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The Effectiveness of Nutritional Monitoring by Text Message Reminders in Controlling Albumin Levels in Hemodialysis Patients

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A B S T R A C T

Background: One of the major problems contributing to hemodialysis failure is patient compliance. The support that can be given as a form of attention to patients can take the shape of continuous nutritional monitoring using a simple, effective, and efficient method, namely short message service (SMS) reminder. This study aimed to explore the effectiveness of nutritional monitoring using SMS reminder in controlling albumin levels in hemodialysis patients.

Methods: This was a quasi-experimental study with a pre-post design with one control group, involving 30 participants recruited through purposive sampling technique. The inclusion criteria were being >18 years of age, willing to be a participant and follow the procedure, having a cell phone and being able to operate it, and being able to read and write. Patients with systemic edema and malignancy complications were excluded. The independent variable was nutritional monitoring by SMS reminder, while the dependent variable was albumin level. An independent t test was used to compare the mean changes in albumin level between the groups.

Results: After the intervention, 100% of the participants in both groups had normal albumin levels. However, the mean change was significantly greater in the treatment group compared with the controls (0.87 mg/dL vs 0.57 mg/dL, $p = 0.04$).

Conclusion: Nutritional monitoring by SMS reminder is effective in managing the albumin level of hemodialysis patients.

Introduction

Chronic kidney disease is one of the noncommunicable diseases with high prevalence in Indonesia. From the data of Riset Kesehatan Dasar (Basic Health Research) in 2013, the prevalence of chronic kidney disease in Indonesia was 0.2%, while the prevalence rate for both Special Region of Yogyakarta and Central Java was 0.3%. One of the major problems contributing to hemodialysis failure is patient compliance [1]. As reported by the BalanceWise Study, only 19% of participants told that they followed the hemodialysis diet 90% to 100% of the time. More than half of the participants reported having problems related to specific behavioral factors (e.g., feeling deprived), technical difficulties (e.g., tracking nutrient intake), and physical condition (e.g., appetite), but issues of time, food preparation, and behavioral factors tended to be the main determinants of reported dietary intakes. Longer duration of hemodialysis was associated with lower intakes of protein [2].

The study at Klaten, Central Java, Indonesia, found that the mean participant energy intake was 847.8 kcal or 16.6 kcal/kg BW/day (should be 35 kcal/kg BW/day), protein intake 32.3 g or 0.6 g/kg BW/day (should be 1.2 g/kg BW/day), sodium intake 277.5 mg, fluid intake 814.4 ml, and interdialytic weight gain 2.3 kg. This shows that the energy, protein, and sodium intake of the participants on average was not sufficient, while the average fluid intake exceeded the hemodialysis diet guidelines. The average interdialytic weight gain exceeded the ideal interdialytic weight gain which should only be 1.5 kg [1]. The data for hemodialysis patients could

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be obtained not only by the monitoring of the weight changes but also by the examining of the blood, including the albumin level.

The amino acid and protein losses during a dialysis session also lead to low nutrient availability for muscle synthesis [3]. This condition can cause malnutrition and hypoalbuminemia in particular. A decrease of 1 g/dL in serum albumin is associated with an increased risk of mortality by 47%, which is associated with inflammation in hemodialysis patients [4]. Hypoalbuminemia in hemodialysis patients is a cause of concern, as it has been associated with increased morbidity and mortality; thus, monitoring albumin levels in these patients is necessary.

Several factors influence the dietary compliance of hemodialysis patients, including knowledge, family support, attitude, and behavior. Behavior has been shown to be the most effective factor in dietary compliance of hemodialysis patients (p value = 0.024; B = 18.996) [5]. Patient's behavior is influenced by the mentoring efforts of those around them. The support that can be given as a form of attention to patients can be provided through continuous nutritional monitoring using a simple, effective, and efficient method, namely, short message service (SMS) reminder. This SMS-reminder support is intended to encourage patients to follow the diet recommended by their nutritionists. This study aimed to explore the effectiveness of nutritional monitoring by SMS reminder to control albumin levels in hemodialysis patients.

Subjects and methods

This controlled clinical trial was conducted at the Hemodialysis Unit of Dr. Soeradji Tirtonegoro Hospital, Klaten, from January to October 2016. The study involved 15 participants in the treatment group and 15 participants in the control group, recruited via purposive sampling. The sample size was determined using the mean difference formula. The inclusion criteria were as follows: being >18 years of age, willing to be a participant and follow the procedure, having a cell phone and being able to operate it, being able to read and write. Patients with systemic edema and malignancy complications were excluded.

Patients in the treatment group were sent daily short text messages containing educational material related to the hemodialysis diet for 1 month. The messages were sent at about 08:00 in the morning and always ended with the slogan "Sehat Bugar dengan Penerapan Diet Hemodialysis yang Tepat," meaning "get healthy by applying the right hemodialysis diet," to increase the participants' motivation for applying the given hemodialysis diet. The control group only received nutritional counseling from hospital nutritionists according to standard hospital protocol.

Blood albumin levels were evaluated before and after the intervention, and the mean change was compared between the two groups using an independent t test. The characteristics of participants in this study included age, gender, and the body mass index (BMI). Statistical analyses were performed using SPSS 21.

Ethics committee approval (198.4/FIKES/PL/IV/2016) was obtained from the Health Research Ethics Committee, Faculty of Health Science, Universitas Respati Yogyakarta.

Results

The characteristics of the participants are shown in (Table 1).

Table 1. Characteristics of study participants

Variable	Category	Group			
		Treatment		Control	
		n	%	n	%
Age	Adult (< 60 years)	15	100	10	66.67
	Elderly (≥ 60 years)	0	0	5	33.3
	Total	15	100	15	100
Gender	Male	9	60	8	53.33
	Female	6	40	7	46.67
	Total	15	100	15	100
BMI, kg/m2	< 18.5 (underweight)	0	0	3	20
	18.5–22.9 (normal)	12	80	7	46.67
	23–24.9 (overweight)	1	6.67	4	26.67

	≥ 25 (obese)	2	13.33	1	6.67
	Total	15	100	15	100

BMI: body mass index

Both treatment and control groups were dominated by patients with Hypoalbuminemia at baseline (Figure 1). At the end of the study, all participants in both groups had normal albumin levels. However, the mean change for the treatment group was significantly greater than for the control group (0.87 vs 0.57, p = 0.04).

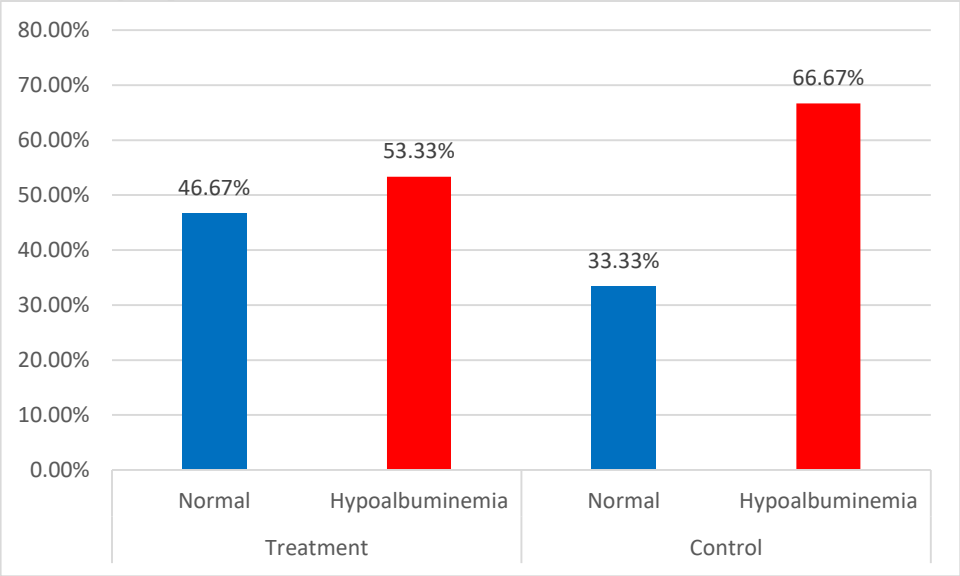

Figure 1. Frequency distribution of participants based on albumin level before treatment

Discussion

This research aimed to explore the effectiveness of nutritional monitoring by SMS reminder in improving blood albumin levels in hemodialysis patients. Hypoalbuminemia is a common complication seen in patients with chronic kidney disease undergoing hemodialysis. [6]. The nutritional status strongly influences the albumin level in the blood of hemodialysis patients. Albumin is an amino acid deposit [7].

Albumin level is a predictor of the risk of death due to malnutrition. Low serum albumin level is a strong predictor of mortality and morbidity among patients undergoing hemodialysis [8]. A 1-g/dL decrease in serum albumin was associated with a 47% increase in mortality risk in hemodialysis patients [4].

In hemodialysis patients, serum albumin concentration is defined by a complex interaction among inflammation, nutrition, and dialysis efficacy [9]. Hypoalbuminemia in hemodialysis patients can be a result of severe malnutrition due to the inflammatory processes in patients with chronic renal failure. Inflammation is associated with anorexia in hemodialysis patients. Chronic inflammation can also result in a decrease in the protein content of skeletal muscle and other tissues, reducing muscle and fat, and resulting in hypoalbuminemia [10].

In addition to inflammation, the hemodialysis process removes protein and vitamins along with dialysate. During hemodialysis, blood will lose 10-12 grams of its amino acids and glucose [11]. Even with sufficient protein intake, it should be noted that the body of hemodialysis patients can lose protein during the hemodialysis therapy process. Patients undergoing hemodialysis need strict restrictions or rules regarding the type and amount of food they consume. Therefore, proper nutrition knowledge dramatically influences the life expectancy of hemodialysis patients [12].

The results of this study showed that nutritional monitoring with SMS reminder was effective in improving the albumin level of hemodialysis patients. Although 100% of the participants had normal albumin levels post intervention, the mean pre-post change was significantly greater in the treatment group.

SMS reminder given in this study not only acts as a form of continuing education but also helps in nutrition monitoring. Mentoring is to help someone find what they want by exploring what resources are needed, the mental attitude that

must be built, and the techniques that are appropriate in implementing it [13]. These results are consistent with the notion that the quality of interaction between health professionals and patients is an essential part of determining the degree of adherence. Patients who enjoy social support are more likely to follow medical recommendations compared with those who lack social support. [14].

Using SMS reminders as an education program was at least as effective as oral supplementation for preventing and even treating malnutrition in hemodialysis patients, improving their nutritional status, which may result in a long-term decrease in the mortality and morbidity of these patients [15]. Jo and colleagues found that consecutive personalized nutritional counseling contributed to increased protein intake and serum albumin levels and decreased muscle wasting, which could also have a positive impact on the nutritional status, particularly in malnourished patients undergoing hemodialysis [16].

In our study, participants who received the SMS reminder were more obedient in consuming protein than those who did not get an SMS reminder. Highest adherence has been observed when both diet and educational efforts are individualized to each patient and adapted over time to changing lifestyle [17]. In well-dialyzed patients, inflammation is the principal cause of decrease in serum albumin, while protein intake plays an insignificant role [18]. If the patient consumes a healthy protein intake or has a good nutritional status, albumin status will be stable.

Albumin concentration in dialysis patients changes with inflammation and nutritional status through their effects on albumin catabolism and synthesis, respectively [19]. Inflammation can be reduced by the increase of the protein intake so that the albumin fractional catabolic rate can be decreased and the albumin level of hemodialysis patients will be increased.

SMS reminder can be used as a means of monitoring nutrition in hemodialysis patients. But this method has weaknesses and limitations that can only be used to patients who have cell phones and can read and write. That is, this method will be difficult to implement for elderly patients who depend on other family members or who do not have a cell phone.

Conclusion

The nutritional monitoring with SMS reminder effectively helps manage albumin levels in hemodialysis patients. It is recommended that hospitals implement nutritional monitoring with SMS reminder to improve dietary compliance of hemodialysis patients, especially for patients who have cell phones and can read and write. Besides, we recommend hospital nutritionists to provide nutritional counseling for patients who do not have a cell phone and are not able to read and write, such as the elderly. Further research is needed on appropriate nutritional monitoring methods to improve dietary compliance of all hemodialysis patients, not limited to ownership of cell phones. A systematic review is required regarding the effect of nutritional education methods on the outcome of hemodialysis patients.

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Author contribution

1 Investigator; study conception and design; data collection, analysis, and interpretation; manuscript draft preparation.

2 Manuscript review.

Conflict of interest

None of authors have conflict of interests.

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