Brief Report

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Effectiveness of Motivational Interviewing based on the Ability, Information and Motivation Model on Adherence to Treatment and Glycosylated Hemoglobin in Females with Type 2 Diabetes Mellitus

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Abstract

Objective: The aim of this study was to determine the effectiveness of motivational interviewing based on the ability, information, and motivation (AIM) model on adherence to treatment and glycosylated hemoglobin (HbA1c) in female patients with type 2 diabetes.

Materials and Methods: In this randomized controlled clinical trial 60 women with type 2 diabetes were randomly selected from the 73 patients who referred to the endocrinology department of Imam Hossein Hospital in Tehran province from December 2018 to April 2019. The experimental group (n= 30) was treated with family empowerment therapy based on self-compassion for eight weekly 90-minute sessions while the control group (n= 30) received the usual hospital treatments. Data collection instrument was Morisky medication adherence scale and HbA1c measurements in three phases. Multivariate repeated measures analysis of variance was used to analyze the data. Data analysis was carried out using SPSS-21 software package.

Results: The findings showed that the mean score of adherence to treatment in the group treated with motivational interviewing based on the AIM model was significantly higher than that of the control group (*P*= 0.001). In addition, women with diabetes in the experimental group had a significantly lower mean HbA1c score compared to the control group (*P*= 0.001).

Conclusion: The results of this study showed that motivational interviewing based on the AIM model can be effective in improving adherence to treatment and reducing HbA1c in women with type 2 diabetes.

Keywords: Treatment adherence, Glycosylated hemoglobin, Motivational interviewing, Type 2 diabetes mellitus

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Introduction

It is estimated that the number of people with type 2 diabetes will increase from 382 million in 2013 to 417 million in 2035 (1). In Iran, type 2 diabetes is a growing health problem, with statistics suggesting that almost 24% of Iranian adults over the age of 40 suffer from this disease (2).

Motivational interviewing based on the ability, information, and motivation (AIM) model is one of the interventions that can be used to reduce the serious complications caused by diabetes (3). It is a patient-centered behavior change strategy that aims to identify and reduce patients' uncertainty about changing their adherence behaviors and improve their perception of the importance of behavior change (4). Motivational interviewing can be offered as a single intervention or be used to create motivation before another treatment (5). In some cases, non-adherence is caused by insufficient knowledge or lack of understanding of the health problem or lack of information about the prescribed medications, their effects, or the ways to obtain those medications (6). In this regard, motivation is an important factor in effective medication treatment (7). Naturally, in order for patients to have such an ability, the obstacles must be overcome. In other words, the patient's personal motivations regarding the disease and its treatment, as well as their beliefs are the determining factors in adherence to treatment (8). Considering these points, a combination of motivational interviewing based on the AIM model can be effective in controlling the symptoms of diabetes. Therefore, the present study aimed at determining the effectiveness of motivational interviewing based on the AIM model on adherence to treatment and glycosylated hemoglobin (HbA1c) in female patients with type 2 diabetes.

Materials and Methods

The present study is the randomized controlled clinical trial. The statistical population included all women diagnosed with type 2 diabetes who referred to Imam Hossein Hospital in Tehran from December 2018 to April 2019. The sample size for this study was calculated 30 subjects for each group (9). Therefore, 60 people were selected based on the inclusion criteria using the purposive sampling method. Inclusion and exclusion criteria in this study were: 40-45 years old, type 2 diabetes diagnosis based on ADA evidence; confirmed by a specialist , at least six months past, education level above high school diploma, no history of neurological and mental illness and hospitalization, no history of substance abuse, ability and willingness to attend group therapy sessions. Exclusion criteria for the experimental group were: absence from intervention sessions for more than two sessions and unwillingness to continue participation in the intervention sessions.

The sampling was performed under the supervision of an endocrinology and metabolism specialist. The patients who met the inclusion criteria had their medical records examined, then completed the initial questionnaire for screening, and were ultimately selected. During the initial assessment phase, 70 eligible patients were identified, 60 of whom were randomly selected for the study. After obtaining their informed consent, random allocation software-21 was employed to divide the subjects into intervention group (receiving motivational interviewing based on the AIM model) and control group (receiving routine medical and educational treatments provided by the diabetes department of the hospital). Random allocation software has been designed to generate random sequences consisting of Unique Identifier (UI) and group name pairs while maintaining additional control over the output format and type. All participants completed demographics and Morisky medication adherence scale in pre-test and post-test stages. In order to determine HbA1c

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levels in patients, HbA1c blood test was performed before and after intervention in the hospital's laboratory. The experimental group was subjected to the mentioned intervention. In line with research objectives, 3 months after the intervention, a follow-up session was conducted to evaluate the effectiveness of the intervention over time. In the follow-up stage another round of HbA1c blood test was performed in the hospital laboratory. For ethical reasons there was no relationship between the control and experimental groups during the study. The control group was treated according to the usual protocols by a specialist where the researcher did not interfere. However, at the end of the study, all the materials taught to the experimental group were also presented to the control group in the form of a training package. The motivational interview sessions were based on the AIM model and structured around the book "Motivational Interviewing: Preparing People for Change" by Surmon-Böhr and Alison (10). And were presented in eight-sessions (as shown in Table 1). The intervention was administered in 1-1.5 hour weekly sessions by a therapist and an assistant therapist familiar with motivational interviewing. It should be noted that they were both certified to conduct motivational interviewing.

Demographic information questionnaire

The purpose of this questionnaire was to collect basic demographic data such as age, marital status, education, socio-economic status, educational background, and career history, as well as questions about how to control diabetes, amount of insulin intake, alcohol consumption, and smoking.

Morisky Medication Adherence Scale (MMAS-8)

Morisky medication adherence scale (MMAS-8) was designed by Morisky et al. in 2008 (11). It is made of 8 items designed

Table 1. Structure of motivational interviewing according to the AIM model

First session	Introduction, welcoming the clients, setting session goals and general group policies, introducing blood glucose test device, present an overview of the disease, definitions, causes of diabetes, role of adherence to treatment in controlling diabetes, practicing emotion identification and naming, practicing the impact of adherence to treatment on different aspects of life, importance of adherence to treatment, having a healthy diet, regular exercise, foot care, introducing the motivational approach, assignments for the next session
Second session	Evaluate short and long term benefits and difficulties of adherence to treatment and practicing balance in decision making, describing a typical day in one's life, identifying symptoms of high and low blood glucose, regular use of medication, emotion recognition exercise, practicing influence and emotional dimensions and assigning homework
Third session	Brainstorming on short and long-term benefits and problems of alternative revised options at home and their description and practice, practicing identification of values and creating structural contradictions in order to increase internal motivation to enhance quality of life, questions and answers on the issues raised and summarizing the points. Principles of motivational interviewing for the intervention group: perspective, recognizing tempting situations and control or lack of control over behavior in those situations, rewarding success, reinforcing adherence to treatment, assignments for the next session
Fourth session	Defining values, practicing identification and prioritizing most important values, practice of defining values and matching value and behavior, getting to know the problems of a person who has been involved in diabetes complications, talking about diabetes by showing photos, slides, and films about diabetes and its side effects in order to motivate patients to prevent disease progression. Group discussion, posters, educational pamphlets and brainstorming were used for education on diabetes control through healthy diets, exercise, and other activities. Assignments for the next session.
Fifth session	Identifying problems related to the disease with discussions followed by doing practical activities (testing blood glucose with glucometer, how to use medications, using reminders to stop forgetting medication time) to help the participants obtain necessary abilities. Assignments for the next session, receiving feedback.
Sixth session	Practical exercises by the participants until they reach mastery. In other words, at this stage in the training process the participants helped to increase their motivation and enhance their abilities. Questions and answers and evaluation of patients about the effort and usefulness of adherence to treatment, assignments for the next session
Seventh session	Understanding the relationship between activity and mood, making a list of enjoyable activities that give people a sense of empowerment, addressing weaknesses in the training program and encouraging participants to take advantage of the benefits associated with adherence to treatment in diabetes, assignments for the next session
Eighth session	An overview of the whole course, ways to hold on to the learning outcomes, choosing a home exercise program that can be continued until the following month, discussing the positive causes and potential barriers to the exercises after the completion of the course and filling out the questionnaires, finalizing the sessions

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based on a 4 point Likert scale. In a 2014 study in Italy, the validity and reliability of this questionnaire was established for diabetes patients. In this study correlation coefficient and Cronbach's alpha were estimated to be 0.68 and 0.62, respectively (12). Kazemi majd and Nouruzi (2017) assessed the face and content validity of this instrument based on experts' opinion and established its reliability by reporting a Cronbach's alpha of 0.68 (13). In this study, the internal consistency (Cronbach's alpha coefficient) for the MMAS-8 scale was obtained as 0.69 for a sample of 78 subjects. Since the Cronbach's alpha was greater than 0.7, the medication adherence scale was deemed to be reliable.

Statistical analysis

Before testing the research hypotheses, the research data were first investigated for normality using Kolmogorov-Smirnov and Shapiro-Wilk test, separated by each group (control-experimental) and test phase (pre-test, post-test, and follow-up). The results of Shapiro-Wilk's normal distribution test in the experimental and control groups showed that the assumption of normality for the adherence to treatment variable was valid in pre-test and post-test and for the hemoglobin variable this assumption was true in pre-test and follow-up phases (P> 0.01).

Multivariate repeated-measures analysis of variance was used to evaluate the effectiveness of self-compassion-based family empowerment model on adherence to treatment and HbA1c dimensions. Therefore, the assumptions of this test for each variable were examined first. The results of the Bartlett's test of sphericity (X^2= 479.441, P< 0.001) indicated that the assumption for this test (correlation between dependent variables) was fulfilled. Then Box's M test was used to examine the assumption of homogeneity of the covariance matrix. The results showed that this assumption could not be established for the components (BoxM=603.75, $F_{231, 7627.42}$=1.413, P< 0.001). However, considering the large sample size in both groups it can be argued that the test can be used even without fulfilling this assumption. Then the sphericity assumption was investigated for all the variables using the Mauchly's test and the results showed that this assumption was not fulfilled for the adherence to treatment and hemoglobin variables (P< 0.001).

As a result, Greenhouse–Geisser corrected results were used. Afterward, the assumption of homogeneity of error variance was investigated using Levene's test and the results showed that this assumption was valid for the adherence to treatment component (P> 0.05) while not being valid for the hemoglobin variable (P< 0.05).

Ethical considerations

The trial was registered at the Iranian registry of clinical trials (http://www.irct.ir) with the IRCT ID: IRCT20190528043744N1.

The study protocols and procedures were approved by the Ethics Committee of Karaj Branch, Islamic Azad University. (IR.IAU.K.REC.1398.021).

Results

In this study 52 patients (out of the initial 60 patients, 8 patients left the program later on, 7 due to unwillingness to continue participation and 1 due to pregnancy) with type 2 diabetes participated (26 people in the control group and 26 in the experimental group). They were between 40-45 years old. The mean and standard deviation of the subjects' age for the control and experimental groups were respectively 44.50 ± 4.52 and 45.03 ± 4.59 years. Comparison of means using ANOVA test showed no significant difference between the mean values of the age variable in two groups (Table 2).

Results of multivariate tests showed that the effectiveness of motivational interviewing based on the AIM model was significant in group and time factors (P: 0.001) as well as in the interaction of time and group (P: 0.001). These results indicate that motivational interviewing based on the AIM model is effective in the investigated dimensions.

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Then the results of between group test to investigate the effectiveness of empowerment in each of the dimensions showed that in both groups there were significant differences between the experimental and control groups in terms of the adherence to treatment (F= 511.163, *P*< 0.001) and HbA1c (F= 389.50, *P*< 0.001) variables, so that mean adherence to treatment score was greater for the experimental group while the average reading for the HbA1c was reduced compared to the control group. In addition, the results of the within-group effect test for comparing the same groups in the course of this study showed that the effect of time factor was significant on adherence to treatment (η^2=0.882, *P*< 0.001, $F_{GG1.28}$= 373.911) and HbA1c (η^2=0.59, *P*< 0.001, $F_{GG1.73}$=72.329) variables.

Then, paired comparisons were used to compare the means of the two groups in all three phases of the study so as to assess outcome stability during follow-up. The results of this analysis are presented in Table 3.

The results of this study showed that intervention according to motivational interviewing based on the AIM model was effective in the experimental group compared to the control group. Comparing the mean scores of the two groups during post-test and follow-up phases indicated the stability of the intervention effect in the experimental group.

Discussion

This study investigated the effectiveness of motivational interviewing based on the AIM model on improving adherence to treatment and HbA1c. The results showed that motivational interviewing based on the AIM model is effective in improving adherence to treatment and reducing HbA1c. Studies by McGovern et al. (14) and Alexander et al. (15) have confirmed the positive effect of information and motivation on adherence to treatment. Tseng et al. (16), Moraveji et al. (17), as well as Razavi et al. (18) have also confirmed the effectiveness of educational intervention based on AIM model in improving adherence to treatment and controlling blood glucose levels. The positive impact of motivational interviewing training based on the AIM model on adherence to treatment in type 2 diabetes patients, is probably due to their increased motivation to comply with the requirements of their treatment. Moraveji et al. concluded that group motivational interviewing increased satisfaction in diabetes patients as an important factor influencing their cooperation

Table 2. Frequency and percentage of the demographic information (marital status, education level, and income) by group

Variable		motivational interviewing		Control group		*P*
		Frequency	Percentage	Frequency	Percentage	
Marital status	Single	5	19.2	4	15.4	0.142
	Married	15	57.7	16	61.5	
	Divorced	6	23.1	6	23.1	
Education level	Below diploma	1	3.8	1	3.8	0.480
	High school diploma	12	46.2	10	38.5	
	Bachelor's degree	10	38.5	12	46.2	
	Master's degree- PhD	3	11.5	3	11.5	
Income level	Low	3	11.5	4	15.4	0.686
	Average	23	88.5	22	84.6	

Table 3. Paired comparison of experimental and control groups at various phases of the study

Element	Test	Group experimental	Group Control	Mean difference	Standard error	*P*
Adherence	Pre-test	Experimental	Control	0.231	0.158	0.151
	Post-test	Experimental	Control	5.846	0.297	0.001
	Follow up	Experimental	Control	4.808	0.297	0.001
Hemoglobin	Pre-test	Experimental	Control	-0.016	0.111	0.887
	Post-test	Experimental	Control	-1.400	0.078	0.001
	Follow up	Experimental	Control	-1.508	0.085	0.001

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and participation (17).

Also a study by Welch et al. showed that motivational interviewing played an important role in changing the patients' behavior and better control over diabetes (18). One of the most important causes of non-adherence to treatment is the lack of information and knowledge, therefore, another reason for the positive results may be attributed to the increased knowledge of diabetes patients regarding their illness (15). It seems that features of this type of intervention have been effective in improving the patients' adherence to medication by increasing their knowledge. A study by Welch et al. showed that patients with a higher level of awareness and better understanding of the disease, adopted more effective self-management behaviors (19). Moreover, the results of the present study indicate a reduction in glycosylated hemoglobin level after the training intervention in the experimental group, which is consistent with the findings reported by Eycong et al. suggesting the level of HbA1c as one of the most important predictors of adherence to treatment in type 2 diabetes patients. Complications of type 2 diabetes and elevated levels of HbA1c have been observed less frequently in patients with better adherence to medication (20).

One of the strengths of this study was the considerable number of patients who referred periodically in order to follow up on their treatment steps. The limitation of the present study was that its sample only consisted of female patients with diabetes that reduces the generalizability of the findings. So, it is recommended that other researchers investigate the effectiveness of motivational interviewing based on the AIM model on patients with other types of diabetes as well as younger and male diabetes patients. Another limitation that may affect the result is sample sizing. Therefore, it is recommended to use larger samples to obtain better estimates of the program's effect size. Moreover, it is recommended to implement placebo programs to control for the expectation effect.

Conclusions

The results of this study showed that AIM-based motivational interviews can be effective at improving treatment compliance and reducing HbA1c in women with type 2 diabetes. In explaining the finding of the present study, it can also be argued that motivational interviewing based on the AIM modelis a context-based approach that challenges people to embrace their own thoughts and feelings and commit themselves to necessary changes.

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Conflict of Interest

The authors declare that they have no conflicts of interests

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