ORIGINAL ARTICLE

The Effect of Self-Care Education on Emotional Intelligence and HbA1c level in Patients with Type 2 Diabetes Mellitus: A Randomized Controlled Clinical Trial

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ABSTRACT

Background: The role of Emotional Intelligence (EI) in glycemic control in type 2 Diabetes Mellitus (DM) has not been fully understood. The present study aimed to investigate the effect of self-care education on EI and hemoglobin glycosylated (HbA1c) in patients with type 2 diabetes.

Methods: In this randomized controlled clinical trial, 48 patients with type 2 DM referred to Shahid Motahari Diabetes Center in 2015 were divided into an intervention and a control group using block randomization. The study data were collected using Bar-On questionnaire and blood testing immediately and two months after the intervention. The educational content was presented to the intervention group through 1-1:30-hour sessions held once a week for 8 continuous weeks. The control group, however, only received the clinic's routine cares.

Results: The results showed a significant difference in the mean level of HbA1c in the intervention group before and two months after the intervention (P=0.003). However, this difference was not significant in the control group. Moreover, the mean of EI was higher in the intervention group compared to the control group (P=0.08).

Conclusion: Self-care education improved the HbA1c level and EI among the patients with type 2 DM. Therefore, it is recommended that health care providers, specially nurses, should train the diabetic patients for self-care, which can lead to better glycemic control.

Trial Registration Number: IRCT201408188505N7

KEYWORDS: Emotional intelligence, Hemoglobin glycosylated (HbA1c), Self-care, Type 2 diabetes mellitus

INTRODUCTION

Diabetes Mellitus (DM) is the most common endocrine disorder. The International Diabetes Federation (IDF) has estimated that approximately 415 million adult individuals had type 2 DM globally in 2015 and the figure is expected to rise to 640 million by 2040. In Iran, 4.6 million adults (8.5%) suffer from type 2 DM that has been estimated to reach 9.2 million by 2040.[1]

Optimizing glycemic control and prevention of long-term complications are the main goals of diabetes management.[2] In order to achieve these goals, patients must adhere to therapeutic regimens including diet, medication, and exercise. However, plenty of studies have revealed the patients' unfavorable adherence rates. For instance, about half of US adults diagnosed with diabetes were not successful in decreasing their HbA1c levels to <7.0%. Such non-adherence to therapies could be attributed to the complexity of therapeutic regimens, lack of information, health system shortcomings, costs, and psychological factors, especially depression.[3] Lack of knowledge is one of the most important effective factors in health behaviors of patients with type 2 DM. In fact, patients who have knowledge about their disease and self-care are expected to show better performance in glycemic control and prevention of progression of the complications. The importance of participation of informed patients in their care has also been emphasized by diabetic associations. In modern diabetes management, the responsibility of metabolic control has been mainly shifted to patients and health professionals are responsible for patient education with an appropriate self-care action.[4]

Self-care has been defined as conscious, educated, and targeted measures performed by individuals in order to live and supply, maintain, and improve their and their families' health.[5] The goal of self-care education and programs is to increase the patients' knowledge and vision about the disease and to emphasize their main role in disease management and treatment via continuous control of diet and blood glucose level. It also aims at maintaining their life roles and managing their negative emotions, such as fear and depression, thus improving health and life quality, saving costs, decreasing hospitalized cases, preventing side effects, and postponing and decreasing the signs as well as physical and mental side effects of the disease.[6,7]

Hemoglobin A1C (HbA1c) is one of the standard tools for measurement of self-care quality among diabetic patients. Its natural and optimum level is 5.6%-7% in diabetic patients. However, it rises up to 7% in cases where health measures are ignored by the diabetic patient.[6] Several studies in England have shown that effective self-care measures performed by patients, which resulted in at least 1% decrease in HbA1c level, could significantly decrease the dangerous consequences of diabetes, such as death, myocardial infarction, and microcellular damage.[8]

Evidence has also supported the crucial role of emotions and their regulation in managing diabetes and determining diabetic management outcomes. Although clinicians are aware of the importance of mental care in diabetic patients, psychological situations and glycemic control have had limited advancements.[9] On the other hand, little information is available about the effect of emotional regulation and emotional abilities on diabetes management. One of the emotion-related concepts that seems to be effective in glycemic control is Emotional Intelligence (EI).[10]

EI was first described by Bar-On in 1980, and a questionnaire was designed accordingly. He described two elements of stress management and adaptation ability as the main elements of EI and introduced EI as a collection of skills and objective talents that causes the individuals' ability to increase in stressful situations. One of the other basic factors of EI is emotional (excitement) control.[11]

Up to now, very few studies have assessed the effect of EI on various aspects of diabetes

management. The results of two studies showed a negative association between EI and HbA1c.[10,12] Indeed, the results of one study showed that an EI program increased the quality of life, well-being, and EI levels among patients with type 2 DM.[2] It seems that proper training and encouragement of patients regarding self-care and, consequently, appropriate and favorable blood glucose control could help them maintain their natural HbA1c levels through improving their EI.

The present study aimed to assess the effect of self-care education on EI and HbA1c level in patients with type 2 diabetes.

MATERIALS AND METHODS

This randomized controlled clinical trial with pre/posttest design was conducted in Diabetes Center of Shahid Motahari Clinic affiliated to Shiraz University of Medical Sciences. The proposal was approved by the Ethics Committee of Shiraz University of Medical Sciences (code: ct-93-71-7091). Based on the study by Yalcin et al.[2] and considering the confidence level of 0.95 and power of 95%, a 38-subject sample size was determined for the study. However, considering the risk of loss, the sample size was increased to 48 subjects (24 as the intervention group and 24 as the control group).

$$N = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 \left(S_1^{\,2} + S_2^{\,2}\right)}{d^2}$$

The inclusion criteria of the study were suffering from type 2 diabetes, being 18-60 years old, having at least high school diploma, being willing to participate in the study, being available via telephone, and living in Shiraz. On the other hand, the exclusion criteria of the study were not being willing to continue cooperation in the study; suffering from Hyperosmolar Hyperglycemic Nonketotic Syndrome (HHNS), any severe life threatening disease, any chronic mental disease, or cognitive disorder; and having attended similar courses prior to this study.

At first, individual characteristics, including age, gender, marital status, occupation, education level, and duration of the disease, were recorded. After that, the participants filled in the Bar-On questionnaire (90 questions). This questionnaire was standardized by Bar-On among 3831 participants (48.8% male and 51.2% female) from different countries (Argentina, Germany, India, Nigeria, and South Africa). The results showed that the questionnaire had an appropriate reliability and validity. The items of this questionnaire were answered using a 5-point Likert scale [I fully agree (5), I agree (4), I relatively agree (3), I disagree (2), and I fully disagree (1)]. After obtaining written informed consents, the demographic data sheet and Bar-On questionnaire were filled in. In addition, blood samples were taken in order to determine HbA1c levels. HbA1c level was measured via High Performance Liquid Chromatography (HPLC) method, using Biorex Fars kits in the laboratory of Shahid Motahary clinic.

The patients were allocated into intervention and control groups by block randomization. After taking quaternary blocks and using the table of random numbers, 12 numbers were selected and 48 patients were divided into two groups. The intervention group patients received the contents of the educational program by video projector device through 1-1:30-hour group class sessions held once a week for 8 consecutive weeks. The class size was about 5 * 10 m, its temperature was 25 °C, and it had enough light. Some titles of the educational program have been listed in Table 1. The control group, however, only received the clinic's routine cares, such as receiving a pamphlet and oral training about diet, daily activities, and drugs, by the personnel of the center.

Bar-On questionnaire was filled in and HbA1c test was performed in both groups at the end of the educational sessions and two months after the intervention. Some patients were excluded from the study because of travel or unwillingness to continue their cooperation. Finally, 21 patients in each group

Table 1: Contents of the educational intervention

Session	Contents
First	Definition and types of diabetes, etiology, role of insulin and its deficiency, diabetes clinical sings, methods to decrease the risk factors, muscle relaxation training and performance, decision-making training and performance
Second	Normal levels of blood glucose, importance of diabetes control, long-term effects of high blood glucose levels on vessels, eyes, nervous system, kidneys, heart, legs, feet, and immune system, conception of diabetes control, role of diet, exercise, and drugs in diabetes control, muscle relaxation training and performance, decision-making training and performance
Third	Role of diet in diabetes control, basics of an appropriate diet, introduction of the best foods in groups of cereals, meats, dairies, fruits, and vegetables, muscle relaxation training and performance, training how to face cognitive deviations
Fourth	Benefits of regular exercising in diabetes control, introduction of beneficial sports, insulin changes during exercising, relationship between duration and severity of exercising and blood glucose level control, muscle relaxation training and performance, training how to face cognitive deviations
Fifth	Alerting signs of hypoglycemia, important measures during hypoglycemia, training how to use blood and urine glucose level checking strips, muscle relaxation training and performance, training how to face cognitive deviations
Sixth	Introduction of different insulin types, manner and method of insulin preparation, mixing, and injection, proper injection sites and times, muscle relaxation training and performance, training how to face cognitive deviations
Seventh	Common anti-diabetic drugs and their side effects, importance of feet sanitation and hygiene, importance of oral health and hygiene, muscle relaxation training and performance
Eighth	Relationship between diabetes and hypertension, proper methods of hypertension control, role of diet in hypertension control, diabetic prophylactic measures for other family members, muscle relaxation training and performance, use of supportive systems

completed the study.

After all, the data were entered into the SPSS statistical software, version 16 and analyzed using Chi-square, independent t-test, Mann-Whitney, Bonferoni, and repeated measures tests (Figure 1).
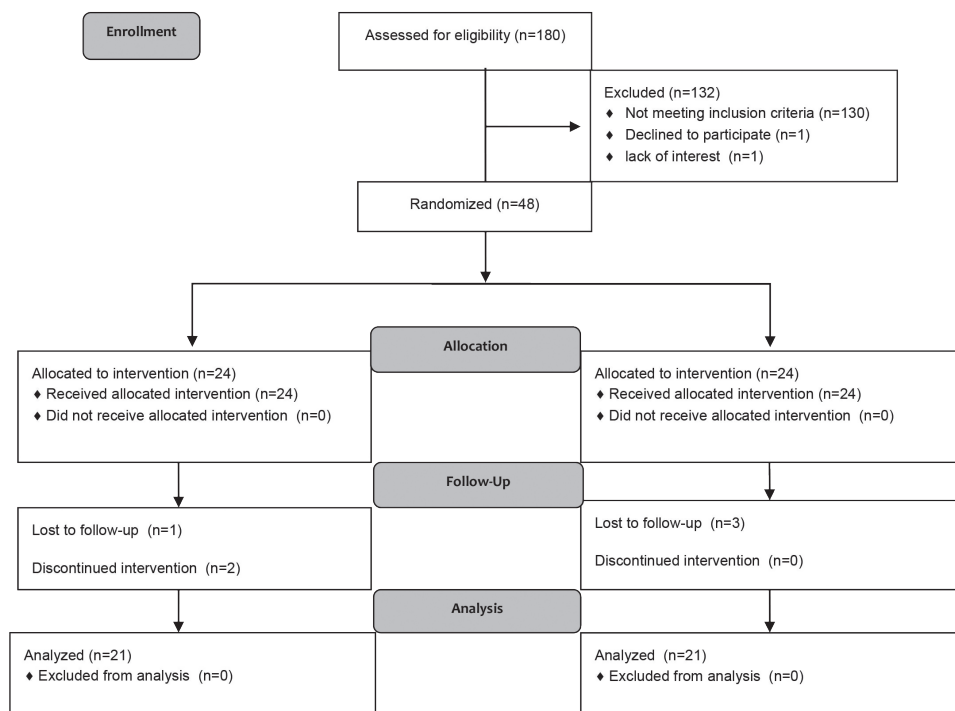

Figure 1: CONSORT flow diagram of participants

RESULTS

The participants' demographic characteristics are presented in Table 2. Accordingly, the proportion of educational degrees was similar in the two groups. The results of chi-square test also showed no significant difference between the two groups regarding frequency distribution of gender (P>0.05). In addition, the results of independent sample t-test indicated no significant difference between the two groups with respect to the mean age and mean age of diabetes onset (P>0.05).

Comparison of the means of HbA1c level and EI before the intervention, at the end of the educational sessions, and two months after the intervention is presented in Table 3. Accordingly, the results of repeated measures test revealed significant differences in the mean HbA1c levels before the intervention, at the end of the educational sessions, and two months after the intervention regardless of the study groups (P=0.003). Also, a significant difference was observed between the two groups concerning the mean HbA1c levels regardless of the time interval (P<0.001).

Moreover, the results indicated significant differences in the mean of EI at different times regardless of the study groups (P<0.001). Also, the interactive effect between the time and group demonstrated a significant difference between the two groups regarding EI changes (P<0.001). Nevertheless, no significant difference was found between the two groups with respect to the mean of EI regardless of the time interval (P=0.08). Yet, the mean of EI was higher in the intervention group compared to the control group.

DISCUSSION

The findings of this study suggested that self-care education could promote EI and HbA1c level in patients with type 2 DM. According to the results, HbA1c levels dramatically decreased to 6.74% after the intervention and during the 2-month follow-up. This demonstrated that self-care education improved glycemic control in these patients. These findings have been supported by those of other studies. The results of one study conducted in Iran showed that self-care training improved the mean level

Table 2: Comparison of the intervention and control groups regarding demographic characteristics

Variables / Groups	Control N (%)	Intervention N (%)	P value
Gender			
Female	16 (38.1)	15 (35.7)	0.73*
Male	5 (11.9)	6 (14.3)	
Educational level			
Diploma	16 (38.1)	16 (38.1)	1*
Post-graduate	5 (11.9)	5 (11.9)	
	Mean±SD	Mean±SD	
Age (Year)	45.42±7.71	48.57±7.89	0.19**
Duration of disease (Year)	7.28±7.84	8.28±3.67	0.33**

* Chi-square test; ** Independent t-test

Table 3: The mean levels of HbA1c and emotional intelligence in the intervention and control groups at three different time intervals

Variable	Group	Before Mean±SD	After Mean±SD	Two months after Mean±SD	Effect of time	Interactive effect of time and group	Effect of group
HbA1c	Intervention	8.72±1.11	6.74±1.24	7.07±1.03	P<0.001	P<0.001	P=0.003
	Control	8.49±1.37	8.85±1.67	8.68±1.40	F=21.21	F=40.06	f=9.65
Emotional intelligence	Intervention	65.09±6.49	70.95±6.92	68.62±6.84	P<0.001	P<0.001	P=0.08
	Control	64.68±7.66	64.38±7.09	64.35±7.62	F=27.42	F=29.36	f=3.14

of HbA1c as well as knowledge, attitude, and self-care performance among female diabetic patients.[13] The results of another study revealed that education could improve self-care and metabolic control variables, such as fasting blood sugar and HbA1c levels.[14] One other study also indicated that electronic education improved the self-care, mean fasting blood sugar level, and HbA1c level in patients with type 2 DM.[15] Overall, it seems that self-care education is an available and cost-effective method to decrease the patients' physical and mental problems.[9,16] A comprehensive literature review on the history and advances of diabetic patients' self-care education from 1998 until 2009 was performed in 2011. The researchers reported that diabetic patients' self-care education using different methods and policies has always been a key and valuable strategy in successful control of diabetes. However, there have always been numerous impediments to its performance, including self-motivation deficit in diabetic patients, emotional stresses, and fear from diabetes, which are all complications of low EI.[17]

The findings of the present study demonstrated that self-care education increased the mean of EI significantly in the intervention group. In other words, EI and self-care were much more favorable in the intervention group after receiving the educational contents. A similar study conducted on 90 patients with type 1 diabetes revealed a significant relationship between EI and self-care.[18] Moreover, a research conducted in 2013 indicated that diabetic patients' education must contain a combination of physical and mental self-care aspects.[19] A study carried out on 100 adult patients with type 2 DM also reported that HbA1c levels were significantly associated with EI.[12] Another study, too, revealed that higher levels of HbA1c in adolescents with type 1 diabetes were associated with low emotional processing (understanding emotions) along with low self-control (regulation of thoughts, emotions, and behavior). It was also reported that emotional processing was a better predictor of HbA1c levels compared to other

variables related to HbA1c and diabetes, such as adherence to regimen.[20]

Considering the crucial role of EI in glycemic control of patients with type 2 diabetes, interventions that increase EI are recommended to be included in their plan of care. In a clinical trial, researchers assessed the effect of EI education on the quality of life and recovery of patients with type 2 diabetes through 12 educational sessions. They found that after the intervention, quality of life, recovery, and EI were significantly higher in the intervention group compared to the control group (P<0.001). This significant difference was continuously observed three and six months after the end of the intervention and follow-up care.[2]

According to the results of the current study, it can be inferred that the control group patients who had lower levels of EI were unsuccessful in performing self-care behaviors and had higher HbA1c levels. Previous studies revealed a significant relationship between low EI and depression[21] and a significant negative relationship between self-care and depression.[22] Therefore, in addition to self-care education that is the cornerstone of self-management, appropriate interventions are recommended to decrease depression and increase EI in patients with type 2 diabetes.

One of the limitations of this study was the short follow-up duration that was limited to two months. The setting of the study was also limited to only one center, which restricts generalization of the results. Therefore, further researches with longer follow-up periods and in multiple centers are suggested to be performed on the issue.

CONCLUSION

The results of this study showed that self-care education improved the glycemic control of the patients with type 2 diabetes, which was demonstrated via favorable HbA1c levels. This educational program increased the patients' EI, as well. Providing adequate and useful information by community based organizations makes

diabetic patients able to keep their motivation and encouragement to overcome and manage their stresses and excitements in order to control their diabetes properly and prevent its fatal and irreversible side effects. Therefore, nurses must continuously educate them on providing self-care in physical and emotional domains.

Conflict of Interest: None declared.

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