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Knowledge of haemodialysis patients about Nutrition: a cross-sectional study from Palestine[†]

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ABSTRACT

Hemodialysis is the most prevalent treatment for the end stage renal disease all over the world. This therapy can extend the live for countless patients, but at the same time, it can result in many mental, social, economic, and physical complication, which in turn can negatively affect their quality of life. Improvement of the nutritional status of hemodialysis patients is an essential component to minimize the complications of the disease. The main aim of the current study is to determine the level of nutrition knowledge and awareness in relation to energy and macronutrients requirements, nutrients with concern during hemodialysis (sodium, potassium and phosphorous), and health complications related to poor nutrition. Interview based pre-tested questionnaire was used during data collection procedure. The collected data consisted of socio-demographic data, medical history, hemodialysis information and nutritional knowledge. The statistical analysis was done using descriptive analysis, Cronbach Alpha was also used to determine the reliability of questionnaire. Independent t-test and ANOVA were done to determine the differences between the selected variables. A total of 200 patients from three different hospitals were involved in the final analysis. The results revealed acceptable reliability for the knowledge questionnaire (Cronbach alpha was 0.71) after deleting 2 items. The mean of the nutrition knowledge score is (5.7 ±1.6). It was confirmed that education level, patient's age, and hospital name has an influence on nutrition knowledge score among patients ($p < 0.05$). Our analysis also reveals that patients has inadequate information regarding the role of macronutrients (especially protein and carbohydrate), and the dietary sources of some micronutrients "e.g. phosphate". Therefore, it is important that qualified doctors, nurses and dieticians, educate hemodialysis patients according to their education levels. We also recommended that hospital staff work together as a medical team to provide the necessary nutritional education to hemodialysis patients. Further studies are needed.

Keywords: Nutrition Knowledge; Hemodialysis; Renal dietitians; Palestine.

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INTRODUCTION

End-stage renal disease (ESRD) is known as an irreversible deterioration of renal function, which is intense enough to be fatal in the absence of transplantation or hemodialysis (HD). ESRD is included under stage 5 of the National Kidney Foundation Kidney Disease Outcomes Quality Initiative classification of chronic kidney disease (CKD), where it points out to individuals with an estimated glomerular filtration rate lower than 15 mL per minute per 1.73 m^2 body surface area, leading to the deterioration of renal function that is no longer enough to maintain life without the use of renal replacement therapy (RRT) in the form of transplantation or dialysis [1, 2].

HD is the most prevalent treatment for the ESRD all over the world. It is well-known that HD can extends the longevity for

incalculable number of patients [3]. However, HD imposes various constraints on these patients and results in many mental, social, economic, and physical complications [4]. A wide range of symptoms during HD therapy is usually reported. The most widely reported symptoms by patients on conventional HD were fatigue, cramping, intradialytic hypotension (IDH), headache, pruritus, back pain, and post-dialysis dizziness [5].

Improving the nutritional status of HD patients is an essential component to minimize the complications of the disease and mortality rates [6]. Moreover, providing adequate knowledge on their diet not only can prevent many possible complications but minimize their present health issues [7, 8]. Patients undergoing HD therapy should take special attention should be taken toward energy, protein, water, sodium, and potassium requirements.

According to recent guidelines, HD patients should consume 25-40 calorie per kg body weight [9] in order to spare protein for tissue synthesis and to prevent its metabolism for energy [10]. They also need to increase their daily protein requirements to 1.2 g/kg of body weight because patients are usually in a chronic state of inflammation, moreover, dialysis is considered as a drainage on body protein [9, 11].

The kidney's ability to deal with sodium and water in ESRD should be monitored continuously by measuring serum sodium intake, blood pressure, fluid weight gain, dietary intake, and edema. The main target for HD patients is to gain fluids less than 4% of their body weight. In order to meet these guidelines, patients should restrict sodium intake from 1500 – 2000 mg/day and limit fluid intake (usually about 750 ml/day plus the amount equal to the urine output) [9, 11].

Furthermore, patients maintained on HD usually needs to limit potassium intake from 3 to 4 g/day. However, the amount of restriction vary from one patient to another depending on several factors including; medications, frequency of HD, urine output, and serum potassium level. Because phosphorous is retained in the plasma, phosphorus intakes also need to be restricted to less than 1200 mg/day [9, 11].

According to the last health annual report, chronic kidney disease is considered the ninth leading cause of death in Palestine by 2.9% [12]. Moreover, it was recorded that the total number of patients on dialysis in the West Bank region was 2071 [12]. Therefore, these patients need nutritional knowledge to improve their well-being and to minimize mortality rates.

Several Palestinian studies have been conducted in order to access the nutritional status and/ or to determine the prevalence of malnutrition among HD patients [13-15]. However, this is the first study of its kind in Palestine regarding evaluating HD patients' knowledge in relation to their energy and macronutrients requirements, and dietary sources of protein, phosphorus, potassium, sodium and fluids.

For this reason, this study is designed to determine the nutrition knowledge and awareness among HD patients in Palestine. Thereafter, patients may be informed about the deficient areas of nutritional awareness. Furthermore, the findings of the current study will help to design educational programs to increase the awareness of the importance of the renal diet on HD patients.

METHODS AND MATERIALS

Study design, settings and population

The study design is observational cross-sectional study. The study population was patients undergoing hemodialysis therapy in three different hemodialysis centers in west bank, Palestine (Alia hospital, Yatta hospital and Jenin hospital).

Sample size

The sample size was estimated depending on the number of hemodialysis patients in each unit. G power software for sample size calculation was used with 5% margin of error and 95% confidence level. The sampling method used in the study is purposive sampling [16]. The inclusion criteria were patients (over 18 years old) under dialysis therapy, willing to participate and to provide all the required data. The exclusion criteria were patients with communication problems, mental problem or feel tired during the hemodialysis prevent them to answer the questions

Ethical Consideration

The study protocol was approved by the Deanship of Scientific Research Ethical Committee at Palestine Polytechnic University committee. Permissions and approval to conduct the study were obtained from the Palestinian Ministry of Health. All patients who go regularly to the hemodialysis unites were invited to join the study, and they were briefed about the study design, objectives, and the type of data that would be collected, with affirmation on the optional participation. Patients who agreed to sign the consent form were included in the data collection.

Data collection and research tool

Interview based pre-tested questionnaire was administered to hemodialysis patients during hemodialysis sessions. Data collection started on September 2017 and ended on March 2018. The collected data included sociodemographic information; age, gender, area of living and educational and economic status, medical history, hemodialysis information and nutritional knowledge.

Nutrition knowledge questionnaire development

The items of the questionnaire were developed after reviewing the guidelines and medical nutrition therapy books for hemodialysis diet and the published papers which explored the nutrition knowledge and awareness of hemodialysis diet among patients [9]. The first draft of the questionnaire was developed by two researchers who are expert of the field and it consisted from 14 items (dichotomous questions), the items concerned about the nutrition diet awareness covering mainly the energy and macronutrients requirements, nutrients with concern in hemodialysis (sodium, potassium and phosphorous), fluids requirement, health complications related to nutrition and others. The questionnaire initially was developed in English then back to back translated to Arabic by official English – Arabic translators. Face validity was done by sending the questionnaire to five experts (3 nutritionists who work on hospitals with hemodialysis patients, 2 measurement expert). After getting the feedback from the assessors the items were decreased to 12 items. After the data collection done, the reliability test was done for the questionnaire using chronbach alpha analysis, which was 0.65, further analysis of reliability was done to examine the reliability if item deleted, and two items were excluded from the analysis to increase the reliability which reach 0.71 for the remaining 10 items. The items were coded to have 1 point for correct answer, 0 for wrong answer and don't know. The total score of the items was calculated and considered as the primary outcome.

Statistical Analysis

The statistical analysis was done using the statistical package for the social sciences SPSS version 21. Descriptive analysis including the means and standard deviation were used to analyze the continuous variables and categorical variables were described in percentage. The inferential statistical tests were used according to the variables and number of groups. Cronbach Alpha was also used to determine the reliability of questionnaire. Independent t-test and ANOVA were done to determine the differences between the selected variables. Chi-square test was used to determine the association between categorical variables.

RESULTS

Patient's Characteristics

Patients' characteristics are epitomized in Table 1. Patients were composed of males (66.2%) and females (39.8%). In the general sample, the mean age was 48.2±16 years, ranged from 18-80 years old. In the general sample. It was revealed that most of the participated patients (73%) are stated to be married, while the rest (27%) are not married "divorced, single, widow". Nearly half of the patients (47%) have received a primary education, (24.7%) have received a secondary education, (15.7%) have obtained a diploma or a degree, and only the minority (12.7%) neither received formal education nor held a postgraduate degree. About three quarter of patients (76.8%) are unemployed, (15.2%) are employed, (8.1%) are retired, while only (0.5%) of the participants stopped working due to kidney disease. Participated patients represent three different hospitals; (57.5%) Alia, (25%) Jenin, whereas the rest (17.5%) represent Yatta hospital. There were signifi-

cant differences according gender in terms of education level, and marital status. The procedure of recruiting patients is described in Figure 1.

Table (1): Socio demographic characteristics of patients according to gender.

Variables		Males 192		Females 98	
		N	%	N	%
Hospital	Alia	54	52.9	61	62.2
	Yatta	13	12.7	22	22.4
	Jenin	35	34.3	15	15.3
Marital status	Married	84	82.4	62	63.3
	Not married (single, divorced, widow)	18	17.6	36	36.7
Level of education	No formal education	2	2	22	22.9
	Primary school	49	48	44	45.8
	Secondary school	29	28.4	20	20.8
	Diploma or degree	21	20.6	10	10.4
	Postgraduate	1			
Work status	Not working	60	58.8	92	60.5
	Working	26	25.5	4	13.3
	Retired	15	14.7	1	6.2
	Stop working after kidney disease	1	1	0	0
Area of living	City	34	55.7	27	27.8
	Out of city (village, camps)	68	(44.3	70	(72.2

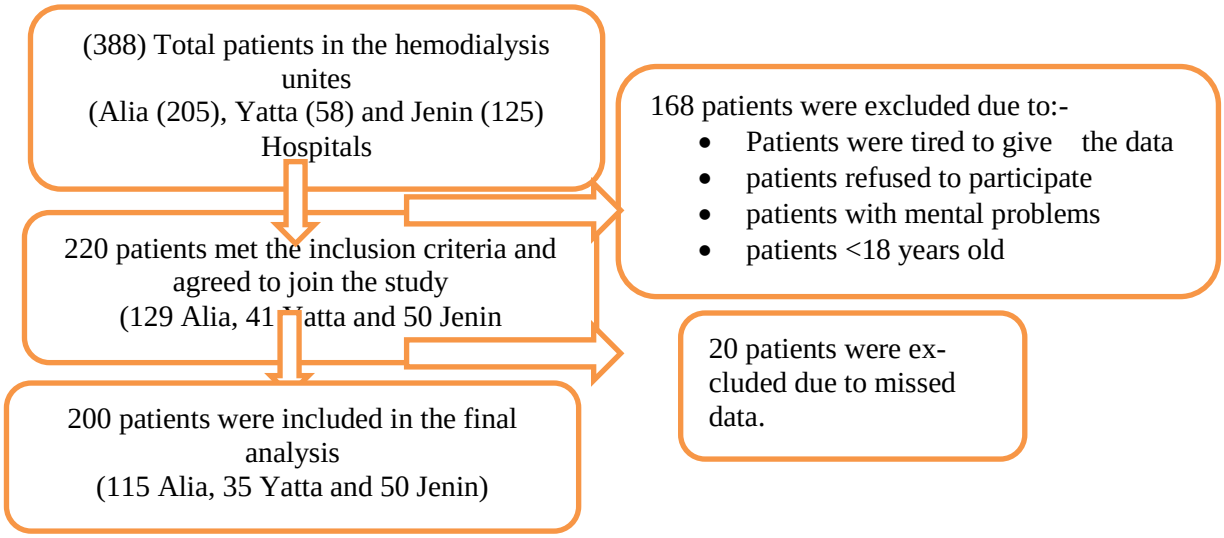

Figure (1): Patients recruitment flow chart.

Patient's Medical History

Most of HD patients suffered from hypertension, and arthritis by 68.5%, and 50.8%, respectively. While a small percentage of the patient's experience gout disease, other health problems "Systemic lupus erythematosus (SLE), hypothyroidism", and vision problems by 11%, 9.9%, and 3.4%, respectively. There were only significant differences according to gender in terms of arthritis.

Hemodialysis information

The mean period of HD session was 36± 35 months. Our data analysis also showed that the majority of patients (79.5%) undergo HD sessions three times per week, whereas 19.5% of patients undergo HD sessions twice per week. Furthermore, 80.5% of HD patients

reported that they use catheter as a route of dialysis.

Complications related to Hemodialysis Therapy

Table 2 summarizes the complications related to HD therapy. Most of the HD patients suffered from fatigue, and itching by 45.5%, and 29%, respectively. Whereas minority of HD patients have reported that they were experiencing from swallowing problems, vomiting, and diarrhea by 9%, 4%, and 3%, respectively. Moreover, there was significant differences among males and females in terms of some complications including; fatigue, hypotension, constipation, nausea, and loss of appetite ($p< 0.05$).

Table (2): Complications of dialysis therapy displayed in frequencies N) and percentages (%) according to gender.

Complications		Total		Male		Female		P value
		N	%	N	%	N	%	
Loss of appetite	Yes	38	19	9	8.8	29	29.6	0.000**
	Sometimes	66	33	32	31.4	34	34.7	
	No	96	48	61	59.8	35	35.7	
Nausea	Yes	35	17.6	9	8.8	26	26.8	0.000*
	Sometime	84	42.2	38	37.3	46	47.4	
	No	80	40.2	55	53.9	25	25.8	
Vomiting	Yes	8	4	2	2	6	6.2	0.198
	Sometime	75	37.7	36	35.5	39	40.2	
	No	116	58.3	64	62.7	52	53.6	
Gastric pain	Yes	26	13.1	13	12.7	13	13.5	0.512
	Sometime	67	33.5	31	30.4	36	375	
	No	105	52.5	58	56.9	47	49	
Constipation	Yes	28	14.1	8	7.8	20	20.6	0.016*
	Sometime	69	34.7	34	33.3	35	36.1	
	No	102	51.3	60	58.8	42	43.3	
Hypotension	Yes	6	18	11	10.8	25	25.5	0.003**
	Sometime	82	41	39	38.2	43	43.9	
	No	82	41	52	51	30	30.6	
Fatigue	Yes	91	45.5	30	29.4	61	62.2	0.000**
	Sometime	75	37.5	47	46.1	28	28.6	
	No	34	17	25	24.5	9	9.2	
Diarrhea	Yes	6	3	1	1	5	5.2	0.055
	Sometime	62	31	27	26.5	35	36.1	
	No	131	65.5	74	72.5	57	58.8	
Itching	Yes	58	29	28	27.5	30	30.9	0.662
	Sometimes	74	37	41	40.2	33	34	
	No	67	33.5	33	32.3	34	35.1	
Swallowing problems	Yes	18	9	7	6.9	11	11.5	0.055
	Sometimes	22	11	7	6.9	15	15.6	
	No	158	79	88	86.3	70	72.9	

*significant at $p< 0.05$ using chi-square test.

Nutrition Intervention

Our results reveal that most of the participated patients have received nutrition consultation related to hemodialysis therapy. The majority of the patients (76.6%) reported that they receive the consultation at the first month of dialysis, followed by17.3% who receive the consultation one month before the session, while a small percentage (5.8%) receive the nutritional education one month before the session. The findings also showed that most patients (59.7%) get the nutrition information from renal dietitians, followed by doctors (26.6%), and nurses (12.3%), while the rest get the information from other sources "e.g. internet". Furthermore, nutrition assessment was not conducted for the majority of the patients (93.1%).

Changes in the Dietary practices between normal days and hemodialysis days

The participants reported changes in the dietary practices during dialysis days as compared to normal days; the number of meals was significantly lower in hemodialysis days ($p<0.05$ using independent t-test). 21% of patients stated that they eat less food during dialysis days. The results also showed that 19.2% experienced loss of appetite, and one quarter of the patients (25%) reported that they feel full faster during dialysis days compared to normal days.

Nutrition Knowledge Score

Table 3 reveals that the majority of patients (81.5%) replied correctly to item number 5 "Dairy products should be limited to 1 serving per day in hemodialysis patients", followed by (74.9%) to item number 1 "Hemodialysis patients need to eat more protein as compared to normal people". Whereas the nutritional knowledge item which got the highest wrong answers was question number 6 "Chocolate, processed meat have high amount of phosphate" where only 30.5% of patients have chosen the correct answer. Detailed results related to nutrition knowledge score is shown in Table 3.

Table (3): Percentages of participated patients responded to 10 nutritional knowledge items.

Item	CA N (%)	WA/ DK N (%)
Hemodialysis patients need to eat more protein as compared to normal people (T)	74.9	25.1
Animal protein is better than plant protein in terms of protein quality (T)	34	64
The amount of calories intake in hemodialysis patients depends on the patient's condition, nutritional status and physical activity level (T)	55.9	44.1
Eating enough amount of protein improve the body defense against inflammation and infections (T)	38.5	61.5
Dairy products should be limited to 1 serving per day in hemodialysis patients (T)	81.5	18.5
Hemodialysis patients need to increase the daily intake of phosphate (F)	62.2	37.4
Chocolate, processed meat have high amount of phosphate (T)	30.5	69.5
Boiling the vegetables is recommended for hemodialysis patients as this will decrease the potassium and other electrolytes (T)	57.4	42.6
Eating enough amount of carbohydrate to protect the muscle and prevent muscle loss (T)	47.2	52.8
Potassium intake is one of the nutrients that must be limited in hemodialysis patients (T)	62.2	37.4

CA: correct answer; DK: don't know; F: false; T: true.

Table 4 presents the relationship between patient's nutrition knowledge and socio-demographic variables. The mean nutrition knowledge scores and standard deviation are displayed according to socio-demographic variables. To detect whether there are differences in the mean nutrition knowledge scores attributed to the socio-demographic variables, the independent t-test (in case of the variable has two levels) and the ANOVA test (in case of the variable has more than two levels) are used. The only significant differences were recognized in the patient's education level, patient's age, and hospital name as p-values were lower than 0.05. As it can be seen, postgraduate patients (8.0±0.0) got higher scores than (5.0±2.2). Furthermore, patients from Alia hospital (5.9±2.3) got the highest score in comparison with the other two groups. Our analysis also reveals the presence of significant correlation between the knowledge score with age using Pearson correlation $p<0.05$.

Table (4): patient's mean nutrition knowledge scores according to socio-demographic variables.

Variables		Mean+SD	P value
Gender	Male	5.8±2.4	0.25
	Female	5.6±2.1	
Hospital	Alia	5.9±2.3	0.002**
	Yatta	5.1±2.2	
	Jenin	5.6 ±2.2	
Area of living	City	5.7±2.2	0.186
	Village	5.6±2.4	
	Camp	5.7 1±2.3	
Level of education	No formal school	5.0±2.2	0.002**
	Primary school	5.5±2.4	
	Secondary school	6.3±1.9	
	Diploma/degree	6.3±2.0	
	Postgraduate	8.0±0.0	
Nutrition consultation	Yes	5.7±2.3	0.719
	No	5.6±2.3	
Search for nutritional information	Yes	6.1±1.6	0.028*
	NO	5.5±1.5	

*significant at<0.05 using independent t-test
**significant at p<0.05 using ANOVA test

DISCUSSION

The current study is designed in order to determine the level of awareness and nutrition knowledge among HD patients. Out of the 10 nutrition knowledge items, there were 5 questions focused on micronutrients "potassium, and phosphate, 4 on macronutrients "carbohydrate, and protein", and only one question about energy requirements.

In the current study, it was observed that the mean nutrition knowledge score, which was (5.7 ±1.6) out of 10, among HD patients was inadequate. The finding is consistent with a former study performed by Montazeri et al where it was about 84% of HD patients had a poor or moderate knowledge of renal dietary recommendations [17]. Our findings also reveal that the patients who had a higher level of education had a higher nutritional knowledge score than those who had a primary or lower level of education. This is being consistent with the findings of Alipour et al. study where they have found a significant positive association between educational levels and nutritional knowledge scores [18]. In a former Palestinian study, it was found that

HD patients with college education had significantly higher SGA score indicative of better nutritional state [14]

Unlike former studies which found that there is no significant association between nutrition knowledge score and patients' age [17, 18], we have found that older patients had a lower awareness and nutritional knowledge score than younger patients. We also did not find any significant correlation between the patients' nutritional knowledge and the duration of dialysis, and gender, and this result is consistent with a study conducted by Alipour et al. [18]. Surprisingly, we did not find a significant association between nutrition knowledge score and nutrition consultation. This is may be because the patients did not receive individualized consultation.

We have found that the main areas of nutrition knowledge that seems to be insufficient among HD patients, as confirmed by lower than 50% of the participated patients answering the nutritional questions correctly, were the role of macronutrients (especially protein and carbohydrate), and the dietary sources of some micronutrients "e.g. phosphate".

In the current study, the knowledge scores of HD patients regarding dietary sources of phosphate were lower than other micronutrients. As it was stated that about three quarter (69.5%) of our patients responded wrongly to the following question "Chocolate, and processed meat have high amount of phosphate". Our results were similar to previous studies [17, 19, 20]. Inadequate control on dietary intake of phosphate leads to adverse effects in hemodialysis patients, such as osteodystrophy, cardiovascular disorders, and hyperparathyroidism [21, 22]. Thus, it is urgent to enhance the nutritional knowledge of hemodialysis patients about dietary sources of phosphate, and to provide them with an adequate education to control their dietary intake of phosphate, which is considered one of the main responsibilities of the medical team, including dietitians, nephrologists, and nurses.

Moreover, the nutritional awareness related to potassium requirements was slightly higher compared to knowledge related to protein and carbohydrate requirements. As only 37.4% of our patients wrongly answered the next question "Potassium intake is one of the nutrients that must be limited in hemodialysis patients". There were no former studies to compare this result. In general, fluctuations in serum potassium may result in cardiac arrhythmia, which is considered dangerous condition for HD patients [23]. Thus, it is fundamental to educate patients and their families about dietary sources of potassium, and how to reduce potassium in vegetables through using various cooking methods.

The knowledge scores related to protein intake were low among our patients. It was responded correctly to the following statements "animal protein is better than plant protein in terms of protein quality", and "eating enough amount of protein improve the body defence against inflammation and infections" by 34%, and 38.5% only, respectively. Our result is consistent with a former study [17]. HD patients lose a high amount of protein during dialysis, thus, they must consume adequate dietary sources of high biological value protein, that produce a low amount of urea, such as fish, egg, and poultry. This recommendation minimizes mortality rates and prohibits protein-energy malnutrition (PEM) among HD patients. [24].

There are a few limitations in the current study. Firstly, we were not able to do anthropometric measurement such as measuring dry and wet weight. Secondly, we couldn't have access to the biochemical data including BUN, creatinine, potassium, etc. Thirdly, we didn't find a validated questionnaire in the Arabic language to assess the nutritional knowledge of HD patients, especially for the different components of a renal diet such as; fluid, electrolyte, and protein. Thus, we attempted to make a questionnaire with these goals and to estimate its reliability and validity. Fourthly, we didn't evaluate the nutritional knowledge of nurses. Nevertheless, the current study provides for the first-time worthy data on the nutritional knowledge and awareness among HD patients.

CONCLUSIONS

The present study reveals that nutrition knowledge score among HD patients was inadequate which could possibly increase the risk of mortality, complications and hospital-

ization. It seems that these patients had not received enough nutritional education to control hemodialysis complications. It was further demonstrated that nutrition knowledge was influenced by educational level, and age. Thus, it is important that qualified doctors, nurses and dieticians, educate hemodialysis patients according to their education levels, especially about dietary sources of phosphorus, and protein and carbohydrate requirements. For example, suitable images, films, and tables could be used to educate illiterate patients about dietary sources of phosphorous. We also recommended that hospital staff work together as a medical team to provide the necessary nutritional education to hemodialysis patients. In this regard, referring HD patients to dietitians by nephrologists can be an important step in controlling the disease's complications. We also recommend using the NKAQH questionnaire in future researches. Furthermore, we encourage future researchers to assess the nutritional knowledge of nurses, as they communicate with patients more than doctors, and dietitians.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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