



Original Article

The Effect of Educational Intervention Based on PRECEDE Model on Improving Self-care Behaviors of Diabetic Elderly

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Abstract

Introduction: Improper lifestyle and unfavorable self-care in diabetic patients have led to the emergence and spread of complications and problems caused by the burden of the disease. This study was conducted with the aim of determining the effect of an educational intervention based on the PRECEDE model on improving the self-care behaviors of diabetic elderly.

Methods: This is a semi-experimental study that was conducted on 200 elderly people with diabetes referring to Fasa diabetes centers in 2019-2020. The experimental group was trained in self-care skills based on the PRECEDE model in 6 training sessions of 50-55 minutes. Before and after the intervention, the self-care behaviors of the patients and the constructs of the PRECEDE model were measured in both groups using questionnaires. After entering the SPSS version 20 software, the data were analyzed using independent t-test, paired t-test and chi-square test.

Results: In the experimental group, the average score of their self-care behaviors increased significantly from 101.31 ± 36.2 to 139.01 ± 35.8 ($P < 0.001$), also in the experimental group, the mean scores of all constructs of the PRECEDE model increased significantly after the intervention ($P < 0.05$). In the control group, there was no significant change in the average score of the constructs of the PRECEDE model and self-care behaviors before and after the intervention ($P > 0.05$).

Conclusion: The results of the study indicated the effectiveness of the educational program based on the PRECEDE model on improving the self-care behaviors of the elderly with diabetes.

Keywords: Aged, Diabetes mellitus, Life style, Self-management



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Introduction

Today, with the increase in life expectancy, one of the basic problems in human health is chronic diseases (1). Diabetes is one of the most common chronic diseases, so that the World Health Organization (WHO) has named it as a silent epidemic. This disease is one of the most important aspects of health care in developed and developing countries (2,3). The trend of diabetes has been increasing in recent years, so it is predicted that the population of people with diabetes will increase by 122% by 2025 (4,5). With 4 million deaths per year, this disease accounts for 9% of all deaths in the world, and in many countries, it is considered the most important cause of high blood pressure between the ages of 40 and 70 (6,7).

According to the report of the WHO, changing and modifying lifestyle plays a very important role for

preventing complications in these patients (8-11). The most important factor in controlling chronic diseases is lifestyle modification, which can be a basis for improving the quality of physical and mental performance of patients (12). Education in the field of lifestyle increases people's awareness and changes attitudes towards unhealthy habits and behaviors (13). When a person becomes aware of the positive impact of a healthy lifestyle during education and realizes its role in controlling the disease and preventing its complications, the person will have the opportunity to practice healthy behaviors (14).

Educational intervention in life style and the application of basic methods in self-management habits and behaviors can have a significant effect on disease control and blood pressure control in diabetic people (15). The major part of the responsibility for the control and management of



diabetes lies with the affected person, self-management is known as the basis of diabetes care, and in the proper management of diabetic patients, self-management education is considered as a key component of care (16). Self-management is an active and practical process that is directed by the patient and is an operationally defined set of behaviors that patients with diabetes perform on a daily basis to achieve diabetes control. These behaviors include adjusting the diet, exercising, taking medications, self-monitoring blood sugar levels, and taking care of the feet (17).

Having enough information is also an effective step to achieve self-management and a desirable lifestyle and control complications such as blood pressure in diabetes patients (18,19). In Abazari and colleagues' study, the lack of knowledge about diabetes was mentioned as the most important obstacle to achieve self-management and control of diabetes (20).

Today, education is one of the most important axes of health care (21) and the field of health education and promotion emphasizes improving lifestyle and self-management by increasing people's participation in health-related activities, and it is one of the best ways that people can improve their health, maintain and control themselves. This can be reached by using appropriate and optimal educational strategies (22). Traditional education in meeting the knowledge needs of patients with diabetes is not enough to lead to behavior change, so there is a need to use basic educational approaches based on defined theories and models (23). Theory and models provide a systematic view of events or successes and are a regular process for analyzing successes or failures and as a map of the educational process, provide the necessary guidance for educational planning and intervention design, and facilitate evaluation (24,25). Although there are many models for health promotion, but studies have shown that using PRECEDE model is more suitable for planning and designing health promotion programs (26).

The PRECEDE model is a framework and a design model for behavior change and examines the possible results of an educational program. This model takes into account all the educational needs to promote health from different aspects of values, beliefs, attitudes, and flexibility. It is acceptable, evaluable and has a process structure (27). PRECEDE model provides a framework by which predisposing, reinforcing, and enabling factors are determined as agents affecting behavior in educational diagnosis, and the most useful application of this model is to explain the factors related to behavior (28,29).

Although a lot of research has been done in the field of education for diabetes patients, we still see inappropriate lifestyles, unfavorable self-care, and the spread of complications such as high blood pressure and problems caused by the burden of the disease on society and patients. Therefore, considering that in the field of self-care of diabetic patients, educational interventions in the form of effective educational models such as PRECEDE

model have been done less, this study was conducted with the aim of investigating the effectiveness of educational intervention based on PRECEDE model on the self-care behaviors of diabetic elderly.

Materials and Methods

Research Population and Sampling

This research was an interventional study that was conducted in 2019-2020. The study population was elderly patients with type 2 diabetes covered by Fasa Diabetes Center, Fars province, Southern Iran. The sample size according to other studies (11,15), 44 cases were obtained in each group (88 cases in total), and in this study, 100 cases were considered in each group (200 cases in total) which were investigated and studied. The samples were randomly selected from among the type 2 diabetic elderly referring to Fasa Diabetes Center based on the inclusion criteria. The inclusion criteria included age of 60 years, having an active file in the diabetes center, having a history of diabetes for more than 10 years. The exclusion criteria were unwillingness to continue participating in the study and absence of more than two training sessions.

In this study, based on the criteria of the study, 250 type 2 diabetes elderly patients who had files in the diabetes center were contacted and invited to participate in the study program, some of them announced their withdrawal from participating in the program. Finally, 200 patients were randomly selected and placed randomly (one in the middle) in two experimental and control groups (100 patients in each group). In this way, the first person was in the experimental group and the second person was in the control group. The next people were placed in these two groups in the same way.

Data Collection Tools

Data collection tools included demographic and background variables, PRECEDE model constructs questionnaire and diabetes self-care behaviors. Demographic information included age, gender, marital status, monthly household income, education, duration of diabetes, and family history of diabetes.

The PRECEDE model constructs questionnaire included 5 parts of knowledge, attitude, self-efficacy, reinforcing and enabling factors, which were designed by researchers using questionnaires of similar studies (24,26). The knowledge questionnaire was measured with 20 four-choice items in which a correct answer was given a score of one and a wrong answer was given a score of zero, and a higher score indicated more knowledge of diabetes. The attitude construct was measured with 10 items with a 5-point Likert scale ranging from strongly agree (score 5) to strongly disagree (score 1). Achieving a higher score in this questionnaire indicated the positive attitude of the patients towards performing diabetes self-care behaviors. Perceived self-efficacy was measured with 10 items with a 5-point Likert scale ranging from not at all (score 0) to very high (score 4). Obtaining a higher score in this

questionnaire indicated a higher self-efficacy of patients to perform diabetes self-care behaviors. Reinforcement factors with 10 items related to receiving support from family members (parents, siblings, etc), relatives, friends, doctors, and healthcare workers with a 5-point Likert scale from not at all (score 0) to very high (score 4) was measured. Enabling factors were measured with 10 items on a 5-point Likert scale ranging from not at all (score 0) to very high (score 4).

The face validity of the questionnaire was checked by 40 diabetic elderly people with demographic, economic, and social characteristics similar to the target population and confirmed after grammatical corrections. In order to determine the content validity, the opinions of 12 experts in the field of health education and promotion (10 people), nursing (1 person), and nutritionist (1 person) were received with an expert panel. In the following, the indexes of content validity ratio and content validity index were estimated and confirmed. The internal reliability of the questionnaire (Cronbach's alpha) among 30 diabetic elderly for knowledge, attitude, self-efficacy, strengthening factors and enabling factors were estimated 0.86, 0.88, 0.84, 0.82 and 0.89, respectively.

Self-care Behaviors Questionnaire

The self-care behaviors questionnaire included 35 items that were designed in 5 dimensions. These dimensions include self-organization with 10 items (related to the ability of diabetic patients to integrate daily life activities with diabetes such as proper diet, physical activity, and weight control), self-regulation with 9 items (related to the self-regulation of patients' behavior through monitoring physical symptoms about diabetes), interaction with health professionals with 9 items, self-monitoring (4 items), and adherence to medication regimen (3 items). All the items were measured based on a 5-point Likert scale ranging from strongly agree (score 5) to strongly disagree (score 1), and obtaining a higher score indicated the desirability of the offending dimensions of self-care behaviors. The validity and reliability of the questionnaire has been confirmed in Iranian society (30,31).

Intervention

Questionnaires were completed before the educational intervention in both experimental and control groups. Then, based on the results of the pre-test, an educational intervention was implemented for the experimental group in the 6 educational sessions in the form of lectures, questions and answers, group discussions and practical demonstrations, showing videos and educational images and PowerPoint. The duration of each session was 50-55 minutes. In these sessions, regarding the definition of blood pressure and the subsequent problems of uncontrolled blood pressure, healthy eating education, the necessity of continuous exercise, and walking at least three days a week, the necessity of basic medication use, continuous control of blood pressure, and self-management of behavior

change (quitting smoking and alcoholic beverages and stress management) and self-development, interpersonal support, and responsibility were presented. One of the sessions was held with the presence of a family member, diabetes center staff and a doctor, and the role of supporters in blood pressure control was emphasized.

Next, a WhatsApp group was formed and training booklets were delivered to the participants of the intervention group. Educational and motivational messages were sent to the WhatsApp group on a daily basis. Also, in order to increase their experience and skills, the participants had the opportunity to communicate with other participants and could provide their information to others, and the possibility of asking questions was available for all participants. Finally, in order to comply with ethical principles, the control group also received educational materials after completing the study.

For better education and the role of support groups and friends, people were divided into groups of 10 people and materials were presented at different times. 3 months after the completion of the educational intervention, the questionnaires were completed by the participants of the two experimental and control groups. According to the incentives considered during the study, all the participants of both groups were present in the study until the end.

Data Analysis

The data were analyzed by SPSS-20 software using chi-square, independent *t* and paired *t* tests at a significance level of less than 0.05.

Results

The average age of the experimental group was 67.21 ± 3.28 years and the control group was 69.06 ± 3.04 years ($P=0.202$). Also, the average duration of diabetes in the experimental group was 29.39 ± 7.35 years and in the control group was 28.11 ± 8.12 years ($P=0.204$). The results of the independent *t* test also showed that there was no statistically significant difference between the two groups in terms of age and duration of diabetes.

Chi-square test showed that the participants of the experimental and control groups in terms of variables of education level ($P=0.184$), household monthly income ($P=0.215$), history of diabetes in the family ($P=0.342$), marital status ($P=0.275$), and gender ($P=0.266$) did not have a statistically significant difference with each other (Table 1).

The mean and standard deviation of the PRECEDE model constructs before and after the intervention in the two groups are listed in Table 2. The results of the present study showed that based on the results of the independent *t* test before the educational intervention, there is no significant difference between the average scores of the constructs of knowledge, attitude, self-efficacy, enabling and reinforcing factors between the two experimental and control groups ($P>0.05$), but 3 months after educational intervention, a statistically significant difference was

Table 1. Comparison of the Demographic and Background Variables of the Participants of the Experimental and Control Groups

Variables		Experimental Group (n = 100)	Control Group (n = 100)	P Value
		No. (%)	No. (%)	
Education	Illiterate	7 (7)	5 (5)	0.184
	Primary	15 (15)	14 (14)	
	Secondary	35 (35)	33 (33)	
	High school	33 (33)	30 (30)	
	Academic	10 (10)	18 (18)	
Gender	Female	67 (67)	61 (64)	0.266
	Male	33 (33)	39 (39)	
Marital status	Single	4 (4)	2 (2)	0.275
	Married	88 (88)	90 (90)	
	Divorced	4 (4)	6 (6)	
	Widow	4 (4)	2 (2)	
Family history of diabetes	Yes	24 (24)	29 (29)	0.342
	No	76 (76)	71 (71)	
Monthly household income	Under 40 million Rials	32 (32)	34 (34)	0.215
	40 to 80 million Rials	45 (45)	42 (42)	
	Above 80 million Rials	23 (23)	24 (24)	

Table 2. Comparison of the Average Scores of the PRECEDE Model Constructs in the Experimental and Control Groups, Before and 3 Months After the Educational Intervention

Variables	Group	Before	After	P Value ^a
		Mean $\pm$ SD	Mean $\pm$ SD	
Knowledge	Experimental	7.33 $\pm$ 1.89	16.11 $\pm$ 7.69	<0.001
	Control	7.10 $\pm$ 7.67	8.10 $\pm$ 3.46	0.284
	P value ^b	0.175	<0.001	
Attitude	Experimental	21.40 $\pm$ 2.72	43.41 $\pm$ 14.2	<0.001
	Control	21.41 $\pm$ 9.41	22.40 $\pm$ 7.83	0.261
	P value ^b	0.193	<0.001	
Self-efficacy	Experimental	12.32 $\pm$ 10.6	34.31 $\pm$ 13.5	<0.001
	Control	12.30 $\pm$ 9.02	13.32 $\pm$ 8.13	0.159
	P value ^b	0.317	<0.001	
Reinforcing factors	Experimental	14.35 $\pm$ 10.17	33.30 $\pm$ 3.64	<0.001
	Control	13.31 $\pm$ 9.23	14.32 $\pm$ 6.43	0.148
	P value ^b	0.322	<0.001	
Enabling factors	Experimental	9.20 $\pm$ 9.82	32.31 $\pm$ 14.1	<0.001
	Control	11.20 $\pm$ 7.42	13.23 $\pm$ 12.2	0.159
	P value ^b	0.144	<0.001	

^a P values obtained by comparing differences in the variable values between the two groups, using independent *t* test.

^b P values obtained by comparing means in the variable values within each group, using *t* test for paired data.

observed in the mean scores of the PRECEDE model constructs between the two groups ($P < 0.001$). As listed, the educational intervention improved the scores of knowledge, attitude, self-efficacy, enabling, and reinforcing factors in the experimental group compared to the control group ($P < 0.05$).

The results of the independent *t*-test showed that there is no significant difference between the average score of

diabetes self-care behaviors between the two experimental and control groups before the educational intervention ($P > 0.05$). However, 3 months after the educational intervention, a statistically significant difference was observed regarding the average scores of self-care behaviors between the two groups ($P < 0.001$). As listed, the educational intervention improved the scores of self-care behaviors in the experimental group compared to the control group ($P < 0.05$) (Table 3).

Discussion

Considering that the theoretical basis of this research was the PRECEDE model, the predisposing factors of the educational diagnosis stage of the PRECEDE model, which included the knowledge and attitude of the research samples towards the disease, were investigated and analyzed. Regarding knowledge as the most important predisposing factor in the PRECEDE model, the average knowledge score of the patients before and after the educational intervention in the experimental group compared to the control group had a significant difference, which showed that the intervention increased the level of knowledge of the patients. Bazpour and colleagues' study (32) on various aspects of the quality of life of adolescents with thalassemia immediately and one month after the intervention showed a significant increase in the average score of the patients' awareness. The results of the study were similar to the results of Wang and colleagues' research (28) on the patients' quality of life of patients suffering from heart failure, Khani Jeihooni et al regarding the promotion of osteoporosis prevention behaviors (33), Koç et al (34), and Kaewchi et al (35). The use of group discussion training, brainstorming, and the participation of people and peers in this method leads to the sharing

Table 3. Comparison of the Average Score of Diabetes Self-care Behaviors in the Experimental and Control Groups Before and 3 Months After the Educational Intervention

Variables	Group	Before	After	P Value ^a
		Mean $\pm$ SD	Mean $\pm$ SD	
Self-organization (10-50)	Experimental	18.46 $\pm$ 12.34	35.91 $\pm$ 12.35	<0.001
	Control	19.89 $\pm$ 15.95	20.95 $\pm$ 10.39	0.184
	P value ^b	0.204	<0.001	
Self-regulatory (9-45)	Experimental	32.46 $\pm$ 9.26	38.45 $\pm$ 9.21	<0.001
	Control	31.71 $\pm$ 8.18	31.61 $\pm$ 8.22	0.175
	P value ^b	0.177	<0.001	
Interaction with health professionals (9-45)	Experimental	29.14 $\pm$ 4.15	36.40 $\pm$ 6.74	<0.001
	Control	29.40 $\pm$ 5.11	30.41 $\pm$ 4.27	0.199
	P value ^b	0.203	<0.001	
Self-monitoring (4-20)	Experimental	12.13 $\pm$ 8.41	16.11 $\pm$ 6.42	<0.001
	Control	11.19 $\pm$ 7.30	11.69 $\pm$ 6.41	0.187
	P value ^b	0.199	<0.001	
Adherence to the drug regimen (3-15)	Experimental	9.12 $\pm$ 2.08	12.13 $\pm$ 1.14	<0.001
	Control	8.10 $\pm$ 2.11	9.26 $\pm$ 2.21	0.194
	P value ^b	0.179	<0.001	
Total Score (35-175)	Experimental	101.31 $\pm$ 36.2	139.01 $\pm$ 35.8	<0.001
	Control	100.29 $\pm$ 38.6	103.91 $\pm$ 31.5	0.114
	P value ^b	0.201	<0.001	

^a P values obtained by comparing differences in the variable values between the two groups, using independent *t* test.

^b P values obtained by comparing means in the variable values within each group, using *t* test for paired data.

of information and experiences, and this feature is more important in our study because of a large sample size. The characteristic of learning in group work is that this method emphasizes the importance of the role of the learner, the learning process and environment. The hidden power in such environments creates a sense of understanding and friendship, and especially the feeling that their power in the groups is greater than when they are alone, therefore, it leads to more effective educational intervention.

In this study, the educational intervention had a significant effect on the attitude of the patients. Studies such as the research by Chaboksavar et al (36), Lin et al (37), Hlaing et al (38), Shanta Bridges et al (39) found the same results. In fact, proper education is not only a process through which knowledge is acquired, but also a process through which values and attitudes are explored. In this study, the use of teaching and group discussion methods along with practical techniques such as role playing, brainstorming and problem-solving skills, considering the benefits such as activating people's minds and developing skills such as creative thinking and active participation in learning led to the improvement of people's attitudes. A change in people's awareness alone, if it does not lead to a change in a person's attitude and beliefs, does not cause a purposeful change in behavior. Patients' self-efficacy was another construct of the model that the educational intervention had a significant effect on.

The results of this study showed that the patients had a low self-efficacy score before the study and it seems that increasing awareness and sufficient attitude towards the

disease in this study will lead to an increase in self-efficacy. On the other hand, increasing self-efficacy in diabetic patients plays an important role in compliance with treatment and disease control. The results of the present study are in line with the research results of Whatnall et al (40), Ebadifard Azar et al (41), who were able to improve the self-efficacy level of patients by using educational strategies and believe that self-efficacy is an important variable to improve the self-management behaviors of diabetes patients.

Barasheh and colleagues' study (42) showed that in order to improve the situation of diabetes and its proper control, interventions should be used that lead to an increase in self-efficacy. In this study, the average score of enhancing factors increased significantly after the intervention. In our study, the support of family members and friends played a vital and strengthening role, the support of family members means accepting the patient with the current condition, and in chronic patients, the support plays an important role in the patient's self-management. The study of Solhi et al (43) also showed that the support of health workers, family members, and friends of diabetic patients has an important strengthening role in the self-care of these patients. Therefore, the results of our study were consistent with other studies in this field (44,45), the only difference being the number of training sessions and sample size. The average score of the enabling factors as the last construct of the PRECEDE model after the educational intervention had a significant effect. Increasing awareness and attitude variables, self-efficacy and enhancing factors have led to

the improvement of enabling factors. Enabling factors are important factors that led to changes in self-care behaviors in elderly diabetic patients participating in this research.

When diabetic patients have sufficient and correct knowledge along with a positive attitude towards lifestyle modification and self-management and feel that they have the ability to perform such behaviors and environmental factors are also in their control, and the family member, the doctor responsible for diabetes, and the employees of the diabetes center encourage them, their intention to improve their lifestyle and self-care will become more important and as a result, the complications of the disease will decrease. The study of Shanta Bridges et al (39) showed that in the educational intervention of depression awareness to prevent suicide in African American college students using the PRECEDE model, the enabling factors in the intervention group increased significantly after the training, which was in line with the results of our study. With the difference that in the mentioned study, the peer education method was used and the study was designed with only one group as a pre-test, post-test and follow-up. In Ebadifard Azar and colleagues' study (46) using the PRECEDE model to improve the quality of life of diabetic patients, the enabling factor increased significantly after the educational intervention in line with our study. In the study of Doshmangir et al (47), participation in educational classes, provision of educational resources, and acquisition of skills to perform regular physical activities in old age were determined as enabling factors, and the average of enabling factors in the intervention group increased after providing these factors and similar to our study, there was a significant difference.

In this study, the self-care behaviors of the patients were measured as one of the most important pillars of diabetes control and prevention of its complications. Based on the results of the study, before the study, the average score of self-care behaviors of the patients in the control and experimental groups did not have a significant difference, which indicated the homogeneity of the samples in both groups. However, in the intervention group, training caused a significant change in the average score of patients' self-care behaviors in all dimensions. The dimension of self-discipline of patients in the experimental group increased significantly after training. In this study, the researchers provided effective educational intervention and increasing the level of understanding and awareness of the patients, providing the context for the coherence and organization of the patient's thoughts and care perspective, which ultimately led to the promotion of desirable self-care behaviors, the result of which is in line with similar studies (48,49).

The educational intervention had a significant effect on the average score of self-regulation in the experimental group. In this study, creating motivation and practicing self-reinforcement and punishment skills was very effective in curbing negative behaviors and strengthening positive behaviors of patients in order to achieve

desirable self-regulation behaviors, which is considered as a strength compared to similar studies. The results of the study by Habibzadeh et al (50) showed that the self-management training of diabetes patients in the form of group discussion is more effective than the usual training on the self-regulation dimension of patients. The results of the educational intervention of Weng et al (51) on self-care behaviors and blood sugar control of 100 diabetic patients indicated a significant effectiveness of the training of the experimental group compared to the control group. The difference between these two studies and our study was in the non-use of the educational model of PRECEDE in the intended intervention.

The comparison of the average score in the area of interaction with health professionals showed that the desired intervention has been able to have a significant impact on this area, which is consistent with the results of the study by Ranaei et al (11), Habibzadeh et al (50), Liu et al (52), Ahmed et al (53) and Ren et al (54) were similar. However, the intervention method, follow-up period, subjects under study, and our sample size were different from the aforementioned studies. The average score of interaction with health professionals was very low before the educational intervention and increased significantly after the intervention, improving the effective communication of the patient with health professionals and health workers will lead to an increase in patient satisfaction and will lead to better compliance with the treatment and care regime. As a result, the patient will recover faster and the complications will be reduced. In many cases, the failure of patient interaction with health professionals is caused by a lack of awareness and communication knowledge. In the current study, the focus of the sessions was on improving the patient's communication with health professionals, which has been very effective based on the results.

The mean self-monitoring score of the patients after training in the experimental group increased significantly. Self-monitoring is one of the most important self-care behaviors to control the disease and prevent complications in diabetic patients. In the study of Ranaei et al (11), the educational intervention had no effect on the patients' self-monitoring, which is due to the self-clinical activities of the patients in both the case and control groups. The same intervention was performed, the results of this study were not consistent with our study. Baptista and colleagues' study (55) on 25 diabetic patients showed that the educational intervention was effective on the patients' self-monitoring of blood sugar. The results of the study of Mayor (56) were also consistent with the results of our study. The state of adherence to the medication regimen was another area that had a significant improvement after the educational intervention, according to the results of the study by Tong et al (57), the educational intervention along with telephone follow-up increased medication adherence and seizure control in epileptic people. The results of Bahiraei and colleagues' study (58) also showed that face-to-face training on self-management of 87 epilepsy

patients in the form of 3 sessions of 90 minutes increased adherence to the medication regimen, which was in line with the results of our study, with the difference that the duration of training and the sample size in our study were more, and it also had more diverse training methods.

Finally, in this study, the improvement of all dimensions and areas of self-care behaviors led to the improvement of self-care status in diabetes patients, which was in line with similar studies in this field (59-61). The results of Chen and colleagues' systematic review of 37 studies (60) showed that educational intervention of self-care behaviors along with standard care can improve disease outcomes in severe mental illnesses. The key to the accurate control of diabetes is in the optimal self-management of the patient, which should be transformed into an active, daily and active process through the effective educational intervention and the use of effective and efficient educational models such as the PRECEDE model through creating deep understanding and insight in the patient. In this study, self-care behaviors were used in the framework of the PRECEDE model, performing practical skills in order to gain successful experiences and using scenario-based educational methods, role-playing, focused group discussion and doing homework among the strategies used in the classroom. It was to increase the self-management of the experimental group. Saffari and colleagues' study (62) investigated the effect of health education through face-to-face and SMS training methods on the lifestyle and blood pressure of military personnel prone to high blood pressure showed that the SMS training method can be somewhat similar to the face-to-face training method in bringing changes in some behaviors related to lifestyle and blood pressure control are effective. In our study, web-based training methods, including training through WhatsApp, were used as a supplementary method.

Among the limitations of this research, the following can be mentioned: Due to the physical conditions of some patients, it was sometimes accompanied by a decrease in concentration and tolerance of the patients, which was tried to prevent this problem from causing a disturbance in the research process by short interruptions of classes in the form of breaks, receptions, etc. Using self-reporting tools in order to collect information, the participants of the control and intervention groups communicated with each other outside of the training sessions and it was possible to exchange information related to the training interventions.

Conclusion

Educational intervention in self-care behaviors and modification and application of basic methods in personal habits and behaviors and behavioral self-care can have a significant impact on the lifestyle of diabetic elderly. Therefore, the application of the PRECEDE model is recommended as a non-invasive, non-pharmacological, cost-effective, and complication-free method and as a complementary measure along with other methods for the

care and treatment programs of elderly diabetic patients.

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Authors' Contribution

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Competing Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

This study approved in the Ethics Committee of Fasa University of Medical Sciences with ethical code IR.FUMS.REC.1399.179. The informed consent was obtained from the study participants. The objectives, importance, and necessity of the research were explained to the participants and they were assured that their information will remain confidential.

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