 0.208 (p>0.05).

Table 2. Changes of Hemoglobin Level in Hemodialysis Patient with The Provision of Nutritional Support after 21 Days

Time	Mean ± SD	Min	Max	p-value
Pre-intervention	9,24 ± 1,31	6,50	11,40	0.208
Post-intervention	9,50 ± 1,28	6,60	11,80	

Adult subjects dominated this study, and female subjects rather than male. This is suitable with the general description of Chronic Kidney Disease (CKD) patients undergoing hemodialysis in Indonesia. Indonesian Renal Registry (IRR) reports that in 2011 89% of CKD patients undergoing hemodialysis whose age are 35–70 years with the most age group 45–54 years (27%).

Population based surveys, such as the National Health and Nutrition Examination Surveys (NHANES), conduced periodically in the USA, have indicated that 13% (or 26,000,000) of adults have CKD, (60% of these have 3rd stage of CKD) based on the application of the eGFR-MDRD and KDOQI-CKD criteria as a representative sample of the general population. Similar results have been reported from many other countries. Not surprisingly, the majority of subjects diagnosed having 3rd stage of CKD are elderly and female. Over 80% of the patients are above 80 years old; more than two-third have no abnormal proteinuria; and the ratio of female : male is 1.27 (5).

Most of the subjects in this study have graduated from senior high school and only a few of them have graduated from universities. Patients who have higher education will have a broader knowledge also allows patients to control themselves in overcoming the problems faced, have high self-confidence, experience, can predict the right way to overcome the incident and easily understand what is recommended by health workers and can reduce anxiety so that they can help these individuals in making decisions (6). Knowledge or cognitive is a domain that is very important for the formation of an action. Behavior based on knowledge will be more lasting than that which is not (7). The most significant factor affecting nutritional compliance of haemodialysis patients is behavior (8).

The study found most of the subjects have complication of diseases. Loss of kidney function leads to uremic syndrome, a complex phenomenon involving dysfunction of many organ systems in the body. The hemodialysis procedure also can contribute to uremic malnutrition through augmented amino acid losses in dialysate. Moreover, treatments designed to prevent one uremic complication can lead to another (9). Complications of disease in this study include hypertension, gastrointestinal disorders (gastritis), gout and lupus, that could be the effects of uremic complications on hemodialysis.

Anemia is one of the complications happen in this study. The result indicated that in both of the pre-intervention and post-intervention conditions, the average hemoglobin level of the participants was still below normal although it increased during the intervention. For example, in the pre-intervention the average of hemoglobin level was 9.24 g/dL then in the post-intervention it incresed to 9.5 g/dL. On the unadjusted base model for the risk analysis of death based on the hemoglobin model, the hemoglobin range 9≤Hb<10 had OR=1.55. It meant that the patients having a range of hemoglobin 9≤Hb<10 g/dL in their blood, they would have a chance to die 1.55 times greater than those having a hemoglobin range of 10 g/dL or more (10).

All subjects in this study always consumed 100% of the given catfish abon, because the researcher controlled it by sending a Short Message Service (SMS) reminder to the subjects. Nutritional monitoring by using SMS reminder effectively improve the dietary adherence of hemodialysis patients (11).

Even though all subjects always consumed 100% of the given catfish abon, the increase of hemoglobin levels, found in this study, was certainly not only influenced by the nutritional support provided, but also may be influenced by the intake of nutrients from other food sources as an addition of nutritional support in the catfish abon. This study did not analyze the effect of total nutritional intake or nutrient intake from the other sources to the hemoglobin level. That was the limitation of this study.

The increase of the average hemoglobin level of hemodialysis patients after the provision of nutritional support formed of catfish abon was not statistically significant (p-value=0.208). This result proved that providing nutritional support for protein sources in catfish abon can help to increase hemoglobin level on hemodialysis patients, although it was not statistically significant.

The level of protein consumption needs to be considered because the lower level of protein consumption will affect to suffer from anemia (12). Catfish abon is containing protein with high biological values. Theoritically, high-protein foods with high biological values can improve the health status of hemodialysis patients. The insignificance of the bivariate analysis results on this study were caused by other factors which can influence the occurrence of anemia in hemodialysis patients as a result of lacking of nutrient intake. That was the limitations of this study. These factors include blood loss associated with dialysis procedures, inflammatory conditions, and also erythropoietin (EPO) deficiency produced in the kidneys, which is the main factor causing anemia in hemodialysis patients (13).

In general, anemia in patients with chronic kidney failure is caused by reducing hemoglobin in the blood due to blood collection for laboratory tests or blood trapped or left behind in hemodialysis devices so that erythropoietin production is also reduced. The other cause of anemia on hemodialysis patients is also the resistance to recombinant human erythropoietin therapy with epoetin alfa (αEPO). It is related to a low serum iron reserve, an inflammatory state, poor nutritional status, and continuous usage of angiotensin receptor blockers (ARBs) (13). Iron deficiency in CKD patients requires the use of iron supplementation, and the latter may benefit from additional erythropoietin stimulating agents (ESA) when hemoglobin is below 10 g/dL (14).

4. Conclusion

Provision of nutritional support increases the average of hemoglobin level during the intervention, although it does not statistically affect the hemoglobin level of hemodialysis patients. It is best to monitor the patient's intake, especially protein sources, continuously in order to maintain the nutritional status of hemodialysis patients. Further research regarding the provision of nutritional support for hemodialysis patients is needed. It should be taking into account of other factors that can affect the dependent variable.

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