Given According to Knowledge, Motivation and Behavioral Skills (IMB Model) The Effect of Diabetes Education on Self-Care

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ABSTRACT

Aim: It has been determined that the education given according to the information, motivation, and behaviour model is effective in AIDS, chronic diseases, glucose control in diabetes, and self-care behaviours such as diet and exercise. The aim of this study, which is planned from this point of view, is to evaluate the effect of education given according to the information, motivation, and behaviour model on diabetic self-care management.

Material and Methods: This study was conducted as an experimental study with a nonrandomized control group that included 90 diabetes mellitus individuals, with 45 in the intervention group and 45 in the control group. The control group were given formal diabetes mellitus education. In contrast, the intervention group received an education based on the information, motivation, and behaviour model and diabetes mellitus cases were followed for six months. Data were collected with a questionnaire on the essential characteristics of the patients, an evaluation form on the level of knowledge about diabetes, an evaluation form on their motivation about diabetes, and a diabetes self-care activities questionnaire. An Independent Sample-t test was used to analyze the data, and Paired Sample-test statistics were used to compare two dependent groups. Mann-Whitney U test was used to compare the measurement values of two independent groups that did not have a normal distribution. Wilcoxon test statistics were used to compare two dependent groups.

Results: At the end of the study, it was determined that while HbA1c in the intervention group decreased for 6 months, knowledge scores, motivation levels and self-care skill scores increased (t=7.067, p<0.001; Z=-7.576, p<0.001; Z=-8.248, p<0.001; Z=-7.807, p<0.001; Z= -5.651, p<0.001; Z=- 4.402, p<0.001; Z=- 6.818, p<0.001). Statistically significant differences were found between the 1st and 6th-month scores. It was determined that HbA1C control variables increased, knowledge score averages increased, motivation levels decreased, and self-care skill averages (except foot care) did not show a statistically significant difference within 6 months in the control group.

Conclusion: Education based on the information, motivation, and behaviour model improved the information, motivation and behaviour skills of diabetes mellitus patients, and additionally HbA1c outcomes, and was determined to contribute to disease management and self-care positively.

Keywords: Diabetes mellitus, Self-care, Nursing, IMB model

Bilgi, Motivasyon ve Davranış Becerilerine (İMB Modeli) Göre Verilen Diyabet Eğitiminin Özbakım Üzerine Etkisi

ÖZ

Amaç: Bilgi, motivasyon ve davranış modeline göre verilen eğitimin AIDS, kronik hastalıklar, diyabette ise glikoz kontrolü başta olmak üzere diyet, egzersiz gibi özbakım davranışlarında etkili olduğu saptanmıştır. Bu noktadn hareketle planlanan bu çalışmanın amacı, bilgi, motivasyon ve davranış modeline göre verilen eğitimin diyabetik öz bakım yönetimine etkisini değerlendirmektir.

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Gereç ve Yöntemler: Bu çalışma, müdahale grubunda 45, kontrol grubunda 45 olmak üzere toplam 90 diyabetes mellituslu bireyden oluşan randomize olmayan kontrol grubu ile deneysel bir çalışma olarak yürütülmüştür. Kontrol grubuna standart diyabet eğitimi verilirken, müdahale grubuna bilgi, motivasyon ve davranış modeline modeline göre eğitim verildi ve diyabetik olgular altı ay boyunca takip edildi. Veriler hastalara ait tanıtıcı özelliklere ilişkin anket formu, diyabet ile ilgili bilgi düzeyine ilişkin değerlendirme formu, diyabet ile ilgili motivasyonlarını değerlendirme formu ve diyabet özbakım aktiviteleri anketi ile toplandı. Verilerin analizinde Independent Sample-t test, iki bağımlı grubun karşılaştırılmasında Paired Sample-t test istatistikleri kullanılmıştır. Normal dağılıma sahip olmayan iki bağımsız grubun ölçüm değerleriyle karşılaştırılmasında Mann-Whitney U test, iki bağımlı grubun karşılaştırılmasında Wilcoxon test istatistikleri kullanılmıştır.

Bulgular: Araştırma sonunda, müdahale grubundaki metabolik kontrol değişkenleri 6 ay boyunca düşerken, bilgi puanları, motivasyon düzeyleri ve öz bakım beceri puanları arttığı saptandı. 1. ve 6. ay puanları arasında istatistiksel olarak anlamlı farklılıklar tespit edildi (t=7.067,p<0.001; Z=-7.576, p<0.001; Z=-8.248, p<0.001; Z=-7.807, p<0.001; Z=- 5.651, p<0.001Z= -4.402, p<0.001; Z=- 6.818, p<0.001). Kontrol grubunda 6 ay içerisinde metabolik kontrol değişkenlerinin arttığı, bilgi puanı ortalamalarının arttığı, motivasyon düzeylerinin düştüğü ve öz bakım beceri puan ortalamalarının (ayak bakımı dışında) istatistiksel olarak anlamlı farklılık göstermediği belirlendi.

Sonuç: Bilgi, motivasyon ve davranış modeline modeline dayalı olarak verilen eğitimin diyabetli hastaların bilgi, motivasyon ve davranış becerilerini ve ayrıca metabolik sonuçlarını iyileştirdiği, hastalık yönetimine ve öz bakıma olumlu katkı sağladığı belirlendi.

Anahtar Sözcükler: Diyabet, IMB model, Hemşirelik, Özbakım

INTRODUCTION

Type 2 diabetes mellitus is a significant public health problem with increasing frequency in Turkey and the world. In the 10th edition of the "Diabetes Atlas" published biennially by the IDF, it was reported that as of 2021, there is 537 million adult (one in 10 adults) diabetes patients, 80% of whom live in low- and middle-income countries. I (1). Turkey has about 7 million people with diabetes, which is about 15% of the adult population (2). With this high incidence, ensuring the management of diabetes mellitus disease is an important topic and requires a long process for the individual and the healthcare professionals. The American Diabetes Association (ADA) recommends diabetes self-care education for this problem.

Diabetes self-care management (DSCM) encompasses processes like nutrition, exercise, medication use (oral antidiabetics (OAD), insulin) and foot care ensuring people acquire behaviour and make changes to behaviour changes to reduce the risk for comorbid conditions and complications (3).

Currently, there are many models to provide or strengthen behaviour changes in health, like the health-belief model, self-care model, information-motivation and behaviour model. One is the information-motivation-behavioural skills (IMB) model, developed by Fisher et al. in 1993, based on information, motivation and behaviour (4). The IMB model is based on three components. First, the data ensures the individual is more informed, motivates the individual to use the information received to change to negative risk behaviour and sustain attitude and healthy behaviour. Behaviour skills ensure the individual reduces adverse outcomes by acquiring behaviour skills to develop health. According to the IMB model, information is essential to completing behaviour changes. Information and motivation support the development of behavioural skills. Information and motivation act together, causing individual behaviour and attitudes changes. Information, motivation and behaviour skills all together ensure the emergence of behaviour (4). Studies using the IMB model generally focus on chronic diseases, sexual health and sexually transmitted diseases (5-7). Various studies show the contribution of the IMB model to behaviour changes and self-care in diabetes (8-11). Another research has shown that an IMB-based exercise program is effective for knee function and health outcomes in obese older adults (12). It is known that clinical nurses and diabetes nurses who provide continuous education to individuals with diabetes have an impact on improving self-care behaviours. In the literature, it has been shown that education given with the IMB model in diabetes offers promising results in HbA1c or blood glucose values (9-11,15,16,26,27).

Additionally, there is no example of the IMB model focusing on the development of positive health behaviour related to the effect on diabetes self-care from Turkey, and it is thought that this model will be effective in the self-care and disease management of people with diabetes. With this aim, the study was performed to determine the efficacy of an education program according to the IMB model on participants' information, motivation and behaviour levels. Finally, the research is considered to provide a map and guide for nursing interventions about education and implementations to develop positive health behaviour related to self-care control in people with diabetes mellitus.

MATERIAL and METHODS

Ethical Considerations

The Ethics Committee approved this study of Ankara Yildirim Beyazit University Yenimahalle Education-Research Hospital Clinical Research Ethics Committee (Approval No. IRB- 2017/37). Verbal consent was obtained from individuals with diabetes who wanted to participate in the study.

Study Setting and Patient Population

The research included People with type 2 diabetes attending the internal diseases or endocrinology clinics of an education-research hospital located in Ankara, Turkey, from September 2017-October 2018. The sample for the research comprised a total of 90 participants, with 45 in the intervention and 45 in the control group.

The sample size admitted to the endocrine outpatient clinic is based on the number of diabetic patients. As a result of the Post-hoc power analysis made with the data obtained from the study using the G*Power 3.0.10 program; The power of the study was found to be 90% with a total of 90 samples (n1:45, n2:45), f=0.173 effect size and 5% margin of error (Figure 1).

Data in the research were collected with a survey form related to descriptive characteristics of participants, an assessment form related to information levels about diabetes (pre-test-post-test) (information), an assessment form for motivation related to diabetes (motivation) and a diabetes self-care activities questionnaire (behaviour skills).

Study Design

This study was conducted as an experimental study with a nonrandomized control group. (Figure 2: Consort Flow Chart). Inclusion conditions for the research: Participants older than 18 years, were literate, had no mental disease, had type 2 diabetes mellitus and used insulin for at least one year, and agreed to participate in the research.

The research was completed in two stages. In the first stage, participants meeting the sample selection criteria in the study were determined among participants with type 2 diabetes diagnosis. These participants were randomly divided into the control group (n=45) and the intervention group (n=45). The list of participants meeting the research criteria was obtained from the diabetes nurse, given numbers and assigned to groups with the simple random method. The diabetes nurse gave participants in the control group routine education. Information tests were performed before beginning education and in the 6th month. At the end of the 1st month and 6th month, HbA1c was examined, and behaviour changes and attitude were assessed. The blood results of individuals with diabetes were taken from the results of routine blood tests requested by their doctors. For this, necessary permission was obtained from the relevant clinic doctor. Afterward, all scales were filled again.

In the second stage of the research, participants in the intervention group (n=45) were given education about diabetes according to the IMB model. The information test was performed before beginning education and in the 6th month. Participants were informed about diabetes and disease man-
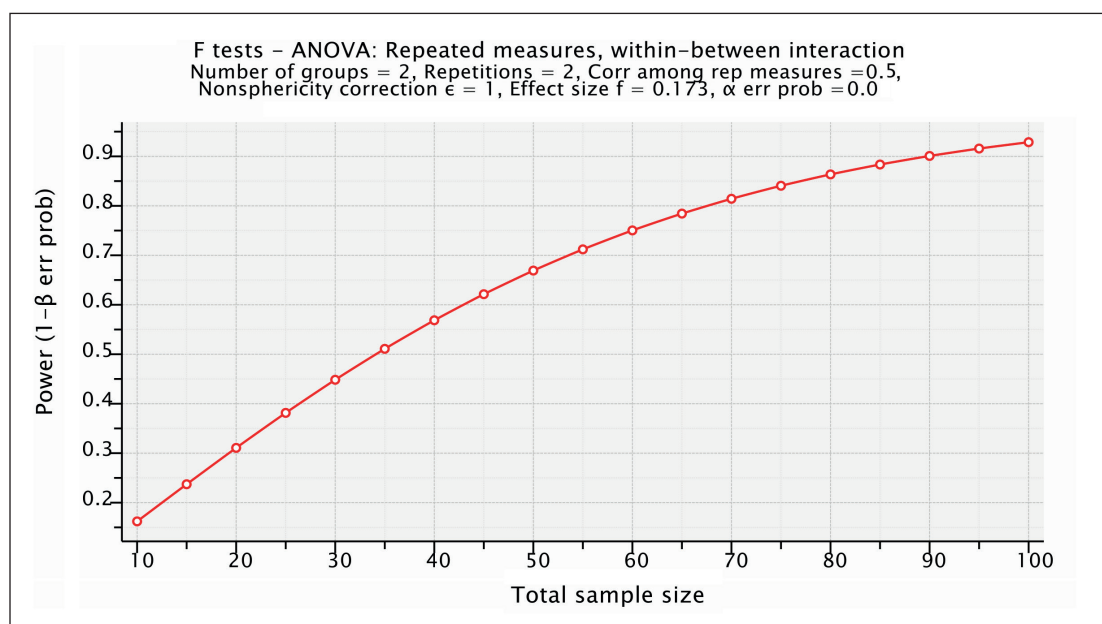

Figure 1: Power Analysis

agement once per month by the diabetes nurse. The HbA1c was examined at the end of the 6th month, and behaviour changes and attitudes were assessed with scales.

Education was given to individuals with diabetes in a diabetes nurse's room. The training took 30-45 minutes. Participants in the intervention group used brainstorming, explanation, demonstration, question-answer and discussion methods in the Diabetes Self-Care Education Program (medical nutrition therapy, physical activity, blood glucose monitoring, oral antidiabetic/insulin) led by the diabetes nurse. The Diabetes Self-Care Education Program was given at appropriate times for participants, with duration set according to the need and educational desires of patients. In addition, participants could reach the diabetes nurse when needed.

All participants in the research were informed about the aim and methods of the study and provided verbal and written informed consent.

Diabetes Information: All participants in the intervention and control group had the assessment form related to information levels about diabetes (Form 2 pre-test) applied for information, the first component of the IMB model. Thus, pre-test and post-test data were obtained about the information levels of participants.

Diabetes Motivation: For the second component of the IMB model of motivation, participants in the intervention group were given positive behavioural feedback to motivate them about diabetes self-care. Participants were encouraged about what needs to be done to balance blood sugar and insulin management. For example, the diabetes nurse motivated participants about diabetes self-care and management once per month in the internal disease clinic. The assessment form for motivation related to diabetes (Form 3) was also applied. The opinions of eight experts were obtained for this form.

Diabetes Behaviour Skills: To measure the third component of the IMB model of behaviour skills, all participants in the intervention group completed the diabetes self-care activities questionnaire (Form 4) with the nurse who gave the education. The opinions of eight experts were obtained for this form.

Hypothesis

H0: Diabetes self-care education based on the IMB model does not affect self-care.

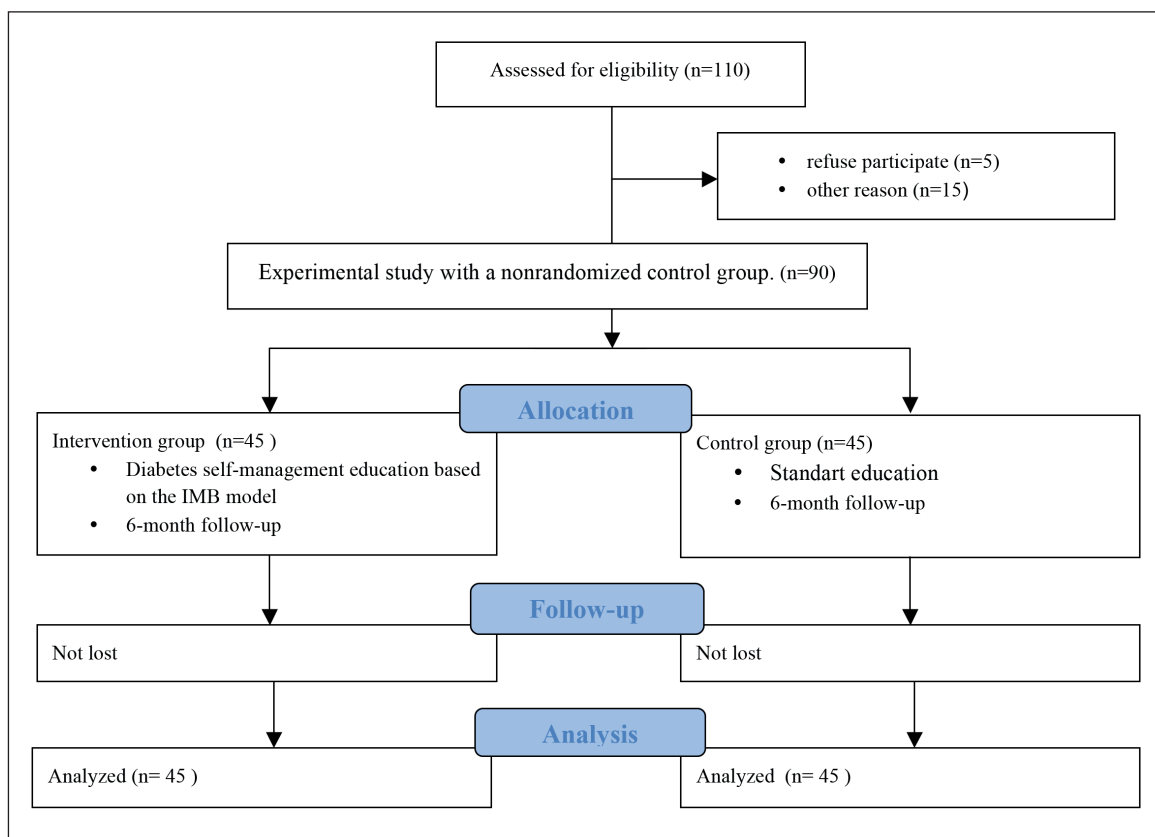H1: Diabetes self-care education based on the IMB model affects self-care.

Figure 2: CONSORT 2010 Flow Diagram

Data Collection

Survey form related to descriptive characteristics of participants (Form 1)

This was prepared by the researchers and comprised 17 questions about the sociodemographic features of participants. Questions about age, sex, marital status, educational level, income level, etc., were included.

Assessment form related to information levels about diabetes (pre-test-post-test) (Form 2)

This form was prepared by the researchers following the first stage of the IMB model (information, motivation, behaviour skills) of providing information. This form was used to assess participants' knowledge levels before and after the educational program for people with diabetes according to the IMB model. This form included 30 statements about topics explained in the Diabetes Education Program. Participants were requested to answer each question. Points obtained from this survey form varied from a minimum of 0 to 30 points, with the increase in facts showing increased information levels. This form was applied to participants in the experiment and control groups before and after the program as pre-test and post-test.

Assessment form for motivation related to diabetes (Form 3)

This form comprises 7 questions prepared by the researchers about increasing motivation, the second stage of the IMB model. The form was applied to the intervention and control groups to determine whether participants experienced any problems related to diabetes and insulin use and whether they used any resources to obtain information related to diabetes. Opinions from 7 experts in the field of diabetes were received about the form. As points obtained from the form reduce, the motivation levels increase.

Diabetes self-care activities questionnaire

The revised form of the Diabetes Self-Care Activities Questionnaire (DSAQ) developed by Toobert and Glaskow (2000) was used (13). This tool questions participants about self-care activities under the headings of diet, exercise, blood sugar tests, foot care and smoking completed within the last seven days (day/week). Responses are marked as days (0-7), with only item 11 questioning tobacco in the form of 0- I don't smoke and 1- I do smoke (amount smoked). Each subdimension of the scale is given separate points and is used independently.

Accordingly,

Diet: the first 4 items are used to determine the situation regarding nutritional practices. The mean of the total for

the 1st and 2nd items are the general diet points, and the mean of the sum for the 3rd and 4th items, with the 4th item given inverse points, comprises the special diet points. The mean total for all 4 items includes "diet points."

Exercise: The mean of the total points for the 5th and 6th items comprise the "exercise points."

Blood sugar test: The mean of the total points for the 7th and 7th items comprise the "blood sugar test points."

Footcare: The mean of the total points for the 9th and 10th items comprise the "footcare points."

Smoking: The 11th item shows the smoking status (0= doesn't smoke, 1= smokes) and the number of cigarettes smoked daily.

Apart from the 11th item questioning smoking, it is expected that points will be high for the other sections. High points show that self-care activity is performed more.

The researchers who developed and revised the scale state that the data obtained with the new form (in the form of day/week) cannot be directly compared with findings obtained in previous studies (out of 100 points); however, the numbers obtained after a conversion procedure allow the opportunity for comparison. According to the results of validity and reliability studies performed in Turkey by Gülhan Coşansu (2009), the Cronbach alpha coefficients for the subdimensions were .59 for diet, .70 for exercise, .94 for blood sugar test and .77 for footcare (14).

It was found Cronbach alpha values for this study; were .64 for diet, .68 for exercise, .88 for blood sugar, and .80 for foot care.

Statistical Analyses

All statistical analyses were performed with the SPSS 20.0 software package (SPSS, Inc., Chicago, Illinois). An Independent Sample-t test was used to analyze the data, and Paired Sample-test statistics were used to compare two dependent groups. Mann-Whitney U test was used to compare the measurement values of two independent groups that did not have a normal distribution. In addition, Wilcoxon test statistics were used to compare two dependent groups.

RESULTS

Study Participants

In the intervention group, 25 participants (55.6%) were in the age class of 50 years and older, and the mean age of these participants was 51.02±12.32 years. It was determined that 26 participants (57.8%) were male, 37 (82.2%) were married, 18 (40.0%) were high school graduates, and 23 (51.1%)

were unemployed. Of the participants, 18 (40.0%) were people with diabetes for longer than 10 years. In terms of treatment, 29 participants (64.4%) received OAD + insulin, 21 (46.7%) performed blood sugar measurements at home, and 12 of these participants (57.1%) performed blood sugar measurements at home 2-3 times per day.

Of participants in the control group, 32 (71.1%) were in the age class of 50 years and older, with the mean age of participants as 56.17±12.95 years. Of participants, 29 (64.4%) were male, 37 (82.2%) were married, 18 (40.0%) were high school graduates and 25 (55.6%) were unemployed. It was determined that 19 participants (42.2%) were people with diabetes for more than 10 years. For treatment, 28 participants (62.2%) received OAD + insulin, 22 (48.9%) performed blood sugar measurements at home, and 14 of these participants (63.6%) performed blood sugar measurements 2-3 times per day at home.

The biochemical findings for the 1st, 3rd and 6th months in the intervention and control groups are given in the table. According to these results, participants in the intervention group fell in HbA1c values over time. Contrarily, participants in the control group were determined to have increases in HbA1c values over time.

There was no statistically significant difference between the D.M. information points in the 1st month between the intervention/control groups ($p > 0.05$).

According to the intervention/control group, a statistically significant difference was identified in D.M. information points in the 6th month ($t = 7.067$; $p < 0.001$). Participants in the intervention group had statistically significantly higher levels of D.M. information points in the 6th month compared to the control group (Figure 3).

There were statistically significant differences in terms of D.M. information points according to the procedure for participants in the intervention group ($t = -16.263$; $p < 0.001$). Participants in the intervention group had statistically significantly higher D.M. information points in the 6th month compared to the points for the 1st month.

There were statistically significant differences in terms of D.M. information points according to the procedure for participants in the control group ($Z = -4.356$; $p < 0.001$). Participants in the control group had statistically significantly higher D.M. information points in the 6th month compared to the points for the 1st month.

According to intervention/control groups, there were statistically significant differences in 6th-month D.M. motivation points ($Z = -7.576$; $p < 0.001$). Participants in the intervention

group had significantly lower 6th-month D.M. motivation points levels than the control group.

According to the procedure, participants in the intervention group had statistically significant differences in D.M. motivation/behaviour points ($Z = -5.900$; $p < 0.001$). In addition, participants in the intervention group had statistically significantly lower levels of D.M. motivation points in the 6th month compared to the 1st month.

According to the procedure, participants in the control group were identified to have statistically significant differences in D.M. motivation points ($Z = -4.476$; $p < 0.001$). In addition, participants in the control group had statistically significantly lower levels of D.M. motivation points in the 6th month compared to the 1st month.

According to the intervention/control group, there was no statistically significant difference between the 1st-month DSAQ general diet and diet points ($p > 0.05$), while there were statistically significant differences identified for 6th-month DSAQ available diet, special diet and diet points ($Z = -8.248$; $p < 0.001$, $Z = -7.807$; $p < 0.001$). According to intervention/control groups, there was no statistically significant difference between 1st month and the 6th-month DSAQ special diet points ($p > 0.05$). Participants in the intervention group had statistically significantly higher levels for 6th month DSAQ general diet, special diet and diet points compared to the control group ($Z = -5.787$ $p = 0.000$, $Z = -3.101$; $p = 0.002$, $Z = -5.715$ $p < 0.001$). According to the procedure, participants in the control group had no statistically significant difference in terms of DSAQ general diet, special diet and diet points ($p > 0.05$). While the DSAQ available diet, special diet and diet points increased during the procedure in the intervention group, they did not change during the control group.

According to the intervention/control group, the 1st-month DSAQ exercise points were not identified to be statistically significantly different ($p > 0.05$), while the 6th-month DSAQ exercise points were determined to be statistically significantly different ($Z = -8.119$; $p < 0.001$). In addition, participants in the intervention group had statistically significantly higher 6th-month DSAQ exercise points compared to the control group.

According to the procedure, participants in the intervention group were identified to have statistically significant differences in terms of DSAQ exercise points (6th month) ($Z = -5.651$; $p < 0.001$). The 6th-month DSAQ exercise points were significantly higher for participants in the intervention group. According to the procedure, participants in the control group had no statistically significant differences in terms of DSAQ exercise points ($p > 0.05$).

According to the intervention/control group, there was no statistically significant difference in terms of 1st-month DSAQ blood sugar points (*p*>0.05), while there were statistically significant differences identified in terms of 6th-month DSAQ blood sugar points (*Z*=-8.104; p<0.001). According to the intervention/control group, participants in the intervention group had statistically significantly higher 6th-month DSAQ blood sugar points compared to the control group.

According to the procedure, participants in the intervention group were identified to have statistically significant differences in DSAQ blood sugar points (*Z*=-4.402; p<0.001). In addition, participants in the intervention group had significantly higher 6th-month DSAQ blood sugar points (Figure 4).

According to the procedure, participants in the control group did not have any statistically significant differences in DSAQ blood sugar points (*p*>0.05). The blood sugar points did not change over time (Figure 4).

According to the intervention/control group, there were no statistically significant differences identified in terms of 1st-month DSAQ footcare points (*p*>0.05), while there were statistically significant differences identified in terms of 6th-month DSAQ footcare points (*Z*=-6.818; p<0.001). Participants in the intervention group had statistically significantly higher 6th-month DSAQ footcare points compared to the control group. According to the procedure, participants in the intervention group were identified to have statistically significant differences in terms of DSAQ footcare points (*Z*=-5.325; p<0.001). According to the procedure, participants in the control group were identified to have statistically significant differences in DSAQ footcare points (*Z*=-2.635; *p*=0.008).

DISCUSSION

This study aimed to assess the effect of education according to the IMB model on diabetes self-care management. According to findings obtained at the end of the study, education according to the IMB model was effective. Therefore, it was determined to benefit the self-care behaviour of people with diabetes.

In our study, in the intervention group given education according to the IMB model, HbA1c values were observed to fall within a 6-month time interval (Table 1). In the literature, education with the IMB model for diabetes provided good outcomes for HbA1c or blood sugar values (9,5,10,16).

Considering the importance of glucose control in preventing developing complications future complications in people with diabetes, it is thought that this result and the training to be given to the participant will contribute to this matter.

Information Levels of People with Diabetes

In this study, according to time, participants in the control group were identified to have statistically significant differences in terms of D.M. information points. With this result, it may be concluded that the education given by health professionals to people with diabetes is effective and creates awareness. However, the lack of continuation of this education and motivation resources, the inability to make the desired behaviour changes and the lack of continuity may explain the more effective outcomes of education using the IMB model. In our research, no difference was observed in the 1st month between the information levels in the intervention and control groups. For example, the 6th-month D.M. information levels of participants in the intervention group were statistically significantly higher than the 1st-month points (Table 2). This result is accepted as an indicator that the education given to participants achieved its aims. The increase in information levels of people with diabetes is considered to cause an increase in their awareness and also their motivation. The study conducted according to the self-management behaviour model determined positive changes over time in the information levels of people with diabetes (17). A study by Bian et al. (2015) showed that the female gender and higher education level caused higher levels of information and motivation (17,18). Our study results are in parallel with the literature. At this point, education based on a model and reminder and motivation interviews by diabetes nurses were observed to increase the awareness and information levels of people with diabetes. Within this scope, the importance of nurses in playing an effective role in patient self-care is revealed.

Table 1: Distribution of HbA1C in the intervention/control group

Variable (N=90)	Intervention (n=45)			Control (n=45)		
	Mean ±S.D.	Median	IQR	Mean±S.D.	Median	IQR
1st month HbA1c	10.77±2.31	10.4	2.9	9.43±1.68	9.1	2.9
3rd month HbA1c	8.54 ±1.31	8.5	1.7	10.34±1.53	10.1	2.4
6th month HbA1c	7.12±1.06	7.0	1.3	11.44±1.56	11.3	2.6

Motivation Levels of People with Diabetes

In this study, the 6th-month D.M. motivation points of participants in the intervention group were statistically significantly lower than the 1st-month points (Table 3). The 6th-month D.M. motivation points for participants in the control group were statistically significantly lower than the 1st-month points. This result is considered to be an indicator that education, according to the IMB model, was effective and increased participants' motivation. It is thought that more planned education will have permanent outcomes and change behaviour. Bian et al. also used the IMB model, which was effective in behavioural skills. A study by Jeon et al. determined that motivation did not change much over a 4-week duration and that participants needed to be monitored for at least 6 months to vary motivation. In our study, participants were observed for 6 months, and it can be said that follow-up was effective in changing motivation (19). In the study of Erol et al. the relationship between the exercise level of patients with diabetes and their motivation was found to be moderate. Based on the data in this study, it can be said that the training to be given to individuals with diabetes, according to the IMB model, will positively affect their motivation and help them to transform them into behavioural patterns (20).

Additionally, people with diabetes must identify what motivates them because motivation is intrinsic.

Attitude And Behaviour Levels of People with Diabetes

Our study showed no statistically significant difference in the control group's special, general and diet points over time. In the intervention group, there were statistically significant differences for the three subdimensions over time (Table 4). This result has the quality or being evidence for how effective the education according to the IMB model was on diet behaviour. However, many studies with IMB models and different diseases exist in the literature. According to one study, IMB-based educational interventions that incorporate information, motivation, and behavioural skills enhancement strategies can be effective in helping HIV-positive patients to follow a diet (21). According to a study by Davis, diet behaviour had the most variation in patients with a 3-month follow-up, followed by medication compliance and exercise (8). Again, the same study determined that patients mostly received and shared information related to diet. Gavgani's (2010) studies showed that the IMB model was effective for diet (22).

In this study, the variation in exercise points according to time for participants in the intervention group with type 2 diabetes was statistically significant. At the same time, there was no significant change in the points for the control group. (Table 4). In the literature, education based on the IMB model effectively develops exercise behaviour (19,22). Another study states that the IMB model in adults with type 2 diabetes will be used to support physical activity behav-

Table 2: Comparison of D.M. knowledge level scores of the intervention/control group

	D.M. knowledge level scores (N=90)				Statistical Analysis * Possibility
	1st month	1st month	6th month	6th month	
	$\overline{X}$±S.D.	Median [IQR]	$\overline{X}$±S.D.	Median [IQR]	
Intervention group (n=45)	15.91±3.45	16.0 [4.0]	23.67±3.71	24.0 [4.0]	t=-16.263 p=0.000
Control group (n=45)	15.91±3.45	16.0 [4.0]	17.84±4.10	18.0 [5.5]	Z=-4.356 p=0.000
Statistical Analysis Possibility	Z=0.000 p=1.000		t=7.067 p=0.000		

Table 3: Comparison of D.M. motivation scores of the intervention/control group

D.M. motivation scores (N=90)	Intervention group (n=45)		Control group (n=45)		Statistical Analysis * Possibility
	$\overline{X}$±S.D.	Median [IQR]	$\overline{X}$±S.D.	Median [IQR]	
1st month	4.18±1.21	4.0 [2.0]	4.89±1.25	5.0 [2.0]	Z=-2.754 p=0.006
6th month	0.71±0.73	1.0 [1.0]	3.36±1.28	4.0 [2.0]	Z=-7.576 p=0.000
Statistical Analysis	Z=-5.900 p=0.000		Z=-4.476 p=0.000		

iour change (23). Our study results are consistent with the literature.

Another result obtained in our study is that the blood sugar points in the intervention group improved more over time compared to the control group (Table 4). A study by Meunier et al. determined that the IMB model was effective on blood sugar behaviour, and patients converted this to behaviour. The study by Jeon identified that education according to the IMB model was effective in self-care behaviour like diet, including blood sugar control and exercise (19). In their study, Bakir et al. also found that Information-Motivation-Behavioural Skills Model-based interventions effectively improved glycemic control among adolescents with type 1 diabetes (24). Finally, another study determined that the IMB model positively affects blood sugar levels and quality of life (25). The variation in footcare points according to time was found to be statistically significant for participants in our study in the intervention/control groups with type 2

Table 4: Comparison of DSAQ scores of the intervention/control group

DSAQ scores (N=90)		Intervention group (n=45)		Control group (n=45)		Statistical Analysis * Possibility
		$\overline{X}$±S.D.	Median [IQR]	$\overline{X}$±S.D.	Median [IQR]	
General diet	1 st month	2.00±2.02	1.5 [3.3]	1.98±1.84	1.5 [3.0]	Z=-0.217 p=0.828
	6 th month	6.01±1.09	6.5 [1.5]	1.63±0.46	1.5 [0.5]	Z=-8.248 **p=0.000**
	Analysis	Z=-5.787 **p=0.000**		Z=-0.722 p=0.470		
Special diet	1 st month	2.67±1.34	3.0 [2.0]	3.10±1.66	3.5 [2.3]	t=-1.364 p=0.176
	6 th month	3.28±0.81	3.5 [0.8]	3.33±0.75	3.5 [1.3]	Z=-0.194 p=0.846
	Analysis	Z=-3.101 **p=0.002**		Z=-0.814 p=0.416		
Diet	1 st month	2.33±1.40	2.3 [1.8]	2.54±1.38	2.8 [2.0]	t=-0.702 p=0.484
	6 th month	4.64±0.78	4.8 [1.0]	2.48±0.41	2.5 [0.5]	Z=-7.807 **p=0.000**
	Analysis	Z=-5.715 **p=0.000**		Z=-0.075 p=0.940		
Exercise	1 st month	1.69±1.99	1.0 [2.8]	1.71±1.87	1.0 [2.5]	Z=-0.322 p=0.747
	6 th month	5.36±1.07	5.5 [1.0]	1.98±0.60	2.0 [1.0]	Z=-8.119 **p=0.000**
	Analysis	Z=-5.651 **p=0.000**		Z=-1.484 p=0.138		
Blood Sugar test	1 st month	2.41±2.20	2.0 [3.0]	2.24±1.99	2.0 [2.8]	Z=-0.330 p=0.742
	6 th month	4.62±1.50	4.0 [2.3]	1.61±0.45	1.5 [0.5]	Z=-8.104 **p=0.000**
	Analysis	Z=-4.402 **p=0.000**		Z=-1.633 p=0.102		
Foot care	1 st month	1.74±2.10	1.0 [3.3]	1.81±1.91	1.0 [3.3]	Z=-0.561 p=0.575
	6 th month	5.09±1.72	5.0 [4.0]	2.49±0.48	2.5 [1.0]	Z=-6.818 **p=0.000**
	Analysis	Z=-5.325 **p=0.000**		Z=-2.635 **p=0.008**		

Figure 3: Information change over time.

Figure 4: DSAQ blood sugar score by time.
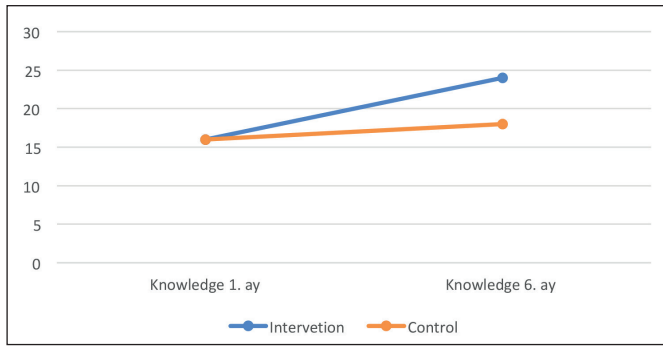
diabetes. The literature states that the IMB model is effective in foot care (10-15,26). Our study results are similar to the literature (Table 4). Nurses performing counseling and education based on a model are thought to provide more effective and permanent results.

The study by Liu et al. observed that the IMB model induced patient behaviour changes and assisted in developing coping strategies (27). Similarly, in the literature, the IMB model was proven effective and efficient for diet, medication compliance, genital infection awareness, foot care and glucose control (19-28,29). A study performed with the IMB model using an interface found effective results; however, it was stated that better results would be obtained with face-to-face counseling (19). Also, in a self-management education study conducted with a smartphone application based on the IMB model, it was observed that this model positively affected blood glucose levels (30). Our results are consistent with the literature and are very valuable in terms of patient outcomes and self-care.

This research showed that education based on the IMB model improved the information, motivation and behaviour skills, in addition to HbA1c outcomes, of people with diabetes and positively contributed to illness management and self-care.

According to the research results,

- It is recommended to look at the effectiveness of the IMB model in gender.
- It is recommended to look at groups with larger samples.
- The effects of the IMB model and different methods on diabetes self-management can be examined in three groups.

Acknowledgments

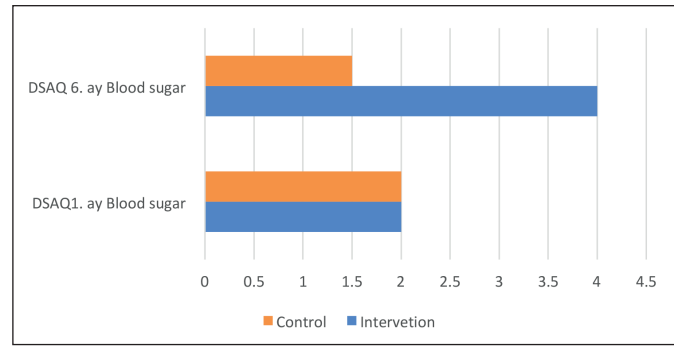We want to thank all the diabetes participants who participated in this study and completed the questionnaires.

Author Contributions

All authors contributed to the literature review and data collection.

Conflict of Interest

The author(s) declared no potential conflicts of interest for this article's research, authorship and/or publication.

Funding

The author(s) received no financial support for this article's research, authorship, and/or publication.

Ethical Approve

The Ethics Committee approved this study of Ankara Yildirim Beyazit University Yenimahalle Education-Research Hospital Clinical Research Ethics Committee (Approval No. IRB- 2017/37).

Peer Review Process

Extremely peer-reviewed and accepted.

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