Original Article

Evaluating the effect of Pender's health promotion model on self-efficacy and treatment adherence behaviors among patients undergoing hemodialysis

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Abstract:

INTRODUCTION: Health promotion through lifestyle improvement is an important topic that has received considerable attention from the scientific community worldwide. This study aimed to determine the effect of Pender's health promotion model on self-efficacy and treatment adherence behaviors of hemodialysis patients in Shahrekord, Iran, in 2018–2019.

METHODS: This quasi-experimental study was performed on 70 hemodialysis patients who were attending routine hemodialysis sessions in Hajar hospital in Shahrekord. Individuals were selected by simple random sampling and randomly assigned to two groups of control and intervention. In the preintervention stage, all patients completed a questionnaire that was prepared to collect demographic information and measure health-promoting behaviors, self-efficacy, and treatment adherence. The intervention group participated in eight sessions of a health promotion model-based education program. Both groups were asked to complete the questionnaire again immediately after the intervention and also 2 months later.

RESULTS: The repeated measures analysis of variance (ANOVA) showed a significant difference between the two groups in terms of the extent of change in mean scores over the three measurement stages (before the intervention, after the intervention, and 2 months after the intervention) ($P < 0.001$). A statistically significant difference was observed between the two groups in terms of self-efficacy scores in the postintervention and follow-up stages ($P < 0.05$). The repeated measures ANOVA also revealed a significant difference between the two groups in terms of the extent of change in mean treatment adherence scores over the three measurement stages ($P < 0.001$).

CONCLUSION: Considering the positive effects of the program on patients undergoing hemodialysis, it is recommended to use the program to promote the well-being of these patients without time restrictions.

Keywords:
Hemodialysis patients, Pender's health promotion model, self-efficacy, treatment adherence

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Introduction

Chronic renal failure is a progressive, irreversible disorder that impairs the ability of the kidney to remove metabolic waste and maintain fluid and electrolyte balance; an impairment that ultimately leads to uremia and several other severe conditions.[1,2] This disease is a public health problem worldwide.[3] The global prevalence of the condition is about 242 cases per million people, which increases by about 8% every year.[4] The incidence and prevalence of renal failure are increasing even in advance countries such as the United States, where the number of people who have undergone or are undergoing dialysis has increased from 340,000 in 1999 to 651,000 in

2010.[3] In Iran too, the statistics show that the incidence of chronic renal failure has been increasing for many years. In a study by Kazemi *et al.*, the number of patients covered by dialysis centers in Iran was estimated at 11,000. Furthermore, the number of end-stage renal disease (ESRD) patients in 2008, when the country had a population of about 70 million, was estimated to 36,000, a figure that was estimated to grow by 12% annually.[5] Since ESRD is a lifelong medical condition, the survival of ESRD patients depends on their adherence to medical instructions and treatment. Further, nonadherence to treatment can worsen the condition and cause frequent hospitalization, which, in turn, can impose significant burdens on the health-care system.[6] Undergoing hemodialysis treatment completely changes the patient's life, as it requires regular attendance in dialysis sessions, adherence to medications, and major changes in diet.[7] There are generally four therapeutic recommendations for ESRD patients: Limiting fluid consumption, taking dietary precautions (e.g., eating low salt, low potassium, and low phosphorus foods), adhering to medication, and adhering to dialysis sessions.[7-9] Nonadherence to these four behaviors has profound impacts on the clinical outcomes of ESRD patients.[10] However, ESRD patients who receive hemodialysis face many challenges in adhering to treatment.[11]

The devastating impact of chronic kidney failure on the life of hemodialysis patients forces them to make fundamental changes in their lifestyle and requires them to adopt necessary strategies to manage their chronic illness. A person with a high degree of self-efficacy is likely to be more involved in self-care activities, which in turn has an impact on their quality of life and can reduce their mental disorders.[12] Perceived self-efficacy is a person's belief in their abilities to control their own actions and performance levels and the events that affect their lives.[13] People with low self-efficacy are less likely to attempt new health behaviors or change the behaviors to which they are accustomed. Self-efficacy can influence people's motivation and stimulates them to strive and persist in positive behaviors, an attitude that is very important for the treatment of chronic diseases.[14,15] In a quasi-experimental study, performed on 62 dialysis patients in Taiwan, the results showed that increased self-efficacy led to increased adherence to certain therapeutic behaviors such as diet restriction.[16] Health promotion through lifestyle change is an important topic that has received much attention from the global scientific community. Health promotion can be described as the science or art of helping people change their lifestyle to move toward a state of optimal health, a goal that can be achieved through concerted effort to raise awareness, change behaviors, and create an environment that promotes healthy behaviors.[17] One of the prominent models developed in this area is

the health promotion model introduced by Pender in 1982, which is focused on empowering people to achieve higher levels of well-being. Pender has defined health promotion as an enhancement in health and well-being that requires a change in lifestyle, with lifestyle described as a set of behaviors aimed at disease prevention and health promotion. The health promotion model is a theoretical framework for analyzing the factors of health and their relationship with health-promoting behaviors that contribute to the movement toward enhanced wellbeing and quality of life. This model is a guide for understanding the complex biopsychosocial processes that compel people to engage in health behaviors that result in health promotion.[18] Numerous studies have extensively demonstrated the effectiveness of health promotion model-based programs on lifestyle and its associated factors, including self-efficacy, perceived barriers, and perceived benefits to behaviors.[19-21]

Despite the great attention paid by the Global Scientific Community to health promotion through lifestyle change and the enormous investments made in this area and also the especial importance of this subject for hemodialysis patients, there is still no single-organized comprehensive program based on a specific educational model for educating hemodialysis patients. As a result, most hemodialysis patients do not acquire the ability to absorb necessary information regarding their condition, which leaves them wondering what programs to follow and how to follow them. Considering that Pender has also provided a tool for measuring health-promoting behaviors, this concept can be used to develop a comprehensive rehabilitation program based on an educational model for hemodialysis patients. The present study aimed to evaluate the effect of the six dimensions of Pender's health promotion model (responsibility, physical activity, nutrition, interpersonal relationships, stress management, and spiritual growth) on self-efficacy and adherence behaviors of patients undergoing hemodialysis in the city of Shahrekord (Iran) in 2018–2019.

Methods

This quasi-experimental study was performed on 70 hemodialysis patients in the city of Shahrekord in 2018–2019. The inclusion criteria were the willingness to participate in the study, having undergone at least 6 months of dialysis, no mental disorder, and no exposure to other methods of education during the study. The exclusion criteria were the withdrawal of consent, traveling, and undergoing renal transplant.

The research goals were achieved with the help of a multi-part instrument for data collection. This instrument was a multidimensional questionnaire

prepared to evaluate the effect of dimensions of Pender's health promotion model on self-efficacy and treatment adherence. This instrument consisted of four parts. The first part consisted of three items related to demographic characteristics of hemodialysis patients, which were completed at the beginning of the study. The second part was the Health Promoting Lifestyle Profile II (HPLP II), which consist of 52 items in six dimensions including spiritual growth (9 questions), health responsibility (9 questions), physical activity (8 questions), nutrition (9 questions), interpersonal relationships (9 questions), and stress management (8 questions). These items are scored based on a Likert scale, with scores ranging from 1 (never) to 4 (always), A higher mean score indicates better health condition. This standard questionnaire was developed by Pender *et al*. in 1996. Walker and Hill-Polerecky reported a Cronbach's alpha of 0.94 for HPLPII and alphas ranging from 0.79 to 0.94 for its six dimensions.[22] In the third part of the instrument, self-efficacy of patients was measured using a tool called the Strategies Used by People to Promote Health. This tool was developed by Lev, and Owen for assessing self-efficacy in the area of self-care and consists of 29 questions, of which 5 are related to coping, 7 to stress reduction, 3 to decision-making, and 14 to positive attitude. These questions measure the extent of a person's confidence in the four aforementioned areas on a 5-point Likert scale from very low (very little) to very high (quite a lot). The scientific validity of this tool has been verified by the internal consistency method (0.93) and by factor analysis (0.81). Other researchers have also confirmed its scientific validity at 0.93.[23] The fourth and final part of the instrument was the ESRD-Adherence Questionnaire (ESRD-AQ) developed by Kim (2009). This 41-item self-report tool measures the patient's adherence to four treatment-related behaviors: hemodialysis attendance, medications, fluid restrictions, and diet prescription. The face validity and construct validity of ESRD-AQ have also been established by the same researchers. The reliability of this tool has been reported to be about 0.83.[24]

After receiving approval for the research design and acquiring authorization, ethics code, and letter of introduction from the Ethics Committee and the Research Department of the Shahrekord University of Medical Sciences, the researcher contacted Hajar Hospital (in Shahrekord) and explained the objectives of the study to the management of the hospital and its dialysis department. After gaining permission from the hospital, the eligible patients were identified and those willing to participate were asked to provide written informed consent. Participants were selected from among eligible patients using the convenience sampling method. Questionnaires of demographic information, self-efficacy, treatment adherence, and health promotion were completed in interviews. Patients were then randomly assigned to two groups, control and intervention, by a random allocation software application [Figure1]. Patients assigned to the intervention group were contacted at the beginning of the education program and were invited in groups to participate in the education process. The sessions were held in one of the rooms of the hospital (intervention was done in the form of group sessions). The program was designed based on the six dimensions of Pender's health promotion theory, namely responsibility, physical activity, nutrition, interpersonal relationships, stress management, and spiritual growth. The program consisted of 45-min sessions held twice a week for 4 weeks [Table 1].

It should be noted that every session started by reviewing the contents of the previous sessions. The sessions involved face-to-face education and the use of videos, clips, booklets, and CDs, which were distributed among participants free of charge at the end of each session. At the end of the last session, participants were given a package containing a booklet of all the materials presented in the sessions plus supplementary materials and a CD containing videos, short clips, relaxation music, software guide, and motivational content. This package was prepared to help patients remember the materials after the program ended. At the end of the program, participants were asked to adhere to the instructed behavior change plans. Immediately after the intervention and 2 months after, all patients in both groups were asked to complete the self-efficacy, treatment adherence, and health promotion questionnaires again. After completing the questionnaire for the third time, patients in the control group were also given a free copy of the education package (booklet and CD). The collected data were analyzed using SPSS software (version 22). This analysis was performed by the use of centrality

Table 1: Contents of the sessions designed based on Pender's health promotion model

| Session number	Dimension	Contents
First session	Awareness	The nature of the disease, its risk factors, and therapeutic methods
Second session	Responsibility	Health responsibility, relaxation exercises, rest, and counseling
Third session	Physical activity	The types of exercise allowed, the frequency, duration, and intensity of exercise
Fourth session	Interpersonal relationships	Mental health and interpersonal relationships
Fifth session	Nutrition	Healthy diet and medication therapy
Sixth session	Stress management	Stress, stressors, stress aggravating factors, stress management
Seventh session	Spiritual growth	Spiritual issues and the use of spiritual counseling
Eighth session	Q and A	Summary of contents covered in previous sessions
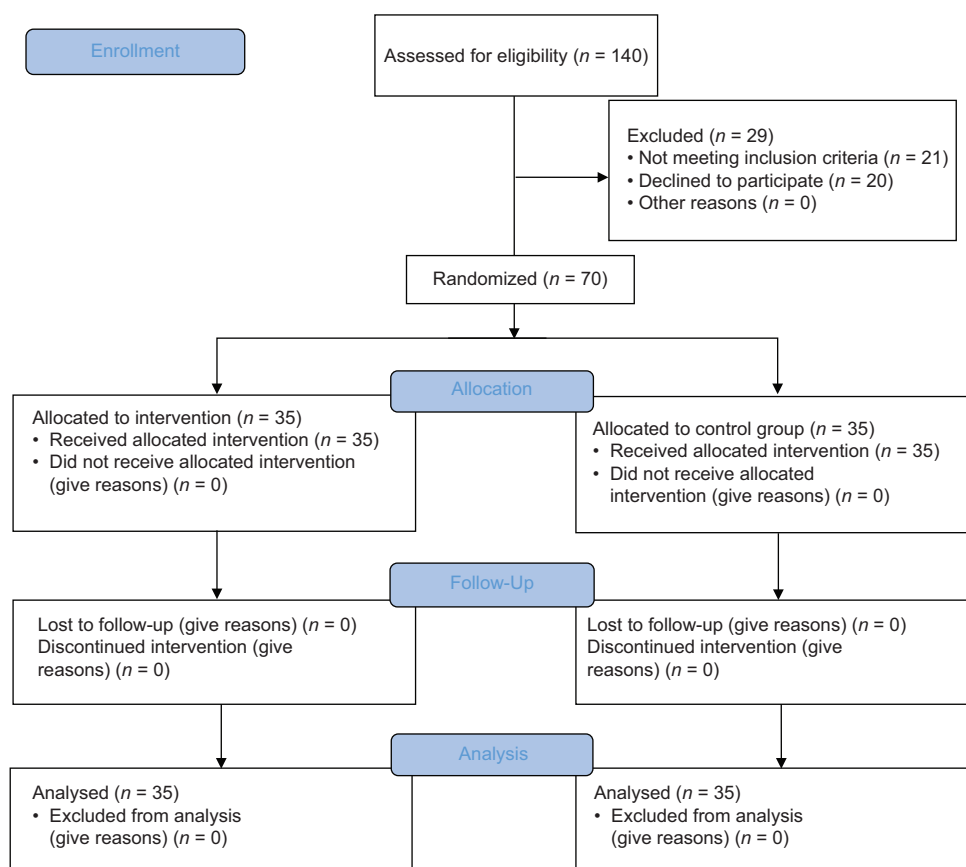
Figure 1: The consort diagram of the number of family caregivers and the reasons for their exclusion the intervention phase in the intervention and control groups

and dispersion measures and statistical tests. Before the statistical tests, the Kolmogorov–Smirnov test was performed to determine whether data have a normal distribution ($P > 0.05$). Ultimately, data were analyzed using repeated-measures analysis of variance (ANOVA).

Ethical considerations

Required permits were acquired from the Research Department and the Ethics Committee of the University of Medical Sciences. The study was performed with advance coordination with the hospital from which patients were selected. Before enrollment, the objectives of the study were explained to potential subjects and those willing to participate were asked to provide informed consent. Confidentiality and privacy requirements, including those related to the use of names and personal information of patients, were respected at all stages of the study. Participants were allowed to leave the study at any time. The research and the program did not impose any cost on the participants. The education materials and data collection instruments were used in full compliance with copyright laws and requirements. The results of the research were shared with the competent authorities as well as participants. After the final stage of data collection, the contents provided to the intervention group were also provided to the control group.

Results

The mean age of the intervention group was 37.9 ± 7.01 and the control group was 38.29 ± 10.29. There were more male participants than female. In terms of marital status, 54% of participants were married. A plurality of participants had a bachelor's degree. Regarding income, a majority of people in both groups stated that they are of low income. A plurality of people in both groups was unemployed. A majority of people in both groups were suffering from the disease for more than 5 years [Table 2].

The results showed that there was no significant difference between the HPLP scores of two groups before the intervention ($P = 0.77$), but the independent *t*-test detected such a difference in the postintervention stage and in the 2-month follow-up ($P < 0.001$). The repeated measures ANOVA showed a significant difference between the groups in terms of the extent of change in mean HPLP score over the three measurement stages (before the intervention, immediately after the intervention, and 2 months after the intervention) ($P < 0.001$) [Table 3].

The results also showed that while there was no significant difference between the mean self-efficacy scores of the two groups before intervention ($P = 0.68$),

they were significantly different in this respect in the postintervention and follow-up stages (*P* < 0.001). The repeated measures ANOVA also showed a significant difference between the two groups in terms of the extent of change in these scores over the three measurement stages (before the intervention, immediately after the intervention, and 2 months after the intervention) (*P* < 0.001) [Table 4].

Regarding the treatment adherence behaviors, the results showed no significant difference between the two groups in terms of mean adherence score before the intervention. However, such a difference was detected in both postintervention and follow-up stages (*P* = 0.47). The repeated measures ANOVA also showed a significant difference between the groups in terms of the extent of change in mean adherence score over the three stages of measurement (before the intervention, after the intervention, and 2 months later) (*P* < 0.001) [Table 5].

Discussion

The results showed that an education program based on the six dimensions of Pender's health promotion model managed to successfully change the behavior (self-efficacy and treatment adherence) of the intervention group, as the patients who participated in this program showed significantly higher self-efficacy and adherence scores both immediately after the program and 2 months after (compared to patients who did not participate in the program).

In a study by Chehri (2018) on the effect of a program based on Pender's health promotion model on the quality of life of patients with heart failure in a select group of army hospitals, it was found that the use of this program had a significant impact on the quality of life of these patients and managed to improve various aspects of their wellbeing including physical functioning, physical role functioning, public health, vitality, social role functioning, and mental health.[25] A study by Yavuz and Hacialioğlu on the effect of an education program based on the health promotion model on the lifestyle behaviors and life quality of obese adolescents also reported that the program had a significant impact on adolescents' lifestyle.[26] These reports are consistent with the findings

Table 2: Comparison of qualitative demographic characteristics of the study groups

Variable	Frequency (%)		P
	Intervention	Control	
Gender			
Male	26 (76.1)	20 (77.1)	0.075
Female	9 (23.9)	15 (42.9)	
Level of education			
Elementary	7 (20)	12 (34.3)	0.567
Below high school diploma	9 (25.7)	8 (22.9)	
High school diploma	10 (28.6)	9 (25.7)	
Higher education	9 (25.7)	6 (17.1)	
Marital status			
Single	14 (37.1)	14 (42.9)	0.82
Divorced	2 (8.6)	3 (8.6)	
Married	19 (54.3)	18 (48.5)	
Income level			
Sufficient	1 (2.9)	5 (14.3)	0.149
Relatively sufficient	8 (22.9)	10 (28.7)	
Insufficient	26 (74.2)	20 (57.1)	
Employment			
Employed	2 (5.7)	4 (11.4)	0.817
Unemployed	21 (60)	20 (57.2)	
Retired	5 (14.3)	5 (14.3)	
Homemaker	7 (20)	6 (17.1)	
History of the disease (years)			
≤5	8 (22.9)	10 (28.7)	0.574
>5	27 (77.1)	25 (71.4)	

Table 3: Mean and standard deviation of health promoting lifestyle profile scores and the results of independent *t*-test and repeated measures analysis of variance for the three measurement stages

HPLP	Mean±SD		Independent *t*-test (*t*, *P*)
	Control group (*n*=35)	Intervention group (*n*=35)	
Before the intervention	134.28±18.01	133.84±19.74	0.13, 0.77
After the intervention	133.91±20.10	154.71±14.46	3.22, <0.001
2 months after the intervention	134.62±18.84	155.66±12.84	3.36, <0.001
Repeated measures ANOVA (*F, P*)	43.36, <0.001		

The range of HPLP scores is between 52 and 208. HPLP=Health promoting lifestyle profile, ANOVA=Analysis of variance, SD=Standard deviation

Table 4: Mean and standard deviation of self-efficacy scores and the results of independent *t*-test and repeated measures analysis of variance for the three measurement stages

Self-efficacy	Mean±SD		Independent *t*-test (*t*, *P*)
	Control group (*n*=35)	Intervention group (*n*=35)	
Before the intervention	50.37±34.61	51.85±36.11	0.41, 0.68
After the intervention	51.68±31.36	87.25±34.55	4.66, 0.001
2 months after the intervention	51.57±57.03	83.66±34.11	3.73, <0.001
Repeated measures ANOVA (*F, P*)	43.36, <0.001		

The range of self-efficacy scores is between 29 and 145. ANOVA=Analysis of variance, SD=Standard deviation

Table 5: Mean and standard deviation of treatment adherence scores and the results of independent *t*-test and repeated measures analysis of variance for the three measurement stages

Treatment adherence behaviors	Mean±SD		Independent *t*-test (*t*, *P*)
	Control group (*n*=35)	Intervention group (*n*=35)	
Before the intervention	854.21±189.11	845.15±180.31	0.11, 0.47
After the intervention	1023.91±199.21	869.71±172.41	4.31, <0.001
2 months after the intervention	988.61±179.84	875.66±193.84	4.11, <0.001
Repeated measures ANOVA (*F*, *P*)	54.13, <0.001		

The range of treatment adherence scores is between 0 and 1200. ANOVA=Analysis of variance, SD=Standard deviation

of the present study in suggesting that an education program based on Pender's health promotion model can change the behavior of a wide variety of patients in regard to many dimensions of wellbeing.

The findings of the present study also showed a significant increase in the self-efficacy score of the intervention group after the program. Research has shown that increasing self-efficacy in hemodialysis patients will lead to better weight control between hemodialysis sessions, less frequent hospitalizations, reduced rate of amputation, better disease complication control, and improved quality of life and life satisfaction.[27] In this regard, a study by Mohseni *et al*. on the effect of an educational intervention based on Pender's health promotion model on the self-efficacy of heart surgery patients for self-care behaviors showed that perceived self-efficacy changed significantly over time and the mean self-efficacy score in the intervention group was significantly higher than that in the control group.[28] The results of the present study are also in agreement with these findings.

Another finding of this study was the significant impact of the health promotion model-based education program on the treatment adherence behaviors of patients, as the mean score of adherence treatment significantly increased after the intervention. Treatment adherence is of vital importance for hemodialysis patients. In a systematic review by Schmid *et al*. titled "Adherence to prescribed oral medication in adult patients undergoing chronic hemodialysis," it was reported that 67% of the results show nonadherence to oral medications, despite its life-threatening consequences. In conclusion, these researchers stated that nonadherence to medication is still a major obstacle to achieving desirable therapeutic outcomes for hemodialysis patients.[9]

The results reviewed above clearly suggest that education programs, especially those based on Pender's health promotion model, can have significant impacts on different aspects of the wellbeing of chronic patients. The findings of the present study also showed the impact of the prepared health promotion program on self-efficacy and treatment adherence of hemodialysis patients. Therefore, it is highly recommended to develop

and use such programs to improve the life of these patients. Furthermore, health-care managers, planners, and policymakers and other relevant authorities are recommended to consider implementing rigorous education programs based on Pender's health promotion model for hemodialysis patients to improve their treatment adherence and other outcome-related factors and increase their participation in positive health and social activities.

Considering the findings of this study, future studies are suggested to examine the effect of similar programs on other variables and other chronic diseases. Since the results of this study were based entirely on self-report and questionnaires, future studies are also recommended to investigate the effects of the intervention by laboratory means.

One of the limitations of the present study was the lack of examination of the patient's mental state at the time of completing the questionnaires, a matter that was beyond the control of the researcher. Nevertheless, the researcher attempted to choose an appropriate time and place for data collection. In future works, it is recommended that the questionnaires be completed at a time other than dialysis days.

Conclusion

An education program developed based on Pender's health promotion model managed to improve the mean score of self-efficacy and treatment adherence of patients undergoing hemodialysis. This program was designed in multiple segments dedicated to six dimensions of health promotion (responsibility, physical activity, nutrition, interpersonal relationships, stress management, and spiritual growth). Given the substantial positive impact of this program on self-efficacy and adherence behaviors of hemodialysis patients, it is recommended to use the program to promote the wellbeing of hemodialysis patients without time restrictions.

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Conflicts of interest

There are no conflicts of interest.

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