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The effect of peer group on self-care behaviors and glycemic index in elders with type II diabetes

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Abstract:

BACKGROUND: Diabetes is one of the most expensive and chronic diseases of elderly age. Knowledge and self-care behaviors play an important role in treating diabetes and preventing its side effects. This study aimed to investigate the effect of peer group on self-care behaviors and glycemic index in the elderly with type II diabetes mellitus in Fasa city, Fars province.

MATERIALS AND METHODS: This quasi-experimental study was conducted on 100 elderly patients with type II diabetes (50 patients in the intervention group and 50 in control group) referred to the diabetes center. Among the elderly, the intervention group was selected as a trainer based on the checklist of the peer group and was trained by the researcher. In addition to the usual care of the diabetes clinic, the patients in the intervention group received training from their peers for 8 weeks during 8–45 min of training sessions. Data were collected using a valid self-reported questionnaire including demographic variables, awareness, and diabetes self-care behaviors (Summary of Diabetes Self-care Activities), as well as free practice (fasting blood sugar [FBS] and hemoglobin A1c [HbA1c]), which was completed by both groups before and 2 months after the intervention. Then, the data were entered into the SPSS statistical software, version 22 and were analyzed using Chi-square test, independent *t*-test, and descriptive statistical methods. $P < 0.05$ was considered statistically significant.

RESULTS: The results showed that the two groups of intervention and test were identical in terms of demographic information. In the intervention group, before and after 2 months of educational intervention, there was a significant difference in increasing awareness and self-care behavior in diet, physical activity, blood sugar testing, foot care, and medication ($P < 0.001$). However, this difference was not significant in the control group ($P < 0.05$). In the intervention group, the mean FBS and quarterly (HbA1c) index decreased significantly ($P < 0.05$).

CONCLUSION: This study showed that teaching self-care program, in the same way, has been effective in improving self-care behavior and blood sugar index in the elderly with diabetes and suggested that this educational method be used in other chronic diseases.

Keywords:

Aged, diabetes, glycemic index, peer group, self-care

Introduction

According to a report by the World Health Organization in 2018, the population of the elderly over 60 years will double from 2015 to 2050 and will increase between 12% and 22%. Further, in 2050, 80% of the elderly will be from low- and

middle-income countries.^[1] Based on Iran's 2016 census, individuals aged above 60 years comprised 9.3% of the country's population,^[2] and this measure has been predicted to reach 26% (26,393,000 people) by 2050.^[3] Aging increases the probability of suffering from several chronic diseases, such a way that most elderly people aged above 60 years suffer from at least

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one chronic disease.^[4] Among chronic diseases, type II diabetes mellitus (T2DM) is the most common hormonal deficiency in the elderly, which is increased in people over 60 years old and is one of the chronic diseases that affect the quality of life.^[5] Diabetes is one of the most widespread health burning problems in the elderly, which represent a heterogeneous and complex population, as it includes both newly diagnosed older diabetic patients and patients with long-standing diabetes with onset in middle or early age.^[6]

Older adults with diabetes are at higher risk for both acute and chronic microvascular and macrovascular complications from the disease, including major lower-extremity amputations, myocardial infarctions, visual impairments, and end-stage renal disease, compared to any other age group.^[7] Diabetes self-management is considered as the cornerstone of T2DM management.^[8] Poor self-care behaviors have also been reported to be the barriers for effective management of diabetes management complications.^[9,10] Diabetes self-care activities are behaviors undertaken by people with or at risk of diabetes to successfully manage the disease on their own. All self-care activities have been found to be positively correlated with good glycemic control, reduction of complications, and improvement in the quality of life.^[11] Successful diabetes self-care requires the following activities: healthy lifestyle, healthy eating, exercise, cessation of smoking, weight management, self-monitoring of blood glucose, taking medication, and foot care. It is the cornerstone to achieve the optimal outcomes.^[12] Self-care promotion is possible through training.^[13] It is believed that training can be effective in changing health behavior and help the patients to identify and understand the disease. It can prevent the complications or postpone them. Self-care training may help the patient to make decision about his/her health correctly.^[14] In reviewing the literature, the effectiveness of the didactic diabetes self-management education programs was seemed to be rather weak when approaching T2DM and its related complications. The educational interventions that involved patient collaboration were more effective than didactic interventions in improving glycemic control.^[15-17] The peer educational approach is effective behavioral change strategies, which utilize all five senses in the activities performed. It helps enhance individuals' thinking, creativity, and the full participation of individuals in planning, implementing, and evaluating observational learning practices.^[18] Peer group encompasses interventions where information, skills, and values are imparted among people who share common characteristics such as age or shared experience.^[19]

Peer educators are individuals who have the characteristics required to execute or participate in the

implementation of an education plan. For example, having the needed time and energy, open-mindedness, self-confidence, leadership potential, and interpersonal skills are usually accepted by the target group and influence it. After completing the training course, they have gained enough ability to play the role of trainer.^[20] Overall, research suggests that a peer may be defined by three elements.^[19,21] First, the peers share relevant common characteristics with the target group, such as age, even though some other characteristics may vary between the peer and the group, such as ethnicity, gender, socioeconomic status, culture, religion, or education. The second element is that the peer experience is valued by the organizer of the peer group program, and the peer-led role is an integral component of the intervention being tested. These characteristics enhance the capacity of peers to share, relate, and empathize with their target groups in a way that nonpeers were unable to do.^[22] The third element is that the peer educators are engaged as volunteers (i.e., have a nonformal role) and have not received formal vocational education for their role.^[23] Studies have shown that successful peers are able to share their weaknesses, strengths, and experiences with patients at the lowest cost. He/she encourages them to choose appropriate health behaviors by providing practical, emotional, informational, follow-up motivation and discussing chronic illness stress.^[24-26] A specific indicator for assessing self-care activities and glycemic control is hemoglobin A1C (HbA1c) measurement^[27] HbA1c shows a person's average blood sugar level over 2–3 months.^[28] The normal value of HbA1c is <7%, and the value 5.8%–7% represents the border control, 5.8% shows poor control of blood sugar, and higher than 10% shows extremely poor control of blood sugar.^[29]

According to the dramatic increase in diabetes and its complications, the inability of healthcare systems to resolve the increasing needs of these patients, and the importance of self-care in controlling the disease, this study aimed to investigate the effect of peer group on self-care behavior and glycemic index in the elderlies with type II diabetes.

Materials and Methods

The present quasi-experiment aimed to explore the effect of peer group on the self-care behavior and blood sugar control indices of the elderly population afflicted with type II diabetes. Thus, the research population comprised all elderlies afflicted with type II diabetes visiting the diabetes clinic in Fasa in 2019.

The sample size was estimated in accordance with the study by Ghasemi *et al.*^[30] using the suggested formula and was decided to be 46. To add to the test power, this size was increased to 100 (50 participants in the

intervention and 50 in the control group). The formula is presented below:

$$n_1 = n_2 \frac{(S_1^2 + S_2^2) \left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right)}{(X_1 - X_2)^2}$$

First, the required permission was gained from the Deputy of Research at University (the ethics committee code: 1398.031) to visit the diabetes clinic of Shariati Hospital. According to the inclusion criteria, the names of elderly whose medical records were existent in the clinic were made and the required sample was selected according to the simple randomization from the existing records. Finally, the records were alternately assigned to the intervention and control groups. The patients selected were contacted via phone and were invited to take part in the research. When the purpose of research was explained to them and their written informed consent was obtained, they were provided with the questionnaires. The research was conducted in a relaxing atmosphere and in the presence of the researcher. If a patient was unable to comprehend a question, the content was elaborated on in simple words by the researcher.

Inclusion criteria

Informed consent to take part in the research, at least 1 year had passed from definitive diagnosis of being affected by type II diabetes,^[31] ability to take part in educational sessions, age above 60 (to be considered elderly), having a phone number as contact information, and literacy (ability to read and write) and no physical or mental disease.^[27]

Exclusion criteria

Absence for more than one session in educational sessions, hospitalization during the study and unavailability of the patient, immigration or mortality, and incomplete questionnaire.

Next, from the intervention group, according to the peer selection checklist (better adaptation to control the disease, less engagement with symptoms of the disease as approved by the visiting physician, capability of handling the sessions, motivation to and interest in participating in the research, and good communication skills), two patients were selected as the educators. They were taught by the researchers the primary content of an instructional booklet on specialists' advice for the elderly to meet their needs concerning diabetic self-care (e.g., exercise, nutrition, and foot care). The booklet had been developed based on the diabetes experts and specialists in the healthcare center. It is noteworthy that the reliability and validity of the peer selection checklist were

tested by Ghasemi *et al.*^[30] The validity had been checked and testified by a panel of experts, and the reliability was tested through Cronbach's alpha and was reported to be 0.86. Patients in the intervention group not only received the usual care provided in the diabetes clinic but were also educated by peers for 8 weeks and 8 sessions each taking 45–60 min [Table 1].

The educational intervention was presented by the peer educator for the intervention group. Before every session, the content to be instructed was taught by the researcher to the peer educator, and peer was asked to handle the session in his/her own way and use personal experiences to make content better comprehensible. Meanwhile, the control group received no such peer group intervention. This group only received the usual care provided in the diabetes clinic. Two months after the educational intervention, the questionnaires were completed by the participants again [Figure 1].

The data collection instrument included a demographic information form to include age, gender, education, and duration of the disease; moreover, the patients received an awareness questionnaire along with a diabetes self-care activities' questionnaire. Blood biochemical tests were also conducted in a single laboratory to estimate fasting blood sugar (FBS) and HbA1c once before the intervention and once again 3 months after the intervention.

Awareness questionnaire with 13 items helped to explore the patients' awareness of diabetes. The criterion was the total score obtained from answering all items. For each item, the correct answer was scored as 2 and incorrect answers or missing data were scored as 0. The total score could range between 0 and 26. The reliability and validity of the awareness questionnaire were explored by Tol *et al.*,^[32] the content validity was testified by a panel of experts, and the reliability was tested via Cronbach's alpha and was found to be above 0.70.

Summary of Diabetes Self-care Activities (SDSCA) questionnaire explored diabetic patients' self-care behaviors with 15 items enquiring about nutrition, physical activity, blood sugar test, foot care, and medication. Each item was scored from 0 to 7 based on the days of the week during which the patient showed self-care behavior. The overall score of the questionnaire ranged between 0 and 105. A score between 65 and 105 was interpreted as good/satisfactory, a score between 35 and 60 was taken as average, and a score between 0 and 30 was interpreted as weak or unacceptable. The items exploring nutritional behaviors were 8 in number and were scored between 0 and 65. One item enquired about physical activity/exercise, and one was concerned about blood sugar control. The range of score for each dimension

Table 1: The content of educational sessions

Sessions	Content	Educational method
1	Introductory sessions about objectives, teaching methods, and evaluation	Lectures
2	Basic definition of diabetes mellitus, diabetic patients' needs, significance of self-care behaviors, recognition of acute and chronic side effects of diabetes	Lectures, group discussions, illustrations, and instructional pamphlets
3	Learning nutritional issues and the significance of complying with nutritional principle, partitioning, and how to replace them with each other (particularly carbohydrates) in meals and snacks, and proper use of fruits, vegetables, and grains as sources of dietary fiber	Lectures, group discussions, illustrations, and instructional pamphlets
4	Positive effects of exercises, description of what a diabetic patient needs before, during, and after exercises	Lectures, group discussions, illustrations, and instructional pamphlets
5	Normal blood glucose ranges and target blood glucose levels, how to control blood sugar and interpret results	Lectures, group discussions, illustrations, and instructional pamphlets
6	Importance of foot care, examine the feet, and prevention of diabetic foot disease	Lectures, group discussions, illustrations, and instructional pamphlets
7	Significance of timely consuming the medications as prescribed, correct way of injection	Lectures, group discussions, illustrations, and instructional pamphlets
8	Overview of the contents of previous sessions	Lectures, group discussions, illustrations, and instructional pamphlets

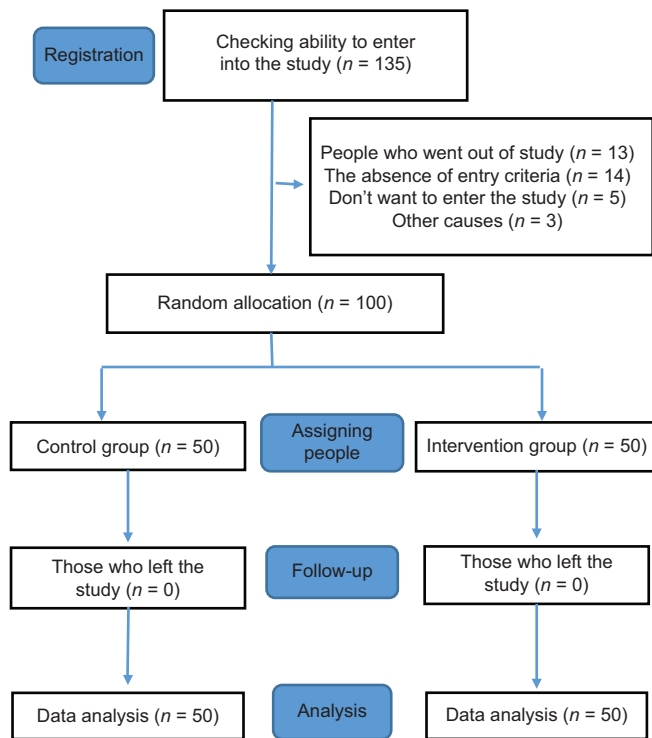


Figure 1: Diagram of the study and the process of participation of diabetic elders

was 0–7. The other part explored foot care behaviors and included three items which were overall rated between 0 and 21. Finally, two items explored the patient’s medical adherence which was rated between 0 and 14. The validity and reliability of the Persian-translated version of the questionnaire were confirmed by Berasteh *et al.*^[33] In this study, the content validity was confirmed by a panel of experts (professors of Tehran University of Medical Sciences), and the reliability was tested via Cronbach’s alpha and found to be 0.88. The data were analyzed using the SPSS Statistics software (version 23.0, SPSS Inc., Chicago, IL, USA), software using. Quantitative variables

(age, duration of the disease) were reported in mean and standard deviations and the qualitative variables (attachment, family history of diabetes, education level) were reported in frequency and percentage. Moreover, Chi-square test, independent-sample *t*-test, and paired-sample *t*-test were also used. Normality of the distribution was checked with Kolmogorov–Smirnov test and the significance level was set at 0.05.

Results

The mean age of the participants was 67.75 ± 3.24 and 68.11 ± 3.34 years in the intervention and the control group, respectively ($P = 0.21$). The mean duration of disease was 15 ± 2.18 and 16 ± 2.10 years in the intervention and the control group, respectively ($P = 0.27$). The two groups were similar in terms of the demographic features, and no significant difference was found between the two groups [Table 2].

The results showed a significant increase in the mean score of awareness and self-care behaviors in dietary control, physical activity, medication adherence, self-monitoring of blood glucose, and foot care. The intervention group’s SDSCA score increased significantly compared to the control group after the intervention ($P < 0.001$). Moreover, the mean 3-month changes showed that there was a significant difference between intervention and control groups ($P < 0.001$), and it was higher in the experimental group. In addition, the present study showed that the average score of SDSCA was 17.60, and the overall score was low (<21 points is poor) [Table 3].

Table 4 shows the biochemical indices of the participants before and 3 months after the training intervention. Paired *t*-test results showed the significant difference of FBS and HbA1c before and after the training intervention in the intervention group ($P < 0.001$).

Furthermore, the independent *t*-test showed that the difference in fasting blood glucose test in control group and intervention group (after intervention) was significant ($P < 0.001$) [Table 4].

Discussion

Diabetes is among the costliest chronic diseases among the elderly population and requires certain

Table 2: Demographic characteristics of the participants in the intervention and control groups

Variable	Intervention group, n (%)	Control group, n (%)
Gender		
Male	25 (50)	27 (54)
Female	25 (50)	23 (46)
Marital status		
Single	1 (2)	1 (2)
Married	45 (90)	47 (94)
Died	4 (8)	2 (4)
Family history of diabetes		
Yes	29 (58)	28 (56)
No	21 (42)	22 (44)
Level of education		
<12 th (Grade)	28 (56)	25 (50)
12 th (Grade)	12 (24)	13 (26)
>12 th (Grade)	10 (20)	12 (24)
Employment status		
Homemaker	23 (46)	24 (48)
Employee	21 (42)	19 (38)
Unemployed	6 (12)	7 (14)

*Chi-square test

awareness-raising and cooperative behavior in showing self-care behaviors in the process of disease treatment and prevention of the adverse effects.^[34] The present research aimed to explore the effect of peer group on self-care behavior and blood sugar of type II diabetic elders. The findings obtained from this study evidenced that self-care scores significantly increased in the intervention group if that was not significant in the control group. It indicates that the impact of self-care education is a peer. There have also been studies on diabetes self-care education by peer group. Simmons *et al.* examined the factors affecting self-care education with the peer group and identified key issues, including the selection and style of education provided to peers, participants' knowledge level about diabetes, and other factors.^[35] As a result, although improving the self-care situation with support of peer group is possible, it is possible to use appropriate strategies to choose peer group and peer education. Results of Chiung-Jung *et al.*'s study showed that peer support program increased self-efficacy, self-care, and knowledge level and decreased readmission rate of patients.^[36] Findings in Ravanipour *et al.*'s study showed that patients who supported the peer group had better control in blood glucose level and better adaptation to treatment. Hence, most of the studies using peer group for training imply positive effects of this educational method that may be due to the fact that patients are more confident about the effectiveness of techniques and experiences of people who have similar situations with their own conditions and try to apply methods that others have benefited from

Table 3: Comparison of mean and standard deviation score awareness, and dimensions of self-care before and 3 months after intervention in the intervention and control groups

Variables	Groups	Before the intervention	After the intervention	P*
Awareness	Intervention group	15.7430±0.11	22.30±3.17	<0.001
	Control group	16.12±2.16	18.243±0.25	
	P**	0.73	<0.001	
Dietary control	Intervention group	10.18±6.28	16.92±3.57	<0.001
	Control group	10.23±3.84	10.95±4.59	
	P**	0.95	<0.001	
Physical activity	Intervention group	3.80±2.51	5.98±2.23	<0.001
	Control group	3.42±1.95	3.50±1.92	
	P**	0.51	<0.001	
Medication adherence	Intervention group	8.46±2.66	12.82±2.25	<0.001
	Control group	8.08±1.78	8.04±1.76	
	P**	0.37	<0.001	
Self-monitoring of blood glucose	Intervention group	2.34±2.21	6.12±2.15	<0.001
	Control group	2.38±1.58	3.02±1.65	
	P**	0.63	<0.001	
Foot care	Intervention group	8.24±3.63	16.14±2.87	<0.001
	Control group	7.44±4.66	7.40±4.64	
	P**	0.24	<0.001	
SDSCA score	Intervention group	28.30±5.47	54.97±6.24	<0.001
	Control group	29.02±5.62	29.79±6.23	
	P**	0.58	<0.001	

*Paired *t*-test, **Independent sample ttest

Table 4: Comparison of biochemical markers before and 3 months after intervention in the intervention and control groups

Variables	Groups	Before the intervention	After the intervention	P*
FBS (mg/dl)	Intervention group	136.42±38.45	123.70±40.72	<0.001
	Control group	135.40±39.24	135.12±39.46	0.42
	P**	0.73	<0.001	
HbA1c (mg/dl)	Intervention group	8.62±1.64	7.74±1.61	<0.001
	Control group	8.83±1.73	8.68±1.75	0.72
	P**	0.69	<0.001	

*Paired t-test, **Independent sample t-test. FBS=Fasting blood sugar, HbA1c=Hemoglobin A1c

the same conditions.^[37] The present findings showed that the mean awareness score of diabetic elders in the intervention group was significantly increased after the intervention compared to the control. Among the factors that can have led to positive findings is the peer group intervention. Similarly, a body of research including Hailu *et al.*,^[38] Debussche *et al.*,^[39] and Liu *et al.*^[40] reported a statistically significant increase in the awareness score of diabetic patients' awareness of the disease, as compared to the control group. Singh *et al.*^[41] reported that educating diabetic patients managed to increase their awareness. The results of Morowatisharifabad *et al.*'s study^[42] showed that peer education was not effective in promoting awareness level which is not consistent with the results of the present study. Perhaps, the difference in the way of training is justified. Therefore, improving knowledge level can increase the ability of patients to manage the disease. The most important effect of peers is increasing awareness among other patients, known as the most effective way to prevent complications of diabetes. In the present study, a significant difference was found in the effect of fasting blood glucose and fasting blood glucose for 3 months. In the study of Tang *et al.*,^[43] with the aim of investigating the effectiveness of their peers and healthcare providers in protecting self-care patients, the study results showed that after implementing a 6-month care plan, both groups showed significant reduction in HbA1c. The results of Sadeghi *et al.*'s study^[44] who used the patient-centric and family-oriented empowerment pattern as educational intervention, in line with the present study, indicated that both approaches would lead to significant reduction in HbA1c. The results of Philis-Tsimikas *et al.*'s study^[45] revealed the training program of self-care treatment with peers in blood sugar control and metabolic indices of type-II diabetic patients so that there was a significant difference between the median HbA1c of the intervention group. Heisler *et al.*^[46] also concluded that peer education in diabetic patients leads to increased self-care, proper use of drugs, and reducing the need for insulin in peer education. The results of study by Vorderstrasse *et al.*^[47] showed that the intervention by peers led to an increase in the mean and standard deviation of the level of self-efficacy and the quality of life of patients in the intervention group and also improved metabolic control

of the hemoglobin levels. In some other works of research, Simmons *et al.*^[48] and Mehl-Madrona^[49] aimed to investigate the effect of peer interventions on controlling diabetes and emphasized that peer support can increase adherence to the medical diet and improve consuming medications. The results of the study showed that in the intervention group, fbs and fbs indices were significantly decreased after intervention. The results of Smith *et al.*'s study^[50] concluded that peer support can decrease self-efficacy and improve the health of diabetic patients. Iranian studies^[51] have also reported that with 3 months of training, self-care diabetes was not seen by their counterparts in blood sugar and consumption of diabetic drugs, but most studies^[52-55] have noted the positive effect of self-care diabetes by their peers on blood sugar and HbA1c and consumption of diabetic drugs. Further, Hamdzadeh *et al.*^[56] stated that in group support with peer group, self-care was related to regular blood glucose control. In the study of Ahmadi *et al.*,^[27] there was no significant difference between patients HbA1c average health and peer-care training groups. Considering that glycemic control is one of the primary goals of the clinical care of diabetes which is effective in the incidence of diabetes, education by peers in diabetic patients leads to an increase in self-care, correct use of drugs, and decrease of blood glucose index in the diabetic group. The results showed that the mean of self-care behaviors in the intervention group, which supported the support and experiences of the peer group, significantly increased in comparison with the control group. Mehl-Madrona^[49] to investigate the effect of a virtual educational environment on metabolic control, diet, and physical activity of diabetic patients in New York. They use a trainer to teach diabetes and the peer role is more supportive. Finally, they found that combined educational intervention by a coach was a supportive role and peer supportive role improves metabolic control, weight control, and physical activity of the intervention group. Results of Johansson *et al.*'s study^[57] showed that peer support improved quality of life and metabolic control of patients. These results are in line with the results of the present study. Morowatisharifabad *et al.*^[42] investigated the effect of peer group and health staff education on diabetic women's awareness, attitude, and nutritional indices. They emphasized that peers were

more effective in improving nutritional indices and patients' attitude than the health staff. In the present study, in the field of sport, the difference between the test and control group was meaningful. In line with previous studies, it was shown that implementing educational programs and supporting peer or peer group plays an important role in the adoption of proper health behaviors such as sports and physical activity and gaining independence of patients with chronic obstructive pulmonary disease, especially in elderly people. As the present findings revealed, after the educational intervention, the highest power of self-care in the experiment group after the educational intervention was 73.5%. The participants were, thus, perceived at an average level of acceptability. 15.5% were perceived at a good level. In their investigations, Anbari *et al.*^[58] and Khazarloo and Feizi^[59] evaluated the self-care behaviors of their research participants at an average level, which is consistent with the present findings, but in Vosoghi Karkazloo *et al.*'s study,^[60] self-care is reported to be weak and undesirable. It seems that the difference in self-care behaviors of patients is due to different factors such as difference in self-care programs to diabetic patients, difference in knowledge and attitude toward self-care, as well as difference in self-care measurement.

Conclusion

Peer groups a practical and acceptable method of improving self-care behaviors and controlling glycemia among diabetic patients better. It can also reduce the risk and adverse effects of diabetes. However, whether this method is more effective than conventional methods requires further research.

Limitations

The small number and the short duration of the training sessions mainly due to the lack of admission of older persons participating in the study in Fasa city.

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Conflicts of interest

There are no conflicts of interest.

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