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Research Article

Effects of Motivational Interviewing Intervention on Self- Management and HbA1c in Type 2 Diabetes Patients

Deniz KAYA MERAL[1*], F. Yasemin KUTLU[2]
[1]Istanbul Gelisim University, Faculty of Health Sciences, Department of Nursing, Istanbul
[2]Istanbul University-Cerrahpasa, Faculty of Florence Nightingale Nursing, Department of Mental Health and Psychiatric Nursing, Istanbul

*Corresponding author: dkaya@gelisim.edu.tr

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Abstract
This study examined the impact of motivational interviewing on self-management and HbA1c in patients with type 2 diabetes using a pretest–posttest control group in a quasi-experimental research design. Twenty-five experimental and twenty-six control patients who applied to an outpatient clinic in a training and research hospital made up the study's sample. The Diabetes Self-Management Instrument, the Behaviour Change Stage Identification Form for Type 2 Diabetes Patients, and the Patient Information Form were used to gather the data. Following the pretest, the control group underwent standard care while the experimental group underwent four sessions of the motivational interviewing (MI) method. In order to analyze the data, descriptive and comparative statistical techniques were applied. Before the intervention, the trial and control groups' patients' individual and illness characteristics, as well as the results of the Diabetes Self-Management scale, were similar. A statistically significant difference was observed in the post-test Diabetes Self-Management Scale total scores between the patients in the trial and control groups. There was a significant difference between the post-test HbA1c outcomes of the patients in the experimental and control groups when comparing their pre- and post-test HbA1c outcomes. The study's findings demonstrated the efficacy of motivational interviewing in raising type 2 diabetes patients' levels of self-management and reducing their HbA1c results.

Keywords: Diabetes type 2, HbA1c, motivational interviewing, self-management

1. Introduction

Diabetes mellitus (DM) is a chronic illness, which presents when the insulin hormone is not or insufficiently produced in the body, or it unable to be used by the body despite being secreted in sufficient amounts. This raises blood glucose levels, which can cause both acute and long-term problems. It also necessitates ongoing medical care and patient education on a regular basis. (IDF, 2021; ADA, 2023). It is estimated that approximately 10.5% of the adult population (537 million people) in the world suffers from diabetes, and By 2045, this is predicted to rise to 783 million people. The International Diabetes Federation (IDF) estimates that around 6.7 million adults between the ages of 20–79 lost their life in 2021 because of diabetes and the complications it brought (IDF, 2021). According to these results, the risk of developing serious health problems, which increases the cost of medical care, reduces quality of life, and endangers life among people suffering from diabetes, is increasing (Adu et al., 2019). Metabolic control needs to be ensured to prevent the development of chronic complications (Bonora et al., 2020). For this, the management of lifestyle is a fundamental characteristic of diabetic care. Lifestyle management consists of self-management training and support for diabetics, medical nutrition therapy, physical activity, counseling to stop smoking, and psychosocial care (ADA, 2019). Self-management in diabetes is a duty that needs to be integrated into the daily lives of patients and is a process that is used for the patient to acquire the necessary knowledge and skills in order to be able to manage crises and perform lifestyle changes (Powers et al., 2020). Despite the importance of self-management in diabetes, in order for patients to be able to keep themselves under control, studies show a lack of motivation or deficiency in empowering patients. When setting off from this assumption, motivation is of considerable importance in order to ensure that patients continue with their treatment, and that they adapt to the illness. Many studies have shown that MIs are effective in patients adapting to their illnesses and in the self-management of diabetes (Carpenter et al., 2019; Dogru et al., 2019). Motivational interviewing are interventions that aim to bring about the motivation of patients in order to ensure they change their health-related behaviors and are adapted specifically to each person (Bischof et al., 2021). A wide range of medical professionals, including psychologists, physicians, nurses, and midwives, use MI (Bell and Roomaney, 2020). As behavioral changes in individuals are more of a process rather than an outcome, it is necessary to intervene in a manner that is appropriate for the stage of the change in which the individual is in order to facilitate the change. Pre-contemplation, contemplation/intention, preparation / decision, action, and maintenance/continuation are the stages that include these. A lot of people go through this cycle multiple times before they finally adopt a new habit (Duckworth and Gross, 2020). The most important role of nurses, who are one of the members of the team, is to educate diabetes patients. Education encompasses effective behavioral change strategies, self-management, and supportive lifestyle changes. Therefore, the responsibilities of a diabetes educator are to ensure that the health status related to diabetes of diabetic patients reaches a level that is sufficiently good by ensuring that the patients use their capacities to the utmost to take precautions based on informed decisions and to increase the quality of life of diabetic individuals (ADA, 2019). As with many other chronic illnesses, diabetes may affect the whole life of the individual and is an illness that has not only physiological but has psychological, economic, and social dimensions as well. Consequently, utilizing the MI technique to improve patients' self-sufficiency may be advantageous for nurses who provide holistic patient care. Despite

the importance of self-management and patients keeping themselves under control in diabetes, studies show a lack of motivation or deficiencies in self-empowerment (Lambrinou et al., 2019). When setting off from this assumption, motivation is of considerable importance to ensure that patients continue with their treatment and that they adapt to their illness. Many studies have shown that MIs are effective in patients adapting to their illnesses and in the self-management of diabetes (Bhat et al., 2020; Li et al., 2020; Bilgin et al., 2022). This study sought to ascertain the effect of motivational interviewing on HbA1c levels and self-management in patients with type 2 diabetes.

2. Materials and Methods

2.1. Research design

This research was applied in a quasi-experimental research design with a pretest–posttest control group.

2.2. Dependent-independent variables

The independent variable of the research is motivational interviewing; dependent variable, diabetes self-management and HbA1c levels. Individual and disease characteristics of the patients were determined as control variables.

2.3. Hypothesis

H1: When patients who have received diabetes training using the MI technique are compared with those who did not receive this training, their self-management scores will be higher. H2: When patients whtho have received diabetes training using the MI technique are compared with those who did not receive this training, their HbA1c levels will be lower.

2.4. Time and setting

The study was conducted between February and December 2017 in a diabetes outpatient clinic in an education and research hospital.

2.5. Study sample

The population of the study was comprised of patients who visited the internal illnesses/endocrinology polyclinics of a training and research hospital or who were receiving treatment as inpatients in the internal illnesses/endocrinology polyclinics (N=1200). A power analysis was carried out using the G* Power (v3.1.7) program to determine the sample size. As a result of the power analysis based on a similar study previously conducted for the study designed as an intervention and a control group (Lin et al. 2008); When the effect size was taken as d = 0.8 (large), the number of samples determined for power 80% with β = II type error probability was calculated as at least 52, 26 people for each group. The intervention group contained 25 patients who completed the study, while the control group contained 26 patients. The inclusion criteria were determined as: having been diagnosed with type 2 diabetes for more than 3 months; being over the age of 18; being in the contemplation, preparation, and/or action stages of any section of the Behavioral Change Stage Identification Form of the Transtheoretical Model; having HbA1c levels above 6; and agreeing to take part in the study. The patients suffering from diabetes included in the sample were allocated into the intervention and control groups.

2.6. Measures

The data of the study were collected using the Patient Information Form, Behavior Change Stage Identification Form for Type 2 Diabetes Patients, and Diabetes Self-Management Instrument (DSMI)-35).

2.6.1. Patient Information Form (Pre Test)

The information form was comprised of a total of 43 questions and queried the personal information of patients, their diabetes-related characteristics, their perceptions of their health status, and information related to their diabetic and HbA1c value.

2.6.2. Patient Information Form (Post Test)

The information form was comprised of a total of six questions and queried

information related to their perceptions of their health status and HbA1c value.

2.6.3. Diabetes Self-management Instrument (DSMI-35)

DSMI-35, which was developed by Lin et al. (2008) is a instrument designed for adults suffering from type 2 diabetes. It is comprised of 35 questions covering the period from the previous three months to determine the frequency of the implementation of the self-management skills of the patients. The response to each question was scored out of 4 and was on a self-reporting Instrument. The responses varied from one (never) to 4 (always). The total score for the Instrument ranged from 35 to 140. A higher score showed that self-management activities were implemented on a more regular basis. In the present study, the Cronbach alpha value of the scale was determined as 0.95.

2.6.4. Behaviour Change Stage Identification Form for Type 2 Diabetes Patients

This was a form prepared by the researcher—based on the literature—who benefited from the stages of change of the transtheoretical model with the aim of determining the stages of patients' behavioral changes in the areas of use of medication, nutrition, and physical exercise.

2.7. Data Analysis

Descriptive analyses (arithmetic mean, standard deviation, minimum–maximum, ratio, percentage) were used to evaluate the similarities of the experimental and control groups, a Mann-Whitney U Test was used to compare the experimental and control groups pretest and posttest Instrument scores, and a Wilcoxon signed-ranks test was used to compare the pretest and posttest scores of the experimental and control groups. The results were evaluated at a 95% confidence interval and a $p < 0.05$ significance level.

2.8. Research Process

A preliminary test, consisting of the Patient Information Form, Behavior Change Stage Identification Form for Type 2 Diabetes Patients, and the DSMI-35, was applied to both the intervention and control groups. This was followed by an intervention using the MI method to only the intervention group. Each of these interventions consisted of four sessions of 30–60 (mean 45 min) min each. The sessions were structured according to the Behavior Change Stage Identification Form developed by the researcher by making use of the transtheoretical model and adapting it to diabetic patients. The subject of the first session was "Opening, Structuring the Discussion, and Establishing the Agenda"; the subject of the second session was "Improving Motivation for Change"; the subject of the third session was "Summarizing, Support, and Talking about the Change"; and the subject of the fourth session was "Evaluation" (Selcuk-Tosun and Zincir, 2019). The discussions were completed in four weeks, with one discussion held every week. The final test and the Diabetes Self-Management Instrument were applied again to the members of the intervention group in the third month after completion of the MI method sessions and in the third month to the control group. The intervention group contained 25 patients who completed the study, while the control group contained 26 patients.

3. Results

The study was carried out in 2017 between February and December. Sixty individuals who satisfied the inclusion criteria were randomized at random to the control and intervention groups. Fig. 1 displays a flow chart of the patients. (see Fig 1).

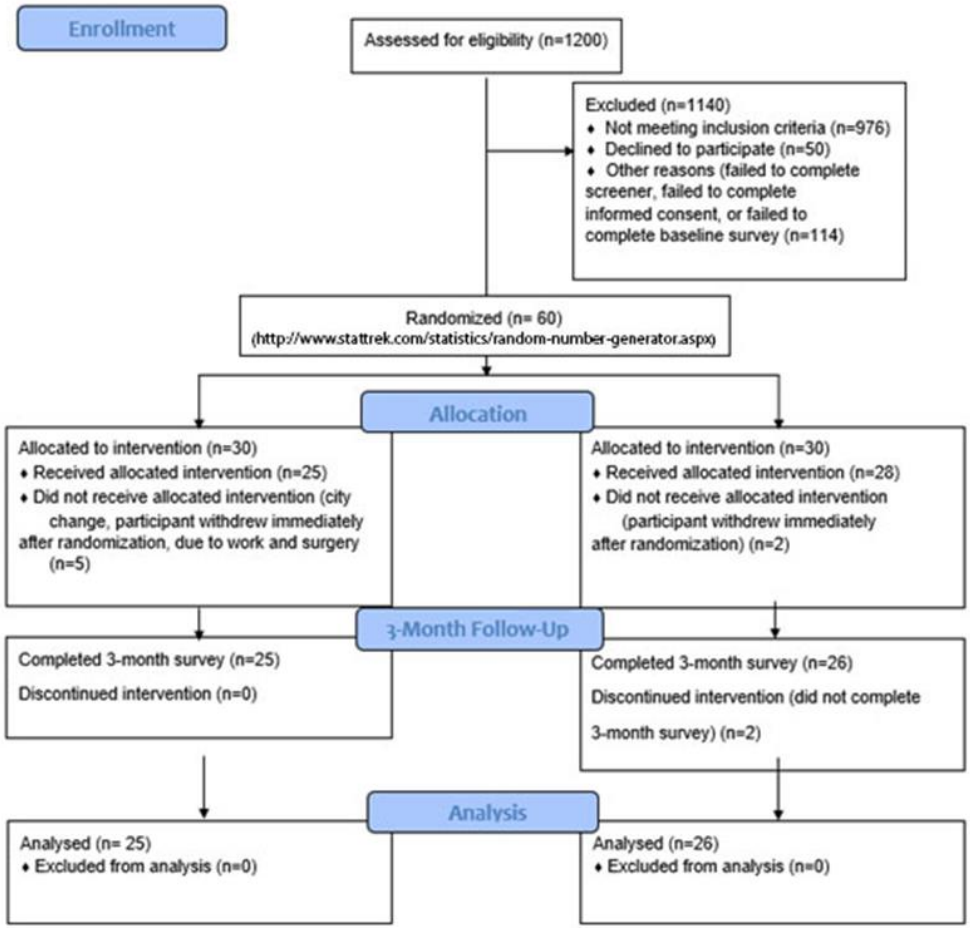

Figure 1. CONSORT Diagram

Table 1 displays particular properties of the diabetic patients. Based on this information, the intervention group's mean patient age was 56.28 ± 8.18 years, with 56% of the patients being female, and their mean BMI was 32.49 ± 6.41. Patients in the control group had a mean age of 55.54 ± 7.60 years, a mean BMI of 33.54 ± 5.93, and 69.2% of the patients were female. A comparison of the personal characteristics of the intervention and control groups revealed no statistically significant differences. The diabetes-related characteristics of the intervention and control groups are also displayed in Table 1. Based on the data, it was discovered that the patients in the intervention group had had diabetes for an average of 9.20 ± 5.70 years, based on their self-reported Vizuel Analog Instrument (VAS) score, 72% of them did not receive routine medical examinations, that their mean compliance score with their diabetes treatment was 5.16 ± 2.40, and that their mean HbA1c level was 10.66 ± 1.91. The control group's mean HbA1c level was 9.95 ± 2.23, the patients' mean compliance with their diabetes treatment was 3.30 ± 1.69, and 69.2% of them did not get regular checkups.

Table 1. Individual and diabetes features of the control and intervention groups

Variable		Intervention *(n=25)*	*Control (n=26)*	*Statistic*	
				Z/ X^2	*p*
Age (year)	*Min-Max (Median)*	40-69 (57)	46-74 (55)	-,632	,527
	Mean±Sd	56,28±8,18	55,54±7,60		
Gender; *n (%)*	Female	14 (56)	18 (69,2)	,954	,329
	Male	11 (44)	8 (30,8)		
BMI (kg/m^2)	*Min-Max (Median)*	24,6-48,3 (30,8)	22,4-47 (32,8)	,962	,318
	Mean±Sd	32,49±6,41	33,54±5,93		
Education; *n (%)*	Literate	1 (4)	5 (19,2)	4,737	,192
	Elementary/High School	21 (84)	17 (65,4)		
	Beyond high school	3 (12)	4 (15,4)		
Occupation; *n (%)*	Not in operation	10 (40)	17 (65,4)	6,400	,094
	Paid worker	3 (12)	5 (19,2)		
	Paid employee	10 (40)	3 (11,5)		
	Other	2 (8)	1 (3,8)		
Economic status; *n (%)*	Worse	3 (12)	1 (3,8)	3,537	,171
	Moderate	20 (80)	25 (96,2)		
	Better	2 (8)	-		
People with whom he/she lives; *n (%)*	Alone	1 (4)	2 (7,7)	2,605	,457
	Partner(wife/husband)	10 (40)	6 (23,1)		
	Partner and children	14 (56)	17 (65,4)		
	Children	-	1 (3,8)		
Duration of diabetes (year)	Min-Max (Median)	1-20 (7)	2-30 (10)	-,454	,649
	Mean±Sd	9,20±5,70	10,15±6,37		
Family history; n (%)	Yes	21 (84)	23 (88,5)	1,739	,419
	No	4 (16)	2 (7,7)		
	Don't know	-	1 (3,8)		
Hospitalization due to complications or diabetes within the last year; n (%)	Yes	2 (8)	1 (3,8)	,397	,529
	No	23 (92)	25 (96,2)		
Routine examination; n (%)	Yes	7 (28)	8 (30,8)	,047	,828
	No	18 (72)	18 (69,2)		
Diabetes theraphy; n (%)	OAD	2 (8)	3 (11,5)	3,248	,197
	Insulin	5 (20)	1 (3,8)		
	Insulin+ OAD	18 (72)	22 (84,6)		
Based on the VAS value, a diabetes treatment compliance score	Min-Max (Median)	1-11 (4)	0-6 (3)	-2,958	,003
	Mean±Ss	5,16±2,40	3,30±1,69		
A1C	Min-Max (Median)	8,4-15,3 (10)	6,5-14,4 (10)	-1,103	,270
	±Ss	10,66±1,91	9,95±2,23		

p<0.05; Z, Mann-Whitney U Test; X2, Chi-square Test; Sd, Standart Deviation

The patients in the control group had diabetes for an average of 10.15 ± 6.37 years. The self-reported VAS value revealed that only the mean scores of the patients' adherence to their diabetes treatment plan differed significantly between the groups of patients in the intervention and control groups, with all other characteristics remaining unchanged. The intervention and control groups' pretest–posttest DSMS–35 scores are contrasted in Table 2. After comparing these data, a significant difference (Z=-6.031, p<0.001) was discovered between the intervention and control groups' final test scores. A significant difference was

also found when comparing the DSMS-35 preliminary test scores to the final test scores in the intervention and control groups (Z=-3.983, Z=-2.542 p<0.05). Though the patients in the intervention group had higher posttest DSMS-35 scores, it was discovered that the patients in the control group had lower final test DSMS-35 scores.

Table 2. Comparison of the Intervention and Control Groups' pre- and post-test DSMS-35 scores and HbA1c outcomes

		Intervention (n= 25)			Control (n= 26)			Z**	p
		Mean±Ss	Min	Max	Mean±Ss	Min	Max		
DSMS-35 Scores	Pre test	83,08±21,30	47	132	80,38±16,08	51	106	-,226	,821
	Post test	122,36±13,37	87	139	73,92±12,93	51	100	-6,031	0,000
	Z*=-3,983 p =0,000				Z*=-2,542 p =0,011				
HbA1c	Pre test	10,66±1,91	8,4	15,3	9,95±2.23	6,5	14,4	-1,103	,270
	Post test	7,20±1,32	4,0	10,3	9,50±2,14	06,4	13,9	-4,093	0,000
	Z*=-4,373 p =0,000				Z*=-1,258 p =,209				

p<0.05; *Z, Wilcoxon Signed Ranks Test; **Z, Mann-Whitney U Test

The comparison of the intervention and control groups' pretest–posttest HbA1c outcomes is also displayed in Table 2. The final test HbA1c outcomes of the intervention and control groups differed significantly (Z = -4.093, p<0.05). When the patient's HbA1c outcomes from the preliminary and final tests in the intervention group were compared, there was also a significant difference (Z=-4,373, p<0,05), and it was observed that the HbA1c outcomes from the final test were lower than the values from the preliminary test. Between the patients in the control group's initial and final test HbA1c outcomes, there was no discernible difference. Z=-1,258, p > 0.05.

4. Discussion

It was discovered that the patients in both the control and experimental groups were similar after examining their diabetes and demographic characteristics. When the studies directed at the effectiveness of motivational interviewing in type 2 diabetes patients were examined, it was found that the patient characteristics in our study were similar to those in the literature (Bilgin et al., 2022; Muslu et al., 2022). Patients in the intervention and control groups had similar preliminary test DSMS-35 results when comparing their final test DSMS-35 scores. The results of their final test, the DSMS-35, showed a significant difference, though, and it was concluded that the intervention group had performed better than the control group. The DSMS-35 scores of the intervention group's preliminary and final tests showed a significant difference as well. According to this research, diabetes self-management can be effectively achieved with diabetes education that incorporates motivational interviewing. The DSMS-35 initail and last test scores of the patients in the control group in this study also showed a significant difference. The final test DSMS-35 post-implementation scores, however, were lower than the pre-implementation scores, which is why there was a difference. The majority of the patients who participated in the study stated that the did not have regular health checks and thought diabetes required only medicine/drugs treatment. They also did not make any changes in their lifestyles. This may be influential in self-management being low among the patients in the control

group. The fact that there was a significant difference between the intervention and control groups, and especially that the final DSMS-35 scores in the control group patients who received only routine diabetes training fell—in line with all of the above results—shows that the MI technique is more effective than routine training, and supports our hypothesis that patients who receive diabetes training using the MI technique will have higher self-management scores than individuals who do not. In a study by Tosun et al. (2019) investigating self-effectiveness and the effects on metabolic control and health-related behavior of transtheoretic model-based motivational interviewing in individuals suffering from type 2 diabetes mellitus, it was found that the implementation of MI increased the level of self-effectiveness over a period of six months and led to improved metabolic control as well as improvements in the behavioral stages of nutrition, exercise, and the use of medication. According to studies on type 2 diabetic patients, it has been stated that MI has contributed to developments in the self-care behaviors in diabetes (Alvarado-Martel et al., 2020; Berhe et al., 2020; Oz and Buyuksoy, 2022). Li et al. (2020) studied the impact of MI on the quality of life and HbA1c results of type 2 diabetes patients and found that MI increased self-management activities to an important extent in type 2 diabetes patients. One of the most crucial markers of a patient's condition with regard to self-management is the HbA1c value. There was a significant difference between the HbA1c outcomes from the final test and the preliminary test, even though there was no significant difference between the intervention and control groups. In a study on the impact of MI conducted by diabetes instructors on the control of blood glucose in badly controlled type 2 diabetes patients Berhe et al. (2020) systematic review and meta-analysis study observed that MIs improved HbA1c levels. In the study carried out by Dogru et al. (2019) researching the effects of MIs on self-management and the metabolic variables results in type 2 diabetes patients, it was seen that the HbA1c outcomes had fallen by statistically significant levels. In a study carried out by Bilgin and Muz (2022) on the effect of MIs on the glycated hemoglobin in type 2 diabetes, a significant fall was seen in HbA1c level following the intervention. In a study carried out by Thepwongsa et al. (2017) on obese patients suffering from type 2 diabetes, it was seen that MIs had a positive impact on the HbA1c value. Finally, in corroboration with the above studies, in our study, it was found that the HbA1c value of the diabetes patients in the intervention group fell in the quarterly controls following MI. Thus, our hypothesis, which states that patients who receive diabetes training using MIs will have lower A1C levels compared with those who do not receive this training, is supported.

5. Conclusion

Ensuring patients remain motivated to self-manage their chronic illnesses, such as diabetes, is extremely important. The circumstances preventing the compliance of patients with their illnesses according to the transtheoretical model were determined and their self-management with MIs was evaluated in the present study. According to the results, we determined that the MI training method was effective in increasing diabetes patients' self-management and reducing their HbA1c outcomes. While the motivational interviewing technique is simply and effectively applicable by nurses in a short time, it is also prominent in terms of helping patients change their lifestyles and improve their health.

5.1. Limitations

A strong aspect of this study is that it includes a control group. Additionally, the measure of the effectiveness of the motivational intervention involves data on physiological variables such as HbA1c, as well as self-management of diabetes. The limitations of this study include the fact that

the sample involves only type 2 diabetes patients. This is why the results do not reflect the state of type 1 diabetes patients. Moreover, the study was carried out at a single center. Thus, it may not be generalized.

Declaration of Author Contributions

The authors declare that they have contributed equally to the article. All authors declare that they have seen/read and approved the final version of the article ready for publication.

Declaration of Conflicts of Interest

All authors declare that there is no conflict of interest related to this article.

Ethical Committee Approval

Ethics committee permission was received from Gaziosmanpaşa Taksim Training and Research Hospital Non-invasive Clinical Research Ethics Committee dated 16 November 2016 and numbered 36.

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