

The Effect of Nutrition Education Program on Biochemical Parameters Among Patients With Chronic Kidney Disease Undergoing Hemodialysis

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Abstract

Background: Nutrition is considered an important part of treatment in patients with chronic kidney disease (CKD). Therefore, poor nutrition leads to decreased life quality and increased complications of hemodialysis as well as mortality in these patients. This study aimed at investigating the effect of nutrition education program (NEP) on biochemical parameters among patients undergoing hemodialysis.

Methods: This quasi-experimental study was conducted on 30 patients who referred to hemodialysis unit at Ayatollah Taleghani hospital in Urmia province, Iran. The sampling method was purposive. Data were collected through interviews and data collection instruments consisted of demographic questionnaires and checklist. In the pre-education stage, the demographic questionnaire was completed and a 2-month average of biochemical parameters (sodium, potassium, calcium, phosphor, blood urea nitrogen, and creatinine) were measured and recorded in the checklist by the researcher. Then, the patients received four 30-minute educational sessions on nutrition using learning assistant tools. Two months after the education program, the laboratory results were measured and recorded again by the researcher. Data analysis was performed using SPSS 14 and paired t test, and significance level was set at 0.05 ($P < 0.05$).

Results: The findings revealed a significant decrease in sodium, potassium, calcium, blood urea nitrogen ($P < 0.05$), but no significant difference was found in the laboratory results of phosphor and creatinine ($P < 0.05$).

Conclusions: The implementation of nutrition education program (NEP) for patients under hemodialysis can improve biochemical parameters as well as complications resulting from their imbalance. Therefore, this program is recommended for this group of patients.

Keywords: Education, Education Program, Nutrition, Biochemical Parameters, Dialysis

1. Background

CKD affects 5% to 10% of the world population and is considered a major public health concern worldwide (1-3). In other words, 50 million people in the world suffer from this disease and this rate is increasing (1, 4). Premature death and decreased life quality are among the consequences of this disease (1). According to a report by ICD, by 2014, there were 53,000 patients with CKD having advanced kidney failure under one of renal replacement therapies. Comparing the annual growth in the number of these patients (6%) with population growth (1.3%) indicates that treatment of these patients is becoming a major medical and economic concern for the country (5). Chronic kidney disease requires extensive changes in diet and life style (6). It is estimated that 40% of patients with chronic renal

failure are at risk of malnutrition (7). This disease causes severe and irreversible malfunctioning of kidneys that result in inability to balance body fluids, electrolytes, and metabolism (4, 8).

The most important health care purposes for patients under hemodialysis are to prevent malnutrition and have suitable nutrition to delay renal osteodystrophy by controlling serum calcium and phosphor; and finally, to encourage the patients to use appropriate nutrition (3, 9). Therefore, these patients need special and continuous education (10). Education is a process in which individuals receive practical, cognitive, and emotional awareness (11). Successful education interventions for patients with chronic diseases lead to increased knowledge. Knowledge is a precondition for change and if people become aware of life style and its effects on their own health, they can

be encouraged toward change in behavior (12). Educating the patients about the disorder can save time and energy and encourages the patient to have a diet that prevents frequent hospitalizations (13). In addition to increasing health care quality, education can improve symptoms, self-control, and independence of the patient (14, 15). One of the methods to determine the effectiveness of education is to examine the results of nutrition program based on laboratory parameters. Among these parameters, creatinine and blood urea nitrogen are key parameters of kidney performance that need to be routinely analyzed (16). Although dialysis leads to decreased mortality among patients with CKD, it is accompanied by increased mineral metabolism risk that leads to increased cardiovascular disorders (17). For example, phosphor is a mineral that exists as phosphate in the nature and has an important role in bone metabolism. Prevention and modification of hyperphosphatemia is a major goal in mineral and bone disorders of patients with CKD. Studies show increased death risk as the result of hyperphosphatemia among patients under hemodialysis. One of the important solutions to achieve this goal is to receive balanced nutrition (18). Hyperkalemia, due to decreased potassium secretion, is also common among patients with CKD. This disorder leads to complications in heart rhythm and finally heart failure. Therefore, it is well known as a risk factor for sudden death and mortality of patients under hemodialysis, and any education on adherence to low potassium level can be effective in decreasing this risk (19). Also, sodium, as one of the important extracellular fluid components, has a crucial role in creating serum osmolality. Sodium excretion problems in patients with CKD put them at the risk of hypertension. Among patients under hemodialysis, sodium balance is dependent on sodium in diet and its secretion through dialysis (20). Despite the importance of nutrition in hemodialysis patients, studies have shown insufficient awareness about proper nutrition in these patients (7, 21, 22). Studies also found favorable clinical results and knowledge of nutrition education in hemodialysis patients. In these studies, nutrition education had positive effects on certain biochemical parameters and no significant impact on some others (7, 12, 22-24).

Among hemodialysis experts, nurses play a special role and due to a close contact with the patients, they are more aware of patients' concerns and can provide suitable suggestions and recommendations (21). The role of nursing education in empowering patients to increase

knowledge and improve adherence to treatment has been confirmed (2). Moreover, education is an efficient method and is among independent and expected roles from nurses and they help the patients as regards to their self-care.

2. Objectives

The present study aimed at investigating the effect of NEP on biochemical parameters (sodium, potassium, calcium, phosphor, blood urea nitrogen, and creatinine) among patients with CKD under hemodialysis.

3. Methods

This quasi-experimental study was conducted on 30 patients who referred to hemodialysis unit at Ayatollah Taleghani hospital in Urmia province, Iran. With the confidence level of 95%, the test power considered to be 80%, and considering the attrition rate, the sample size of 30 patients was estimated.

The sampling method was purposive, and those patients who were interested to participate and also were following diet adherence behaviors were selected through an interview. Those patients who had a plan for kidney transplant or immigration, took an educational courses on nutrition, had consciousness disorders or aphasia, and those who were not interested in continuing the program were excluded.

Data collection was done through interviews, and data collection tool was a researcher-made questionnaire that included age, sex, marital status, education level, job both before and after disease, source and amount of income, and reasons for CKD as well as a checklist to collect information pertinent to laboratory results (sodium, potassium, calcium, phosphor, blood urea nitrogen, and creatinine) in patients. Content validity was used to validate the questionnaire and checklist. Accordingly, after studying the relevant books and articles, data collection tools (questionnaire and checklist) were prepared and sent to the experts of nursing and midwifery at faculties of Islamic Azad Universities of Tehran and Urmia and were modified according to their comments. For reliability, test retest method was used and the questionnaire was completed by qualified patients in 2 stages with a 15-day interval and the correlation was calculated and the reliability was confirmed (0.84). The initial checklist and demographic questionnaire were completed by interview, and the laboratory results (sodium, potassium, calcium, phosphor, blood urea nitrogen, and creatinine) were measured for 2 months before the program, and their mean was recorded as the data before the education program. Prior to program implementation, to learn more, patients were divided into 3 small groups, with 10 patients in each group. Then, equal trainings in nutrition were presented in a face to face manner during 30 days in Four 30 minute sessions per week, using teaching assistant tools (video projector and booklets) by the researcher. Moreover, the researcher

answered the questions raised by the patients. In the education program, explanations were presented to provide the reason why the patients should follow nutrition, and also the list of allowed and restricted foods, how to estimate protein level, and the level of allowed fluids as well as complications resulting from increased laboratory results (sodium, potassium, calcium, phosphor, blood urea nitrogen, and creatinine) were provided. At the third stage of the study, 2 months after the last session, the laboratory results (sodium, potassium, calcium, phosphor, blood urea nitrogen, and creatinine) were measured again and their mean was recorded as the posteducation data. To assess data normality, Kolmogorov-Smirnov test was used. The resulted data were analyzed by descriptive statistics (paired t test) and SPSS 14 with the significance level assumed to be 0.05 ($P < 0.05$). Patients' written informed consent, their justification about nature, method and purpose of the study, confidentiality regarding the information and freedom to leave the study were among the ethical principles that were observed in this study.

4. Results

A total of 30 patients aged 40 ± 13.6 , who were undergoing hemodialysis participated in this study. Most participants were male (58.3%), married (75%), unemployed (78.3%), and literate (65%). The details of demographic characteristics are demonstrated in Table 1.

In this study, the results of paired t test revealed a significant decrease in the mean of sodium, calcium, and blood urea nitrogen ($P > 0.05$) after the program, but no significant change was observed in the laboratory results of phosphor and creatinine. However, their values decreased. In other words, nutrition based program influenced reduction in sodium, calcium, and blood urea nitrogen, but it did not influence phosphor and creatinine levels. The mean of laboratory results both before and after nutrition as well as the significance level are presented in Table 2.

5. Discussion

The present study aimed at investigating the effect of NEP on laboratory results (sodium, potassium, calcium, phosphor, blood urea nitrogen, and creatinine) among patients with CKD undergoing hemodialysis who referred to the hemodialysis unit at Ayatollah Taleghani hospital in Urmia province, Iran. The findings of this study signified the effect of face to face education on a significant decrease in all parameters of interest. However, decreased levels of creatinine and phosphor were not significant. According to a

Table 1. Demographic Characteristics of the Patients (N = 30)

Characteristics	Group (%)	
Age (mean age)	40 ± 13.6	
Gender	Female	41.7
	Male	58.3
Marital status	Single	25
	Married	75
Educational degree	Reading Writing	65
	Diploma	26.7
	Associate Degree	3.3
Employment status before disease	Bachelor and higher	5
	Working	61.7
	Unemployment	38.3
Employment status after disease	Working	21.7
	Unemployment	78.3
	Diabetes	15.8
Primary causes of disease	Hypertension	29.8
	Glomerulonephritis	10.5
	Polycystic Kidney	5.3
	Urologic	3.5
	Congenital	1.8
Source of income	Cause unknown	33.3
	Patient	14
	Patient's family	84
Level of income	Other	2
	Sufficient	4
	Non-sufficient	96

Table 2. Effect of NEP on Biochemical Parameters

Laboratory Results	Before Education	After Education	P Value
Sodium	145.93 ± 2.81	140.70 ± 2.54	0.049
Potassium	5.34 ± 0.49	3.63 ± 0.79	0.020
Calcium	8.47 ± 0.81	7.15 ± 0.56	0.038
Phosphorus	5.70 ± 1.26	5.63 ± 1.32	0.061
Blood Urea Nitrogen	57.47 ± 12.05	50.53 ± 9.22	0.000
Creatinine	7.02 ± 2.34	6.91 ± 2.23	0.226

study by Jafari et al. (2011) on 100 patients under hemodialysis, they found that face to face education leads to decreased urea and creatinine; however, the level was not significant (24). Another study by Ebrahimi and Sadeghi

(2014) on 99 patients under hemodialysis showed that NEP leads to decreased levels of creatinine, sodium, potassium, phosphor, calcium, and albumen (25). Baraz et al. (2014) also investigated the effect of education on biochemical parameters of 63 patients under hemodialysis in 2 groups of oral and visual educations. In this study, oral education led to a significant decrease in creatinine, phosphate, uric acid, and blood urea nitrogen, but no significant effect was found in other parameters such as albumen, calcium, and potassium (23). In another quasi-experimental study, the effect of intervention based on a self-care model on 32 patients under hemodialysis was investigated. The results showed a significant decrease in the intervention on parameters such as sodium, potassium, calcium, urea, and creatinine (26). Among several studies, the findings of one study indicated that the implementation of education program on patients under hemodialysis did not influence calcium, sodium, creatinine, and albumen, but it significantly decreased urea, uric acid, phosphor, and potassium (27). In addition, the results of a quasi-experimental study conducted on 63 hemodialysis patients showed that nursing educational interventions led to a significant reduction in the levels of phosphate, creatinine, and calcium (2). The reason for these differences can be due to difference in economic, educational, custom, and nutrition status in various societies. For example, most of the participants in this study had low educational level and were restricted to a specific society. Different ethnicities have various cultures. Socioeconomic status and cultural variables affect an individual's lifestyle. One limitation of this study was due to its implementation in one dialysis center, which led to lack of considering a control group independent of the experimental group. In our study, nutrition education program significantly decreased levels of sodium, potassium, calcium, and blood urea nitrogen. However, there were not any significant reductions in the amounts of phosphorus and creatinine. Therefore, the use of education interventions to decrease the complications resulted from increased laboratory parameters is highly recommended. The results of this study, in addition to indicating the importance of educating patients under hemodialysis to patients, nurses and managers, is useful for other researchers in this context. The researchers of this study indicated that in all interventions, patients' preferences should be considered and they further suggested that other studies be conducted based on various interventions. Moreover, they stated that the effectiveness of face to face education should be compared with other methods and advised that the impact of educational interventions on other related biochemical parameters be measured.

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Footnotes

Authors' Contribution: Parinaz Jahanpeyma: substantial contributions to conception and study design, data collection, drafting manuscript; Dr Khadijeh Makhdoomi: administrative/technical/material support and final approval of the version to be published; Seyedeh Azam Sajadi: contributions to study design, data analysis and interpretation of data; drafting the article, final approval of the version to be published.

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