Original Article

The Effect of Nutritional Education Based on Health Belief Model on Nutritional Knowledge, Health Belief Model Constructs, and Dietary Intake in Hemodialysis Patients

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Abstract

Background: Based on the results of many studies on the relationship between nutritional status and clinical implications in dialysis patients, malnutrition is one of the most important factors associated with mortality in these patients. The current study examined the effect of nutritional education based on Health Belief Model (HBM) on nutritional knowledge, HBM constructs, and dietary intake in Hemodialysis (HD) patients. **Materials and Methods:** One-hundred chronic HD patients entered to this randomized clinical trial in 2017 in Iran; 41 in control group and 45 in intervention group completed the study. Demographic data and four 24-h recalls were collected. To evaluate the nutritional knowledge and HBM constructs, a researcher-made questionnaire was used. Patients were evaluated before, immediately after, and 3 months after intervention. Eight 1-h education sessions in 4 weeks were considered for intervention group. Independent samples *t*-test, Chi-square test, and repeated measures ANOVA were used to analyze the data. **Results:** Repeated measures ANOVA test showed significant increases in scores of the nutritional knowledge test, perceived susceptibility, perceived severity, perceived barriers ($p = < 0.001$), perceived benefits ($p = 0.010$), and self-efficacy ($p = 0.019$) after the study in the intervention group. There were no significant differences between two groups in energy, protein, High Biologic Value (HBV) protein, carbohydrate, fat, cholesterol, fiber, vitamin B2, B3, B6, B12, E, calcium, phosphorus, and potassium intake. **Conclusions:** It seems that education based on HBM can improve nutritional knowledge but in order to influence on dietary intake, longer interventions that are more comprehensive are needed.

Keywords: *Diet, education, hemodialysis, knowledge*

Introduction

Various studies have examined the relationship between nutritional status and clinical outcomes in dialysis patients and have supported the hypothesis that malnutrition is one of the most important factors contributing to mortality in these patients.[1] For a long time, nutrition is considered as one of the essential services in the treatment of Hemodialysis (HD) patients.[2] Nutritional treatment in Chronic Kidney Disease (CKD) reduces symptoms of uremia and anemia, decreases the imbalances of fluid and electrolyte, reduces vulnerability of patients to infections, and restricts catabolism.[3] Patients undergoing HD often struggle to cope with their conditions and deny their need for treatment regimens until the complications of non-observance appear and become intolerable. If patients are aware of the rationale of following the diet and the complications of non-adherence and believing that these complications can endanger their life, they may be more likely to act on recommendations.[4]

Previous studies have shown that knowledge is one of the variables influencing adherence.[5] It has been pointed out that psychological theories-based education can affect the knowledge of patients.[6] Health Belief Model (HBM) is one of the effective theoretical models in the health education. This model shows the relationship between health beliefs and health behaviors and treats behavior as a function of knowledge and attitude of the individual.[7] HBM has six components, including perceived susceptibility to illness or condition, perceived severity of the disease or condition, perceived benefits of predictive action, perceived barriers that

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prevent action, cause to action that affect individual to take action, and self-efficacy.[8] This model is used for nutrition education in a variety of subjects.[9]

Nurses can play an important role in the patients' adherence to diet. Since nurses in the HD department contact with patients at least twice a week for 3--4 h, so they can monitor the behavior of patients more regularly. Adherence to diet of these patients has a significant impact on controlling and improving the complications of the disease, malnutrition, and its complications, and improving their quality of life. Considering the effectiveness of health education based on HBM in other groups with chronic diseases, such as those with diabetes, the aim of this study was to determine the effect of nutritional education based on HBM on nutritional knowledge, HBM constructs, and dietary intake in HD patients.

Materials and Methods

This study is a randomized clinical trial (IRCT2016081811763N29) with control group and is conducted in Rasht, Iran in 2017. The participants in the study included HD patients referring to Razi and Caspian HD centers affiliated to the Guilan University of Medical Sciences who has criteria for entry into the study. Inclusion criteria were: CKD, HD for at least 6 months,[4,10] age between 20 and 70 years,[4,5] stable conditions, nonmalignancy, the ability to collaborate on one-person and group training sessions,[10] no waiting list for kidney transplantation in the next 6 months, and non-pregnancy and lactation. Exclusion criteria included unwillingness to continue cooperation, moving from the center of HD to other centers for any reason, the occurrence of acute and malignant disease, the need for transplantation for any reason. Sample size in current study was determined in order to detect the standardized effect size $\Delta = 0.6$, considering the type one error rate $\alpha = 0.05$, statistical power $1\text{-}\beta = 0.8$, and 20% additional sample for compensating possible attrition resulted $n = 50$ participants in each group. One-hundred patients undergoing HD and eligible to enter the study were invited. We explained the study objectives to qualified candidates and reminded them that if they did not want to cooperate they can leave the study at any time. Then, clients completed the informed consent form and randomly divided into two groups of intervention and control, each group included 50 people. Then demographic data were collected. Eighty-six out of 100 participants completed this study. Five patients from the intervention group and nine patients from the control group were excluded from the study because of unwilling to continue, kidney transplant, transfer to other HD centers, and death; finally, 45 patients were trained in intervention group and the results were compared with 41 patients in control group [Figure 1].

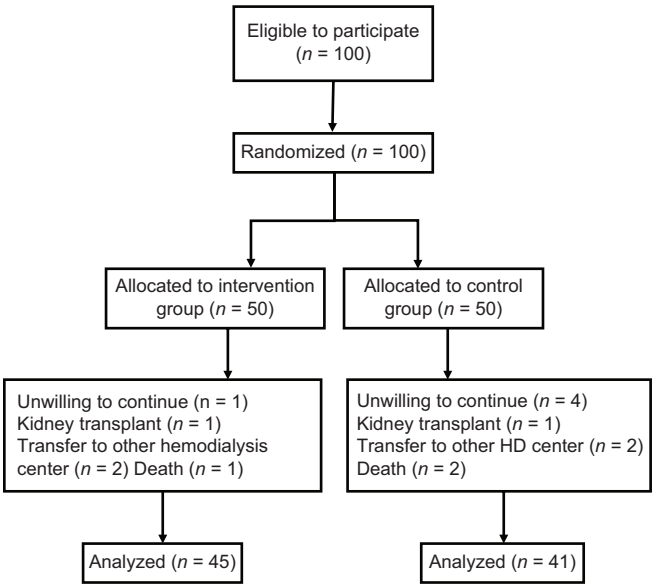

Figure 1: Trial CONSORT flow diagram

Nutritional knowledge and HBM constructs questionnaire was designed by several nutrition, health, and nephrology professors in two sections. The first part of the questions related to nutritional knowledge contains 23 questions with answers yes, no, and I do not know. The second part related to HBM constructs includes 32 questions which follow the Likert scale (perceived susceptibility: eight questions, perceived severity: six questions, perceived benefits: five questions, perceived barriers: six questions, and self-efficacy: seven questions). Face and content validity was determined by applying 10 experts views (a group of four nutritionists, three nephrologists, and three health promotion experts). To determine the reliability, this questionnaire was completed by 30 HD patients, and this was repeated 14 days later. These patients did not enter the main study. Reliability alpha of the HBM constructs and nutritional knowledge part was more than 0.65 (0.65--0.85). The highest and lowest ICCs (corrected item total correlation) belonged to perceived barrier construct (0.92) and perceived susceptibility construct (0.83), respectively ($p < 0.001$). This questionnaire completed by patients at three times including before intervention, immediately after the end of the intervention, and 3 months after the end of the intervention. We used 24-h recall method to assess the dietary intake. These recalls were completed three times by a trained expert for each patient, the first time before the intervention, the second time immediately after the end of the intervention and the third time, 3 months after the end of the intervention. At each stage, four recalls have been completed, 2 days of HD sessions made by phone and 2 days between HD sessions made at their scheduled HD sessions. We used Nutrition IV software to analyze the recalls' data. The variables we investigated in this regard were: energy (kcal), total protein (g), high biologic value (HBV) protein (g), carbohydrate (g), total fat (g), fiber (g), cholesterol (g), thiamin (B1) (mg), riboflavin (B2) (mg), niacin (B3) (mg),

vitamin B6 (mg), folate (B9) (μg), vitamin B12 (μg), vitamin E (IU), vitamin C (mg), zinc (mg), calcium (mg), phosphorus (mg), and potassium (mg).

Eight 1-h education sessions in 4 weeks were considered for patients in intervention group. In-person training was done individually and in groups of 5–6 people using lecture, group discussion, question and answers, role-playing, pamphlets, and booklets during the HD. The education was given based on HBM and according to reliable sources. The content of the education sessions was: (1) perceived susceptibility of patients to their illness and the importance of proper diet for HD patients, its effect on health and complications of non-adherence to diet; (2) perceived susceptibility of patients to their illness, food groups, and substitution lists for renal patients; (3) perceived severity of the complications of non-adherence to diet, protein, its sources, recommended amounts, and complications of inappropriate amounts intake of it; (4) perceived severity of the complications of non-adherence to diet, phosphorus, its sources, recommended amounts, and complications of inappropriate amounts intake of it; (5) perceived benefits of adherence to appropriate diet for patients health, potassium, its sources, recommended amounts, and complications of inappropriate amounts intake of it; (6) perceived barriers to adherence to appropriate diet, sodium and fluids, their sources, recommended amounts, and complications of inappropriate amounts intake of them; (7) self-efficacy to adherence to appropriate diet, fats, the most suitable ones and the proper methods of cooking; (8) self -efficacy to adherence to appropriate diet and a review of previous sessions [Table 1].

SPSS (version 16, SPSS Inc., Chicago, Ill., USA) was used for all statistical analyses. Categorical and continuous variables were reported as frequency (percentage) and mean (SD). Kolmogorov--Smirnov test and Q--Q plot were used for assessing the normality of continuous data. Continuous normality distributed data were compared between groups using independent samples *t*-test while Chi-square test was used for categorical ones. Repeated measures ANOVA were used for evaluating the changes in continuous data over time in each group as well as between groups.

Ethical considerations

To begin the study, we obtained a license from the Faculty of Nutrition and Food Sciences of Isfahan University of Medical Sciences. The ethics committee of Isfahan University of Medical Sciences approved this study (ethical code. IR.MUI.REC.1394.3.962). All of the participants completed the informed consent form.

Results

Analysis of demographic variables showed no significant differences between two groups. 62% of the patients in intervention group and 61% of the patients in control group were male and the mean (SD) for age of these groups were 56.64 (9.85) and 52.95 (11.32) years, respectively. Diabetes, hypertension, or both, were the main cause of end-stage renal disease in 73.30% of the patients in the intervention group and 63.40% of the patients in the control group. The mean (SD) duration on HD was 4.51 (4.62) and 3.65 (4.17) years in intervention and control groups, respectively [Table 2].

Repeated measures ANOVA test showed significant increases in scores of the nutritional knowledge test, perceived susceptibility, perceived severity, perceived barriers ($p = < 0.001$), perceived benefits ($p = 0.010$), and self-efficacy ($p = 0.019$) after the study in the intervention group. In the control group, the results of repeated measures

Table 1: An outline of educational session's content to improve the patients' HBM[1] constructs

Variable	Training goals	Training techniques
Perceived susceptibility	Understanding the relationship between non-adherence to diet and the risk of hypertension, excessive weight gain between two HD[2] sessions, osteoporosis, body and legs edema, and cardiovascular disease	Lecture and using image
Perceived severity	Discussing the relationship between milk and yogurt consumption and itching of the body	Lecture and question-and-answer
	Discussing the relationship between consuming foods high in potassium, such as tomatoes, oranges, legumes, and nuts and causing heart disease	Lecture and question-and-answer
	Discussing the relationship between excessive salt intake and body and legs edema	Lecture and using image
Perceived benefits	Understanding the results of adherence to the diet including reduction of itching, weakness and lethargy, increasing the ability to do daily tasks, reduction of body and legs edema, and improvement of quality of life	Lecture and group discussion
Perceived barriers	Emphasis on what prevents patients from adherence to diet, such as that the HD diet is not more expensive than regular diets, preparing appropriate dishes for a HD patient does not require special skills and is not time consuming also it is not necessary to separate the table from the family.	Lecture and group discussion
Self-efficacy	Increasing patient's ability to detection and selection of authorized foods, control of the water and fluids intake, use of low salt foods, provide delicious and diverse cuisine that appropriate for them	Group discussion and role-play

[1]Health Belief Model, [2]Hemodialysis

Table 2: Basic characteristics of study participants

	Groups		*p*
	Intervention (*n*=45)	Control (*n*=41)	
Age Mean (SD)	56.64 (9.85)	52.95 (11.32)	0.110*
Gender *n* (%)			
Male	28 (62.20%)	25 (61%)	0.905**
Female	17 (37.80%)	16 (39%)	
Marital status *n* (%)			
Married	38 (84.40%)	34 (82.90%)	0.371**
Single	7 (15.50%)	7 (17.10%)	
Educational level *n* (%)			
Diploma and college	13 (28.90%)	11 (26.80%)	0.450**
Under diploma	32 (71.10%)	30 (73.20%)	
Cause of illness *n* (%)			
Diabetes	13 (28.90%)	7 (17.10%)	0.420**
Hypertension	15 (33.30%)	13 (31.70%)	
Diabetes and hypertension	5 (11.10%)	6 (14.60%)	0.545**
Others	12 (26.70%)	15 (36.60%)	
Family history *n* (%)			
Yes	5 (11.10%)	3 (7.30%)	0.627**
No	40 (88.90%)	38 (92.70%)	
Type of access *n* (%)			
Fistula	21 (46.70%)	17 (41.50%)	0.374*
Permcath	24 (53.30%)	24 (58.50%)	0.110*
Length of time on HD1 (year) Mean (SD)	4.51 (4.62)	3.65 (4.17)	
Number of HD per week Mean (SD)	2.87 (0.34)	2.98 (0.27)	

*t-test, **χ^2, 1Hemodialysis

Table 3: Changes over time in mean (SD) knowledge and HBM[1] constructs scores in intervention and control groups

Variable	Groups	Dietary Intake (mean (SD))			*p* time*	*p* group*
		Before intervention	After intervention	3 months after intervention		
Nutritional knowledge	Intervention	50.26 (6.02)	57.75 (4.04)	58.80 (3.59)	< 0.001	< 0.001
	Control	48.41 (5.49)	49.80 (6.19)	47.82 (5.73)	0.012	
Perceived susceptibility	Intervention	26.57 (3.92)	28.46 (2.59)	29.57 (1.88)	< 0.001	0.010
	Control	26.34 (3.88)	27.19 (3.87)	26.21 (3.51)	0.026	
Perceived severity	Intervention	23.51 (4.44)	26.24 (2.61)	25.17 (2.63)	< 0.001	0.002
	Control	23.39 (3.98)	23.29 (3.89)	22.39 (3.54)	0.128	
Perceived benefits	Intervention	24.51 (5.17)	26.08 (3.17)	25.31 (2.27)	0.010	0.008
	Control	25.14 (5.37)	24.65 (5.11)	25.04 (4.23)	0.395	
Perceived barriers	Intervention	12.37 (4.77)	14.71 (3.18)	14.68 (3.21)	< 0.001	0.001
	Control	11.39 (4.25)	11.87 (4.50)	10.78 (3.95)	0.040	
Self-efficacy	Intervention	11.91 (4.81)	12.55 (3.13)	13.64 (2.98)	0.019	0.336
	Control	13.00 (4.13)	13.58 (4.81)	13.19 (3.45)	0.419	

*Repeated measures ANOVA test. [1]Health Belief Model

ANOVA test showed significant differences in the scores of the nutritional knowledge, perceived susceptibility, and perceived barriers between three times but these differences in the nutritional knowledge and perceived barriers scores were negative, that was, the scores after intervention were less than before intervention. The mean (SD) nutritional knowledge score in control group before the study was 48.41 (5.49) and after that was 47.82 (5.73) (p = 0.012). As well as the mean (SD) scores of the perceived barriers were 11.39 (4.25) and 10.78 (3.95) (p = 0.040) [Table 3]. At the end of the study, the results of repeated measures ANOVA test indicated statistically significant differences

Table 4: Mean (SD) changes of dietary intakes over study course in the intervention and control groups

Variable	Groups	Dietary Intake (mean (SD))			*p* time*	*p* group*
		Before intervention	After intervention	3 months after intervention		
Energy (kcal)	Intervention	1623.93 (533.87)	1644.13 (450.30)	1674.64 (458.74)	0.618	0.404
	Control	1710.78 (420.18)	1673.68 (368.46)	1696.27 (399.21)	0.868	
Total protein (g)	Intervention	71.31 (32.38)	71.65 (27.52)	72.43 (26.25)	0.855	0.782
	Control	71.15 (21.98)	70.11 (21.54)	71.48 (22.02)	0.945	
HBV protein (g)	Intervention	24.23 (12.48)	25.15 (11.01)	25.53 (9.81)	0.582	0.735
	Control	24.17 (9.10)	24.29 (8.01)	25.19 (8.91)	0.593	
Carbohydrate (g)	Intervention	226.31 (89.54)	225.11 (76.67)	212.22 (75.31)	0.408	0.079
	Control	244.72 (64.64)	301.41 (83.30)	239.85 (59.16)	0.931	
Total fat (g)	Intervention	49.04 (19.02)	52.91 (16.80)	54.78 (20.83)	0.152	0.886
	Control	49.75 (13.14)	58.53 (17.11)	50.06 (13.29)	0.971	
Fiber (g)	Intervention	9.82 (7.14)	11.93 (7.69)	12.31 (7.10)	0.109	0.270
	Control	13.17 (8.80)	13.60 (9.11)	13.87 (7.83)	0.713	
Cholesterol (g)	Intervention	247.04 (137.88)	246.30 (109.53)	259.87 (111.40)	0.613	0.329
	Control	225.24 (125.28)	239.05 (99.24)	246.26 (114.91)	0.402	
Thiamin (B1) (mg)	Intervention	1.63 (0.54)	1.71 (0.48)	1.77 (0.44)	0.172	0.001
	Control	1.86 (0.45)	1.90 (0.40)	1.94 (0.41)	0.386	
Riboflavin (B2) (mg)	Intervention	1.06 (0.39)	1.11 (0.39)	1.30 (1.21)	0.141	0.925
	Control	1.09 (0.31)	1.17 (0.31)	1.19 (0.31)	0.144	
Niacin (mg)	Intervention	22.97 (11.55)	23.82 (9.64)	31.64 (17.12)	0.198	0.275
	Control	22.05 (11.01)	22.83 (10.22)	23.63 (12.02)	0.519	
Vitamin B6 (mg)	Intervention	1.21 (0.65)	1.36 (0.60)	1.41 (0.60)	0.131	0.239
	Control	1.27 (0.68)	1.44 (0.70)	1.55 (0.66)	0.062	
Folate (µg)	Intervention	172.67 (141.10)	163.67 (118.76)	170.27 (122.52)	0.929	0.019
	Control	131.13 (90.07)	133.83 (98.24)	141.78 (102.18)	0.619	
Vitamin B12 (µg)	Intervention	2.10 (2.23)	2.01 (1.62)	2.24 (2.03)	0.740	0.525
	Control	2.39 (1.84)	2.17 (1.13)	2.20 (1.22)	0.561	
Vitamin E (IU)	Intervention	3.20 (6.09)	3.39 (6.86)	3.40 (5.82)	0.877	0.121
	Control	2.36 (3.04)	2.46 (2.47)	2.34 (2.17)	0.946	
Vitamin C (mg)	Intervention	60.49 (53.46)	90.77 (66.03)	130.04 (74.07)	<0.001	<0.001
	Control	111.67 (85.82)	141.85 (84.53)	164.44 (102.54)	0.010	
Zinc (mg)	Intervention	3.41 (2.14)	3.19 (2.13)	3.63 (2.14)	0.628	<0.001
	Control	2.36 (1.78)	2.33 (1.43)	2.42 (1.51)	0.880	
Calcium (mg)	Intervention	491.49 (261.09)	446.48 (227.15)	439.37 (226.45)	0.301	0.150
	Control	497.24 (203.66)	504.63 (190.63)	492.96 (187.70)	0.920	
Phosphorus (mg)	Intervention	799.78 (324.60)	808.13 (348.33)	797.02 (263.56)	0.967	0.082
	Control	707.55 (214.58)	749.45 (206.82)	768.51 (258.00)	0.226	
Potassium (mg)	Intervention	1667.25 (604.54)	1683.33 (506.49)	1743.00 (513.95)	0.508	0.089
	Control	1524.99 (494.41)	1641.14 (473.52)	1597.38 (508.62)	0.506	

*Repeated measures ANOVA test

between two groups in terms of nutritional knowledge (p = <0.001), perceived susceptibility (p = 0.010), perceived severity (p = 0.002), perceived benefits (p = 0.008), and perceived barriers (p = 0.001), but in terms of self-efficacy, such a result was not achieved. The mean (SD) score of nutritional knowledge of the intervention group was 58.80 (3.59) versus 47.82 (5.73) in the control group. In the intervention group, the mean (SD) score of perceived susceptibility was 29.57 (1.88) versus 26.21 (3.51) in the control group. Regarding perceived barriers, the mean (SD) score of intervention group was 14.68 (3.21) versus 10.78 (3.95) in the control group [Table 3].

Results of dietary intake were shown in Table 4. There were no significant differences between two groups in energy, protein, HBV protein, carbohydrate, fat, cholesterol, fiber, vitamin B2, B3, B6, B12, E, calcium, phosphorus, and potassium intake. Calcium and carbohydrate intake in the intervention group was reduced by 39 mg and 40 g compared with the control group, respectively, but this decrease is not statistically significant (p = 0.150) and (p = 0.079). Repeated measures ANOVA test showed significant differences regarding vitamin B1, B9, C, and zinc between two groups. Dietary intake of vitamin B1 and C were decreased (p = 0.001) and (p < 0.001) and intake of vitamin B9 and zinc were increased (p = 0.019) and (p < 0.001) in intervention group compared with the control group.

Discussion

The results of this study confirmed that an effective nutritional education program plays a considerable role

in the improvement of nutritional knowledge, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy. The results of present study on 86 HD patients showed that the education significantly improves the nutritional knowledge in the intervention group. In a study by Ford *et al*. in 2004, the effects of adding 30-min monthly training to routine training, focusing on phosphorus on knowledge in HD patients were investigated. There was a significant positive effect on knowledge in the intervention group.[11] Ebrahimi *et al*. (2016) reported that 40--60 min educational sessions lasting 3 months significantly improved the dietary knowledge in the intervention group in HD patients.[12] In another study was done by Duzalan *et al*. (2018) on HD patients, it was shown that the dietary knowledge post-test scores significantly increased compared with the pretest scores.[13] This finding is consistent with other two investigations, which demonstrated an improvement in the score of knowledge through education in the intervention group in HD patients.[14,15]

In our study, the mean (SD) score of perceived susceptibility was increased significantly in the intervention group, which means that patients after taking training found themselves exposed to complications of non-adherence to the diet. In this study, the perceived severity score of intervention group increased at the end of the education and 3 months after that. It means that at the end of the study, more patients perceived complications of non-adherence to diet and its costs for themselves and their families, so the likelihood of the properly behavior would be higher. Perceived benefits were increased moderately with education. This finding emphasizes that educated patients had an acceptable perception about the benefits of the diet adherence regardless of their performance. There was a significant difference between intervention and control group regarding the perceived barriers. In other words, the impact of training is to reduce the barriers to adherence to diet. Studying the self-efficacy mean (SD) scores in the current study showed that patients in the intervention group had a significant increase in their self-efficacy, which means that after education their belief in the ability to adherence to diet was higher compared with before education. These findings were in agreement with several studies; Diddana *et al*. (2018) reported that there was a significant improvement in all HBM constructs scores in intervention group through nutrition education based on HBM in pregnant women in Ethiopia.[7] In another study by Jeihooni *et al*. (2015), nutrition education based on HBM aimed at preventing osteoporosis increased the score of all components of HBM in intervention group.[8]

According to the findings of this study, most of the variables of dietary intake after intervention were unchanged in the intervention group. There were no significant changes in terms of phosphorus intake in the intervention group. Lim *et al*. (2018) reported that after 30-min face-to-face education sessions with leaflets focusing on phosphorus in HD patients, its dietary intake did not change.[16] But in the study of Cupisti *et al*., phosphorus intake in HD patients with hyperphosphatemia was significantly reduced following a nutritional education.[10] The intake of protein in the present study did not change significantly in the intervention group, which is consistent with the result of Cupisti *et al*.[10] In the intervention group, although calcium intake decreased by 39 mg, this reduction was not significant in comparison to the control group, but Cupisti *et al*. reported that their calcium intake decreased significantly in the intervention group.[10] There were no significant differences in energy, carbohydrate, fat, cholesterol, fiber, vitamin B2, B3, B6, B12, E, and potassium intake between two groups after intervention. Dietary intake of vitamin B1 and C were decreased and intake of vitamin B9 and zinc were increased in the intervention group compared with the control group after intervention.

It is advisable that healthcare professionals evaluate the role of the family in the patient's treatment plan before trying to help patients to better comply. In addition, if the patient's food is provided by other family members, it cannot be guaranteed that the information about dietary constraints (such as avoidance of foods with high potassium or sodium) available to the person in charge of the food; therefore, family involvement is necessary in patient's training process.[5] In our study, 62% of participants in the intervention group were male and in most Iranian families, women are responsible for preparing food for family members and there were some limitations in the study location laws that prohibit the presence of patient's family members during HD, maybe our study results are affected.

It has been suggested that interventions aimed at upgrading the patient's adaptive behavior should focus on lowering the environmental barriers that prevent patient from responding to recommendations. For example, to increase the utility of the renal diet, several recommendations have been proposed that could be useful. Patients can use flavors such as onion powder, garlic powder, and curry powder in order to eliminate food insomnia. In addition, they can discuss about a variety of foods that can be appropriate for them in a restaurant and the consistent patients can share their experiences on modifying nutritional behaviors.[5] Nurses cooperate with nutritionists on the facilitation of nutritional self-care in patients. It is very important for them to provide an appropriate educational method in dietary management to encourage the patients to adherence to diet and improve their quality of life. What is the best method of teaching for HD patients is still unclear. The present study is the first study to examine the effect of nutrition education based on the HBM in HD patients. The present study contained limitations such that we could not

educate families and care givers due to cost and facilities limitations, also because of considering all aspects of HD diet in this education, the duration of the educational intervention could be greater.

Conclusion

The present study indicated that although nutritional education based on HBM significantly improved the nutritional knowledge and all of the HBM constructs in the intervention group, it had not such an effect on dietary intake. It indicates that making a long-term change in patients' behavior needs continuous monitoring and comprehensive programs through long-lasting interventions and participation of people who are involved in the lifestyle of patients. It is suggested that further studies in this field be carried out in order to achieve more results that are definitive.

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Conflicts of interest

Nothing to declare.

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