Original Article

Effect of Face-to-face Education, Problem-based Learning, and Goldstein Systematic Training Model on Quality of Life and Fatigue among Caregivers of Patients with Diabetes

Abstract

Background: Education is a fundamental component for patients with diabetes to achieve good glycemic control. In addition, selecting the appropriate method of education is one of the most effective factors in the quality of life. The present study aimed to evaluate the effect of face-to-face education, problem-based learning, and Goldstein systematic training model on the quality of life (QOL) and fatigue among caregivers of patients with diabetes. **Materials and Methods:** This randomized clinical trial was conducted in Hajar Hospital (Shahrekord, Iran) in 2012. The study subjects consisted of 105 family caregivers of patients with diabetes. The participants were randomly assigned to three intervention groups (35 caregivers in each group). For each group, 5-h training sessions were held separately. QOL and fatigue were evaluated immediately before and after the intervention, and after 1, 2, 3, and 4 months of intervention. **Results:** There was a significant increase in QOL for all the three groups. Both the problem-based learning and the Goldstein method showed desirable QOL improvement over time. The desired educational intervention for fatigue reduction during the 4-month post-intervention period was the Goldstein method. A significant reduction was observed in fatigue in all three groups after the intervention ($P < 0.001$). **Conclusions:** The results of the present study illustrated that the problem-based learning and Goldstein systematic training model improve the QOL of caregivers of patients with diabetes. In addition, the Goldstein systematic training model had the greatest effect on the reduction of fatigue within 4 months of the intervention.

Keywords: *Diabetes, face-to-face education, family caregivers, fatigue, Goldstein systematic training model, Iran, problem-based learning, quality of life*

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Introduction

Today, chronic diseases such as diabetes are considered to be the most common metabolic disorders and a serious threat to developing countries.[1,2] This disease has an increasing prevalence, and it is estimated that by 2030 the number of people diagnosed with diabetes will reach 366 million around the world.[3] In Iran, 1.5–2% of the population are diagnosed with diabetes.[4] The treatment cost of this disease imposes a heavy burden on the patient and their family members, and it is estimated that by 2030, this amount will increase to $192 billion.[5]

Group caregivers are individuals who provide care and support for those in need including chronic disease patients anywhere, including within the family. Accepting the responsibility of caring for patients, especially with chronic diseases such as diabetes, raises concerns for caregivers. The results of a study classified

the concerns of caregivers as receiving information and resources related to the disease, compatibility with the patient's behavior, emotions, and conditions, and providing physical care.[6] Providing continuous and complex care creates challenges for the caregivers and causes changes in their dynamism and daily activities.[7] These factors are evident in various aspects of their physical, psychological, and quality of life (QOL). In providing care for patients with chronic diseases, the World Health Organization (WHO), in addition to patients, has also considered their caregivers.[8]

QOL is a multidimensional concept and, in addition to the material aspects of life, it is also influenced by cultural, social, economic, and environmental aspects. Constant pressure of the disease and patient care imposes

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definite effects on the QOL of the caregivers. In other words, with increased demand for family caregivers, QOL should be considered as a variable in studies related to family caregivers of patients with chronic diseases.[9] Another factor that has a profound effect on the QOL of the caregivers is fatigue. Fatigue in this group has been considered as a multidimensional concept and is defined as the feeling of extreme fatigue caused by physical activity, mental activity, or the illness. Fatigue may affect their supportive role and the quality of care and increase their level of concern.[10] It is expected that their QOL can be affected by increased fatigue, stress, and anxiety.[11]

One approach to improvement of QOL and fatigue is the implementation of educational interventions for the caregivers.[12] Providing education on diabetes facilitates disease management and is considered to be the cornerstone of the quality of care.[13] Education should be systematic and focused on the patients' obtaining of knowledge and the necessary ability to create a satisfying life. This training should be effective on outcomes such as reduced number and duration of hospitalization, costs, risk of nosocomial infections, and anxiety; patient's cooperation in self-care, increased participation in health care programs, and independence; and ultimately improved health of the individuals and society as well as QOL of patients and their caregivers.[13,14]

Various studies have emphasized the importance of trained caregivers specializing in chronic diseases and reduction of stress caused by care.[15,16] Researchers believe that in order to improve the quality and efficiency of care, the Smith principles should be applied. These principles include providing appropriate physical and psychological conditions for the caregivers and providing an opportunity for formal training in health care management, which results in improved health and increased QOL. It seems that safe and cost-effective programs to empower caregivers are a priority. To improve the level of care provided by caregivers, training programs should be designed and implemented to equip them with the necessary skills to provide care for their patients.[16]

One of the methods of education in the healthcare system is the face-to-face teaching method, which is considered as the gold standard method. In this method, the teacher provides training individually for the trainee and an opportunity to exchange information and feelings verbally and non-verbally. In this method, change in behavior is possible due to teacher–student discussions and confrontations. However, some of its features, such as being time consuming, lack of full understanding of all the content expressed or failure to recall them, and the fear of asking questions in case of not receiving information completely, have led to the use of a writing method along with this method.[17]

Another effective educational method is teaching through problem-based learning. Clinical education can be conducted and the individual's skills and knowledge can be utilized more effectively through problem-based learning.[18] This method requires self-directed learning (SDL) and learning through group discussions. In this method, the individual spends more time on SDL, and may obtain his/her information after a long time, and therefore, are more prepared for lifelong learning. Learners using the group discussion method actively participate in educational activities and are personally responsible for their learning. They are also given the opportunity to share their experiences and ideas with others.[19]

Another less known educational model in the health system is the Goldstein systematic training model. This model is based on the sequences of the educational approach of the learner. It expands creativity and enables the learner to control each stage of the learning regarding what occurred and what is going to occur. This model emphasizes the role of the learner as an organizer. This model includes sequences of determining the needs and extracting the goals, designing training programs, training, and evaluating educational outcomes.[20]

Based on the foregoing and given the nature of chronic diseases, including diabetes, and serious complications that can disrupt the foundation of the family, empowering a member of the family who has the most responsibility for patient care to increase the effectiveness of care is important. In view of this fact and the necessity of educational planning, to gain a better understanding, and improve the QOL of these individuals, this study aimed to investigate the effects of using face-to-face training, problem-based learning, and Goldstein systematic training model on the QOL of caregivers of patients with diabetes in 2012.

Materials and Methods

This study was a randomized clinical trialconducted among the family caregivers of patients with diabetes admitted to the Hajar Hospital in Shahrekord, Iran. Based on a confidence level of 95%, Pocock's[21] formula, and the study results of Benedict *et al.*,[22] the sample size was determined as 35 caregivers in each of the 3 experimental groups. The inclusion criteria included the greatest contribution to patient care among the family members, no history of diseases such as psychiatric and cognitive disorders, and no history of drug addiction. The subjects were randomly allocated to three groups. Caregivers were coded from 1 to 105. The codes which were multiples of 1, 4, 7, and 10 to 103 were placed in the face-to-face training group, multiples of 2, 5, and 8 to 104 were placed in the problem-based learning group, and multiples of 3, 6, and 9 to 105 were placed in the Goldstein systematic training group.

In order to collect information, a three-part questionnaire including a demographic information questionnaire, the Quality of Life Questionnaire, and the Rhoten Fatigue Scale (RFS) was used. The demographic information

questionnaire included questions on age, gender, marital status, education level, economic status, employment status, income, and relation to the patient. The Quality of Life Questionnaire was scored using the visual analog scale (VAS).[23] Based on the scoring of this questionnaire, QOL level ranged from 0 (lowest) to 10 (highest). The RFS was a VAS and scored from 0 (no fatigue, feeling energetic, and euphoric) to 10 (highest level of fatigue).[24]

The content of the training program was based on the needs of caregivers of patients with diabetes. It was prepared after interviewing several of the caregivers and obtaining complete knowledge of their needs by studying books and scientific documents. The program was implemented for all three groups through three distinct approaches. In the lecture group, this program was conducted by the researcher using PowerPoint software in five 60-min sessions (training medication treatment, diet, physical activity, and diabetes control) held in the amphitheater of the hospital. The participants attended the meetings as a group. The sessions were conducted with questions and answers and continued with group discussions and problem-based learning. At the beginning of each session, questions on the previous session's content were asked, any ambiguous points were cleared, and new topics were taught.

In the problem-based learning group, 35 caregivers were divided into groups of 9 and the program content were taught through the problem-based learning in five 1-h sessions. In this approach, the goal of the researcher was to understand the caregivers' problem instead of solving it. Brainstorming was also used in these sessions. The participants chose the proposed solutions that were discussed.[19,25]

The third group was trained using the Goldstein systematic training model. This model emphasizes the role of the learner in organizing the concepts and involves determining the needs and extracting the objectives, designing training program, and training and evaluating outcomes of education. The first stage of this model included three stages of reviewing the needs, which consisted of five levels of determining developmental aims, analysis of existing conditions, evaluation of authorities' commitment to and guarantee of the progression of goals, improvement of organizational performance during conflict, and participants' attendance. The second stage was achieving the desired behaviors using behavioral models in order to reinforce positive behavior through rewarding, repetition, and practice and the use of a guide. In this regard, media and assistive softwares, such as PowerPoint, were used.[20] In the second stage of the model, evaluation was discussed, the evaluation criteria were developed, and pretest was applied. Then, training and the program were implemented and monitored. Finally, the entire process and all that was transferred were evaluated. It should be noted that the needs of the caregivers were obtained after self-review by the individuals, patients, and the hospital staff. Then, the taught behaviors were strengthened and the barriers were removed with the participation of the caregivers, the

use of teaching aids, such as models for insulin injection, different medications, projectors, overhead, and visualizers; active participation of the researcher in the discussions; and repetition and practice. Positive feedback during the learning of effective behaviors was also used.

For the 4-month follow-up of the program, daily self-report checklists of the program implementation were prepared for each group. The caregivers of the three groups were trained to complete the checklists after the daily implementation of the program. The checklists were collected after 4 months and evaluated. During these 4 months, the researcher performed a follow-up every Sunday by attending the clinic in order to resolve any existing problems and to answer caregivers' questions; the researcher also checked the implementation of the programs by a phone call. The information were obtained from the self-report checklists and the questionnaires were completed before and immediately, 1 month, 2 months, 3 months, and 4 months after the implementation of programs. Meanwhile, researchers examined the caregivers' QOL and fatigue according to their self-report checklists and questionnaires.

The Statistical Package for Social Sciences (version 22.0, SPSS Inc., Chicago, IL, USA) was used for data analysis. Descriptive statistics for numerical variables were displayed as mean [standard deviation (SD)] and for categorical variables as number (percentage). Inferential statistics including Chi-square/Fisher's exact test, analysis of variance (ANOVA), independent and paired *t*-test, and repeated measurement analysis were also used. Chi-square/Fisher's exact test was used to determine the distribution of nominal/qualitative data in the groups. In addition, one-way ANOVA was performed to examine the mean of continue/quantitative variables such as age, length of care, and QOL and fatigue scores in the groups. In order to compare the effectiveness of training between and within groups, independent and paired *t*-tests were used, respectively. Repeated measurement was also performed to compare the effect on QOL and fatigue in each training group during the 4 months of intervention. Statistical significance was set at $P < 0.050$.

Ethical considerations

The study was approved by the Ethics Committee of Qazvin University of Medical Sciences, Qazvin, Iran (No. U-91138). Caregivers were informed of the study aims and procedures. Moreover, they were ensured that participation was voluntary. The confidentiality of caregivers' information was guaranteed. In addition, informed consents were obtained from all participants.

Results

In total, 105 family caregivers participated in this study. The majority of participants were men. Regarding the distribution of demographic variables, no significant differences were found between the three groups. Other participant characteristics are presented in Table 1.

There was a significant increase in QOL over time for all the groups [Table 2 and Figure 1]. In this table, values were presented as mean (SD). Repeated measurement was adjusted for age, sex, marital status, educational level, employment, financial status, number of family members, duration of care, kinship, and patient's sex. Furthermore, General Linear Model was adjusted for pre-intervention scores, age, sex, marital status, educational level, employment, financial status, number of family members, duration of care, kinship, and patient's sex. There were no differences in QOL variation across the 3 groups immediately after the intervention ($P = 0.532$).

After 1 month of intervention, the problem-based learning group ($P < 0.001$) had a superior increase in QOL compared to the face-to-face group and a marginal superiority over the Goldstein method group ($P = 0.064$). There were no differences between the face-to-face group and Goldstein method group ($P = 0.152$). After 2 months of intervention, the problem-based learning group ($P < 0.001$) had a superior increase in QOL compared to both the face to face and the Goldstein method groups ($P < 0.001$). There were no differences between the face to face group and Goldstein method group ($P = 0.383$). After 3 months of intervention, both the problem-based learning group ($P < 0.001$) and Goldstein method group ($P < 0.001$) had a superior increase in QOL compared to the face-to-face group. There were no differences between the problem-based learning and Goldstein method groups ($P = 0.594$). After 4 months of intervention, both problem-based learning method ($P < 0.001$) and Goldstein method groups

Table 1: Demographic characteristics of the study participants

Demographic characteristics	Mean (SD) or *n* (%)			*P* value*
	Face-to-face education	Problem-based learning method	Goldstein systematic training model	
Age: mean (SD)	37.17 (17.60)	35.77 (16.78)	37.58 (15.33)	0.89
Length of care: mean (SD)	3.20 (1.30)	3.2 (1.19)	3.20 (1.20)	0.99
Kinship, *n* (%)				
Mother	10 (28.6)	9 (25.7)	9 (26.5)	0.990
Father	4 (11.4)	4 (11.4)	3 (8.8)	
Wife/Husband	10 (28.6)	11 (31.4)	11 (32.4)	
Sister	2 (5.7)	2 (5.7)	2 (5.9)	
Brother	1 (2.9)	2 (5.7)	2 (5.9)	
Daughter	3 (8.6)	2 (5.7)	2 (5.9)	
Boy	2 (5.7)	2 (5.7)	2 (5.9)	
Other	3 (8.6)	3 (8.6)	3 (8.8)	
Sex, *n* (%)				
Female	14 (40)	12 (34.3)	11 (32.4)	0.78
Male	21 (60)	23 (65.7)	23 (67.7)	
Marriage, *n* (%)				
Single	6 (17.1)	5 (14.3)	5 (14.7)	0.93
Married	29 (82.9)	30 (85.7)	29 (85.3)	
Educational status, *n* (%)				
Primary	7 (20)	4 (11.4)	4 (11.8)	0.71
Guidance	12 (34.3)	8 (22.9)	8 (23.5)	
High School	9 (25.7)	13 (37.1)	12 (35.3)	
Collegiate	7 (20)	10 (28.6)	10 (29.4)	
Employment, *n* (%)				
Housekeeper	10 (28.6)	11 (31.4)	11 (32.4)	0.97
Employed	12 (34.3)	13 (37.1)	12 (35.3)	
Unemployed	8 (22.9)	5 (14.3)	5 (24.7)	
Retired	5 (14.3)	6 (17.1)	6 (17.6)	
Economic status, *n* (%)				
Poor	8 (22.9)	9 (25.7)	9 (26.5)	0.87
Moderate	17 (48.6)	13 (37.1)	13 (38.2)	
Good	10 (28.6)	13 (37.1)	12 (35.3)	
Patient's Sex, *n* (%)				
Female	21 (60)	21 (60)	21 (61.8)	0.98
Male	14 (40)	14 (40)	13 (38.2)	

*Fisher'0s exact test/Chi-square test, **One-way analysis of variance

($P < 0.001$) had a superior increase in QOL compared to the face-to-face group. There were no differences between the problem-based learning and Goldstein method groups ($P > 0.990$). Both the problem-based learning and Goldstein method groups would be desirable for better QOL improvement.

There was a significant reduction in fatigue over time for all the groups [Table 3 and Figure 1]. In this table, values were presented as mean (SD). Repeated measurement was adjusted for age, sex, marital status, educational level, employment, financial status, number of family members, duration of care, kinship, and patient's sex. In addition, General Linear Model was adjusted for pre-intervention scores, age, sex, marital status, educational level, employment, financial status, number of family members, duration of care, kinship, and patient's sex.

Immediately after the intervention, with the Bonferroni correction, both problem-based learning method ($P = 0.038$) and Goldstein method groups ($P < 0.001$) had a superior reduction in fatigue compared to the face-to-face group. There were no differences between the problem-based learning and Goldstein method groups ($P = 0.263$). After 1 month of intervention, a superior reduction in fatigue was observed in the Goldstein method group, compared to the problem-based

learning method group ($P = 0.001$) and face-to-face group ($P < 0.001$). There were no differences between the problem-based learning and face-to-face method groups ($P = 0.302$). After 2 months of intervention, the Goldstein method groups had a superior reduction in fatigue compared to the problem-based learning method ($P = 0.003$) and face-to-face groups ($P < 0.001$). There were no differences between the problem-based learning and face-to-face method groups ($P = 0.441$). After 3 months of intervention, there were no differences across the 3 groups ($P = 0.057$). After 4 months of intervention, the Goldstein method groups had a superior reduction in fatigue compared to the problem-based learning method ($P = 0.001$) and face-to-face groups ($P < 0.001$). There were no differences between the problem-based learning and face-to-face method groups ($P > 0.990$). The desired intervention for fatigue reduction would be the Goldstein method.

Discussion

This study aimed to determine the effectiveness of the three training approaches of face-to-face training, problem-based learning method, and Goldstein model on QOL and fatigue among caregivers of patients with diabetes. The results showed that all three methods of

Table 2: Comparison of quality of life across the three intervention groups

Independent variables	Mean (SD)						P value*
	Before the intervention	Immediately after the intervention	1 month after the intervention	2 months after the intervention	3 months after the intervention	4 months after the intervention	
Face-to-face education	3.8 (1.2)	4.0 (1.2)	4.3 (1.1)	4.9 (0.91)	4.3 (0.93)	4.9 (0.97)	0.018
Problem-based learning method	3.7 (1.0)	4.3 (1.2)	5.0 (0.95)	6.2 (0.71)	6.9 (0.92)	7.4 (0.88)	<0.001
Goldstein systematic training model	3.8 (1.3)	4.1 (1.2)	4.6 (0.98)	5.2 (1.1)	6.7 (0.80)	7.4 (0.65)	<0.001
P value+	0.511	0.532	<0.001	<0.001	<0.001	<0.001	

*Repeated measurement, +General Linear Model

Table 3: Fatigue comparison across the three intervention groups

Independent variables	Mean (SD)						P value*
	Before the intervention	Immediately after the intervention	1 month after the intervention	2 months after the intervention	3 months after the intervention	4 months after the intervention	
Face-to-face education	8.5 (1.1)	8.4 (1.0)	8.0 (1.0)	7.4 (1.0)	5.9 (1.3)	5.7 (1.3)	<0.001
problem-based learning method	8.5 (0.9)	8.1 (0.96)	7.7 (1.0)	6.97 (1.1)	5.4 (1.2)	5.3 (1.2)	<0.001
Goldstein systematic training model	8.5 (1.0)	7.9 (0.95)	7.2 (0.95)	6.3 (1.1)	5.1 (1.2)	4.3 (1.5)	<0.001
P value+	0.545	<0.001	<0.001	<0.001	0.057	<0.001	

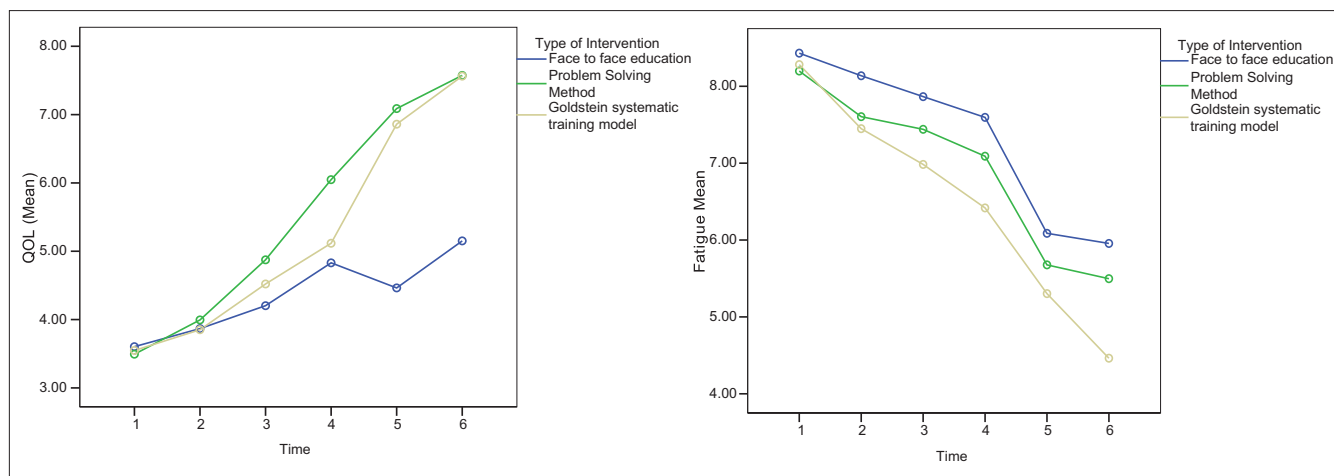*Repeated measurement, +General Linear Model

Figure 1: The trend of quality of life (left) and fatigue (right) over time

training reduced fatigue among caregivers of patients with diabetes. However, the QOL of caregivers improved through the problem-based learning method and Goldstein model. It seems that teaching is the most basic method of controlling and treating chronic illnesses such as diabetes and can improve different dimensions of QOL.[26] Results of the study showed that teaching using the problem-based learning technique had the highest share in increasing the QOL of caregivers of patients with diabetes during the first, second, third, and fourth months after the intervention. This finding was consistent with the results of the study by Halamsloee *et al*. on the impact of problem-based learning method on the QOL of parents of children with autism.[27] Findings from another study that examined problem-based learning method among caregivers of children with mental disorders also confirmed the effectiveness of this method.[28]

Training based on the Goldstein model increased QOL and fatigue in caregivers. Nevertheless, its impact in improving the QOL of caregivers was less than training through the problem-based learning method during the 4 months of the intervention. Goldstein believes that identifying the requirements of learners is the most important step in training through which information essential to providing training is obtained. This stage requires more careful attention to the identification of issues and needs of the learners. Therefore, the lower efficacy of this method in improving the QOL of caregivers may be due to the fact that training was not precisely designed based on the requirements of caregivers.

Face-to-face training method also had lower efficacy in the improvement of the QOL of caregivers in all the 4 months of intervention compared to the other two methods. These findings were consistent with the results of several studies.[29-31] The lower effectiveness of face-to-face method in improving the QOL of caregivers of patients with diabetes compared to the other two methods may be due to the large amount of information

taught in a short duration of time. The individuals who received training by this method may not be able to fully understand or memorize all the information. This factor is considered as one of the shortcomings of face-to-face training method.[32]

Interventions using the 3 methods of face-to-face training, problem-based learning method, and systematic Goldstein model had significant impact on reducing fatigue among caregivers during the 4 months. Results of a study showed that training methods were effective in reducing fatigue and improving QOL.[33] Therefore, education is one of the important techniques of reducing fatigue among the caregivers of patients with diabetes.

Limited sample size and also the contextual factor those affecting the fatigue and quality of life of caregivers of patients with diabetes are the limitations of the present study that overshadow the generalization of the study results.

Conclusion

In the present study, the problem-based learning method and Goldstein systematic training model were the most effective techniques in improving the QOL of caregivers of patients with diabetes. In addition, the greatest reduction in fatigue among caregivers within the 4 months of the intervention was achieved through the implementation of the Goldstein systematic training model.

Conflicts of interest

There are no conflicts of interest.

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