Efficacy of mindfulness-based cognitive therapy on resiliency and blood glucose control in patients with type II diabetes

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Abstract

Original Article

BACKGROUND: Mindfulness-based cognitive therapy (MBCT) training has positive effects on the resilience and blood sugar control in people with type 2 diabetes (T2D). This study aimed to investigate the efficacy of MBCT on resiliency and blood glucose control in patients with T2D.

METHODS: This study was a quasi-experimental pretest-posttest with control group. The study population consisted of all patients with T2D in 2018 referring to diabetes clinic of Imam Khomeini Hospital in Sari County, Iran. The sample consisted of 30 (15 for each group) patients with T2D that were selected by availability sampling method and randomly recruited to each of the groups. Next, the experimental group members took part in a total of 8 sessions of 90 minutes each, with one session per week, for MBCT. Instruments for gathering data were the Connor-Davidson Resilience Scale and hemoglobin A1C (HbA1c) test. The data were analyzed with the use of SPSS software and statistical tests such as multivariate analysis of covariance (MANCOVA) and analysis of covariance (ANCOVA).

RESULTS: The MBCT had a significant impact on resiliency among patients with T2D ($P = 0.001$, $F = 13.828$), but the impact of MBCT on blood glucose control was not significant ($P = 0.103$, $F = 2.854$).

CONCLUSION: It seems that MBCT is an applicable treatment for improving psychological health for patients with T2D.

KEYWORDS: Mindfulness-Based Cognitive Therapy; Resiliency; Blood Glucose Control; Type II Diabetes

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Introduction

Diabetes is the most common chronic metabolic disease, which is described by anomalies in the metabolism of carbohydrates, proteins, and fats. The most common symptoms are glucose intolerance or hyperglycemia. For this reason, a person suffers from short-term and long-term complications of diabetes.[1] The incidence of diabetes has increased dramatically in the last

two decades, from 285 million in 2010 to more than 438 million in the world by 2030. Diabetes has many negative psychological consequences that have a significant impact on the course of the disease.[2] Findings of various studies show that mental health in patients suffering from chronic diseases is reduced and this defect has a negative impact on various aspects of patients' lives.[3,4] In this regard, based on scientific evidence, a significant and negative relationship has been observed between resilience and psychological problems. Thus, resilience can be defined as an individual's capacity to maintain a state of bio-psychological equilibrium in hazardous

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circumstances.[5,6] A person with diabetes may be under pressure to manage disease. In patients with diabetes, high blood sugar causes early and late complications of diabetes in the body, which can be prevented or delayed by long-term control of blood sugar.[7] Stress or psychological pressure causes some practical changes in the internal environment of the body, including the change in the secretion of many hormones, and if it lasts for a long time, it may cause various physical and mental disorders.[8] Therefore, it seems that performing psychological interventions for people with diabetes in addition to controlling blood sugar can be effective in improving psychological problems in this area. Over the past decade, research literature has shown that various studies have been conducted on the effectiveness of psychological therapies in improving the health status of patients with diabetes. For example, the supportive group therapy, acceptance and commitment therapy, resilience education, spiritual education, and dialectical behavior therapy have been effective in promoting the health of patients with diabetes.[9-13] Therefore, identifying and using an effective treatment approach to solve the problems of these patients is important and necessary and will be of great help to this group of society. One of the less effective therapeutic approaches in this field is mindfulness-based cognitive therapy (MBCT) education. Mindfulness is a concept that has its roots in the Buddhist tradition and is representative of all external and internal experiences in the present moment.[14] Mindfulness encourages one to view all emotions from a different perspective. Although mindfulness has been practiced in Buddhism for centuries, it has been used in therapeutic interventions for common psychological problems such as stress, worry, anxiety, and depression since the 1970s. Consciousness promotes various factors of mindfulness such as observation, non-

judgment, non-reactivity, and conscious action. The growth of these factors also leads to the growth of psychological well-being, stress reduction, and psychological symptoms.[15,16]

Research literature confirms the effect of mindfulness therapy on the studied variables. For example, Shojaeyan and Abolmaali showed that MBCT had a significant impact on resiliency.[20] Moreover, Fakhri et al.[24] and Mohammadi Shirmahaleh et al.[25] confirmed that MBCT improved blood glucose control in people with diabetes. Therefore, based on the aforementioned, the main inquiry of the present study is whether MBCT training is effective on resilience and blood sugar control in people with type 2 diabetes (T2D).

Methods

The research methodology employed in this study was a quasi-experimental pretest-posttest design, with a control group. The statistical population of this study consisted of all patients diagnosed with T2D who had visited the diabetes clinic at Imam Khomeini Hospital in Sari, Iran, during the year 2018. According to the Sari Diabetes Treatment Center, 4000 patients with diabetes had medical records at the center. According to the research design, a sample of 30 people were selected non-randomly by availability sampling method according to the inclusion criteria. The study participants were randomly assigned to either the experimental or control group, with 15 individuals in each group.

Inclusion and exclusion criteria were also considered for the inclusion of participants in the study. Criteria for admission to the study were having T2D, age range of 18 to 65 years, and ability to read and write (to complete research questionnaires). In addition, suffering from psychiatric disorders, substance abuse disorders, and unwillingness to participate in the study were selected as the exclusion criteria. After reviewing the entry and exit criteria, eligible individuals participated in the study. It

should be noted that among the selected patients who were selected by availability sampling method, all patients had an equal chance to be in the control and experimental groups, so that members of the sample group were randomly divided into two groups. In order to form the experimental and control groups, 30 patients who expressed interest in participating in the study were initially selected based on their voluntary presence. Subsequently, a random selection process was conducted using a lottery system, with the patients' names placed into a bag and drawn to assign them into either the experimental or control group. Each group consisted of 15 individuals.[17]

Therapeutic sessions were performed in groups among the members of the experimental group; however, the control group did not receive any form of treatment. MBCT in this study is a treatment program that was performed in 8 sessions of 90 minutes (one session per week) as a group among the members of the experimental group. After 8 treatment sessions for all members of the experimental group, questionnaires were redistributed to collect post-test information. In this study, the following questionnaires were used to

collect information.

Connor and Davidson Resilience Questionnaire: This questionnaire was used to assess the resilience of the subjects in this study. The questionnaire utilized in this study was originally developed in 2003 by Connor and Davidson, who reviewed research literature in the area of resilience. The scale was designed to measure various dimensions of resilience, including a sense of personal competence, ability to withstand adversity, positive adaptation to change, trust in one's own instincts, perceived social support, faith, and a practical approach to problem-solving strategies. The questionnaire comprises 25 items and is scored on a 5-point Likert scale.[18] Psychometric properties of this scale have been studied abroad in six groups of general population, patients referred to the primary care ward, psychiatric outpatients, patients with generalized anxiety disorder (GAD), and two groups of patients with post-traumatic stress disorder (PTSD). The validity of the scale was achieved by factor analysis and convergent and divergent validity and reliability by retesting and Cronbach's alpha in different groups (normal and at risk). In Iran, among students, its internal consistency was obtained using Cronbach's alpha coefficient of 0.87.[18,19]

Table 1. Mindfulness-based cognitive therapy (MBCT) training sessions

Session	Content
1	Introduction session for members, explanation of group rules, implementation of research questionnaires for both control and experimental groups
2	Attention and awareness training focusing on thoughts related to depressive symptoms, resilience, quality of life and blood sugar control, practice of thoughts and feelings, recording pleasant events, thinking and meditation while sitting, giving homework
3	Realizing mind-boggling training, body control techniques, controlling the wandering mind by practicing body-checking, reviewing your negative thoughts
4	Mindfulness of breathing and mindfulness meditation practice, sitting meditation, mindfulness of breathing and body, mindfulness practice with meditation.
5	3-minute breathing (integration, awareness, expanding), staying in the present, comfortable contact, discovering experience, limiting and expanding attention (meditating)
6	Creating a different relationship with experience, how to create and use acceptance, contemplation in a sitting position for 40 minutes, awareness of breathing, body and then thoughts, reviewing exercise, assigning homework
7	An overview of "Thoughts Are Not Truths" and the ways in which thoughts can be viewed differently
8	Self-care review, selecting self-care options, linking activity and mood, integrating behavior activation in training, activity planning, reviewing past sessions, conducting post-tests for both experimental and control groups

The same study reported that the results of factor analysis using the principal component method indicated the existence of a general factor in the scale. The criterion for extracting was higher than one. Kaiser-Meyer-Olkin (KMO) index was 0.89 and Bartlett's sphericity coefficient was 189.83 which showed the adequacy of question sampling and correlation matrix.

Blood glucose control test [hemoglobin A1C (HbA1c) test] was used to measure blood glucose control in the studied patients. In patients with diabetes who have had high blood glucose for a long time, glucose combines with hemoglobin (Hb) to produce HbA1c, which is measurable. This test actually measures HbA1c in the blood, so that an estimate of the patient's average blood sugar and duration of illness can be obtained. All study participants, including those in the experimental and control groups, underwent two stages of testing at a laboratory authorized by the Ministry of Health and Medical Education.

To ensure adherence to ethical standards, we made every effort to encourage patient participation in the study and assured them that all information collected would be kept confidential. Additionally, participants were informed that they could elect to receive information regarding their psychological state and would only be given their individual scores. The control group was assured that after the completion of the study, they will be offered 8 sessions of intervention if desired. Moreover, patients were free to leave the study whenever they wished. Univariate analysis of covariance (ANCOVA) and multivariate ANCOVA (MANCOVA) were used to analyze the data using SPSS software (version 21, IBM Corporation, Armonk, NY, USA). Before performing inferential statistics tests, Kolmogorov-Smirnov normality test and other assumptions were reported to check the normality of the data.

Results

The experimental group had a mean ± standard deviation (SD) of age of 49.40 ± 13.12 years, while the control group had a mean ± SD of age of 50.00 ± 5.39 years. A Student's t-test was conducted to evaluate whether the mean age of the two groups was similar. The findings indicated that there was no statistically significant difference in mean age between the two groups ($P = 0.625$, $t = 28.49$), as presented in table 2.

Table 2. Central indicators and dispersion of the two groups in research variables

Variable	Group	Pre-test (n = 15) Mean ± SD	Post-test (n = 15) Mean ± SD
Feeling of individual ability	Experimental	10.13 ± 0.83	1.47 ± 0.91
	Control	10.07 ± 1.10	10.13 ± 0.91
Resistance to negative effects	Experimental	12.27 ± 2.12	13.87 ± 1.06
	Control	13.27 ± 1.16	13.20 ± 0.86
Positive acceptance of change	Experimental	4.33 ± 1.17	6.07 ± 1.43
	Control	4.07 ± 0.96	5.80 ± 0.77
Trust in individual instincts	Experimental	4.87 ± 1.24	4.60 ± 1.18
	Control	4.93 ± 1.03	4.67 ± 1.39
Feeling of social support	Experimental	11.53 ± 1.24	13.13 ± 1.30
	Control	12.13 ± 1.50	12.33 ± 1.50
Faith and pragmatic practice	Experimental	12.40 ± 1.35	13.33 ± 1.63
	Control	12.60 ± 1.45	12.67 ± 1.39
Resilience	Experimental	55.53 ± 3.60	61.80 ± 3.00
	Control	56.73 ± 3.47	58.80 ± 3.01
Blood sugar control	Experimental	7.57 ± 0.52	7.50 ± 0.46
	Control	7.48 ± 0.63	7.53 ± 0.58

SD: Standard deviation

Univariate ANCOVA and MANCOVA were used to determine the effectiveness of MBCT on resilience and blood sugar control in patients with T2D. The use of this test requires assumptions that were tested before inferential analysis. All presuppositions were tested and confirmed**.** Therefore, by observing the presumptions of the parametric test, the use of ANCOVA is unobstructed. To evaluate the effect of MBCT on resilience in people with T2D, MANCOVA test was used according to the fulfillment of the parameters of the parametric test (Table 3). The results of the Willks' Lambda test showed that there was a significant difference between the two groups with respect to their quality of life (F = 7.39, P = 0.001).

The value of F is the effect of the independent variable (MBCT) on the dimensions of resistance to negative effects (P < 0.01, F = 13.93), feeling of social support (P < 0.01, F = 14.14), pragmatic faith and attitude (P < 0.01, F = 20.71), and overall resilience score (P < 0.01, F = 13.82), which were significant (P < 0.01). The findings suggested that MBCT had a positive impact on enhancing resilience among individuals with T2D. Besides, the effect size indicated that the changes in the scores of the groups in the dimensions of resistance to negative effects, feeling of social support, faith and pragmatic approach, and the overall score of resilience were 0.38, 0.39, 0.48, and 0.33, respectively. They were due to the implementation of the independent variable (cognitive therapy based on mindfulness). To evaluate the effect of MBCT on glycemic control in people with T2D, MANCOVA test was used (Table 4). According to the fulfillment of the parameters of the parametric test, and the value of F (2.85), the effect of the independent variable (MBCT) was not significant (P = 0.10), because the significance level was greater than the set alpha level. As a result, in the present study, MBCT had no significant effect on blood sugar control in people with T2D (P = 0.10, F = 2.85).

Discussion

The aim of this study was to evaluate the effectiveness of MBCT training on resilience and blood sugar control in people with T2D.

Table 3. The effectiveness of mindfulness-based cognitive therapy (MBCT) on resilience

Variable	Refrences	df	MS	F	P	Effect size
Feeling of individual ability	Covariate	1	4.49	7.16	0.01	-
	Group	1	0.04	0.06	0.79	-
	Error	22	0.62	-	-	-
Resistance to negative effects	Covariate	1	10.14	22.16	< 0.01	
	Group	1	6.37	13.93	** < 0.01	0.38
	Error	22	0.45	-	-	-
Positive acceptance of change	Covariate	1	3.13	2.73	0.11	-
	Group	1	0.04	0.03	0.84	-
	Error	24	1.14	-	-	-
Trust in individual instincts	Covariate	1	4.16	3.07	0.09	-
	Group	1	0.01	0.01	0.91	-
	Error	22	1.35	-	-	-
Feeling of social support	Covariate	1	13.12	14.24	< 0.01	-
	Group	1	13.02	14.14	** < 0.01	0.39
	Error	22	0.92	-	-	-
Faith and a pragmatic approach	Covariate	1	20.10	67.87	< 0.01	
	Group	1	6.13	20.71	** < 0.01	0.48
	Error	22	0.29	-	-	-
Resilience	Covariate	1	73.73	11.11	< 0.01	-
	Group	1	91.70	13.82	** < 0.01	0.33
	Error	22	6.63	-	-	-

**P < 0.01
MS: Mean squares; df: Degree of freedom

Table 4. The effect of mindfulness-based cognitive therapy (MBCT) on blood sugar control

References	df	MS	F	P	Effect size
Covariate	1	6.91	208.14	[**]< 0.01	-
Group	1	0.09	2.85	[*]0.10	
Error	27	0.03	-	-	

[*]$P < 0.05$; [**]$P < 0.01$
MS: Mean squares; df: Degree of freedom

The study's results indicate that the application of MBCT program is effective in enhancing the resilience of patients with T2D. The findings of Shojaeyan and Abolmaali,[20] Heidarian et al.,[21] and Poshtyafte[22] were consistent with the results of the present study. Explaining the effectiveness of MBCT training on patients' resilience, it can be said that reducing the pain and suffering caused by the disease is one of the main concerns of society in relation to patients with diabetes. Increasing resilience in these patients can change an important part of their lives, so that patients with high resilience will be able to be more careful in dealing with life issues. MBCT training can protect a person from mood disorders due to stress and rumination by strengthening cognitive coping processes and strengthening emotion regulation skills such as resilience.[21] Doing mindfulness exercises can make visible changes in patients' lives and their psychological functions after a while and help their mental well-being by developing coping strategies and better defense mechanisms in people. People learn to have a positive reassessment of unpleasant events such as diabetes.

By teaching coping skills, they deal with stressful events with optimism and self-confidence. Increased resilience following MBCT training activates an area of the brain that creates positive emotions and beneficial effects on the functioning of the immune system. Patients with T2D have the ability to deal directly with internal and external stimuli and to cope with problems without bias and negative judgment and with appropriate assessment methods. Adopting the right approach to problem solving leads to increased resilience and helps the person achieve positive adjustment and rebalancing after a short time.[23] The effectiveness of MBCT in improving glycemic control among individuals with T2D was not supported by the findings of this study. A literature review revealed conflicting results regarding the impact of MBCT on blood sugar control, which aligns with the present study's outcomes. Fakhri et al.[24] and Mohammadi Shirmahaleh et al.[25] in various studies on patients with diabetes showed that mindfulness therapy had a significant effect on blood sugar control. It is worth noting that several studies in the research literature have suggested that the use of MBCT may not have a significant impact on blood sugar control among individuals with diabetes. For instance, Sohrabi found no significant effect of cognitive-behavioral therapy (CBT) integrated with mindfulness on blood sugar control among patients with diabetes, which is in line with the findings of the present study[26]. It seems that in order to achieve more accurate results, more controlled research is needed to determine the effectiveness of various mindfulness trainings on blood sugar control.[23-25] In addition, blood glucose measurements were performed based on the HbA1c test, which shows the average blood sugar of patients in the past three months. It seems that by increasing the number of sessions as well as using more accurate methods for measuring blood sugar levels, better results can be achieved in this field.

One of the limitations of this study was that it lacked follow-up of treatment outcomes, and it is unclear whether MBCT is effective in patients with T2D over a longer period of time. In addition, blood glucose control in this study was performed using the HbA1c test, which shows the average blood sugar of patients in the past three months. The failure of the treatment method used to

control blood sugar can be attributed in part to the administrative limitations for more accurate blood glucose measurements.

Conclusion

Chronic diseases like diabetes can have a significant impact on the mental well-being and resilience of patients. Therefore, it is essential to provide comprehensive care programs that address both the physical and psychological aspects of the disease. Based on the present study's outcomes, one recommendation is to incorporate psychological interventions, such as MBCT, to enhance the resilience of patients with T2D.

Conflict of Interests

Authors have no conflict of interests.

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