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The Effect of Peer Group-Based Training Using Health Belief Model on Quality of Life and Foot Ulcer Self-Care Behaviour in Patients with Type 2 Diabetes: A Randomized Controlled Clinical Trial

ABSTRACT

Objective: The present study was aimed at investigating the effect of peer group-based training (PGBT) using the health belief model (HBM) on the quality of life (QOL) and foot ulcer self-care behavior in patients with type 2 diabetes.

Materials and methods: The present study was a randomized controlled clinical trial performed on patients with type 2 diabetes who were referred to the Diabetic Care Clinic in Shiraz (Iran) from September 2019 to June 2020. A total of 70 patients participated in the study and were randomly assigned to peer training (n = 35) and control groups (n = 35). Diabetes Quality of Life, and diabetes self-care behaviors, which were completed by both groups before, immediately, 1 month, and 3 months after the intervention. The data were analyzed using the Chi-square test, paired t-test, independent t-test, ANOVA, and descriptive statistical methods. P < 0.05 was considered statistically significant.

Results: The results showed that mean scores of QOL, constructs of HBM (awareness, perceived susceptibility, perceives severity, perceived benefit, self-care behavior, and foot care) before the intervention did not reveal a significant difference between the two groups, but immediately one month after the educational intervention, the mean values for the intervention group were significantly higher than the control group (p < 0.05).

Conclusion: PGBT using HBM was effective in increasing the mean score of QOL and self-care behavior in patients with type 2 diabetes. Thus, this method is recommended to be utilized alongside other methods to train patients. (Clin Diabetol 2022, 11; 4: 251–261)

Keywords: diabetic foot ulcer, self-care behavior, peer group, health belief model

Introduction

Diabetes is the most common chronic disease worldwide which is a common problem in the health care system, which creates major issues for the individual, their family, and community [1] According to the International Diabetes Federation, the number of

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people with type 2 diabetes in the world was about 451 million in 2017 which is projected to increase to 693 million by 2045 [2]. One of the most commonly overlooked complications of diabetes is diabetic foot ulcers [3]. Considering epidemiological studies, 2.5% of people with diabetes annually develop foot ulcers, and 15% to 25% of all patients with diabetes develop foot ulcers at least once during their lifetime [4, 5]. More than one million patients with diabetes lose their foot due to this disease each year, i.e., one-foot amputation every 30 seconds [6]. The cost of care, treatment, and frequent hospitalizations of a patient with diabetes and a foot ulcer is 4.5 times the cost of a person with diabetes with no ulcer [7]. One of the main reasons for the development and progression of diabetic foot ulcers is the lack of self-care by patients [8]. Self-care increases the ability of patients to deal effectively with health problems [9] and increases participation in caring and treatment practices in long-term illness [10, 11]. Education is one of the effective factors to promote self-care behaviors [12].

Education can be effective in changing health behaviors and gaining a better understanding of the disease to prevent or delay complications. Self-care education helps patients make the right decisions about their health status [13]. An educational method that affects facilitating and promoting health and creating a suitable environment for learning is peer group training [14]. A peer is a person belonging to the same social group considered by the individual to have similar capabilities and can have strong motivational effects on learning [15]. Peers are better able to communicate with each other and encourage them to choose appropriate health behaviors because they can share their common strengths, weaknesses, and common experiences at the lowest cost [16].

Choosing the right educational model is the first step in the educational planning process. Health Belief Model (HBM) is one of the educational models in preventing chronic diseases and health promotion that acts as an effective framework to design the educational interventions and promote preventive behaviors [17, 18]. The HBM is based on the assumption that performing health behaviors such as self-care, is rooted in people's health beliefs and leads people to healthy behaviors [19]. According to the increasing prevalence of diabetes and various complications of disease which require long-term treatment and the need to control blood glucose on a daily basis, lifestyle modifications and the acquisition of knowledge are necessary to perform self-care behaviors throughout life [20]. At present, self-care assessment is one of the best methods for managing patients with chronic diseases such as diabetes [21].

Lower limb health plays a crucial role in the mobility and productivity of people in the community. No studies were found to deal with peer education method based on the HBM in the field of diabetic foot ulcers. Therefore and also due to the prevalence of diabetic foot ulcers and high costs of care, treatment, and frequent hospitalizations of these patients in the health care system, the present study was performed aiming at assessing the effect of peer group-based training (PGBT) based on HBM on quality of life (QOL) and self-care behavior of foot ulcer in patients with type 2 diabetes in Iran.

Materials and methods
Study design

The present study was a randomized controlled clinical trial, designed to evaluate the effect of PGBT on QOL and self-care behavior in patients with type 2 diabetes. Because of the obvious nature of the intervention, patients and field researchers could not be blinded. In the present study, the CONSORT (Consolidated Standards of Reporting Trials) checklist was used to determine the quality of randomized controlled trials [22]. The study was conducted from September 2019 to June 2020 at the Diabetic Care Clinic, established in 2007, in Shiraz (Iran). The center admits patients with type 2 diabetes during work hours and provides a variety of educational, medical, and professional services. The patients with type 2 diabetes who registered for the training sessions were selected to participate in the study.

Participants and sample

In the present study, 70 patients with type 2 diabetes were selected through simple random sampling by a random number table. The patients with type 2 diabetes were enrolled into the study after an investigation of the inclusion and exclusion criteria. Inclusion criteria were: diagnosis of type 2 diabetes confirmed by two endocrinologists, having a history of diabetic foot ulcer or diabetic foot ulcer at the time of the study, having physical ability to participate in the training session, having the ability to speak, having no cognitive, behavioral, and verbal disorders and willingness to participate in the study. Exclusion criteria were: absence from training sessions (maximum of 2), having the acute diabetic condition, partially completed questionnaires and withdrawal from the study for any reason.

Based on the study of Ahmadi et al [23] and considering (d = 9) and the standard deviation (s1 = 13.2, s2 = 9.4) with 95% accuracy and 90% power ($\alpha = 0.05$, $\beta = 0.1$) a sample size of 33 subjects was estimated for each group. The sample size was

increased to 70 (in each group 35 subjects) by considering the probability of loss.

$$n = \frac{(s_1^2 + s_2^2)}{d^2} (Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2$$

The researchers first invited 80 patients with type 2 diabetes to participate in convenience sampling. Of them, 10 patients with type 2 diabetes who were reluctant to participate in the study or did not meet the inclusion criteria were excluded. Therefore, the remaining 70 patients with type 2 diabetes were randomly allocated to the two groups: a control group (group B) and an intervention group (group A). Thereafter, 70 cards were prepared, including 35 cards labeled A (intervention group) and 35 cards labeled B (control group). These 70 cards were then put in an envelope, and each patient was asked to draw out one card randomly. Each card labeled A, and B was the intervention and control groups. Figure 1 presents the CONSORT flow diagram of the participants throughout the study (Fig. 1).

Data collection tools

The data collection tools consisted of the Thomas Diabetes Quality of Life questionnaire (DQOL) and Hazavehei et al.'s self-care behaviors questionnaire and a demographic datasheet. The demographic characteristics included age, gender, occupation, marital status, educational degree, etc.

Thomas Diabetes Quality of Life (DQOL) questionnaire

DQOL questionnaire has 15 items rated in the 5 points Likert scale from "completely dissatisfied" (score 1) to "completely satisfied" (score 5). A score between 15 and 30 indicates the patient's low quality of life, a score between 30 and 45 shows the average quality of the patient's life, and a score above 45 shows the patient's high quality of life [23]. In Iran, in the study of Pakpour et al., the reliability of this instrument has been confirmed with a Chronbach's alpha of 0.87 [24].

Self-care behaviors questionnaire

To evaluate self-care behavior, a questionnaire designed by Hazavehei et al. was used [25]. The questionnaire consists of 54 items in 4 parts:

Part 1: Awareness questions: consist of 12 items which are designed as multiple-choice questions. The correct answer is given a score of one, and the wrong answer is given a score of zero.

Part 2: The second section was related to HBM constructs including Perceived Susceptibility questions (5 items), Perceived Severity questions (5 items), Perceived Benefits (5 items), Perceived Barriers (5 items),

and Cues to Action (2 items), a total of 22 items in a multiple-choice form, rated in a 4-point Likert scale.

Part 3: Diabetic foot ulcer prevention behaviors: consist of 10 items (for foot care at home that was self-reported, for example, "Do you wash your feet every day?" "Do you examine your feet every day?"...). "Yes" was given a score of one and "No" was given a score of zero.

Part 4: Performance monitoring checklist: consists of 10 items (including; "Is your shoes made of leather?" "Does your shoe cover the whole foot?"). "Yes" was given a score of one, and "No" was given a score of zero. The test-retest method was used to assess the reliability of the questionnaire. For this purpose, a questionnaire was given to 30 patients with diabetic ulcers and was completed after two weeks. The correlation coefficient between the scores in these two intervals was 0.89.

Training program

The objectives of the study were explained and written informed consent was obtained from all subjects. Prior to the intervention, the QOL questionnaire, self-care behavior questionnaire, and the demographic data sheet were filled in by all subjects.

The patients in the peer training group received the training during five sessions (45 minutes each) for 5 weeks. The training in the educational session based on the constructs of the HBM included education about diabetes, symptoms, nutrition, and medication, early and late complications, the causes of foot ulcers, types of foot problems in this disease, caring methods for the diabetic foot ulcer and foot ulcer prevention (Suppl. File 1).

The peer group training was carried out through lecture and sharing experience, role-playing, group discussion, educational videos, instructional pamphlets, and question and answer. The training was conducted by two peers in groups of 8 to 9 patients in the training room of the diabetes clinic. The peer group was selected from patients. The peers were selected by such criteria as having at least a diploma degree, having experience of diabetic foot ulcer, ability to speak fluently, and being interested in training other patients. The peers were trained in the nursing school by the researchers through lecture, role-play, group discussion, and question and answer one month before intervention. In order to ensure the peers' understanding, the trained issues were discussed at the end of the training sessions. In the control group, the patients were provided with the training routine by the health worker of the diabetic clinic. The training included the complications of type 2 diabetes the causes of foot
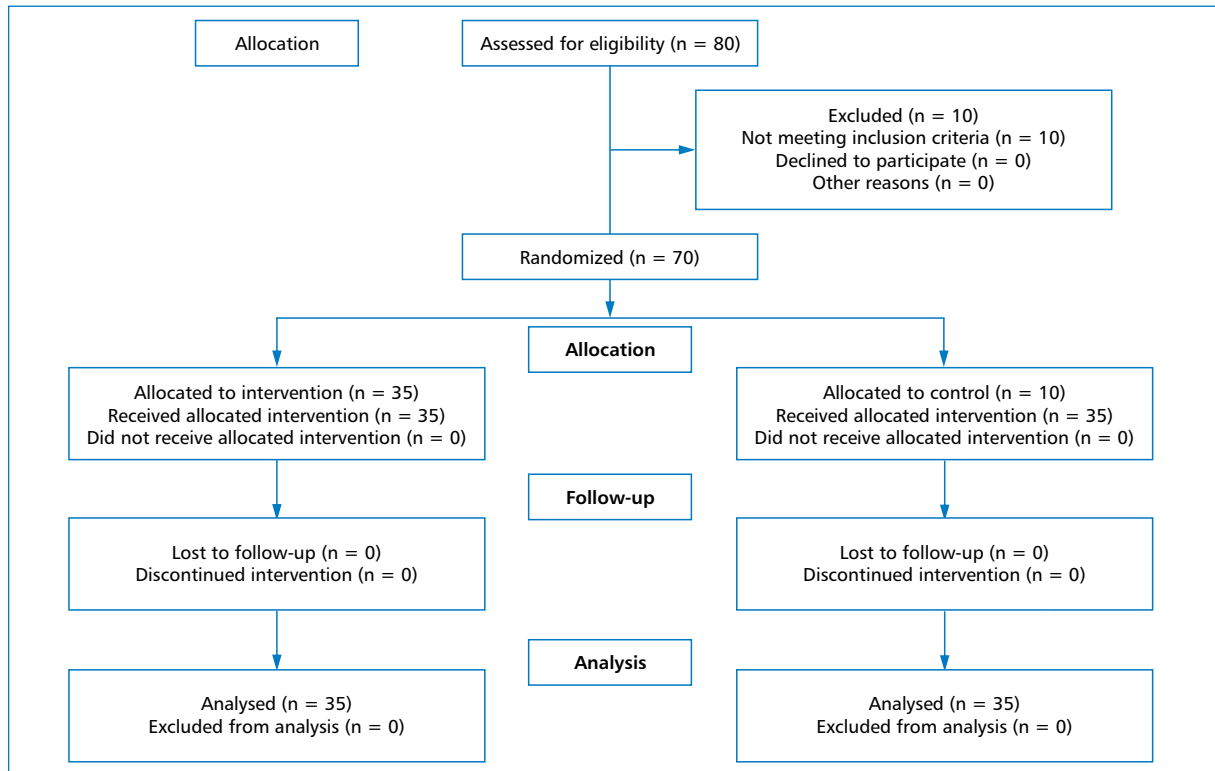
Figure 1. CONSORT Flow Diagram of the Participants

ulcers, types of foot problems, foot ulcer prevention and how to take care of diabetic foot ulcers. The control group received routine training by a staff of the diabetic clinic.

Ethics considerations

The present study was conducted based on the principles of the revised Declaration of Helsinki, a statement of ethical principles which directs physicians and other participants in medical research involving human subjects. The participants were assured of the anonymity and confidentiality of their information. Moreover, the study was approved by the local Ethics Committee of Fasa University of Medical Sciences, Fasa, Iran (Ethical code: IR.FUMS.REC.1399.069).

Statistical analysis

The data analysis was performed using the SPSS software (version 22.0). Descriptive and inferential statistics were used to analyze the collected data. In descriptive statistics, for describing the data, the frequency distribution table, mean and standard deviation were used. In inferential statistics, the first Kolmogorov-Smirnov test was used to check the normality of data distribution. Then, the data obtained from the study were analyzed using statistical tests (independent t-test, paired t-test, chi-square, ANOVA), and the sig-

nificance level in all tests was considered $p \leq 0.05$. Data analysis was performed using SPSS v.22

Results

The mean age of the participants was 57.10 ± 11.32 and 55.00 ± 9.90 years in the intervention and the control group, respectively ($p = 0.442$). The mean duration of diabetes was 14.50 ± 8.00 and 13.30 ± 6.70 years in the intervention and the control group, respectively ($p = 0.520$). Also, the mean HbAlc was 8.93 ± 1.47 and 8.61 ± 1.49 in the intervention and the control group, respectively ($p = 0.356$). The two groups were similar in terms of demographic features, and no significant difference was found between the two groups. This is what is tested by the chi-square test (Suppl. File 2).

The mean score of quality of life before the intervention was not significant in the control and intervention groups ($p = 0.240$), but immediately, one month and three months after the educational intervention, the mean score of quality of life in the intervention group showed a significant difference ($p < 0.001$), while no significant difference was observed in the control group ($p > 0.05$) (Tab. 1).

The mean scores of self-care behavior before and after the intervention were compared. The results showed that mean scores of awareness, constructs of

Table 1. Inter- and Intra-Group Comparison of the Mean Score of Quality of Life in the Intervention (Peer Education) and Control Groups Before, Immediately, One Month, and Three Months After the Intervention

Quality of Life	Control (n = 35)			Intervention (n = 35)			p-value[3]
	Mean	SD	P-value[1]	Mean	SD	p-value[2]	
Before	24.23	4.62	—	25.57	4.85	—	0.240
Immediately	24.60	3.99	0.647	36.46	5.35	< 0.001	< 0.001
1 month	23.51	5.20	0.468	34.89	5.17	< 0.001	< 0.001
3 month	23.37	4.63	0.376	30.20	5.25	0.001	< 0.001
Diff. Immediately from 0	−0.86	5.65	—	4.63	7.53	—	< 0.001
Diff. 1m from 0	−0.71	5.75	—	9.31	6.49	—	< 0.001
Diff. 3m from 0	0.32	4.82	—	10.89	6.06	—	0.008

p-value[1] — comparison with before in control group (Bonferroni post hoc after RM-ANOVA)
p-value[2] — comparison with before in peer group (Bonferroni post hoc after RM-ANOVA)
p-value[3] — comparison between control and peer group (first line t-test, others ANCOVA when before measurement was considered as covariate, lower part Mann-Whitney)

HBM, self-care behavior, and foot care before the intervention did not reveal a significant difference between the two groups, but immediately, one month and three months after the educational intervention, the means for the intervention group was significantly higher than the control group (p < 0.05), except for the mean of the perceived barrier which was not significant between two groups after three months (p = 0.08) (Tab. 2). The regression analysis in predicting the self-care behavior showed that the perceived susceptibility and perceived severity had the greatest impact on self-care behavior and perceived barriers had the least impact on the self-care behavior of the study population (Tab. 3).

Based on this study's results, the Pearson correlation coefficient showed a significant relation among self-care behaviors, quality of life, and foot care (p < 0.05) (Tab. 4).

Discussion

Improving the quality of foot care services and emphasizing self-care are essential components of patients with type 2 diabetes self-management at all levels of the health care delivery system to reduce the risk of diabetic foot ulcers [26]. Prevention of diabetic foot ulcers requires proper training to raise awareness, improve self-care behavior and finally improve the quality of life [27]. This study aimed to determine the effect of peer education based on the HBM on QOL and foot self-care behavior in patients with type 2 diabetes in Iran.

The findings obtained from this study evidenced that QOL scores significantly increased in the peer training group, but it was not significant in the control group. It indicates that peer group training based on HBM is effective on the quality of life of patients with type 2 diabetes. In this regard, the results of studies

have shown that peer training improves the quality of life of patients with type 2 diabetes [28, 29]. Danet et al. (2016) evaluated a peer training strategy for patients with type 2 diabetes mellitus in the Basque Country and Andalusia. They identified the positive impact of peer training on physical activity, the use of health services, and self-management in patients with type 2 diabetes. They also identified key issues, which included strengthening the patient-health provider relationship, generating group support and self-confidence, and improving emotional management [30]. The Findings of Ghasemi et al.'s study showed that with respect to QOL scores, elderly patients with type 2 diabetes who were supported with education by the peer group had better satisfaction from treatment and were less worry about the disease [31]. Therefore, the results of most studies indicate the positive effect of peer education on patients' quality of life. This can be due to the fact that patients share their experiences and trust each other when they encounter people with similar problems [32].

This study's results indicated the effectiveness of peer education via the health belief model on increasing awareness of foot ulcer, perceived susceptibility, perceived severity, and perceived benefits in patients with type 2 diabetes in the intervention group. The present findings showed that the mean awareness score of patients with diabetes in the intervention group was significantly increased after the intervention compared to the control group. In this regard, the results of Bridges et al.'s (2019) and Debussche et al.'s (2018) studies showed a statistically significant increase in the disease awareness score in patients with diabetes, as compared with the control group [13, 33]. The results of the study conducted by Morowatisharifabad et al. indicated that peer group training had no significant effects on the knowledge

Table 2. Mean Score of HBM Constructs, Self-care Behavior, and Diabetic Foot Care for Control and Intervention Groups Before, Immediately, One Month, and Three Months After the Intervention

		Before	Immediately	1 month	3 month
Awareness	Control (n = 35)	5.6 ± 1.22	5.83 ± 1.4	5.69 ± 1.16	5.94 ± 1.97
			p¹ = 0.547	p¹ = 0.646	p¹ = 0.468
	Intervention (n = 35)	5.31 ± 1.47	8.83 ± 1.34	8.34 ± 1.66	6.8 ± 1.51
		p³ = 0.070	p² < 0.001	p² < 0.001	p² < 0.001
			p³ < 0.001	p³ < 0.001	p³ = 0.379
Perceived susceptibility	Control (n = 35)	7.11 ± 2.49	7.63 ± 2.26	7.03 ± 1.95	7.34 ± 2.29
			p¹ = 0.155	p¹ = 0.838	p¹ = 0.244
	Intervention (n = 35)	6.91 ± 2.38	9.54 ± 1.58	8.94 ± 1.61	6.29 ± 2.09
		P³ = 0.733	p² < 0.001	p² < 0.001	p² = 0.218
			p³ < 0.001	p³ < 0.001	p³ = 0.035
Perceived severity	Control (n = 35)	5.31 ± 3.54	5.77 ± 2.41	5.43 ± 2.46	5.74 ± 3.23
			p¹ = 0.251	p¹ = 0.809	p¹ = 0.023
	Intervention (n = 35)	5.86 ± 1.82	9.31 ± 2.1	8.89 ± 2.01	9.71 ± 1.76
		p³ = 0.422	p² < 0.001	p² < 0.001	p² < 0.001
			p³ < 0.001	p³ < 0.001	p³ < 0.001
Perceived benefit	Control (n = 35)	6.17 ± 3.06	6.46 ± 2.32	5.97 ± 1.96	6.97 ± 2.93
			p¹ = 0.361	p¹ = 0.710	p¹ < 0.001
	Intervention (n = 35)	5.74 ± 2.34	9.26 ± 2.49	8.83 ± 3.15	7.23 ± 2.26
		p³ = 0.513	p² < 0.001	p² < 0.001	p² < 0.001
			p³ < 0.001	p³ < 0.001	p³ = 0.014
Perceived barrier	Control (n = 35)	5.51 ± 2.97	6.11 ± 2.23	5.80 ± 1.64	5.89 ± 2.23
			p¹ = 0.208	p¹ = 0.611	p¹ = 0.381
	Intervention (n = 35)	5.23 ± 2.44	9.17 ± 2.50	8.60 ± 2.03	6.54 ± 2.28
		p³ = 0.662	p² < 0.001	p² < 0.001	p² = 0.001
			p³ < 0.001	p³ < 0.001	p³ = 0.081
Self-care behavior	Control (n = 35)	4.34 ± 1.37	4.74 ± 1.46	4.49 ± 1.72	4.51 ± 1.50
			p¹ = 0.100	p¹ = 0.676	p¹ = 0.481
	Intervention (n = 35)	4.77 ± 1.31	6.51 ± 1.36	6.20 ± 1.53	5.46 ± 1.72
		p³ = 0.185	p² < 0.001	p² < 0.001	p² = 0.012
			p³ < 0.001	p³ < 0.001	p³ = 0.049
Foot care	Control (n = 35)	4.66 ± 1.49	5.14 ± 1.4	4.91 ± 1.76	4.69 ± 1.39
			p¹ = 0.117	p¹ = 0.486	p¹ = 0.865
	Intervention (n = 35)	4.31 ± 1.13	6.03 ± 1.48	5.63 ± 1.33	5.35 ± 1.37
		p³ = 0.283	p² < 0.001	p² < 0.001	p² < 0.001
			p³ = 0.009	p³ = 0.060	p³ < 0.001

p-value¹ — comparison with baseline in control group (Bonferroni post hoc after RM-ANOVA)
p-value² — comparison with baseline in peer group (Bonferroni post hoc after RM-ANOVA)
p-value³ — comparison between control and peer group (first line t-Test, others ANCOVA when baseline measurement was considered as covariate, lower part Mann-Whitney)

level of the mothers with children undergoing febrile convulsion which is not consistent with the results of the present study [34]. The difference between the results of the present study and the above-mentioned study could be related to the experience and abilities of the peer groups as well as the way of training. The peer group should be selected from individuals who have sufficient experimental knowledge and have characteristics similar to the target population. Peer groups must be able to motivate learning [35]. In this regard, the results of the study of Zare et al. (2020) [36] which was conducted as a systematic review and meta-analysis showed that education through the health belief model can greatly increase the level of knowledge, attitude, and self-care behaviors in patients with type 2 diabetes. It is suggested that this model is used in education and in order to change patients' health behaviors. Many studies, including

Table 3. The Regression Analysis in Predicting the Self-Care Behavior of the Diabetic Patients with Foot Ulcer

HBM	Non-standard coefficients		t-value	p-value
	Std. Error	B		
Constant value	0.636	1.420	0.027	0.027
Awareness	0.068	0.162	0.017	0.017
Perceived susceptibility	0.037	0.175	0.00	p < 0.001
Perceived severity	0.032	0.083	0.010	0.010
Perceives benefits	0.034	0.073	0.031	0.031
Perceived barrier	0.033	0.023	0.473	0.473

Table 4. Relationship Between Quality of Life, Self-Care Behavior and Diabetic Foot Care

		Quality.1	Behavior .1	Foot care.1
Quality of life.1	Pearson Correlation		0.474	0.109
	Sig. (2-tailed)		0.000	0.370
Behaviour.1	Pearson Correlation	0.474		0.211
	Sig. (2-tailed)	0.000		0.080
Foot care.1	Pearson Correlation	0.109	0.211	
	Sig. (2-tailed)	0.037	0.080	

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Melaniani (2018) [37], Masoudiyekta (2018) [38] and Shabibi (2017) [39], also showed that the level of knowledge and the average score of the constructs of the health belief model increased after the educational intervention. Therefore, increasing awareness levels can improve the behavior of patients with type 2 diabetes to prevent foot ulcers.

The results showed that the perceived susceptibility immediately and one month after the educational intervention showed a significant difference between the two groups. However, no significant difference was found between the perceived susceptibility during the intervention and three months after the intervention within the intervention group. Based on the health belief model, a high understanding of vulnerability to a health problem, which in this study is diabetic foot ulcer, is essential in motivating people to adopt problem-preventing behaviors. However, as the results showed, over time, the educational intervention in the present study was not successful in this field. Perhaps the reason for the decrease in perceived susceptibility over time is exposure to a lifelong illness and cultural factors. Another reason for the decrease in susceptibility over time could be the lack of continuous training. The results of the Morvati study also showed that despite the desirable perceived severity of diabetes complications in the subjects, the perceived susceptibility was low [40]. The researchers recommend further

research to reveal the role of perceived susceptibility over time in stimulating preventive health behaviors.

The results of the present study showed that peer group training caused a significant increase in the perceived severity score of the patients with type 2 diabetes in the intervention group compared to the control group. In the same vein, the results of a study conducted by Hazavehei et al. in Iran demonstrated that providing the patients with type 2 with information through displaying experiences and pictures of foot ulcers could significantly increase their perceived susceptibility and perceived intensity levels [25]. The results of Shao show that increased perceived susceptibility and perceived intensity lead to improved perceptions of patients' susceptibility to foot ulcers. There is a relationship between perceived susceptibility and perceived intensity with the percentage of behaviors that prevent late complications of diabetes [41]. A study in Iran shows that the higher perceived susceptibility and severity, the better self-care behavior will be performed, which is consistent with the results of this study [42]. Therefore, perceived susceptibility and perceived intensity can be good evidence of the impact of peer education.

The results of the present study showed that peer group training caused a significant increase in the perceived benefits score of the patients with type 2 diabetes in the intervention group compared to the

control group. The results obtained by Tawfik et al. indicated that support and training through peers increased perceived benefits scores. Increasing perceived benefits can play an important role to prevent unhealthy behaviors which are in line with the study's results by Tawfik et al. (2017) [43]. These results were also in agreement with those of the study by Hazavehei et al., which showed that utilizing peer groups could increase understanding of the benefits of foot care for patients with type 2 diabetes [25]. This study showed that the peer training in the three months after the intervention had no significant effect on reducing the perceived barriers in the intervention group. Perhaps the reason is the impact of social and cultural factors beyond the control of the researcher and the individual on this construct: therefore, the researchers suggests the use of multidimensional models such as the health promotion model. The involvement of other important people in diabetes can also be examined in future studies. The non-significance of the perceived barrier construct after the implementation of the educational intervention has been reported in other studies [44, 45]. In the study of Habibi et al., it was also shown that the lowest score related to the constructs of the health belief model was related to the construct of perceived barriers. This study showed that there is a relationship between understanding barriers and patients' educational status, and people with lower levels of education have fewer barriers to understanding [46]. Perceived barriers to self-care are significantly related to identity, outcome, time frame and emotional representation, personal control, treatment control, and dimensions of disease coherence in perceiving illness [47]. There is a significant difference between the mean score of foot care after the educational intervention in the intervention and control groups which indicates the positive effect of education on awareness, improving self-care behaviors, and improving the level of foot care in the intervention group. The results of a study by Bahador et al. (2017) [48] and Khiyali et al. (2021) [41] are consistent with this study's results. Moreover, the results of the study of Farahmand et al. (2017) showed that subjects with type 2 diabetes need knowledge and information on caring for their feet and that the implementation of health belief model-based educational programs is effective to perform foot care among patients with diabetes [49].

Therefore, this study's findings can expand our viewpoint about the concept of peer education. In total, most studies conducted on peer groups have shown the positive effect and usefulness of this educational method, which is probably due to the fact that patients are more confident in the effectiveness of experiences of those who have had similar conditions and will use these experiences.

The strengths and limitations of this study

This is the first study to investigate the effect of peer group-based training using the Health Belief Model on quality of life and self-care behavior in patients with diabetic foot ulcers in Iran. This study was performed on patients with diabetes in one of the diabetes clinics in southern Iran, and the target population was limited, so it is recommended that the study is performed in other countries with a larger sample sizes. In addition, COVID-19 decreases the intimate atmosphere between the researcher and participants due to the need to follow the protocols and social distance.

Conclusions

Peer group-based training using the HBM leads to increased awareness, improved quality of life, and improved self-care behaviors in patients with type 2 diabetes. This educational approach also leads to positive effects on the constructs of HBM, including perceived susceptibility, perceived severity, perceived benefits, and ultimately, better care for diabetic foot ulcers. Therefore, it is recommended that diabetic clinic managers and health policymakers use this educational approach in caring programs for this disease.

Acknowledgments

Conflict of interest

None declared.

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Supplementary File 1. The Content of Educational Sessions

Sessions	Content	Educational methods
1	Getting acquainted with each other, explaining the study objectives, assessment of patients' experiences of diabetic foot ulcers,	Lecture, group discussions, question and answer
2	Teaching and sharing experiences of the impact of diabetic on the health. Teaching and expressing experiences of the role of adherence to drug treatment in maintaining health	Lectures, group discussions, illustrations, and instructional pamphlets, question and answer
3	Teaching and sharing experiences of the role of diet, exercise and on the diabetes self-care. Teaching and expressing experiences of the relationship between stress and blood sugar control in diabetes	Lectures, group discussions, illustrations, and instructional pamphlets, question and answer
4	Teaching and sharing experiences of the Importance of foot care, examine the feet, Features suitable shoes and socks, how to care for nails and prevention of diabetic foot ulcer	Lectures, group discussions, educational video, role play, question and answer
5	Training and sharing experiences of susceptibility to diabetic foot complication, severity of diabetic foot complication, foot care benefits and barriers to foot care	Lectures, group discussions, educational video, role play, question and answer

Supplementary file 2. Frequency Distribution of Demographic Characteristics of Study Participants in Control and Intervention Groups

Qualitative variables	Qualitative variables		Intervention		p-value Chi square*
	Number	Percent	Number	Percent	
Gender					0.445
Female	13	37.1%	10	28.6%	
Male	22	62.9%	25	71.4%	
Marriage					0.452
Single-widow	5	14.3%	3	8.6%	
Married	30	85.7%	32	91.4%	
Job					0.151
Employed	21	60.0%	15	42.9%	
Unemployed	14	40.0%	20	57.1%	
Education					0.016
< 12 years (Diploma)	5	77.1%	14	40%	
Diploma & above	30	22.9%	21	60%	
Insurance					0.550
Yes	27	37.1%	29	82.9%	
No	8	37.1%	6	17.1%	
Degree of diabetic foot ulcer					0.697
One	9	25.7%	11	31.4%	
Two	16	45.7%	12	34.3%	
Three	8	22.9%	8	22.9%	
Four	2	5.7%	4	11.4%	
Smoking					0.179
Yes	7	20.0%	12	34.3%	
No	28	80.0%	23	65.7%	