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The effect of educational intervention on medication adherence behaviour in patients with type 2 diabetes: application of social marketing model

ABSTRACT

Background. Patient's adherence to the medication regimen leads to successful treatment in diabetic patients and a reduction in the severity of complications. Educational intervention is needed to improve behaviour and change attitudes in diabetic patients. This study aimed to determine the effect of educational intervention based on social marketing on promoting medication adherence behaviour in type 2 diabetic patients.

Methods. Using random sampling, 110 diabetic patients covered by health centres in Qazvin in the form of experimental and control groups participated in a randomized controlled trial. Data collection tools included demographic questions and valid scales related to psychological constructs and drug adherence. The intervention program consisted of 5 group training sessions for 90-60 minutes based on the initial needs assessment and the theoretical framework of the social marketing model for the experimental group. Also, a purposeful educational pamphlet, two sessions of telephone counselling, and educational messages via mobile phone were provided in addition to the group

training program for patients in the experimental group. Data were analysed using SPSS software version 25 and independent sample t-test, Chi-square test, One-way ANOVA, and covariance analysis.

Results. The mean age of study participants was (54.12 ± 8.22) years. Also, the average duration of diabetes was 5-10 years and 50% had primary education. The correlation between attitude, self-efficacy and subjective norm with medication adherence behaviour was significant ($P < 0.05$). After the intervention based on the social marketing model, the mean of the constructs of attitude (39), self-efficacy (31), awareness (66), subjective norm (85), and medication adherence (49) increased significantly in the experimental group. **Conclusion.** Educational intervention based on social marketing could have a significant effect on improving medication adherence behaviour. The design of cognitive-behavioural interventions based on social marketing is recommended to promote the health behaviours of diabetic patients. (Clin Diabetol 2021; 10; 4: 359-369)

Key words: social marketing, type 2 diabetes, medication adherence, education, attitude

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Clinical Diabetology 2021, 10; 4: 359-369

DOI: 10.5603/DK.a2021.0040

Received: 3.01.2021

Accepted: 8.03.2021

Introduction

Out of every five deaths in the world, four are attributed to non-communicable diseases including cardiovascular disease, cancer, chronic lung disease, and diabetes [1]. Diabetes is a chronic and metabolic disease characterized by elevated blood glucose levels and is recognized as a major public health challenge [2, 3]. Persistently high blood glucose levels can lead to

complications including serious cardiovascular disease, kidney disease, blindness, peripheral nerve problems, retinopathy and neuropathy, dental problems, and amputation [4, 5]. In 2019, the cost of diabetes at the World Health Organization is \$ 760 billion and is projected to reach \$ 825 billion by 2030 and \$ 845 billion by 2045 [6, 7]. According to the IDF, in 2019, the prevalence of diabetes was 9.3% in the world, which is an increase compared to 2017, when the prevalence was 8.8%. It is estimated that the prevalence of diabetes in 2030 will reach 10.2% and in 2045, 10.9. The highest prevalence is related to the Eastern Mediterranean region, where the prevalence is 12.2% in 2019 [4, 8]. The prevalence of diabetes in Iran, which is part of the Eastern Mediterranean region, has shown 14.6–11.3%. Also, in Qazvin, an average of 8.5% of people have diabetes [9, 10]. About 90% of the prevalence of diabetes is related to type 2 diabetes. Risk factors for diabetes include genetic factors, inactivity, poor nutrition, high blood pressure, and high cholesterol levels, and stress [11]. Despite advances in pharmacological interventions to control type 2 diabetes, self-care education, which includes physical activity, a healthy diet, medication adherence, self-monitoring of blood sugar, and foot care, is beneficial and effective in controlling diabetes [3, 12]. According to the definition of the World Health Organization; Drug adherence, the degree of obedience to medical advice, medication use, and lifestyle changes that reduce costs and hospitalization and control a patient's blood sugar [13, 14]. Over time, patient adherence decreases so that after three months, 21% and after 6 months, 44% of patients refuse to take the medication [15]. The World Health Organization divides the factors of adherence to medication adherence in chronic patients into five categories, which include economic and social factors, the health team, and the patient care system, and treatment-related factors. Factors related to the patient can be changed by using education and increasing knowledge [16, 17]. Patient education will lead to the improvement of psychological factors affecting health behaviours such as how to use the medication [18]. Due to the complexity of patient's behaviour, it is necessary to use theories and patterns of behaviour change in this field [19]. Social marketing is commonly used as an intervention strategy in global health to influence behaviours that benefit the health of individuals and communities [20]. The function of this strategy was effective in the field of healthy eating, control of AIDS, and reducing smoking, which was used to correct undesirable behaviours and change attitudes [21]. In a social marketing intervention, the following components should be considered:

1. Behavioural change: Setting goals to achieve behav-

2. Evolutionary research: Using research to understand the needs of the target audience, pre-test interventions, and monitoring their performance, which is an essential part of the intervention
- 3- Segmentation: Segmentation of the audience based on common characteristics
- 4- Marketing mix: which is known as 4P. The 4P concept consists of four sub-dimensions: Product; Includes ideas and behaviours acceptable to the audience, Price; perceived costs and barriers related to the product; Place; where the customer has access to the product and its current information, Promotion; communication elements, and ways in which people become aware of the existence of a product or behaviour [22, 23]. Samad et al. [24] have also recommended the social marketing approach as a suitable framework for diabetes control programs and awareness-raising. Rogers et al. [25] used the social marketing campaign to raise the awareness and attitude of diabetic patients about diabetes prevention. In Iran, in a review study, Rezaei-Pandari et al. [26] showed that health promotion interventions with a social marketing approach in relation to changing behaviours that require the use of a health product and access to facilities and also more influenced by individual attitudes and decisions; It can be associated with valuable success. Given the burden of diabetes and the need to reduce health costs, it is necessary to take steps to change the behaviour of diabetic patients. In this regard, this study was conducted to determine the effect of educational intervention on medication adherence of patients with type 2 diabetes referred to health centres in Qazvin using a social marketing model.

Material and methods

Type of study

The present study is a randomized controlled trial with clinical trial code IRCT20190927044901N1. This study was performed on patients with type 2 diabetes who were covered by health centres in Qazvin between February 2019 and July 2020. For the purpose of a double-blind approach, 1- the outcome evaluator and 2- the analyst did not know the details of the groupings and knew the groups as A and B.

Sampling method

The study population was all patients with type 2 diabetes who had a file in Qazvin Health Centre who were willing to participate in the study voluntarily. Using the multi-stage sampling method, 110 patients with type 2 diabetes were included in the study based on inclusion and exclusion criteria. First, out of 12 health centres in Qazvin, 4 centres were selected by simple random sampling. Considering the cultural, social,

and economic similarities and differences, Qazvin city was divided into two large regions and two centres were randomly selected from each region. A list of patients covered by each centre was prepared. Then, with the convenience Sampling method and based on the random number table, the sampling process was performed randomly from all 4 centres to reach the required sample size. The sample size was calculated using the mean difference formula was calculated by considering the 95% confidence level, 5% percentage error, 80% test power. Finally, with a 10% drop, 55 people were assigned to each of the experimental and control groups [27].

Inclusion and exclusion criteria

Inclusion criteria were: voluntary and informed participation, at least six months of diagnosis of type 2 diabetes, age range 30 to 65 years, literacy for writing a history of type 2 diabetes medication treatment, living in Qazvin for at least the next 6 months, not participating in similar educational interventions in the last six months, having a mobile phone in patients or a family member to send a text message. Also, patients were excluded if they had the following: advanced physical consequences and complications due to diabetes, having mental disorders such as depression (based on the doctor's diagnosis and recorded in the patient's file) that prevent the correct response or active participation in the research, having gestational diabetes during the research period, having type 1 diabetes, hospitalization history during the study, suffering from uncontrolled underlying diseases such as hypertension above 130.90 mm Hg with drug use, drug dependence.

Data collection tools

The required data were collected using a self-report questionnaire in two basic stages and 3 months after the educational intervention. The questionnaire consisted of the following sections:

- A) Background information, demographic information and medical records: including questions on age, sex, education, economic status, marital status, occupation, weight, body mass index, cardiovascular disease, kidney and duration of illness.
- B) Morisky Medication Adherence Scale, which consists of 8 questions. 7 questions with two-choice expressions (zero = yes and one = no) and one question with five-choice expressions (from zero = never up to 4 = Always). A score of 6 or higher is considered a desirable adherence to treatment. The Morisky Medication Adherence Questionnaire has been used extensively in domestic and foreign studies and its psychometric properties have been

confirmed [28, 29]. Also, by completing a questionnaire with a sample size of 20 patients with an interval of two weeks, the reliability of this questionnaire was calculated in the present study. The coefficient of retest was 0.78 and Cronbach's alpha coefficient was 0.83 which confirmed the internal consistency coefficient. The sample was randomly selected from the main population and did not participate in the final study.

- C) Diabetic Patient's Awareness Scale: The scale consisted of 16 questions that participants were asked to answer the questions using the options Yes, No and I do not know. Each correct answer was given a score of one and the wrong answers and I do not know was also given a score of zero. The range of scores between zero and 16 higher scores indicates greater awareness. Its validity and reliability have been measured in various studies [30]. Psychometric properties scale in the present study were also confirmed in the pilot study ($\alpha = 0.79$, $r = 0.82$).
- D) Diabetic Patient's Perceived Benefits Scale: The scale consists of 4 questions and participants were asked to answer questions based on a five-scale Likert scale (1 = strongly disagree to 5 = strongly agree). Responses ranged from 4 to 20 points, and higher scores indicated greater perceived benefits. The internal consistency and its reliability have been confirmed in previous studies [31]. Also, the psychometric properties scale in the present study were confirmed ($\alpha = 0.93$, $r = 0.88$).
- E) Diabetic Patient's Perceived Barriers Scale: This scale has 7 questions and participants were asked to answer the questions based on the five-scale Likert response range (1 = strongly disagree to 5 = strongly agree). Questions ranged from 7 to 35. Higher scores indicated more perceived barriers. The internal consistency and reliability have been confirmed in previous studies [31]. Cronbach's alpha coefficient ($\alpha = 0.87$) and retest coefficient ($r = 0.84$) were also calculated in the present study.
- F) The specific self-efficacy scale for diabetic patients: It has 19 questions and participants were asked to answer questions based on the five-scale Likert (from 1 = I am not at all confident, 2 = somewhat confident and 3 = very confident). Questions ranged from 19 to 57, and higher scores indicated greater self-efficacy. The internal consistency has been confirmed (0.92) in Haghayegh. et al study. In the study of Slath et al., The internal consistency and reliability of the questions (Cronbach's alpha = 0.86) were confirmed [32, 33]. Also, Cronbach's alpha coefficient ($\alpha = 0.78$) and retest coef-

ficient ($r = 0.80$) in the present study confirmed the internal consistency and reliability, respectively.

G) Diabetic patient's Subjective Norms Scale: It has 4 questions and participants were asked to answer the questions based on the five-scale Likert response range (1 = strongly disagree to 5 = strongly agree). Higher scores indicated better social support. Internal consistency and reliability have been confirmed in the study of Dashtian et al. [19]. In addition, Cronbach's alpha coefficient ($\alpha = 0.96$) and retest coefficient ($r = 0.92$) in the present study confirm the internal consistency and Were the reliability.

Educational intervention

Steps of study and educational intervention: First, the literature was reviewed and the necessary resources were collected. Then the necessary coordination was made with the Vice Chancellor for Health and Research of Qazvin University of Medical Sciences. In the next step, telephone calls were made to the patients selected to participate in the study for coordination, and after the initial introduction, they were given a brief explanation of the objectives of the study. If individuals expressed a desire to participate voluntarily, the necessary coordination would be made based on a proposed timetable for participants to attend the selected health centres. The objectives of the study were described during the patients' attendance at the relevant centre. They were then reassured about voluntary participation in research, the confidentiality of information, anonymous questionnaires, the possibility of leaving the research at any time and other ethical issues were reassured. Informed and written agreement was obtained from all participants. Then, the research questionnaire was given to the patients in the presence of one of the members of the research group in the health centres. The presence of the researcher was to ensure complete and accurate answers to all questions, remove possible ambiguities and answer patients' questions while completing the questionnaire, explained about other stages of the research and appreciated their participation. The approximate time to answer the questions was 25 minutes. In addition, due to the participation of the control group, the educational materials should be done in the form of pamphlets and a 2-hour face-to-face meeting. An educational intervention based on the 4P social marketing model was presented to promote medication adherence behaviour in type 2 diabetic patients based on psychological constructs in the experimental group (Table 1) [23].

After evaluating and analyzing the results of the questionnaire, interviews and evolutionary research,

the educational program was conducted as a group discussion to develop educational interventions based on patient's needs. After approval by the panel of experts in terms of importance, relevance, the complexity of the content and compliance of the content with the objectives, the training program was developed in the form of 5 sessions of face-to-face training for 60–90 minutes two days a week (Fig. 1). Each training group consisted of 15 participants. To facilitate the presence of patients in the experimental group, classes were conducted in one day and two round in 10-9 AM and 2-1 PM. In designing the training content and determining the training strategies, emphasis was placed on increasing awareness, changing attitudes, improving self-efficacy and subjective norms, promoting medication adherence behaviour and identifying and removing barriers. In this regard, verbal feedback, individual and face-to-face consultation with a physician in the field of diabetes, consultation with a psychiatrist and nutritionist (twice a week at 2–10 pm) was performed and family members also attended meetings to support the patient. In the fifth session, educational pamphlets were provided to the participants to review the materials that were taught in the sessions. Patients who were successful in controlling diabetes were also invited to share their experiences. For example, a patient who had the retina problem and had improved with glycemic control, as well as a patient who had high blood sugar and was able to lower his blood sugar with suitable adherence, were invited to motivate other patients to promote medication adherence behaviour. After the face-to-face sessions to remind and re-learn the content presented in the class, educational videos and photos were continuously shared through What's Up groups. Patients without access to WhatsApp also received training via SMS and phone call. After three months, the questionnaires were completed again by the samples. To thank the patients for participating in the study, the two groups were invited to perform A1C and FBS tests and the cost of the test was transferred to their account.

Statistical analysis

The obtained data were analysed using SPSS software version 25. After ensuring the normal distribution of data using Kolmogorov-Smirnov test, Chi-square tests to evaluate the relationship between qualitative variables, independent sample t-test to compare quantitative variables between two independent groups and paired t-test to compare quantitative variable changes between groups before and after the intervention and analysis of variance to examine and compare a quantitative variable between three independent groups

Table 1. Mixed social marketing model for diabetic patients' medication adherence

P	Definition	Medication Adherence	Application
Product	Idea / Behaviour / Service	Start taking diabetes medications (pills and insulin) on time	<ul style="list-style-type: none"> • Patients should first be aware of the problem through group discussion and training sessions (increase awareness to promote drug adherence behaviour) • Execute medical orders on time, Taking medications controlling blood sugar
Price	The value that consumers are forced to give up as long as they receive the product (psychological, attitudinal, functional, anxiety)	<ul style="list-style-type: none"> • Lack of knowledge about the correct way to use the medications • Forgetting medications • Lack of motivation • Interference with daily tasks • The cost of medicines and lack of insurance coverage • Lack of family support • Side effects of medications • Use of various medications 	<ul style="list-style-type: none"> • Better price understanding to improve patient attitude and self-efficacy • Training and counselling classes to overcome barriers to attitude and self-efficacy
Place	A place where consumers gather to receive a product and be exposed to communication	<ul style="list-style-type: none"> • All people with diabetes • All family members • All health centres and hospitals • Doctors and medical staff 	<ul style="list-style-type: none"> • Invite family members to participate in the training program (subjective norms) as the most important communication channel • Consult a doctor
Promotion	A tool for conveying messages and communicating with the target audience	<ul style="list-style-type: none"> • Mass media • Interpersonal communication • pamphlets 	Using various means of communication including mobile phones, daily text messages and holding telephone counselling classes, training by doctors, pamphlets and educational booklets to raise patients' awareness

and more were performed. The internal validity of the control study was also assessed using covariance analysis. The significance level in the study was considered less than 0.05.

Ethical approval

This study is a master's thesis that has been done by obtaining the necessary licenses from Qazvin University of Medical Sciences, the Vice-Chancellor for Health of Qazvin University of Medical Sciences and Qazvin Health Centre. (Ethics code: IR.QUMS.REC.1398.190)

Results

In the present study, the mean age of participants was generally 54.12 ± 8.22 years with an age range of 36 to 65 years. The mean weight of patients was 74.25 ± 12.58 with a weight range of 50–115 kg. Other information is provided in Table 2.

The mean and standard deviation of psychological variables affecting medication adherence were compared between experimental and control groups before the intervention. This comparison showed that there was no significant difference between the two groups

in terms of these variables (Table 3). The mean and standard deviation of medication adherence behaviour before intervention in the experimental group was 3.45 ± 1.24 and in the control group was 3.64 ± 1.15 . It showed that there was no significant difference between the two groups. The results of the independent sample t-test and comparison of medication adherence's mean between male patients 3.55 ± 1.21 and female patients 3.53 ± 1.17 did not show a significant difference between the two groups.

There is a correlation between demographic and psychological variables affecting medication adherence. Findings indicate that there is a significant correlation between medication adherence and attitude, subjective norms and self-efficacy. Attitude also had the strongest correlation coefficient with medication adherence behaviour ($P < 0.05$, $r = 0.312$) (Table 4).

Table 5 shows that the mean score of psychological variables in the experimental group increased significantly ($P < 0.001$). According to the obtained squares, it can be stated that social marketing intervention training explains 38.2% of awareness mean's variance, 23.5% of attitude mean's variance, 22.5% of self-

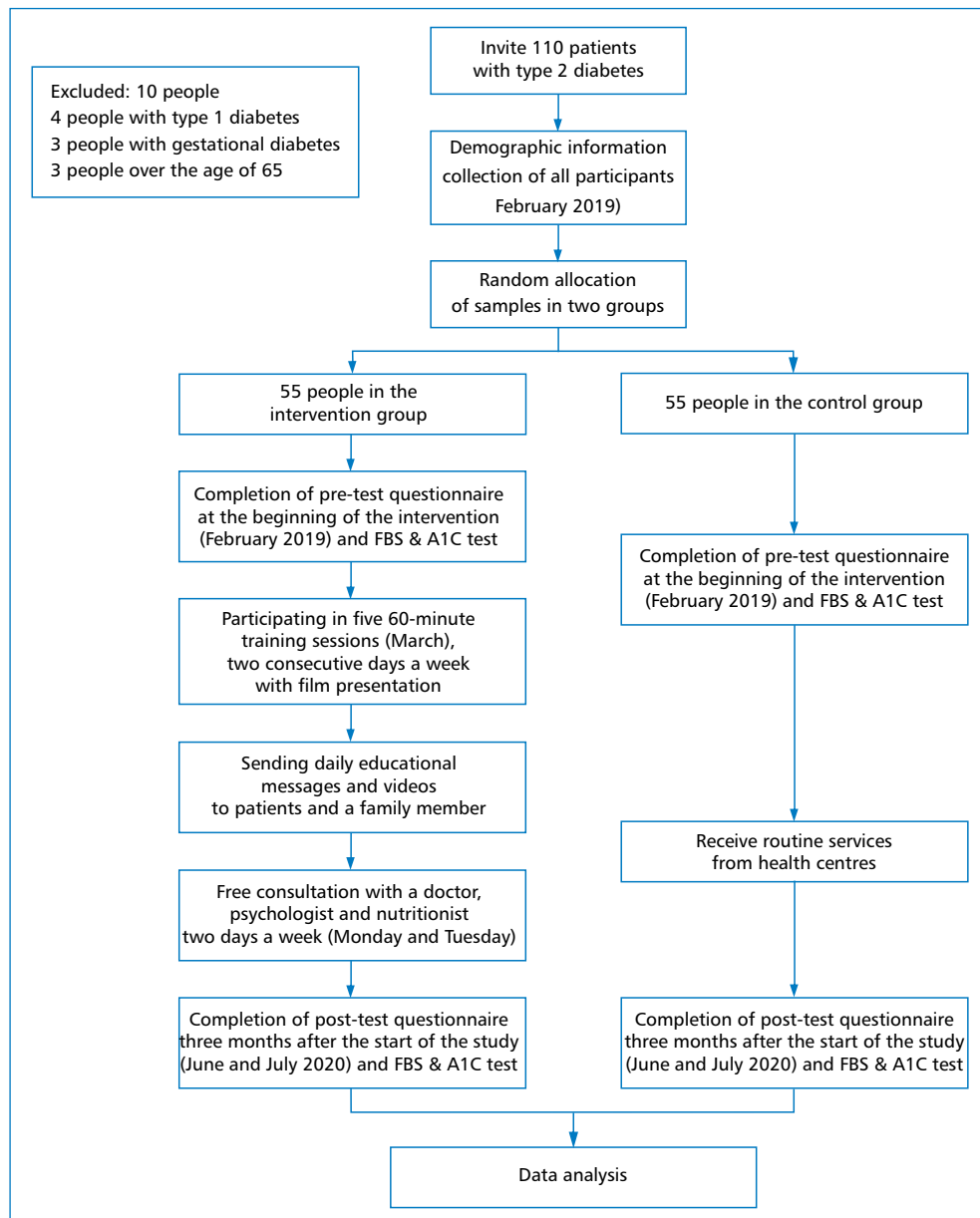


Figure 1. Research process diagram

efficacy mean's variance, 44.5% of subjective norms mean's variance and 31.8% of medication adherence mean's variance in type 2 diabetic patients.

Discussion

The present study was performed on 110 type 2 diabetic patients living in Qazvin province. The effect of education on medication adherence in diabetic patients based on psychological constructs (attitude, self-efficacy, subjective norms, behavioural control and awareness) which is equivalent to social marketing 4P (price, place, product, promotion) was evaluated for the first time in Iran. The results showed that the

medication adherence's mean (equivalent to product) increased to $f = 49.94$ after educational intervention in the experimental group. This finding is consistent with the study of Dashtiani et al. Which showed that medication adherence is at a desirable level in 76% of patients (19). The study of Gholamaliei et al. [34] which was a cross-sectional study, showed that 59.4% had poor adherence. It also stated that the most important reasons for medication non-adherence were patient-related beliefs, anxiety, self-efficacy and care group that was significantly associated with medication adherence ($P < 0.05$) [34]. In Hashemi et al.'s study, the most important strategy for improving medication

Table 2. Demographic characteristics of Diabetic patients participating in the study in the form of control and experimental groups (n = 110)

Variable		Experimental group	Control group	P value
Sex	Male	(30.9) 17	(27.3) 15	P = 0.834
	Female	(69.1) 38	(72.7) 40	
Education	Primary school	(54.5) 30	(45.5) 25	$\chi^2 = 4.635$ df = 4
	Middle school	(18.2) 10	(20) 11	
	High school	(1.8) 1	(7.3) 4	P = 0/327
	Diploma	(25.5) 14	(12.7) 7	
Job	University	(7.3) 4	(7.3) 4	$\chi^2 = 3.210$ df = 4
	Housewife	(65.5) 36	(67.3) 37	
	Retired	(12.7) 7	(18.2) 10	
	Employee	(3.6) 2	(3.6) 2	
	Self-employment	(18.2) 10	(9.1) 5	
Marital status	Other	(0/0) 0	(1.8) 1	$\chi^2 = 3.313$ df = 3
	Married	(81.8) 45	(89.1) 49	
	Single	(1.8) 1	(0) 0	
	Divorced	(0) 0	(1.8) 1	
The economic status (Scheffer test)	Other	(16.4) 9	(9.1) 5	P = 0.346
	Excellent	(0) 0	(0) 0	
	Good	(0) 0	(0) 0	
	Medium	(50.9) 28	(43.6) 24	
History of underlying diseases	Weak	(49.1) 27	(56.4) 31	$\chi^2 = 0.584$ df = 1
	Cardiovascular disease	(21.8) 12	(12.7) 7	
	Kidney disease	(1.8) 1	(0) 0	
	High blood pressure	(30.9) 17	(52.7) 29	
Duration of illness	Other cases	(45.5) 25	(34.5) 19	P = 0.361
	12–6	(1.8) 1	(0) 0	
	5–1	(10.9) 6	(25.5) 14	
	10–5	(52.7) 29	(38.2) 21	
Type of insurance	10 <	(34.5) 19	(36.4) 20	$\chi^2 = 5.506$ df = 3
	Rural insurance	(10.9) 6	(9.1) 5	
	Social Security Insurance	(40) 22	(43.6) 24	
	Armed Forces Insurance	(1.8) 1	(5/5) 3	
	Health insurance	(18.2) 10	(10.9) 6	
Supplementary insurance	Other	(29.1) 16	(30.9) 17	P = 0.698
	Yes	(6.43) 24	(45.5) 25	
Family history	No	(56.4) 31	(54.5) 30	$\chi^2 = 0.037$ df = 1
	Yes	(70.9) 39	(70.9) 39	
Type of treatment	No	(29.1) 16	(29.1) 16	P = 0.848
	Yes	(70.9) 39	(70.9) 39	
Type of treatment	Pills	(70.9) 39	(70.9) 39	$\chi^2 = 0.000$ df = 1
	Insulin	(29.1) 16	(29.1) 16	
	Insulin / Pills	(70.9) 39	(70.9) 39	
Type of treatment	Pills	(54.5) 30	(47.3) 26	$\chi^2 = 0.037$ df = 2
	Insulin	(7.3) 4	(12.7) 7	
	Insulin / Pills	(38.2) 21	(40) 22	

adherence was to increase motivation and remove barriers and concerns in diabetic patients (13). A study in southwestern Ethiopia, which was in line with the present study, showed the proportion of patients with low, medium and high adherence was 24.9%, 2.9% and 37.37%,

respectively. It was mentioned that having a desirable level of blood sugar control is associated with high adherence and also considered that an approach to increase patient awareness through educational intervention to promote medication adherence to be effective [35].

Table 3. Comparison of the mean and standard deviation of psychological constructs affecting medication adherence in experimental and control groups before intervention

Construct's name	Experimental group M ± SD	Control group M ± SD	P value
Awareness	19.63 ± 3.01	18.76 ± 2.57	0.104
Self-efficacy	46.25 ± 4.58	47.15 ± 3.75	0.267
Attitude	42.45 ± 3.95	42.43 ± 3.11	0.979
Subjective norms	18.23 ± 2.30	18.71 ± 2.33	0.287

Based on the results, the average self-efficacy (equivalent to the price) increased to 31.05 after the educational intervention, which is in line with the results of the study of Zamani et al. with 30.38 self-efficacy's mean after the training. Therefore, the results indicate that education promotes self-efficacy and consequently medication adherence behaviour in patients [31]. A higher self-efficacy score indicates a person's confidence in his ability to adhere to better behaviour. In the study of Mohamadinejad et al. [36] the mean self-efficacy was 167.60 after 8 weeks of educational intervention. In this case, one of the reasons for the high mean can be attributed to the sampling of hospitalized patients with a particular problem. The present study is consistent with a study in the United States with a self-efficacy score of 34.69 ± 4.93 and it is inferred from this study that to improve self-efficacy, physicians should address the concerns of low-health literate patients [37]. The results were consistent with a study in Laotian that showed self-efficacy was the most important factor in explaining the variance of medication adherence, so the need for an intervention program that includes methods to increase self-efficacy was recommended [38].

Other psychological constructs (equivalent to price) include patient's attitudes (perceived barriers and benefits) to medication adherence. The mean score of attitude was 39.912 and the strongest correlation coefficient was related to attitude and medication adherence behaviour. The study of Gholamaliei et al., Which introduced patients' attitudes as the most important factor of non-adherence, is consistent with this study [34]. In a study in the United States, barrier constructs accounted for 44% of the variance on medication adherence behaviour, which showed that the most important barriers to medication adherence were the simultaneous use of several medications, medications side effects, forgetfulness, and it recommended education to promote medication adherence behaviour [39]. Findings from a study in Singapore [40] showed that educational intervention via smartphones increases awareness and reduces attitudinal barriers in patients, which is consistent with the present study. The results of a study at the Joslin Diabetes Centre showed that psychologists have an important role in reducing emotional distress, improving knowledge and education, so receiving advice from a doctors and diabetes nurse and, if necessary, using a psychiatrist can remove barriers and improve attitudes in patients [41].

The mean of subjective norms (equivalent to place) was $f = 85.670$. Also, the ETA coefficient showed that family members' participation in the education process and communicating with the doctor, which is the most important source of information affect the patient's behaviour. Meanwhile, 44.5% of the variance of the abstract norms variable is explained by educational intervention. The study of Gholamaliei et al. [34] showed that the most important sources of information were physicians and health workers (60%), family and friends (3%) and the least important were newspapers and magazines (0.6%). The present results

Table 4. Pearson correlation coefficient between demographic and psychological variables affecting medication adherence

Variable	1	2	3	4	5	6	7	8	9
1 BMI	1								
2 Age	-0.229**	1							
3 FBS	-0.021	0.137	1						
4 HbA1C	0.051	0.041	0.933	1					
5 Awareness	0.035	0.166	0.308	0.046	1				
6 Attitude	-0.157	-0.018	-0.029	-0.122	-0.118	1			
7 Subjective norms	0.070	-0.060	-0.115	-0.143	-0.155	0.163	1		
8 Self-efficacy	-0.131	0.034	-0.055	-0.362	-0.208*	0.226*	0.053	1	
9 Medication adherence	-0.140	0.094	-0.032	-0.075	-0.099	0.312*	0.192*	0.234*	1

*P < 0.05; **P < 0.01

Table 5. Covariance analysis of the effect of educational intervention on the mean of awareness, attitude, self-efficacy, subjective norms and medication adherence

Source of changes	Sum of square	df	Mean of square	F	Sig	Eta coefficient
Awareness	540.149	1	540.149	66.219	0.000	0.382
Group	1.371	1	1.371	0.168	0.683	0.002
Error	872.797	107	8.157			
Total	32870.000	110				
Source of changes	Sum of square	df	Mean of square	F	Sig	Eta coefficient
Attitude	1474.853	1	1474.853	39.912	0.000	0.235
Group	11.755	1	11.755	0.262	0.610	0.002
Error	4794.892	107	44.812			
Total	268143.000	110				
Source of changes	Sum of square	df	Mean of square	F	Sig	Eta coefficient
Self-efficacy	762.110	1	762.110	31.005	0.000	0.225
Group	5.139	1	5.139	0.209	0.648	0.002
Error	2630.109	107	24.580			
Total	285363.000	110				
Source of changes	Sum of square	df	Mean of square	F	Sig	Eta coefficient
Subjective norms	419.050	1	419.50	85.670	0.000	0.445
Group	8.708	1	8.708	1.780	0.185	0.016
Error	523.386	107	4.891			
Total	46517.000	110				
Source of changes	Sum of square	df	Mean of square	F	Sig	Eta coefficient
Medication adherence	79.568	1	79.568	49.944	0.000	0.318
Group	0.002	1	0.002	0.001	0.975	0.000
Error	170.466	107	1.593			
Total	2566.563	110				

are consistent with a cross-sectional study in Brazil that introduces the patient's children and physicians as important social and informational sources [42]. In line with the findings, a study in the Mexican-Americans promotes family support as an important source of information and facilitator of medication adherence. In this study, patients also stated that reminders from their spouses and children prevent them from giving up medications [43].

The mean awareness (equivalent to promotion) is 66.219. In this regard, a study in Saudi Arabia reported an average of 51 to 75 [44]. In contrast, the mean awareness in a study in Pakistan was $r = -0.036$, $p = 0.404$). One of the reasons for this discrepancy was patients' lack of understanding of their disease, which could be due to the traditional nature of education and lack of patient feedback and lack of communication between the patients and physician [45]. This study showed that educating patients based on social marketing approach has a positive effect on all psychological constructs and this will lead to a change in medication

adherence behaviour and better control of blood sugar by providing continuous counselling and educational messages.

Conclusion

The present study shows that educational intervention based on social marketing, which was equivalent to the psychological constructs including awareness, self-efficacy, subjective norms, and attitude, promoted medication adherence behaviour in type 2 diabetic patients. The important point in the field of education through this approach was to identify the barriers and concerns of patients and remove these barriers through communication with the doctor. This increases self-efficacy and thus promotes medication adherence behaviour in patients. Therefore, to develop a medication adherence program, it is necessary for physicians and all those patients who are in contact with these patients to improve their skills by updating their information and participating in professional meetings in the field of social marketing. By this mean they can communicate

with the patient, follow up patients through electronic devices and provide online counselling.

Conflict of interest

None.

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