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Comparison of the Effectiveness of Web-Based Motivational Interviewing and Web-Based Diabetes Self-Management Education in Glycemic Control in Patients with Type 2 Diabetes

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Abstract

Background: Diabetes is a chronic debilitating disease and one of the most severe public health problems, especially during the Covid-19 pandemic, which increases the risk of developing and exacerbating the symptoms of diabetes.
Objectives: The present study aimed to compare the effectiveness of web-based motivational interviewing and diabetes self-management education in glycemic control.
Methods: This quasi-experimental research was conducted based on a pretest-posttest control group follow-up design. The statistical population of this study included all patients with type 2 diabetes who were referred to Imam Khomeini Hospital and municipality health centers in Tehran in 2021. A total of 45 people who met the inclusion criteria were purposefully selected and randomly assigned to three experimental and control groups. Data were analyzed in SPSS software (version 26) using the analysis of covariance.
Results: The results pointed out that web-based motivational interviewing and diabetes self-management education was effective in blood sugar control (P<0.05).
Conclusion: As evidenced by the results of this study, due to the effectiveness of motivational interviewing and diabetes self-management education in controlling blood sugar and glycosylated hemoglobin, these techniques can be used as web-based and online psychological interventions to help manage the disease without the need for face-to-face visits.

Keywords: Diabetes, Hemoglobin A1C, Motivation, Self-management

1. Background

Diabetes is a chronic metabolic disorder caused by impaired insulin secretion, insulin function, or both. It leads to relatively long-term eye and kidney complications, as well as an increased risk of cardiovascular disease (1). Diabetes is known as the most dangerous and challenging disease. People with type 2 diabetes are at risk for complications of small arteries (retinopathy, neuropathy, nephropathy) and large arteries (cardiovascular disease) that result from elevated normal blood sugar levels (2). It is estimated that about 463 million people in the world are living with type 2 diabetes, and the number is expected to reach 700 million by 2045 (3).

The treatment of diabetes depends crucially on the patient's self-management behaviors (4). Nonetheless, only half of the people with diabetes are on the verge of treatment (5). Diabetes and patients' commitment to disease management presents them with daunting challenges in their lives. Continuous drug use and constant blood sugar control, dietary restrictions, and psychological problems are the consequences of this complex disease and treatment conditions (6). Patients' empowerment to manage the disease can increase their capacity to cope effectively with the disease (7). Self-management is patients' active participation in the management and control of the disease. It encompasses the aspects of physical, emotional, and social health, as well as such behaviors as healthy eating, exercise, regular blood sugar monitoring, drug use, problem-solving skills, and behaviors that reduce risk (8).

Motivational interviewing is one of the effective interventions to change behavior and improve diabetes self-management (9). Motivational interviewing is a client-centered method and guide for strengthening and enhancing inner motivations to change by resolving doubts and ambiguities, as well as a movement toward a specific goal in an empathetic atmosphere (10). Patients may not respond well to routine behavioral or lifestyle changes due to low motivation and commitment to change, high levels of ambivalence, resistance, low levels of self-efficacy, and conflicting goals (11). Insufficient motivation is one of the problems posed to effective adaptation to the disease and an obstacle to self-care. Motivational interviewing can help increase and strengthen the patient's response to treatment. In recent years, motivational

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interviewing has entered the field of treatment of chronic diseases (12). There is research evidence regarding the effect of motivational interviewing on the management and control of diabetes (13).

The present study aimed to compare the two approaches of motivational interviewing and self-management education in web-based and remote methods. Some previous studies have pointed to the effectiveness of these two approaches through web-based and remote methods in controlling blood sugar (14); nonetheless, the findings of some studies (15) indicated that these web-based interventions did not have a significant effect. Technological advances in the treatment of diabetes in recent years have made it possible to apply newer methods of communication therapy than more traditional methods. These technological advances can transcend organizational geographical and temporal barriers posed to care systems (16).

New electronic and mobile-based methods (17) have attained a good position in chronic disease treatment programs (18). Technology-based interventions in diabetes self-management have improved disease and reduced blood sugar (19). New Internet-based e-learning methods have major benefits: accessibility to all locations and populations, better interaction with therapists and health care teams (20), provision of a good perspective for the development of treatment methods (21), as well as time and cost-effectiveness (22). The need to develop effective face-to-face methods to control diabetes prompts further studies to identify the effects of this intervention on ethnic, age, economic, and cultural populations.

The importance of remote interventions in diabetes care increased during the Covid-19 pandemic. In these conditions, people with chronic diseases were at greater risk and demonstrated more severe symptoms of Covid-19 disease (23). With the onset of the Covid-19 pandemic, the need for changes in diabetes prevention and treatment mechanisms has become more urgent. In the new context of social distancing, which interrupts the provision of diabetes care services, it is necessary to expand diabetes self-management education programs virtually to increase access to health services. In light of the aforementioned issues, the present study aimed to identify more effective methods of distance diabetes control methods. Very few web-based studies have been conducted on diabetic patients in Iran.

2. Objectives

This study aimed to compare web-based interventions of motivational interviewing and diabetes self-management education.

3. Methods

This quasi-experimental study was conducted based on a pretest-posttest and control group design. The statistical population of this study included patients with type 2 diabetes who were referred to the Endocrinology Clinic of Imam Khomeini Hospital and municipality health centers in Tehran in September and October 2021. The participants were selected via convenience sampling and took part in this study voluntarily. Among the volunteers, 45 cases who met the inclusion criteria were purposefully selected and randomly assigned to the experimental and control groups; however, six cases were eliminated in the implementation process.

The inclusion criteria were as follows: diagnosis of patients with type 2 diabetes based on clinical criteria (diagnosis of the specialist physician) and paraclinical (HbA1C> 7.0 and FBS> 120), a history of at least one year, an age range of 25-45 years, education higher than a diploma, and an ability to work with smartphones. On the other hand, the exclusion criteria entailed addiction, mental disorders, and absence from one education session. The implementation of motivational interviewing web-based interventions based on the Poursharifi (24) protocol set for diabetes and diabetes self-management education was conducted according to the Stanford University DSMP (Diabetes Self-Management Program) (25).

Motivational interviewing interventions in five sessions and self-management education in six sessions per week were held in groups and through WhatsApp social media.

In addition to the motivational interviewing sessions, stress control training was carried out by the psychologist, diabetes education by a diabetes nurse, and adjusting the appropriate diet and food program by the nutrition expert. Before the implementation of the research, a practice session was held to familiarize the subjects with Whatsapp messenger. Assignments and training materials were presented in the form of documents, video clips, and photos. The therapist was available within sessions.

Table1. Content of motivational interviewing sessions

Session	Content
Session 1	Introducing the motivational approach, setting group rules, familiarizing clients with the stages of change, and determining the stage of personal change
Session 2	Introducing the topic of a day of life, description, and discussion
Session 3	Discussing personal values, discovering conflict between values and behavior
Session 4	Identifying pros and cons and measuring decision balance
Session 5	Self-efficacy and commitment to changing behavior, identifying motivators, setting clear and realistic goals, as well as preparing a personal plan

Table 2. Content of diabetes self-management education sessions

Session	Content
Session 1	Recognition of the disease, etiology, complications, and diagnostic methods and its complications in simple language to patients. Adjusting the appropriate diet plan based on the number of calories for each patient
Session 2	Identifying barriers to disease management, examining thoughts and feelings related to the disease
Session 3	Problem-solving skills training
Session 4	Planning an action plan and commitment to goals
Session 5	Commitment to the plan and goals
Session 6	Experience and evaluation of the action plan

Data were analyzed in SPSS software (version 22) using the multivariate analysis of covariance (MANCOVA).

4. Results

In this study, the mean age scores of participants in the first experimental group (motivational interviewing), the second experimental group (self-management), and the control group were 42.58±3.39, 42.69±3.17, and 43±2.94, respectively. In terms of education, 62.5%, 24.7%, and 12.8% of subjects had a diploma and associate's degree, bachelor's degree, and master's degree, respectively. Regarding gender, the majority of subjects (66.6%0 were female. As displayed in Table 3, statistical tests showed no significant difference between the groups in terms of demographic variables.

Then Shapiro-Wilk index related to blood glucose indices in all three experimental and control groups and both pre-tests and post-test stages demonstrated that it was insignificant at the level of 0.05. Therefore, data distribution was normal for both groups in all three stages of implementation. Furthermore, the results of the Leven test illustrated that the difference in the variance of scores related to biological indicators in the three groups in the two stages of the test was not significant; therefore, the assumption of homogeneity of variance of error between the data was established (P<0.05).

Table 4 displays the results of the regression slope homogeneity assumption for the dependent variables. The results pointed out that the F value of the interaction of the independent and scattering variables for any biological indicator was not greater than 0.05; therefore, the assumption of homogeneity of the regression slope was observed. Table 4 presents the results of a one-way analysis of covariance related to blood glucose index in three groups and two test stages.

The results of Table 5 indicate that the effect of independent variables on the A1C index (η2 = 0.226; P=0.011, F=5.106 (2 and 35)) is significant (P<0.05). Moreover, the effect of independent variables on fasting blood sugar index (η2= 0.167; P = 0.041, F = 3.511 (2 and 35)) is significant (P<0.05). As a result, with a probability of 0.95, motivational interviewing training and web-based self-management education affect fasting blood sugar and hemoglobin A1c index in patients with type 2 diabetes. Consequently, it can be concluded that motivational interviewing and self-management education can significantly affect the blood sugar index in these patients. To compare the effect of independent variables on HbA1c index and fasting blood sugar, a one-to-one comparison of means was used, the results of which are reported in Table 6.

Table 3. Mean (SD) of blood glucose index in participants of experimental and control groups in the pre-test and post-test stages

Variable	Group	Pre-test	Post-test
Quarterly blood sugar	Motivational interviewing	7.32 (0.43)	6.88 (0.62)
	self-management education	7.80 (0.80)	7.29 (0.85)
	Control	7.85 (0.82)	7.50 (1.09)
FBS	Motivational interviewing self-management education	154.91 (24.86)	134.75 (24.84
	Motivational interviewing self-management education	145.23 (29.69)	123.30 (16.93)
	Control	174.50 (40.47)	174.78 (59.58)

Table 4. Assumed results of regression slope homogeneity (interaction of independent and scattering variables) for research

Variable	SS	MS	F	P
Quarterly blood sugar	0.367	0.183	1.316	0.282
FBS	5145.25	2572.65	6.52	0.071

Table 5. Summary of analysis of covariance to evaluate the effect of motivational interviewing and self-management education on blood sugar in diabetic patients

Dependent variable		SS	Df	MS	F	P	η2
Quarterly blood sugar	Group	1.44	2	0.72	5.10	0.011	0.22
	Error	4.96	35	0.14			
FBS	Group	3643.83	2	1821.91	3.51	0.041	0.16
	Error	18160.12	35	518.86			

Table 6. Results of one-to-one comparison of group mean in HbA1c and fasting blood sugar

Variable	Group (I)	(J)	Mean diff.	Standard Error	P
HbA1c	Motivational interviewing	Control	-0.32	0.15	1.00
	self-management	Control	-0.44	0.14	0.01
	Motivational interviewing	self-management	0.12	0.15	1.00
FBS	Motivational interviewing	Control	-20.56	9.24	0.098
	self-management	Control	-22.38	9.40	0.069
	Motivational interviewing	self-management	1.81	9.18	1.00

As displayed in Table 6, there is a significant difference between the effectiveness of motivational interviewing and self-management education in the reduction of trimester blood sugar in type 2 diabetic patients. The difference between the mean of self-management training compared to the control group (P=0.012) demonstrates that self-management education is more effective in reducing three-month HbA1c in diabetic patients. The results also show that the effectiveness of motivational interviewing and self-management in reducing fasting blood sugar is not significantly different.

5. Discussion

The present study aimed to determine and compare the effectiveness of diabetes self-management education and motivational interviewing on glycemic control in patients with type 2 diabetes by web-based and remote methods. The results pointed out that both diabetes self-management education and motivational interviewing were effective in lowering blood sugar and hemoglobin A1c; moreover, self-management education had a more significant effect on blood sugar control. The findings of this research are consistent with the results of previous studies that assessed the effectiveness of motivational intervention (26) and diabetes self-management (27-29) in improving the symptoms of diabetes.

The management of diabetes requires a complex combination of medication, proper nutrition, physical activity, proper lifestyle, and managing many daily decisions to be able to perform care activities. Diabetes self-management education provides the foundation for guiding these decisions and activities. This educational method provides important information and problem-solving skills needed to manage the disease process and improve glycemic control (Norris et al., 2002). Al-Sufiani et al. (30) established a virtual clinic for diabetes self-management education during the pandemic period and reported the satisfaction of most patients and effective control of patients' blood sugar.

In their study, Mackenzie et al. (31) used interactive online content, including videos, customized discussion pages, and online social networks, to increase self-management and knowledge of type 2 diabetes. The statistical findings pointed to a significant increase in self-management ability and personal knowledge. The stability of these results was also reported in the six-month follow-up (32). In a clinical trial, Vluggen (33) used a program that focused on several behaviors, gathering web-based assessments of levels of physical activity, calorie intake from unhealthy snacks, medication adherence, and evidence of treatment adherence.

Kim, Lee, and SEO (34) measured the impact of a diabetes self-management program based on a behavioral-motivational skills model using a smartphone app, including virtual face-to-face education sessions and telephone counseling, and reported a decrease in blood glycosylated hemoglobin. The study by Cheng et al. (35) pointed out that the use of feedback and interactive techniques in education and interventions makes diabetes management more effective, and better results are obtained when combined with telephone calls and providing feedback on performance. Moreover, the problem-solving process and operational planning that focuses specifically on behavioral change techniques make interventions more effective.

Berhe et al. (36), in a systematic analysis of studies from 2009-2020, reported that motivational interviewing intervention was effective in lowering blood sugar. The success of treatments is hampered by an inability to follow the treatment regimens, lack of participation, unpreparedness for change, lack of regular attendance at treatment sessions, low motivation and commitment to continuous change, high level of ambivalence, resistance, fear, and anxiety about treatment, low self-efficacy, and the existence of conflicting goals. Motivational interviewing helps patients improve their levels of intent for behavioral change (37). A systematic review of studies by McDaniel et al. (38) indicated that motivational interviewing intervention using new remote technologies was effective in controlling glycosylated hemoglobin, blood pressure, patient self-efficacy, and increased physical activity.

This study aimed to compare the effectiveness of the two interventions and confirm the results of the effectiveness of both interventions. Both interventions exerted effects with different reasons

on behavior change and laboratory results. The results also denoted that self-management education had a more marked effect on blood sugar control. The intervention method implemented in this research was online through social media. The emergence of the Covid-19 pandemic, the nationwide lockdown, a reduction in referrals to healthcare providers, as well as concerns about disease and vulnerability to Covid-19 highlighted the need for new methods in diabetes control and treatment to provide education and management in line with social distancing policies. The provision of virtual and remote services in diabetes education and motivational programs can help effectively manage the disease. These innovative services should provide efficient low-cost education in the new context of social distancing. It is essential to expand diabetes management programs virtually in order not to interrupt the provision of diabetes care services.

Among the limitations of this study, we can refer to the existence of the Covid-19 pandemic, as well as social and individual limitations (lack of open sports venues, forced masking, Covid anxiety, social isolation) that made behavioral changes difficult, and the slow Internet connection. It is suggested that future researchers design and conduct a qualitative study of a web-based intervention for diabetic patients and then repeat this study with more subjects.

6. Conclusion

As evidenced by the results of this study, due to the effectiveness of motivational interviewing and diabetes self-management education in controlling blood sugar and glycosylated hemoglobin, these techniques can be used as web-based and online psychological interventions to help manage the disease without the need for face-to-face visits.

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Conflicts of interest

All authors declare that they have no conflicts of interest.

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