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Effectiveness of Mindfulness-Based Therapy on Emotion Regulation Difficulties, Quality of Life, and Blood Glucose Levels in Patients with Type 2 Diabetes

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ABSTRACT

Objective: Type 2 diabetes is one of the most common chronic diseases, which, in addition to its physical consequences, is often accompanied by psychological problems such as difficulties in emotion regulation and reduced quality of life. This study aimed to investigate the effectiveness of mindfulness-based therapy on emotion regulation difficulties, quality of life, and fasting blood glucose levels in patients with type 2 diabetes.

Methods and Materials: This quasi-experimental study employed a pretest–posttest design with a follow-up phase and a control group. The sample consisted of 30 patients with type 2 diabetes in Tehran, selected through convenience sampling and randomly assigned to either the intervention group (n=15) or the control group (n=15). The intervention group participated in eight 60-minute sessions of mindfulness-based therapy. Data collection tools included the Difficulties in Emotion Regulation Scale (DERS), the World Health Organization Quality of Life Questionnaire, and fasting blood glucose measurements. Data were analyzed using the Kolmogorov–Smirnov test, Levene's test, and repeated-measures ANOVA.

Findings: The findings revealed that, compared to the control group, mindfulness-based therapy significantly reduced difficulties in emotion regulation ($p < 0.001$), increased quality of life ($p < 0.001$), and lowered fasting blood glucose levels ($p < 0.001$). These positive effects persisted during the follow-up phase.

Conclusion: Mindfulness-based therapy can be used as a complementary, non-invasive intervention for the psychological and physiological management of patients with type 2 diabetes, contributing to improved quality of life.

Keywords: Type 2 diabetes, mindfulness-based therapy, emotion regulation difficulties, quality of life, fasting blood glucose.

Introduction

With social and industrial changes, the pattern of disease incidence has shifted. As a result, chronic illnesses are considered the most important public health problems of societies; they themselves are regarded as major sources of stress and impose substantial economic costs on society (Norris, 2021). These illnesses have many types, one of the most important of which is diabetes. Diabetes is a disease with rising prevalence and one of the most common endocrine disorders worldwide (Gregory et al., 2022; Karimi et al., 2024). The global prevalence of diabetes in 2010 was about 6.4% (285 million people) and is predicted to reach about 7.7% (439 million people) by 2030. Most of these new cases will occur in developing countries. It appears that by 2020 the greatest increase in diabetes prevalence will be in the Middle East (Timajchi et al., 2025; Lomeli et al., 2025). At present, the prevalence of diabetes is high in the Middle East, and in Iran this rate has been reported as 7.7% (Rahmati et al., 2022). The overall pattern of diabetes prevalence worldwide indicates that developing countries, as well as lower socio-cultural strata in developed societies, are also afflicted with high rates of this disease.

Type 2 diabetes is one of the most common chronic diseases worldwide, and especially in Iran (Organization, 2004). Given the increasing prevalence of this disease in Tehran, it is necessary to examine effective therapeutic methods to improve the quality of life and mental health of patients with type 2 diabetes. In addition to physical problems, diabetic patients face psychological issues such as anxiety, depression, and difficulty in emotion regulation that require specific therapeutic interventions (Oraii et al., 2022). Traditional treatments for type 2 diabetes are usually limited to managing physical symptoms and medications. However, considering the psychological impacts of this disease, there is a felt need for novel and effective psychological treatments. Mindfulness-based therapy and the Unified Transdiagnostic Treatment are two newer approaches in psychotherapy that can help improve the psychological status and quality of life of diabetic patients.

One common problem in diabetic patients is difficulty in emotional expressiveness and emotion regulation (Coccaro et al., 2021). These problems can exacerbate diabetes symptoms and reduce quality of life. Therefore,

examining the impact of mindfulness-based therapies and the Unified Transdiagnostic Treatment on these psychological dimensions is of great importance. The quality of life of diabetic patients decreases due to the numerous physical and psychological problems they face. Improving quality of life is one of the primary goals of therapeutic interventions, and this study can show which of the aforementioned therapeutic methods is more effective in improving quality of life. Therefore, the aim of the present study was to compare the effectiveness of mindfulness-based therapy and the Unified Transdiagnostic Treatment on emotional expressiveness, difficulty in emotion regulation, quality of life, and blood glucose levels in individuals with type 2 diabetes in Tehran.

Methods and Materials

Study Design

The present study was a semi-experimental research with a pretest-posttest-follow-up design and a control group. The statistical population included all patients with type 2 diabetes in Tehran who visited diabetes treatment centers and clinics in 2024. The sampling method used was convenience and voluntary sampling. To ensure generalizability and increase statistical accuracy, the sample size was determined based on Cochran's formula and the estimated effect size, resulting in 30 participants who were randomly assigned to three groups. This included 15 participants in the Mindfulness-Based Therapy group and 15 participants in the control group.

Inclusion criteria were: (1) confirmed diagnosis of type 2 diabetes by a physician, (2) age between 30 and 65 years, (3) voluntary consent to participate in the study, (4) ability to regularly attend treatment sessions, and (5) not receiving any simultaneous psychological treatments that could affect the study results. Exclusion criteria included: (1) absence from more than two therapy sessions, (2) unwillingness to continue participation at any stage, (3) occurrence of new physical or psychological problems limiting continued participation, (4) receiving new therapeutic interventions that could affect results, (5) participation in similar psychological treatments during the study, and (6) having another physical or psychological illness of higher clinical priority.

Instruments

Difficulties in Emotion Regulation Scale (DERS): Developed by (Gratz & Roemer, 2004), emotion regulation is defined as encompassing (a) awareness and understanding of emotions, (b) acceptance of emotions, (c) ability to control impulsive behaviors, and (d) ability to act according to desired goals to achieve personal aims and situational demands. This self-report questionnaire assesses difficulties in emotion regulation and includes 36 items across six subscales. Reliability analysis indicates high internal consistency: total scale (α = 0.93), and for subscales—nonacceptance (0.80), goals (0.89), impulse (0.86), awareness (0.80), strategies (0.88), and clarity (0.84) (Gratz & Roemer, 2004). Construct and predictive validity are also adequate. Items are rated from 1 ("almost never") to 5 ("almost always"); higher scores indicate greater difficulty in emotion regulation. Items 1, 2, 6, 7, 8, 10, 17, 20, 22, 24, and 34 are reverse-scored. In an Iranian sample, Cronbach's alpha was reported as 0.92 (Azizi et al., 2009).

World Health Organization Quality of Life Questionnaire (Group, 2004): This 26-item instrument evaluates four domains of quality of life—physical health, psychological well-being, social relationships, and environment. Each item is scored on a five-point Likert scale ranging from 1 ("not at all") to 5 ("completely"), or from "very dissatisfied" to "very satisfied." Physical health domain items: 3, 4, 10, 15, 16, 17, 18; psychological domain: 5, 6, 7, 11, 19, 26; social relationships: 20, 21, 22; environmental domain: 8, 9, 12, 13, 14, 23, 24, 25. Items 3, 4, and 25 are reverse-scored. Cronbach's alpha coefficients reported by WHO ranged from 0.73 to 0.89. In Iran, (Nasiri-Amiri et al., 2016) reported reliability coefficients of 0.67 (test–retest), 0.87 (split-half), and 0.84 (Cronbach's alpha). Nejat et al., (2007) found α = 0.88 for total scale, 0.70 for physical, 0.77 for psychological, 0.65 for social, and 0.77 for environmental domains. Validity analysis showed significant correlations (r = 0.45–0.83, p < 0.01) between each item and its corresponding domain.

Mindfulness-Based Therapy

The Mindfulness-Based Therapy by Kabat-Zinn (2003) was implemented over eight 60-minute sessions focusing on specific topics.

Table 1

Mindfulness-Based Therapy by Kabat-Zinn et al. (1992)

Session	Content
1	Body scan, meditation sessions, mindful movements, and three-minute breathing exercises as examples of formal mindfulness practices. Participants selected a daily activity and practiced mindful awareness of sensory experiences. Each session included discussions of experiences. Focused attention on bodily sensations developed control over mental activity and expanded attentional capacity.
2	Participants recorded daily pleasant events, noting what happened, associated bodily sensations, thoughts, and emotions. Focus on breathing helped anchor the mind in the present, facilitating detachment from ruminative thinking.
3	The same process was repeated for unpleasant events (e.g., traffic jams, cleaning, customer service calls). Meditation emphasized cultivating concentration and awareness to engage consciously with experiences.
4	Focused on understanding emotions as a combination of situation outcomes and interpretations. Participants imagined unpleasant scenarios and observed how thoughts shaped emotions.
5	Through emotion modulation, participants learned to break habitual reaction patterns, reduce aversion, and foster acceptance. Meditation focused on experiencing unpleasant memories nonjudgmentally, promoting openness and self-acceptance.
6	Participants explored the reciprocal relationship between thoughts and emotions. Mindfulness helped interrupt reactive chains by fostering awareness of interpretations and mental flexibility. Practices included sensory grounding, mindful breathing, and seated meditation.
7	Emphasized recognizing that thoughts are not facts. Participants practiced distancing from negative thoughts, observing them objectively, and engaging in reflective meditation to expand cognitive perspective.
8	Reinforced sustained attention and conscious engagement with experiences. The goal was awareness of present reality without judgment, replacing habitual automaticity with intentional awareness. Participants practiced mindful observation to cultivate purposeful focus and motivation.

Implementation Method

A single-blind design was used, and both treatments were conducted by the researcher. Eligible patients were randomly assigned to two groups: mindfulness-based therapy and control. The treatment group attended eight weekly 60-minute sessions. The control group was placed on a waiting list and received the more effective treatment after the study. Pretest and posttest assessments were conducted using validated questionnaires on emotion regulation difficulties and quality of life. Blood glucose levels were measured in a medical laboratory under a specialist's supervision before and after the intervention.

Ethical Considerations

All participants received verbal information about the study and participated voluntarily after giving informed consent. Participants were assured that all information would remain confidential and used only for research purposes. Names and personal identifiers were not recorded to maintain privacy. All questionnaires were administered directly by the researcher to ensure procedural accuracy.

Analysis

To describe and summarize sample characteristics, measures of central tendency and dispersion (mean, standard deviation, minimum, and maximum) were used. The Kolmogorov–Smirnov test was applied to assess data normality, and Levene's test to verify homogeneity of variances. Data were analyzed using repeated-measures ANOVA. All statistical analyses were performed with SPSS version 25.

Findings and Results

A total of 30 participants with type 2 diabetes were included in two groups: the "Mindfulness-Based Therapy" group (n=15) and the "Control" group (n=15). The mean age of the mindfulness group was 47.26 years (SD = 6.18), and for the control group, 46.80 years (SD = 5.92). The female-to-male ratio was 9 to 6 in the mindfulness group and 8 to 7 in the control group. The mean duration of diabetes was 7.53 years (SD = 2.41) in the mindfulness group and 7.80 years (SD = 2.15) in the control group. The Chi-square and independent t-tests indicated that the two groups did not differ significantly in terms of age, gender, or duration of diabetes ($p > 0.05$).

Table 2

Demographic characteristics of participants by group

Variable	Mindfulness Group (n=15)	Control Group (n=15)	Test Statistic	p
Age (years)	47.26 ± 6.18	46.80 ± 5.92	t = 0.21	0.834
Gender (female/male)	9 / 6	8 / 7	χ^2 = 0.13	0.716
Duration of diabetes (years)	7.53 ± 2.41	7.80 ± 2.15	t = -0.32	0.751

The mean and standard deviation of emotion regulation difficulties, quality of life, and fasting blood glucose in the pre-test, post-test, and follow-up stages for both groups are presented in Table 3.

Table 3

Means and standard deviations of variables by group and time

Variable	Phase	Mindfulness Group	Control Group
Difficulties in Emotion Regulation	Pre-test	88.40 ± 7.21	87.93 ± 6.94
	Post-test	65.26 ± 6.18	86.73 ± 6.51
	Follow-up	66.13 ± 6.42	86.93 ± 6.39
Quality of Life	Pre-test	54.13 ± 4.91	54.40 ± 5.02
	Post-test	71.86 ± 5.28	55.13 ± 4.98
	Follow-up	70.93 ± 5.10	54.86 ± 5.07
Fasting Blood Glucose (mg/dl)	Pre-test	168.20 ± 11.48	167.46 ± 12.01
	Post-test	140.60 ± 10.34	166.93 ± 11.82
	Follow-up	142.40 ± 10.50	167.13 ± 11.74

The Kolmogorov–Smirnov test for all variables at different stages was not significant ($p > 0.05$), indicating a normal distribution of data. Likewise, Levene's test for homogeneity of variances was not significant ($p > 0.05$), confirming that the assumption of homogeneity was met.

Table 4

Results of repeated-measures ANOVA

Variable	Source of Variation	F	df	p	η^2
Difficulties in Emotion Regulation	Time	254.31	2,56	<0.001	0.901
	Group × Time	239.87	2,56	<0.001	0.896
Quality of Life	Time	312.14	2,56	<0.001	0.918
	Group × Time	298.63	2,56	<0.001	0.914
Fasting Blood Glucose	Time	187.26	2,56	<0.001	0.870
	Group × Time	175.92	2,56	<0.001	0.863

The repeated-measures ANOVA showed that the main effect of time was significant for all variables: difficulties in emotion regulation: $F(2,56)=254.31$, $p<0.001$, $\eta^2=0.901$; quality of life: $F(2,56)=312.14$, $p<0.001$, $\eta^2=0.918$; fasting blood glucose: $F(2,56)=187.26$, $p<0.001$, $\eta^2=0.870$. The group × time interaction was also significant for all three variables ($p<0.001$), indicating that the mindfulness intervention had a greater impact on improving the variables compared to the control group.

Table 5

Bonferroni post-hoc pairwise comparison results for study variables

Variable	Phase Comparison	Mean Difference (Mdiff)	Standard Error (SE)	p
Difficulties in Emotion Regulation (Mindfulness)	Pre-test – Post-test	23.14	1.45	<0.001
	Pre-test – Follow-up	22.27	1.51	<0.001
	Post-test – Follow-up	-0.87	1.02	0.412
Difficulties in Emotion Regulation (Control)	Pre-test – Post-test	1.20	1.38	0.389
	Pre-test – Follow-up	1.00	1.34	0.468
	Post-test – Follow-up	-0.20	1.12	0.859
Quality of Life (Mindfulness)	Pre-test – Post-test	-17.73	1.12	<0.001
	Pre-test – Follow-up	-16.80	1.09	<0.001
	Post-test – Follow-up	0.93	0.87	0.284
Quality of Life (Control)	Pre-test – Post-test	-0.73	0.94	0.446
	Pre-test – Follow-up	-0.46	0.90	0.615
	Post-test – Follow-up	0.27	0.85	0.754
Fasting Blood Glucose (Mindfulness)	Pre-test – Post-test	27.60	1.98	<0.001
	Pre-test – Follow-up	25.80	1.87	<0.001
	Post-test – Follow-up	-1.80	1.05	0.092
Fasting Blood Glucose (Control)	Pre-test – Post-test	0.53	1.92	0.786
	Pre-test – Follow-up	0.33	1.89	0.862
	Post-test – Follow-up	-0.20	1.78	0.912

The Bonferroni test results showed that in the mindfulness group, there were significant differences between pre-test and post-test, as well as between pre-test and follow-up for all three variables ($p<0.001$). However, the difference between post-test and follow-up was not significant ($p>0.05$), indicating the stability of the intervention's effects. In the control group, no significant differences were observed between the stages ($p>0.05$).

Discussion and Conclusion

In this study, which examined the effect of mindfulness-based therapy on difficulties in emotion regulation, quality of life, and fasting blood glucose levels in patients with type 2 diabetes, the findings showed that the mindfulness intervention produced significant and relatively stable improvements in the studied variables. These results are consistent with the existing body of literature and support the psychological and physiological effects of this modern therapeutic approach. In particular, it was found that the mindfulness intervention, compared to the control group, significantly reduced difficulties in emotion regulation, noticeably improved quality of life, and considerably lowered fasting blood glucose levels, while such changes were not observed in the control group.

These findings reflect the theoretical hypothesis that mindfulness enhances emotional awareness,

nonjudgmental acceptance, and reduces impulsive emotional reactions, thereby improving patients' emotion regulation abilities. The results are in line with studies such as Grossman et al. (2004), who reported that mindfulness intervention programs reduce psychological stress, anxiety, and depressive symptoms in patients with chronic illnesses. Similarly, Carlson et al. (2007) demonstrated that in cancer patients, mindfulness programs led to significant improvements in quality of life and physical symptoms. This study also showed that mindfulness training and practice can directly and indirectly affect physiological indicators by reducing emotional stress—particularly by lowering blood glucose, which is a critical outcome for diabetic patients. It is assumed that mindfulness exercises contribute to glucose regulation through activation of the parasympathetic nervous system, reduction of cortisol levels, and improved regulation of autonomic responses.

Furthermore, regarding quality of life, studies such as Schirda et al. (2015) on patients with type 2 diabetes have shown that mindfulness interventions significantly improve both the psychological and physical dimensions of quality of life. The findings of the present study further confirm these effects; specifically, a substantial increase in quality of life scores was observed in the intervention group compared to the control group, and this improvement remained largely stable during follow-up. This indicates the persistence of mindfulness effects, which are likely due to lifestyle changes, increased acceptance of the illness, and reduced worry about the future.

Regarding difficulties in emotion regulation, the findings showed a marked and sustained reduction in the intervention group during both post-test and follow-up phases. This aligns with mindfulness-based psychotherapeutic theories such as MBSR, which emphasize trust in inner experience, reduction of impulsive reactions, and strengthening of emotion regulation capacity (Kabat-Zinn & Hanh, 2009; Karimi et al., 2024). The level of difficulty in emotion regulation—which includes subscales such as emotion acceptance, impulse control, and emotional awareness—improved noticeably in this intervention. This improvement could potentially lead to reductions in maladaptive behaviors such as anxiety-driven overeating, insomnia, or inappropriate emotional reactions.

This study has considerable clinical and research implications. From a clinical perspective, providing non-invasive, self-directed psychological interventions such as mindfulness can be used as a complement to pharmacological management in diabetic patients. Mindfulness exercises can be implemented in clinics, mental health centers, and even online through educational materials, group therapy sessions, or mobile applications. Given their low cost and feasibility for home practice, this approach is well-suited for treating a large population of patients. From a scientific standpoint, this research represents a valuable step in the psychological understanding of diabetes management by emphasizing emotion regulation alongside physiological control, thus paving the way for future studies integrating applied psychology and medical care.

However, the study also had limitations. The sample size was small and based on convenience sampling, which may limit the generalizability of the results. Additionally, the lack of an active control group that received a non-mindfulness intervention (e.g., lifestyle education or supportive psychotherapy) was a limitation of the study design. Moreover, the follow-up period was relatively short; a longer follow-up (e.g., six or twelve months) could have provided a clearer view of the long-term stability of the effects. Future studies are recommended to use larger and randomly selected samples, include active control groups, and conduct long-term follow-ups to strengthen the validity of the findings.

Finally, it should be emphasized that mindfulness is only one component of a comprehensive strategy for diabetes management and should be integrated with pharmacological treatment, nutritional interventions, and physical activity. It is also recommended that future psychological intervention programs include components such as social support, self-care education, and coping skills training to achieve greater effectiveness in improving both quality of life and physiological control of diabetes. As scientific evidence in this field accumulates, mindfulness-based therapy may be recognized as an effective complementary option in the psychomedical rehabilitation programs for diabetic patients. This approach can enhance not only psychological well-being but also glucose control, quality of life, and patients' daily functioning.

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