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The Effect of a Peer-Based Educational and Supportive Intervention on Diabetes Distress and Treatment Adherence in Patients with Type 2 Diabetes: A Clinical Trial

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Article

Keywords: Type 2 Diabetes, Treatment Adherence, Psychological Distress, Peer Education, Supportive Intervention

Posted Date: November 6th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10854576/v1

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Additional Declarations: No competing interests reported.

Abstract

Background and Objective:

Type 2 diabetes mellitus (T2DM) is one of the most prevalent chronic non-communicable diseases, characterized not only by physical complications but also by psychological distress and diminished treatment adherence. Diabetes-related psychological distress can adversely affect self-care behaviors and compliance with therapeutic regimens. Consequently, identifying effective interventions to reduce distress and enhance treatment adherence is of critical importance. To this end, the present study aimed to evaluate the effect of a peer-based educational and supportive intervention on the levels of psychological distress and treatment adherence among patients with type 2 diabetes.

Methods

This clinical trial study was conducted among patients with type 2 diabetes. Sixty-six patients meeting the inclusion criteria were randomly assigned to either an intervention or a control group (n = 33 per group). The data were collected using the Diabetes Distress Scale and the Treatment Adherence Questionnaire for Chronic Diseases. The participants in the intervention group received peer-based education and support during five weekly sessions, each lasting 30 to 40 minutes. Assessments were performed at three stages: baseline (pre-test), immediately after the intervention, and at a two-month follow-up. The data were analyzed using the independent samples t-test, analysis of covariance (ANCOVA), and repeated measures ANOVA via SPSS (version 23).

Results

The results indicated a statistically significant reduction in the mean psychological distress scores of the intervention group immediately after the intervention ($p = 0.01$) and at the two-month follow-up ($p = 0.001$), whereas no significant changes were observed in the control group ($p = 0.86$). Furthermore, the total treatment adherence score and all its dimensions—including effort, participation, adaptability, integration of treatment into daily life, persistence, commitment, and implementation—increased significantly in the intervention group ($p < 0.05$). These effects remained sustained for up to two months following the intervention ($p < 0.05$).

Conclusion

The peer-based educational and supportive intervention significantly improved treatment adherence and reduced psychological distress in patients with type 2 diabetes. Due to its cost-effectiveness, ease of implementation, and cultural acceptability, this approach can be utilized as an effective strategy in education and care programs for diabetic patients within primary healthcare systems.

Introduction

Type 2 diabetes mellitus (T2DM) is one of the most prevalent chronic non-communicable diseases, characterized by impaired glucose metabolism, insulin resistance, and diminished insulin secretion (1). According to reports from the World Health Organization (WHO), more than 537 million adults worldwide are living with diabetes, with T2DM accounting for approximately 90% to 95% of these cases. This figure is projected to reach 783 million by 2045, an increase primarily attributed to obesity, unhealthy dietary patterns, and sedentary lifestyles (2). The prevalence of T2DM is also significantly high in Iran. Based on the 2021 STEPs study, approximately 14.2% of adults (over 7 million individuals) are affected (3), and this figure is expected to rise to 9.2 million by 2030 (4). Beyond the physiological burden, T2DM entails extensive socio-economic consequences. The global cost associated with the disease was estimated at approximately 966 billion USD in 2021 and is projected to exceed 1,050 billion USD by 2045 (5). Furthermore, the onset of complications such as cardiovascular diseases, renal failure, neuropathy, and retinopathy leads to a diminished quality of life and increased mortality rates among affected patients (6).

In addition to these physical manifestations, a critical challenge in the management of T2DM is the psychological burden associated with the disease (4). Diabetes distress is defined as the persistent negative emotions related to the demands of managing the illness, including anxiety regarding complications, treatment burnout, feelings of failure in glycemic control, and the fear of hypoglycemia (7). Studies have indicated that the prevalence of diabetes distress among T2DM patients varies between 20% and 50% (8, 9). A global study in 2024 reported that approximately 35% of patients experience moderate to severe levels of distress (10). A study by Azadbakht et al. (2021) in Iran estimated the prevalence of distress to be approximately 49% (9). Such psychological distress can exert a direct negative influence on patients' self-care behaviors and their adherence to therapeutic regimens (11).

Treatment adherence in T2DM patients encompasses compliance with dietary restrictions, regular physical activity, consistent medication use, glucose monitoring, and attendance at medical appointments (12). Evidence suggests that non-adherence to the therapeutic regimen is a major obstacle in the management of chronic diseases and can lead to disease recurrence, the progression of disability, and an increased need for hospitalization (13). Numerous studies have reported poor treatment adherence among T2DM patients, citing it as a primary factor in the escalation of disease complications. Wabe et al. demonstrated that every 10% increase in regimen adherence is associated with a 0.14% to 0.16% reduction in glycated hemoglobin (HbA1c) (14). A study in Iran reported that approximately 30% to 50% of patients abstain from using antihypertensive and lipid-lowering medications, which play a vital role in reducing cardiovascular events, during the first three months of treatment, indicating a low level of overall adherence to the therapeutic regimen (20).

In recent years, numerous psychological and educational interventions have been explored to alleviate distress and enhance treatment adherence (15, 16). Diabetes self-management education programs

based on cognitive-behavioral models (17) have been shown to reduce glycated hemoglobin (HbA1c) by approximately 0.32% in adults, with this reduction increasing to 0.52% when supplemented with feedback (18). Beyond glycemic control, such educational initiatives have also been found to reduce diabetes distress (19). Nevertheless, these programs are often constrained by limitations, including high costs, a shortage of specialized personnel, and restricted accessibility. In this context, peer-based interventions have emerged as a cost-effective, culturally adaptable, and scalable alternative (20). Peer-led supportive education involves group or individual interactions between trained patients and their peers, facilitating the transfer of lived experiences, emotional support, and practical guidance (21). Peer education is a sustainable approach through which patients establish a close rapport based on shared experiences, thereby receiving essential information as well as social and emotional support (22, 23). This methodology can positively influence not only clinical outcomes but also the psychological distress and self-efficacy of patients. However, the empirical evidence in this domain remains inconsistent; while some studies indicate that peer education contributes to the reduction of distress in patients with type 2 diabetes (24, 25), others have reported no statistically significant effect (26).

Given the high prevalence of type 2 diabetes and its profound impact on the physical and mental health of patients, identifying effective strategies to mitigate distress and improve treatment adherence is of critical importance. Due to their cultural adaptability, cost-effectiveness, and potential for scalability, peer-based interventions possess significant potential to enhance clinical outcomes. However, there is currently limited evidence regarding the simultaneous efficacy of these interventions in reducing psychological distress and increasing therapeutic adherence among patients with type 2 diabetes. Consequently, the present study sought to evaluate the effect of a peer-based educational and supportive intervention on the levels of diabetes distress and treatment adherence in patients with type 2 diabetes mellitus.

Methods

This study was designed as a randomized controlled clinical trial and was conducted during 2025–2026 at the teaching healthcare centers affiliated with Shahrekord University of Medical Sciences, Shahrekord, Iran. The trial was prospectively registered with the Iranian Registry of Clinical Trials (IRCT) under the registration number IRCT20250810066800N1 on **2025-12-22**. The study protocol is publicly accessible through the following link: https://www.irct.ir/user/trial/86852/. Written informed consent was obtained from each participant before enrollment, and participation was entirely voluntary. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and was approved by the Ethics Committee of Shahrekord University of Medical Sciences under the ethical approval code IR.SKUMS.REC. 1404.034. The research population consisted of outpatients with type 2 diabetes mellitus (T2DM) visiting the Endocrinology and Diabetes Clinic affiliated with Shahrekord University of Medical Sciences. The inclusion criteria were defined as follows: age between 20 and 65 years; a confirmed diagnosis of T2DM by an endocrinologist; a minimum disease duration of six months since diagnosis (27); provision of informed consent; literacy (reading and writing proficiency); absence of known cognitive impairments or physical and psychological disabilities; absence of chronic diabetic

complications—including diabetic foot ulcers, renal failure, and blindness (as diagnosed by a specialist); absence of psychological disorders, such as anxiety or depression, based on patient self-reports and medical record reviews; no participation in other educational programs beyond the routine care provided by the diabetes clinic; accessibility via direct telephone contact with the patient or a family member; and the ability to attend and actively participate in the educational sessions.

Peer educators were selected based on a specific set of criteria, including: willingness and enthusiasm to educate other patients; absence of chronic diabetic complications such as foot ulcers, amputation, renal failure, or blindness; a glycated hemoglobin (HbA1c) level of less than 7.5% within the previous trimester (28); a history of T2DM for more than one year; a high score on the Treatment Adherence Questionnaire (between 150 and 200) and a low score on the Diabetes Distress Scale (less than 13); a minimum educational qualification of a high school diploma; and an age range between 20 and 40 years (29).

The criteria for patient exclusion from the study included death; modifications to the therapeutic regimen (specifically changes in the type or dosage of antidiabetic medications); the onset of acute illness or complications necessitating hospitalization (including myocardial infarction, stroke, or renal failure); and absence from more than two educational sessions. Similarly, peer educators were excluded if they withdrew their consent to continue participation during the study or experienced medical complications requiring hospitalization during the study period.

Sampling Procedure

Based on a study by Ju et al. (24), the sample size was calculated assuming a mean difference in psychological distress scores of 3.0 and a standard deviation of 4.0 for both groups. With a significance level (α) of 0.05 and a type II error probability (β) of 0.20, the minimum required sample size was estimated to be 28 participants per group. To account for a predicted 15% attrition rate during the study, the sample size was increased to 33 participants per group to maintain adequate statistical power.

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

$$N = \frac{(0.4^2+0.4^2)(0.84+1.96)^2}{0.3^2} = \frac{0.32\times\ 7.84}{0.09} \cong 28$$

Eligible patients were selected via convenience sampling and subsequently assigned to the two groups using block randomization. The randomization process was implemented in blocks via Sealed Envelope Ltd. (2017) through the website www.sealedenvelope.com. The participants were organized into six blocks of 11, resulting in the allocation of 33 participants to both the intervention and control groups. The person responsible for allocation did not have access to the outcome assessment data before group assignment. Because of the nature of the peer-led educational and supportive intervention, the participants and peer educators could not be blinded to group allocation. The researcher responsible for

delivering and supervising the intervention was also aware of the group assignments. The outcome assessor and the data analyst were blinded to group allocation

Instruments

The instruments used for data collection in this study included a demographic data collection form, the Diabetes Distress Scale (DDS), and the Treatment Adherence Questionnaire for Chronic Diseases. The demographic form collected information on age, gender, educational level, marital status, duration of the disease, place of residence, occupation, insurance status, history of hospitalization, insulin use, use of oral antidiabetic medications, and the most recent glycated hemoglobin (HbA1c) level.

The Diabetes Distress Scale was developed by Kessler et al. (2009) and consists of 10 items designed to measure the level of psychological distress associated with diabetes. Total scores range from 0 to 40. Scores below 13 indicate mild distress, 14 to 27 indicate moderate distress, and 28 to 40 indicate severe distress, with higher scores representing a greater level of psychological distress (30). The Persian version of this scale was psychometrically validated by Ataei et al. (2015), with reliability confirmed by a Cronbach's alpha of 0.95 (31). Criterion validity was also established by calculating a cut-off point of 8, based on its correlation with the Composite International Diagnostic Interview (CIDI) (32).

The Treatment Adherence Questionnaire for Chronic Diseases was developed and validated by Modanloo (2013) for patients with chronic conditions. This instrument comprises 40 items divided into seven subscales: treatment effort (9 items), willingness to participate (7 items), adaptability (7 items), integration of treatment into daily life (5 items), persistence (4 items), commitment (4 items), and implementation (3 items). Responses are scored on a six-point Likert scale, with total scores ranging from 0 to 200. A higher score indicates a higher level of treatment adherence. Adherence levels are categorized based on the percentage of the total score as follows: 0–25% (poor), 26–49% (moderate), 50–74% (good), and 75–100% (very good). In Modanloo's original study, the content validity index was 0.91, Cronbach's alpha was 0.921, and test-retest reliability was 0.875 (33). In the present study, the Cronbach's alpha for this questionnaire was calculated to be 0.89, indicating satisfactory reliability.

Interventional Procedure

A total of 70 patients were initially enrolled in the study; however, four participants withdrew due to a lack of interest in continuing. Consequently, 66 participants were allocated to the two final groups, with no further attrition occurring throughout the remainder of the study. At the onset of the study, all participants attended the diabetes center at the scheduled time. After providing informed consent, they completed the demographic, treatment adherence, and diabetes distress questionnaires. To prevent cross-contamination (the exchange of information) between the two groups, the intervention was first implemented for the control group, followed by the intervention group. The study was conducted in five distinct phases: patient selection, peer selection, peer training, patient education, and patient evaluation.

Selection and Training of Peer Educators

To select the peer educators, the researcher collaborated with educational and therapeutic centers in Shahrekord. After explaining the study objectives to the center managers, lists of patients with type 2 diabetes were obtained. From these lists, six individuals were initially selected based on criteria including an HbA1c level below 7.5%, the absence of chronic diabetic complications, a minimum educational level of a high school diploma, and a willingness to participate. Following telephone contact, these individuals were invited to the diabetes center on a designated date. During the face-to-face meeting, the study goals were explained, and the participants were asked to complete the Treatment Adherence Questionnaire. Individuals who scored above 50% on the adherence scale and met all other inclusion criteria were selected as peers. Ultimately, three eligible individuals were chosen as peer educators and received the necessary training from the researcher.

The peer training process consisted of three 30-minute sessions (34). At the beginning of each session, the training objectives and guidelines were outlined. The educational content included an overview of type 2 diabetes, its symptoms, treatment and follow-up, the prevention of complications, glycemic control, the administration of medications and insulin, and stress management. The training was delivered using audio-visual aids and group discussions. The final content was developed based on a needs assessment of the patients and an analysis of the baseline questionnaire scores, which was then provided to the peer educators. All peers were trained simultaneously and were instructed to deliver the educational program to the patients according to a predefined schedule (34).

Peer-Led Patient Education

In the subsequent phase, three peer educators were introduced to the participants in the intervention group. To facilitate the educational process, the 33 patients in the intervention group were divided into three subgroups of 11 participants each, using block randomization. The peer educators delivered the training over five sessions, each lasting 30 to 40 minutes, conducted at weekly intervals. These sessions were held at the diabetes clinic under the coordination of the researcher. The educational content was developed based on the baseline questionnaire results and was approved by a panel of experts comprising an endocrinologist and two faculty members. The researcher attended all educational sessions to provide direct supervision over the implementation of the training procedure.

The participants in the control group received only the routine care provided by the healthcare centers, which included general education from physicians and nurses as well as informational posters. Accordingly, no peer-led interventions were administered to this group. Following the completion of the educational sessions, the diabetes distress and treatment adherence questionnaires were re-administered to the participants in both groups. Furthermore, to evaluate the durability of the intervention's effect, the participants were contacted by telephone two months after the conclusion of the training and invited to return to the center to complete the follow-up questionnaires.

Data Analysis

Data analysis was performed using SPSS software (version 23). To compare the variables and evaluate the impact of the intervention, the independent samples t-test, analysis of covariance (ANCOVA), repeated measures ANOVA, chi-square, and Fisher's exact tests were employed. The level of statistical significance for all tests was set at $p < 0.05$.

Results

The chi-square test revealed no statistically significant differences in demographic characteristics or baseline variables between the intervention and control groups ($p > 0.05$) (Table 1).

Table 1
Comparison of the frequency distribution of demographic characteristics and background variables between the intervention and control groups

Variable	Category	Intervention (n = 33)	Control (n = 33)	p-value
Gender	Male	17 (51.5%)	10 (30.3%)	0.080
	Female	16 (48.5%)	23 (69.7%)	
Age (years)	< 30	6 (18.2%)	4 (12.1%)	0.766
	30–35	14 (42.4%)	16 (48.5%)	
	≥ 35	13 (39.4%)	13 (39.4%)	
Marital Status	Single	5 (15.2%)	2 (6.1%)	0.484
	Married	26 (78.8%)	29 (87.9%)	
	Divorced/Widowed	2 (6.1%)	2 (6.1%)	
Educational Level	Lower education/High school diploma	11 (33.3%)	9 (27.3%)	0.854
	Associate’s degree	7 (21.2%)	10 (30.3%)	
	Bachelor's degree	10 (30.3%)	9 (27.3%)	
	≥ Master's degree	5 (15.2%)	5 (15.2%)	
Occupation	Employee	3 (9.1%)	4 (12.1%)	0.743
	Self-employed	9 (27.3%)	9 (27.3%)	
	Retired	0 (0.0%)	1 (3.0%)	
	Worker	8 (24.2%)	4 (12.1%)	
	Homemaker	11 (33.3%)	12 (36.4%)	
	Unemployed	2 (6.1%)	3 (9.1%)	
Monthly Income	Sufficient	0 (0.0%)	2 (6.1%)	0.214
	Somewhat sufficient	18 (54.5%)	13 (39.4%)	
	Insufficient	15 (45.5%)	18 (54.5%)	
Place of Residence	Urban	22 (66.7%)	16 (48.5%)	0.135
	Suburban	11 (33.3%)	17 (51.5%)	
Hypertension	Yes	12 (36.4%)	17 (51.5%)	0.215
History of Myocardial Infarction	Yes	4 (12.1%)	6 (18.2%)	0.492

Variable	Category	Intervention (n = 33)	Control (n = 33)	p-value
Hyperlipidemia	Yes	19 (57.6%)	16 (48.5%)	0.459
History of Hospitalization	Yes	11 (33.3%)	15 (45.5%)	0.314
Insulin Use	Yes	17 (51.5%)	19 (57.6%)	0.621
Oral Antidiabetic Medication Use	Yes	15 (45.5%)	20 (60.6%)	0.218
Duration of Disease (years)	< 2	10 (30.3%)	3 (9.1%)	0.092
	2–4	8 (24.2%)	7 (21.2%)	
	5–7	3 (9.1%)	8 (24.2%)	
	≥ 8	12 (36.4%)	15 (45.5%)	

The data presented in Table 2 indicate that the peer-led educational and supportive intervention had a significant effect on reducing psychological distress among patients with type 2 diabetes. The mean psychological distress scores in the intervention group decreased significantly after the intervention ($p = 0.01$) and during the follow-up phase ($p = 0.001$), whereas the control group exhibited no significant change ($p = 0.86$). Furthermore, the peer-led intervention led to improvements across all dimensions of treatment adherence. Specifically, scores for treatment effort, willingness to participate, adaptability, integration of treatment into daily life, persistence, commitment, and implementation were significantly higher in the intervention group compared to the control group ($p < 0.05$ to $p = 0.014$). The total treatment adherence score was also significantly higher in the intervention group in the post-intervention and at follow-up phases compared to the control group ($p = 0.001$). However, no significant difference was observed between the two groups at baseline ($p = 0.59$).

Table 2
Comparison of mean psychological distress scores and various dimensions of treatment adherence between the intervention and control groups at baseline, post-intervention, and follow-up phases

Variable	Group	Before Intervention (Mean ± SD)	Immediately After Intervention (Mean ± SD)	Two Months After Intervention (Mean ± SD)	Intragroup p-value#
Psychological Distress	Control	25.84 ± 7.50	26.45 ± 7.05	26.81 ± 7.14	0.86
	Intervention	24.93 ± 7.33	22.36 ± 5.75	21.57 ± 5.32	0.04
	Intergroup p-value	0.62*	0.01**	< 0.001**	—
Treatment Commitment	Control	18.24 ± 3.82	17.57 ± 3.38	17.30 ± 3.33	0.53
	Intervention	20.51 ± 4.33	22.81 ± 4.20	23.33 ± 4.22	0.01
	Intergroup p-value	0.05*	< 0.001**	< 0.001**	—
Willingness to Participate in Treatment	Control	17.30 ± 4.62	16.87 ± 4.37	16.27 ± 4.11	0.63
	Intervention	17.39 ± 4.26	21.00 ± 4.31	22.18 ± 4.43	< 0.001
	Intergroup p-value	0.93*	< 0.001**	< 0.001**	—
Ability to Adapt Treatment to Life	Control	17.45 ± 4.95	17.06 ± 4.62	16.51 ± 4.59	0.72
	Intervention	17.75 ± 4.53	21.21 ± 4.74	22.18 ± 4.74	< 0.001
	Intergroup p-value	0.79*	< 0.001**	< 0.001**	—
Persistence with Treatment	Control	10.54 ± 2.82	10.00 ± 2.54	9.72 ± 2.60	0.44
	Intervention	9.66 ± 2.64	11.42 ± 2.48	12.00 ± 2.79	< 0.001
	Intergroup p-value	0.19*	0.02**	< 0.001**	—
Adherence Commitment	Control	12.03 ± 3.20	11.36 ± 2.98	10.96 ± 2.88	0.36
	Intervention	11.18 ± 3.42	13.63 ± 3.56	14.66 ± 3.84	< 0.001
	Intergroup p-value	0.30*	0.007**	< 0.001**	—
Treatment Management	Control	6.51 ± 2.29	5.96 ± 2.02	5.60 ± 2.03	0.22
	Intervention	7.00 ± 2.22	8.51 ± 2.25	9.18 ± 2.35	< 0.001

Notes: *Independent samples t-test; **Analysis of covariance (ANCOVA); # Repeated-measures ANOVA.*

Variable	Group	Before Intervention (Mean ± SD)	Immediately After Intervention (Mean ± SD)	Two Months After Intervention (Mean ± SD)	Intragroup p-value#
	Intergroup p-value	0.38*	< 0.001**	< 0.001**	—
Overall Treatment Adherence	Control	93.06 ± 12.22	89.33 ± 11.42	86.36 ± 10.98	0.06
	Intervention	94.54 ± 9.98	111.15 ± 8.22	116.87 ± 7.82	< 0.001
	Intergroup p-value	0.59*	< 0.001**	< 0.001**	—

Notes: *Independent samples t-test; **Analysis of covariance (ANCOVA); # Repeated-measures ANOVA.*

Discussion

The present study evaluated the efficacy of a peer-led educational and supportive intervention on treatment adherence and psychological distress among patients with type 2 diabetes mellitus (T2DM). The findings demonstrated that this intervention significantly enhanced treatment adherence in this population. While both groups were baseline-equivalent in terms of total adherence scores and all related dimensions, the intervention group exhibited a significant superiority over the control group in both the total score and all specific dimensions of adherence following five needs-based, two-hour educational sessions. A critical finding is that these improvements persisted two months after the intervention, suggesting the internalization of the behavioral and cognitive changes induced by the intervention. These findings are consistent with previous literature identifying peer education as an effective strategy for the management of chronic diseases. For instance, Khavasi et al. (2016) demonstrated that peer-led education increases self-efficacy in patients with T2DM (35). As a primary predictor of self-management behaviors, self-efficacy may explain the underlying mechanism of the present intervention; specifically, peer educators, by sharing lived experiences and fostering empathy, encourage patients to assume greater responsibility for their treatment (36). Similarly, Seuring et al. (2019) reported improvements in treatment adherence, knowledge, and quality of life following peer education (29). However, their study primarily focused on biochemical markers such as HbA1c and did not assess adherence through a direct, multidimensional approach. In contrast, the present study utilized the Modanloo questionnaire to examine adherence as a multifaceted (cognitive, emotional, and behavioral) construct, revealing more sustainable effects. Furthermore, while Chan et al. (2014) found peer-led telephonic support effective in reducing HbA1c (37), their intervention lacked the structured, face-to-face educational component utilized in the present study. The weekly group sessions in the current study provided opportunities for deeper interaction and the exchange of experiences, which likely strengthened the participants' sense of belonging and accountability. Although Edraki et al. (2020) reported improved self-care among adolescents with type 1 diabetes after four group peer sessions (38), the demographic and clinical differences (adolescents vs. adults; T1DM vs. T2DM) limit direct generalizability. Nevertheless, the fundamental principle, the efficacy of peer education across different

age groups, is reaffirmed. In addition, while Safavi et al. improved self-efficacy and self-management through ten educational sessions (39), they did not analyze treatment adherence as an independent variable, a gap that the present study has addressed. Conversely, Liu et al. (2015) reported no significant difference in self-management (36). This discrepancy may be attributed to differences in the measurement tools used (multidimensional adherence vs. general self-management), the duration of the intervention, or the failure to control for mediating variables such as social support. By implementing more rigorous controls and focusing on the actual needs of the patients, the present study achieved more robust and significant outcomes.

The peer-led educational and supportive intervention resulted in a profound and sustainable reduction in psychological distress, which is recognized as one of the most potent predictors of treatment non-adherence and the exacerbation of insulin resistance via the chronic activation of the hypothalamic-pituitary-adrenal (HPA) axis (7). While both groups were baseline-equivalent regarding the severity of distress, the intervention group experienced a significant decrease following only five two-hour sessions, an effect that persisted two months later. This durability suggests that the outcome was not merely a transient emotional response but rather an indication of the restructuring of coping mechanisms and a reduction in the chronic cognitive load associated with the disease. From a clinical perspective, this reduction not only enhances the quality of life but also interrupts the stress-inflammation-hyperglycemia cycle, thereby creating the potential for long-term improvement in glycemic control, a mechanism well elucidated in psych neuroendocrinological models of diabetes (40). Consistent with these findings, Ju et al. (2018) reported that peer-led education and support led to a significant decrease in psychological distress during long-term follow-up periods (24). The difference in follow-up duration highlights the advantage of the weekly sessions employed in the present study in creating an initial "acceleration effect", as intensive support during the early phases of diagnosis or disease exacerbation, periods when distress typically peaks, can prevent the consolidation of avoidant behavioral patterns. Similarly, de Vries et al. (2014) demonstrated that peer-led education could reduce psychological distress over 6 to 12 months, even with monthly sessions (41). In contrast, the weekly frequency of the present study provided immediate and continuous support, which is vital during the critical phase of disease acceptance and minimizes the probability of distress relapse. The discrepancy with the findings of Liu et al. (2015), who reported no significant effect on distress (36), can be attributed to three primary factors: First, the use of general stress assessment tools rather than a diabetes-specific distress scale, which possesses higher sensitivity to the specific burden of the disease; second, the absence of a peer component, which ensures empathy and experiential credibility; and third, a longer intervention duration without sufficient frequency, which may lead to “intervention fatigue”. By focusing on shared experience, the present study leveraged a unique mechanism: the transformation of shared suffering into collective strength. This process not only mitigates distress but also reinforces psychological resilience, acting as a buffer against future stressors. Consequently, this shifts the intervention from simple education to a form of “social therapy”, which holds a specialized and critical position within integrated care models for diabetes.

Conclusion

By fostering deep interpersonal connections, facilitating the transfer of experiential knowledge, and enhancing a sense of empowerment, the peer-led educational and supportive intervention not only improved treatment adherence across its cognitive, emotional, and behavioral dimensions but also mitigated psychological distress, a primary barrier to effective self-management in patients with type 2 diabetes. Due to its cost-effectiveness, scalability, and high level of cultural acceptability, this approach holds significant potential for integration into primary diabetes care systems. Future studies should utilize structural modeling to investigate mediating mechanisms, such as self-efficacy and perceived social support, and evaluate long-term outcomes (exceeding six months) through the simultaneous measurement of glycated hemoglobin (HbA1c) and comprehensive cost-effectiveness analyses.

Declarations

Acknowledgments

The authors express their sincere gratitude to the patients who participated in this study, to the authorities of Shahrekord University of Medical Sciences, and to the administrators and staff of the Imam Ali Clinic in Shahrekord for their support in the conduct of this research project.

Authors’ Contributions

S GH contributed to the conceptualization, data collection, and preparation of the initial draft of the manuscript. HR performed the data analysis, contributed to the methodology, and undertook the revision and editing of the manuscript.RSH was involved in the conceptualization of the study, methodology, RJ was involved in the conceptualization of the study, methodology, supervision of the research, revision and editing of the manuscript, and acquisition of funding. All authors read and approved the final version of the manuscript

Funding

This study was derived from the master's thesis of **Saba Ghasemian**, an M.Sc. student in Medical–Surgical Nursing at the School of Nursing and Midwifery, Shahrekord University of Medical Sciences, Shahrekord, Iran. This research was financially supported by Shahrekord University of Medical Science

Data Availability

The datasets are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Written informed consent was obtained from each participant before enrollment, and participation was entirely voluntary. The study was conducted in accordance with the ethical principles outlined in the

Declaration of Helsinki and was approved by the Ethics Committee of Shahrekord University of Medical Sciences under the ethical approval code IR.SKUMS.REC. 1404.034.

Consent for Publication

Not applicable.

Conflict's Interests

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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