ORGINAL ARTICLE

Effectiveness of Mindfulness-Based Stress Reduction Training on Emotional Expressiveness and Fear of Hypoglycemia in Patients with Type 2 Diabetes

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Abstract

Objective: Diabetes is a common chronic disorder in which there is a high risk of physical complications and psychological problems such as hypoglycemia and inability to express emotions. Psychological interventions can be effective in this regard. The aim of this study was to investigate the effectiveness of mindfulness-based stress reduction (MBSR) training on emotional expressiveness and fear of hypoglycemia (FOH) in patients with type 2 diabetes visiting Yazd Diabetes Center.

Materials and Methods: This study was a quasi-experimental study with a pretest and posttest design. The statistical population was all patients with type 2 diabetes visiting Yazd Diabetes Center in 2020. Forty men and women were selected using purposeful sampling and were randomly allocated to case and control groups. The case group received 8 sessions of MBSR training, 2 hours each and the control group received no interventions. Emotional Expressiveness Questionnaire (EEQ) and the Hypoglycemia Fear Survey (HFS) were used to collect data.

Results: Results of ANCOVA showed that MBSR training significantly increases emotional expressiveness and its components (*P*-value< 0.0001) and decreases the fear of hypoglycemia (*P*-value< 0.0001) in patients with type 2 diabetes (*P*-value< 0.035).

Conclusion: Based on the results of the study, MBSR training could improve emotional expressiveness, prevent hypoglycemia and reduce the fear of it.

Keywords: Mindfulness-based stress reduction, Emotional expressiveness, Fear of hypoglycemia, Type 2 diabetes.

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Introduction

Diabetes is a common metabolic disorder characterized by higher blood glucose levels caused by varying degrees of insulin resistance or impaired insulin secretion (1). This chronic condition occurs when the body is unable to produce or effectively use insulin. Diabetes is an effective and preventable risk factor that affects 171

million people worldwide. According to the statistical studies, the prevalence of diabetes in Iran is 9.73% (2). There are two main types of diabetes: type 1 and type 2. Although the prevalence of type 1 and type 2 diabetes is increasing, the prevalence of type 2 diabetes is increasing more rapidly due to the increasing prevalence of sedentary lifestyle and obesity (3). Diabetes has a wide range of effects on the body, mind, and individual and social functioning. Although medical treatments reduce symptoms, they also disrupt life patterns. There is a correlation between diabetes and psychological disorders. In addition, it is a source of stress for people with the disease. Stress caused by diabetes imposes negative psychological impacts in addition to physical adverse effects. The goal of diabetes treatment is to lower blood glucose and prevent complications (4,5). Hypoglycemia is a major complication in diabetes (6). If blood glucose approaches normal levels, the risk of life-threatening hypoglycemia increases (7). Therefore, one of the main goals of treatment is to prevent hypoglycemia (8). Hypoglycemia in diabetics causes physical and mental disorders, anxiety and stress, and may affect self-care and blood sugar control, which in some cases can even lead to death (9,10). Severe and recurrent hypoglycemia leads to fear of hypoglycemia (FOH), which negatively affects diabetes and its control (11).

The term 'fear of hypoglycemia' is used to show severe symptoms such as anxiety in diabetics and their families. It leads to concerns about low blood glucose and avoidance behaviors such as excessive blood glucose monitoring, reduced insulin consumption and excessive treatment of hypoglycemia (12,13). FOH might be severe such that many patients keep normal blood glucose levels to minimize the frequency and severity of hypoglycemic events (14). Patients with FOH might exhibit behaviors such as overeating, low insulin intake, and limiting daily life activities such as exercising and driving to prevent this complication (15). However, different adaptive strategies lead to poor metabolic control and increased risk of diabetes-related health problems as well as psychological disorders (11).

One of the psychological problems in diabetics is emotional expressiveness (16). Results of studies show that in diabetics, responding to negative emotions such as stress, anxiety, and failure is associated with the progression of diabetes (17). Frequency of emotions such as anxiety, sadness and anger can reduce couples' satisfaction and increase conflicts (18). Emotional expressiveness refers to the external display of emotions regardless of their value (positive or negative) or method (verbal, facial, or gestural) (19). Patients with type 1 and 2 diabetes are quite sensitive to stress and negative emotions such as fear and anger and have trouble controlling stress and regulating their emotions (20). Results of studies show that patients with chronic physical problems such as diabetes experience negative emotions more than normal people and in the face of problems, they are more confronted with emotion-oriented or avoidance-oriented problems and less problem-solving in a problem-oriented way, which in the short term causes relative calm to the diabetics, but in the long run, it causes the vicious cycle to continue (21). Alexithymia is associated with several physical problems such as pain, types of diabetes, essential hypertension, cardiovascular disease, respiratory disease and rheumatoid arthritis (22).

So far, several psychological therapies have been developed to address the diabetics' problems, and mindfulness-based stress reduction (MBSR) is one of the most effective therapies developed in recent decades. It is a potentially effective intervention in the treatment of psychological complications in chronic diseases and Kabat-Zinn used it to reduce stress and pain symptoms (23). Mindfulness is a series of techniques designed to encourage intentional and no evaluation contact with events that occur here and now (24). It means maintaining a moment-by-moment awareness without judgment (25). Cognitive and emotional responses are

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features of mindfulness that develop when paying attention to the present. Adherence to these features has significant intrapersonal and interpersonal effects. These features overlap and improve other features in individuals and interaction with others and the world. These symptoms can be presented directly to the clients as important concepts for revelation and meditation. In addition, in order for the clients to perceive these features, poems, metaphors and riddles could be used. Revelation and specific mindfulness strategies create and enhance these features. Some techniques emphasize a specific mindfulness feature and others emphasize all characteristics of mindfulness (26).

Studies have been conducted on the effectiveness of MBSR in reducing stress. For instance, Keyvan et al. investigated the effectiveness of MBSRon psychosocial adjustment to the disease in patients with type 2 diabetes. Results of their study indicated the significant effect of MBSR on psychosocial adjustment to diabetes (27). The study by Khosravani and Ghorbani entitled 'the effectiveness of MBSR on perceived stress and blood pressure among the hypertensive women' indicated that positive perception of stress increased and negative perception of stress decreased in the case group significantly (28). Rosenzweig et al. investigated the effectiveness of MBSR in glycemic control, body weight, blood pressure and stress-related psychological symptoms in patients with type 2 diabetes. Results suggested a reduction in hemoglobin, blood pressure, general psychological distress, depression and anxiety (29). Vala et al. investigated the effect of MBSR group training on depression, anxiety, stress, self-confidence and hemoglobin A1c in 60 patients with type 2 diabetes. Results of their study showed that depression, anxiety, stress and self-confidence were related to hemoglobin A1c and the above treatment was effective in reducing some psychological symptoms in patients with type 2 diabetes, increasing their self-confidence and controlling their blood glucose (23). Results of such studies are a basis for more research on diabetics and are effective in providing these patients with appropriate counseling and psychological services. Therefore, the aim of this study was to investigate the effectiveness of MBSR training on emotional expressiveness and FOH in patients with type 2 diabetes visiting Yazd Diabetes Center.

Materials and Methods

The research method was quasi-experimental with a pretest-posttest design with control group. The statistical population was all patients with type 2 diabetes visiting Yazd Diabetes Center in 2020. Of these patients, 40 were selected using purposeful sampling and were randomly allocated to case (n=20) and control (n=20) groups. Given that in experimental studies a sample size of at least 30 suffices (30), this sample size seems appropriate. In this study, a sample size of 40 patients was considered given the dropout rate. Inclusion criteria were age between 30 and 60, definitive diagnosis of type 2 diabetes for at least one year by a specialist at the Diabetes Center, no history of nervous and mental disease and substance abuse, not taking psychological medications and receiving psychological treatments during the study period, minimum education of junior high school and consent to participate in the study. Exclusion criteria were being absent for more than two sessions during the treatment process, unwillingness to continue treatment, chronic diseases such as cancer or serious medical conditions other than those associated with diabetes or comorbidities.

Before implementing the intervention program for case and control groups, the Emotional Expressiveness Questionnaire (EEQ) developed by King and Emmons and the Hypoglycemia Fear Survey (HFS) were completed as pretest. Then, the case group received MBSR training for 8 sessions of 2 hours. A summary of MBSR training sessions are presented in Table 1. Following the session, the posttest was conducted for case

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Table 1. Details of MBSR sessions

First session	Introducing members to each other and the counselor, introducing the intervention program and a review of 8 sessions, defining group rules and objectives, providing general explanations for MBSR training program, starting intervention techniques by explaining automatic guidance, mindful raisin meditation and giving home assignments.
Second session	Retrieving and reviewing previous session assignments and barriers to implementing them, examining these barriers and providing solutions, discussing the difference between thoughts and feelings, 30 minutes of body meditation and giving home assignments.
Third session	Retrieving and reviewing previous session assignments, three minute breathing space, practice seeing and hearing, sitting meditation and breathing, and giving home assignments.
Fourth session	Retrieving and reviewing previous session assignments, sitting meditation with breath awareness, teaching how to stay present, the concept of focusing attention, explaining the physiology of emotion and its various dimensions, and giving home assignments.
Fifth session	Reviewing previous session assignments, explaining the concept of acceptance, sitting meditation with breath, sounds and feelings awareness, presenting and doing yoga movements and giving home assignments.
Sixth session	Reviewing previous session assignments in pairs, raisin meditation, 30 minutes of body meditation, the use of metaphor and poetry in connection with mindfulness and the emphasis on the fact that thoughts are not real, and giving home assignments.
Seventh session	Reviewing previous session assignments, sitting meditation and awareness of what enters the consciousness in the moment, presenting an exercise to prepare a list of pleasant and unpleasant life events, experiencing awareness and accepting thoughts without judgment (non-selective) and giving home assignments.
Eighth session	Reviewing previous session assignments, body meditation, three minute breathing space, discussing ways to cope with barriers to meditation, asking questions about the whole session, such as whether participants met their expectations of the session. Or whether they like to keep doing meditation practices. Finally, feedback from each participant was obtained and posttest, readiness to terminate the sessions and terminate the intervention was announced.

and control groups and data were analyzed in SPSS using ANOVA.

Research tool

Emotional Expressiveness Questionnaire (EEQ): King and Emmons (1990) developed the EEQ in three subscales and 16 items to assess the expression of positive and negative emotion and the expression of intimacy. Items 1-7 were related to the expression of positive emotions, items 8-12 were related to the expression of intimacy and items 13-16 were related to the expression of negative emotions. Each item was answered on a 7-point Likert scale ranging from strongly agree to strongly disagree and it was confined to a 5-point scale in order to facilitate the accountability of respondents (31). The Likert scoring system was used ranging from 1 (strongly disagree) to 5 (strongly agree). However, in the case of the answer to items 7, 8 and 9, the scoring method is inverse due to the negative direction of the expression of emotion, i.e. the strongly agree answer is scored 1 and a completely disagree answer is scored 5, and based on this scoring method, it will vary from 16 to 80. A higher score indicated a higher emotional expressiveness. Reliability of this scale was approved by Shahgholian (2007) using internal consistency. A Cronbach's alpha of 0.68, 0.59, 0.65 and 0.68 was obtained for the whole scale, expression of positive emotion, expression of intimacy and expression of negative emotion respectively.

Hypoglycemia fear survey

The Hypoglycemia Fear Survey consisted of 18 questions that measured the patients' fear in the past 6 months which ranged between 0 and 72. Each answer was scored on a five-point Likert scale from 0 to 4. Higher scores indicated more FOH in patients. This survey was used in various studies and Amiel et al. approved its reliability and validity with a Cronbach's alpha of 0.87 (32). The reliability of this tool by retest method was 0.76 (14). In the study by Mo'meni et al., after translation and retranslation, the validity of the questionnaire was determined by content validity method and its reliability was determined by internal correlation method with a Cronbach's alpha of 0.96 (10).

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Ethical considerations

The study was approved by the ethics committee of Shahid Sadoughi University of Medical Sciences Yazd. (Ethics code: IR.SSU.REC.1400.078).

Results

Forty patients with diabetes aged between 30 and 60 years old participated in the study and their demographic data including gender and marital status presented in Table 2.

The mean and standard deviation of emotional expressiveness, expression of positive emotion, expression of negative emotion, expression of intimacy, and FOH in patients with type 2 diabetes in case and control groups are shown in Table 2 in the assessment process.

Before analyzing the data, assumptions were examined by multivariate analysis of covariance. First, normality of data was checked using Kolmogorov-Smirnov test. Since the significance level was greater than 0.05 for all variables, the null hypothesis of Kolmogorov-Smirnov test indicating no difference between the normality of the data and the normal distribution was confirmed. Considering the statistics obtained from Levene's test to investigate the homogeneity of variances in four tests related to each variable, it was observed that the level of significance in Levene's test is greater than 0.05. Therefore, the assumption of equality of variances has been observed and confirmed and analysis of covariance was used the results of which are shown in Table 3.

Results showed that MBSR training significantly increases emotional expressiveness and its components *(P*-value< 0.0001) and decreases FOH (*P*-value< 0.035) in patients with type 2 diabetes. The statistical power of the test indicates its accuracy, which is 97% for emotional expressiveness, 99% for expression of positive emotion, 99% for expression of negative emotion, 95% for expression of intimacy and 98% for the FOH. In addition, given the eta squared, it could be said that 53% of the variance of emotional expressiveness, 35% of the variance of

Table 2. Frequency of demographic variables in case and control groups

Variable		Frequency in case group	Percentage in case group	Frequency in control group	Percentage in control group
Gender	Male	5	25	6	30
	Female	15	75	14	70
Marital status	Single	1	5	1	5
	Married	19	95	19	95

Table 3. Descriptive indices of research variables in case and control groups

Variable	Group		Mean	Standard deviation
Emotional expressiveness (Total)	Case	Pretest	68.70	7.74
		Posttest	71.70	6.66
	Control	Pretest	71.00	6.72
		Posttest	70.90	6.63
Expression of positive emotion	Case	Pretest	32.10	2.150
		Posttest	33.70	1.59
	Control	Pretest	31.35	2.18
		Posttest	31.60	2.03
Expression of negative emotion	Case	Pretest	22.55	1.73
		Posttest	24.35	0.875
	Control	Pretest	21.70	1.62
		Posttest	21.65	1.75
Expression of intimacy	Case	Pretest	18.50	1.23
		Posttest	19.55	0.825
	Control	Pretest	17.95	1.31
		Posttest	18.05	1.31
Fear of hypoglycemia	Case	Pretest	55.65	8.27
		Posttest	50.50	8.84
	Control	Pretest	56.85	6.06
		Posttest	56.50	5.94

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expression of positive emotion, 43% of the variance of expression of negative emotion, 59% of the variance of expression of intimacy and 68% of the variance of FOH in people with type 2 diabetes is due to the effects of MBSR training.

Discussion

The aim of this study was to investigate the effectiveness of MBSR training on emotional expressiveness and FOH in patients with type II diabetes visiting Yazd Diabetes Center. Given the investigations conducted and considering the results from data analysis, MBSR intervention affects emotional expressiveness and FOH in patients with type 2 diabetes. In fact, MBSR training significantly increased emotional expressiveness and its components in patients with type 2 diabetes. Findings of the present study comply with the results of studies by Keyvan et al. (27), Khosravani et al. (28), Rosenzweig et al. (29) and Mo'meni et al. (10). In a study entitled 'the predictors of FOH in patients with type 2 diabetes treated with oral diabetic medications', it was concluded that employment status, number of medications used, number of hospitalizations, hyperlipidemia, hypoglycemia and severity of hypoglycemia were associated with FOH (10). Given that if hypoglycemia is not treated, cognitive and motor functions may be affected and often due to these negative consequences, patients may experience psychological fears caused by the symptoms of hypoglycemia. This fear may turn into phobia and reduce the quality of life and subsequent adherence to treatment (33). In their study, Shi et al. emphasized that FOH may be a stronger predictor of the health and well-being of patients with diabetes than hypoglycemia itself (34). In this way, the use of diabetes management solutions reduces hypoglycemia events and makes it possible to maintain blood glucose control, which leads to an improvement in the patient's quality of life. The other finding of their study was the effectiveness of MBSR training on emotional expressiveness in patients with type 2 diabetes. Findings of the present study comply with the results of studies by Ahmadi et al. (16), Rostami et al. (35), and Greenberg et al. (36). To explain these findings, hormonal imbalance due to diabetes on the one hand and the influx of negative thoughts on the other hand cause excessive arousal in the expression of negative emotions and feelings. Having a chronic physical disease, such as diabetes, can cause stress and anxiety, which seems normal at first; but as the stress of the disease continues, the quality of a person's life and their relationship with others are affected. Patients with diabetes are more likely to experience negative emotions due to the level of stress caused by the disease. Therefore, MBSR intervention improves patients 'emotional expressiveness by identifying unexpressed and repressed emotions and emotional needs of patients. MBSR emphasizes stress reduction using a series of mindfulness techniques that further reduce patients' emotional and anxiety problems and boost their physical and mental health. Expression of emotions includes dimensions such as expression of positive emotions, expression of negative emotions and

Table 4. The effect of MBSR training on emotional expressiveness and FOH in type 2 diabetics

Dependent variables	Source of effect	Degree of freedom	Mean squares	F statistic	*P*-value	Eta squared	Power of the test
Emotional expressiveness (Total)	Group	1	79.96	41.69	0.0001	0.530	0.970
	Error	37	1.92				
Expression of positive emotion	Group	1	24.62	19.92	0.0001	0.358	0.996
	Error	37	1.23				
Expression of negative emotion	Group	1	11.81	28.60	0.0001	0.436	0.999
	Error	37	0.413				
Expression of intimacy	Group	1	43.75	54.12	0.0001	0.594	0.952
	Error	37	0.808				
Fear of hypoglycemia	Group	1	228.87	52.56	0.035	0.687	0.988
	Error	37	4.35				

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expression of intimacy; thus, MBSR training allows people to talk about their emotions in comfortable and stress-free group sessions, which makes emotional expressiveness easier and reduces the lack of emotional expressiveness in patients with type 2 diabetes.

Conclusions

It is concluded that FOH has a significant inverse correlation with the quality of life of diabetics. Therefore, special measures must be taken to prevent these complications. MBSR training provides the basis for improving emotional expressiveness by identifying emotions and targeting diabetic patients' emotions and feelings. In addition, the use of lower-risk medications can reduce the FOH in patients with type 2 diabetes and it can be considered as an essential need in them.

Among the limitations of the present study were the cross-sectional nature of the study, considering only one clinic to conduct the study, not conducting a three- or six-month follow-up period, and disregarding patients' mental health status, including personality disorders, thoughts, and beliefs. Since this subject has not been extensively studied by researchers in Iran, it is suggested to conduct future research on nursing interventions and the FOH in these patients as well as the relationship between diabetics' personality traits in predicting the FOH.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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