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ORIGINAL ARTICLE

Factors related to the empowerment of patients with diabetes: a cross-sectional study

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Abstract

Aim Given the high prevalence of diabetes along with its effects and complications, attention to empowerment approaches in this disease care has become increasingly important. The application of theory of planned behavior (TPB) has the potential to develop behavioral change interventions, improving the empowerment of patients with diabetes. The present study aimed to evaluate the application of TBP for empowerment of patients with diabetes in Ahvaz, Khouzestan, Iran.

Subjects and methods In this descriptive-analytical study, 451 patients with diabetes referred to public clinics in Ahvaz (Imam and Golestan hospitals) were included. The participants completed a 3-section questionnaire including demographic information, awareness questions, and questions related to the dimensions of the theory of planned behavior and diabetes empowerment. Data were analyzed based on descriptive and analytical statistics tests using SPSS version 22.

Results Diabetes empowerment and its components were significantly different in terms of gender, ethnicity, educational attainment, occupation, and income, $p < 0.05$. The components of behavioral intention, attitude, and subjective norms had a significant positive relationship with the diabetic empowerment score, but the component of perceived behavioral control had a significant inverse relationship with the diabetic empowerment score, $p < 0.05$. According to logistic regression analysis, male gender (B = 0.12), good income (B = 0.03), behavioral intention(B = 0.66), perceived behavioral control (B = –0.09) and subjective norms (B = 0.55) were predictors of diabetes empowerment.

Conclusion Targeting and tailoring educational interventions based on constructs of TPB, regarding the background characteristics of the patients with diabetes, should be recommended.

Keywords Diabetes mellitus · Empowerment · Theory of planned behavior

List of abbreviations

TPB theory of planned behavior

Background

Diabetes mellitus is a multifactorial disorder and the most common endocrine disease that is associated with chronic increased blood glucose or hyperglycemia. This disease is caused by disruption in the secretion or action of insulin or both. Diabetes mellitus is of two types: 1 and 2, with type 2 accounting for 90% of cases. In 2019, the global prevalence of diabetes mellitus was estimated to be 9.3% (463 million people), with the majority of patients living in low- and middle-income countries. Over the past few decades, both the number of cases and the prevalence of diabetes mellitus have been steadily increasing, and its prevalence is projected to reach 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045 (Smokovski 2021). The increase in the prevalence of diabetes mellitus is proportional to population aging, lifestyle changes associated with economic development, and the increase in obesity. Data related to Iran show that the prevalence of this disease in Iran is 9 to 12%, of which 95% suffer from type 2 diabetes mellitus (Esteghamati et al. 2017).

Diabetes mellitus causes major complications in most body systems and organs, and its early or late complications, including cardiovascular complications, nephropathy, neuropathy, and retinopathy, are associated with disability, invalidity, high cost of treatment, and mortality (Zimmet et al. 2014). With regular glycemic control and lifestyle and dietary change, the complications of diabetes mellitus can be prevented or at least delayed (Blonde 2010), which in turn requires the identification of patients with diabetes' beliefs and behavioral changes. Among the

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many theories and models that have been proposed for this purpose, the theory of planned behavior is one of the most effective theories in relation to diabetes mellitus (Rohani et al. 2015). This theory includes constructs and variables that are represented on a spectrum of behavior change, intention, and performance, and it has been validated in many studies in the field of nutritional behaviors (Bagheri et al. 2019), physical activity (Dashtian et al. 2017), drug adherence (Dashtian et al. 2017), blood sugar control, and prevention of diabetic complications (Hosseini et al. 2020).

The theory of planned behavior predicts the occurrence of a particular behavior before a person intends to perform that behavior. In other words, based on this theory, the most important determinant of a person's behavior is behavioral intention. According to this model, the intention to perform a behavior is predicted based on three factors: 1. The individual has a positive (emotional and logical) attitude toward performing the behavior (attitude). 2. The individual feels under social pressure to perform the behavior (subjective norms). 3. The individual feels that they are able to perform the behavior and that the behavior is under their control (perceived behavioral control). As a general rule, in this model, a person's positive attitude toward doing things, desirable subjective norms, and highly perceived behavioral control provide the individual with a stronger intention to perform the behavior.

In recent years, the concept of empowerment has become a recurring theme in various health texts (Skelly et al. 1995). Anderson, for instance, sees the goal of the empowerment approach as helping patients make informed choices about their disease self-management and provides a four-step behavior change model: 1. understanding the patient's problem areas; 2. examining the emotions associated with these problems; 3. designing a set of goals and strategies for overcoming barriers to achieving those goals; and 4. determining patients' motivation to be committed to a behavior change plan (Anderson and Funnell 2000). Studies that have examined the empowerment model and factors affecting self-management in patients with diabetes have shown the effectiveness of the empowerment model in improvement of quality of life and self-management among patients with diabetes (Johnson 1996; Liu et al. 2010; Skelly et al. 1995). Because diabetes is a chronic disease that is associated with complex complications and considerable stress, empowerment becomes an important indicator of disease adaptation in individuals with diabetes and helps them to discover and use their maximum ability to manage their disease. Empowering the patient in health care means self-determined and self-regulated promotion. Therefore, the potential of individuals for health and well-being is maximized in this way. Identifying the ability and the factors affecting empowerment, in addition to identifying the problems of patients with diabetes, helps them to discover and use their maximum ability to overcome the disease and manage chronic diseases such as diabetes.

Given the fact that the theory of planned behavior provides a comprehensive framework for predicting and explaining health behavior determinants, the present study was conducted to determine the predictors of diabetes empowerment based on this theory.

Method

This is a descriptive study approved by the Vice Chancellor for Research of Ahvaz Jundishapur University of Medical Sciences (Ref. ID: IR.AJUMS.MEDICINE.REC.1398.026). The participants of the study (n = 451) were selected from among patients with diabetes referring to two public clinics in Ahvaz Imam and Golestan hospitals – the diabetes referral centers - in 2021 using simple random sampling and based on inclusion and exclusion criteria.

The inclusion criteria were as follows: age 18 years or more, a prior diagnosis of diabetes by an internal medicine physician, ability to communicate in Farsi (the Iranian official language), and having consented to participate in the study. After the participants were briefed on how the research was going to be conducted, and confidentiality of their data and its application, a written informed consent was obtained from them. The participants were also reassured that they had the right to withdraw from the study at any stage they wished.

Measures

The questionnaire used in the present study included three sections: 1. Demographic information; 2. Awareness and dimensions of the theory of planned behavior; and 3. Diabetes Empowerment.

The section dedicated to awareness involved 10 questions that were scored either 1 for the correct answer or 0 for the wrong answer, so the score range was 0–10, with the higher scores indicating better awareness. The Planned Behavior Questionnaire includes 4 dimensions of attitude (4 questions), subjective norms (4 questions), behavioral intention (3 questions), and perceived behavioral control (4 questions). The scores of subjective norms, behavioral intention, and perceived behavioral control are calculated based on a 5-point Likert scale from strongly agree (Blonde 2010) to strongly disagree. The behavioral intention scores range from 3 to 15, those of subjective norms from 4 to 20, and those of perceived behavioral control from 4 to 20. Attitude questions are scored based on a 7-point Likert scale from useful to harmful (Bagheri et al. 2019), and its score range is 4–28. The validity and reliability of this tool have been confirmed in the study by Beiranvand et al. who obtained a Cronbach's alpha of 0.71 for awareness, 0.77 for attitude, 0.86

for subjective norm, 0.71 for perceived behavioral control, and 0.87 for behavioral intention (Beiranvand et al. 2014).

The Diabetes Empowerment Scale consists of 28 questions in 3 sub-scales (management of the psychological aspects of diabetes = 9 questions; assessment of dissatisfaction and readiness for change = 9 questions, setting and achieving goals for diabetes treatment = 10 questions), and it is scored based on a five-point Likert scale (completely I agree = 5, I completely disagree = 1). The numerical value of each scale is determined by adding the scores and dividing the total score by the number of items in each sub-scale. The overall score on the Diabetes Empowerment Scale is the sum of all the scores divided by 28. The range of scores of each sub-scale (i.e., management of the psychological aspects of diabetes, assessment of dissatisfaction and readiness for change, and setting and achieving goals for diabetes treatment) and the total diabetes empowerment index is 1–5, with higher scores indicating higher empowerment according to this tool. The validity and reliability of this tool have been reported to be acceptable in Iranian samples. In the study of Nusratabadi et al., for example, the internal reliability of this instrument (Cronbach's alpha) for its subscales was 0.9, 0.87, and 0.86, respectively (Nosratabadi et al. 2016). The reliability of the tools used in the present study is shown in Table 1.

Sample size

Sample size estimation was performed using the following formula:

$$n = (z1 - \propto 2)2 \times p(1 - p)/d2$$

where α: 5%, d: 6%, p: 50%. Finally, a total of 400 (with considering 50% for sampling method) were selected for the study.

Data analysis

Data were analyzed applying t-test, ANOVA, and logistic regression. To explore the factors affecting diabetic empowerment, bivariate analysis was performed on demographic variables and knowledge, attitude, subjective norms, intention, and perceived behavioral intention. In the next step, significant variables were entered into the regression model. An analysis of residuals confirmed the assumptions of linearity. It should be mentioned that co-linearity was checked, which was negative. Data were analyzed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA). P-values less than 0.05 at the final stage were considered statistically significant.

Results

In the present study, 451 patients with diabetes with a mean age of 44.88±14.69 (18 to 88 years) including 327 men (72.5%) were studied. Of all patients, 340 (75.5%) were non-Persian and 111 (24.6%) were of Persian ethnicity. As far as educational attainment was concerned, 260 patients (57.6%) did not have a high school diploma, while 99 patients (22%) had high school diplomas and university

Table 1 Mean score of Diabetes Empowerment and TPB constructs and their dimensions

Variable		Mean±SD	Min	Max	Cronbach's alpha
Diabetes empowerment	Management of the psychological aspects of diabetes = 9 questions (score: 1–5)	3.00±0.37	2.33	3.56	0.72
	Assessment of dissatisfaction and readiness for change = 9 questions (score: 1–5)	3.09±0.12	2.78	3.33	0.82
	Setting and achieving goals for diabetes treatment = 10 questions (score: 1–5)	3.11±0.19	2.60	3.50	0.79
	Total Diabetes Empowerment 28 questions (score: 1–5)	3.07±0.16	2.71	3.36	0.89
Planned behavior	Behavioral intent 3 questions (score: 3–15)	9.21±2.89	3	14	0.89
	Attitude 4 questions (4–28)	22.51±1.87	17	25	0.9
	Subjective norms 4 questions (4–20)	47.57±2.72	42	53	0.78
	Perceived behavioral control 4 questions (4–20)	13.92±2.78	8	18	0.82
Awareness 10 questions (0–10)		5.78±2.25	2	9	0.92

degrees. With respect to occupation and income, 402 (89.1%) were employed, whereas 49 (10.9%) were unemployed, and 288 (63.9%) had a low income as opposed to 117 patients (25.9%) who had a moderate income and 46 people (10.2%) having a good income. The scores of the Diabetes Empowerment and Planned Behavior Questionnaires and their dimensions are shown in Table 1.

According to the results of Table 2, there was a significant difference in the Diabetes Empowerment score and its sub-scales in terms of gender, ethnicity, educational attainment, occupation, and income, except for the component of assessment of dissatisfaction and readiness for change, which was not significantly different in terms of occupation and educational attainment.

Based on the results of Tables 3 and 4, diabetes empowerment and the sub-scale of setting and achieving goals related to diabetes had a significant and positive relationship with age, but the sub-scale of assessing dissatisfaction and readiness had a significant inverse relationship with age. Behavioral intention had a significant positive relationship with diabetes empowerment, management of the psychological aspects of diabetes, and setting and achieving diabetes-related goals, but had a significant inverse relationship with assessing dissatisfaction and readiness for change. Attitude

Table 2 The relationship between the sub-scales of the Diabetes Empowerment Scale and demographic variables

Variable		Management of the psychological aspects of diabetes Mean±SD	Assessment of dissatisfaction and readiness for change Mean±SD	Setting and achieving goals for diabetes treatment Mean±SD	Total diabetes empowerment Mean±SD	
Sex	Male	3.19±0.23	3.07±0.10	3.17±0.13	3.14±0.11	
	Female	2.49±0.13	3.16±0.12	2.94±0.22	2.87±0.10	
P value*	0.000	0.000	0.000	0.000		
Ethnicity	Persian	2.84±0.40	3.11±0.12	3.04±0.23	3.00±0.18	
	Non-Persian	3.05±0.35	3.09±0.11	3.13±0.17	3.09±0.15	
P value*	0.000	0.036	0.000	0.000		
Educational attainment	No diploma	3.06±0.35	3.08±0.08	3.13±0.18	3.09±0.16	
	Diploma	2.89±0.41	3.11±0.11	3.07±0.23	3.02±0.18	
	University degree	2.94±0.35	3.10±0.10	3.09±0.18	3.05±0.002	
P value**	0.000	0.09	0.03	0.000		
Occupation	Unemployed	2.68±0.28	3.10±0.16	3.04±0.20	2.94±0.12	
	Employed	3.03±0.36	3.09±0.11	3.11±0.19	3.08±0.16	
P value*	0.000	0.772	0.019	0.000		
Income	Low	2 .95±0.40	3.10±0.12	3.08±0.22	3.04±0.13	
	Moderate	3.13±0.30	3.09±0.10	3.16±0.14	0.10±3.13	
	Good	2.96±26.0	3.05±0.12	3.17±0.06	3.06±0.16	
P value**	0.000	0.04	0.000	0.000		

*Derived from t test

**derived from ANOVA

Table 3 Correlation of Diabetes Empowerment Scale with age, awareness, and planned behavior

Variable	Age	Behavioral intent	Attitude	Subjective norms	Perceived behavioral control	Awareness
Management of the psychological aspects of diabetes	0.019r= 0.681p=	0.907r= 0.000p=	0.618r= 0.681p=	0.645r= 0.000p=	–0.602 r= 0.000p=	–0.098 r= 0.038p=
Assessment of dissatisfaction and readiness for change	0.211r= 0.000p=	-0.444 r= 0.000p=	0.05r= 0.293p=	0.234r= 0.000p=	0.616r= 0.000p=	0.420r= 0.000p=
Setting and achieving diabetes-related goals	–0.012 r= 0.841p=	0.728r= 0.000p=	0.695r= 0.000p=	0.555r= 0.000p=	-0.218 r= 0.000p=	0.039r= 0.413p=
Total diabetes empowerment index	0.451r= 0.000p=	0.855r= 0.000p=	0.747r= 0.000p=	0.751r= 0.000p=	-0.382 r= 0.000p=	0.043r= 0.362p=

Table 4 Multiple linear regression analysis for the assessment of Diabetes Empowerment Scale

Variable	B	Standard error (SE)	Standardized beta coefficients	t	*P* value
Male to female ratio	0.04	0.011	0.122	4.19	0.000
Ratio of good income to low and moderate income	0.02	0.008	0.036	2.37	0.018
Behavioral intention	0.039	0.002	0.666	20.58	0.000
Subjective norms	0.032	0.001	0.519	23.51	0.000
Perceived behavioral control	-0.006	0.002	–0.094	-3.59	0.000

Model Adjusted R Square = 0.9.

had a significant positive relationship with setting and achieving diabetes-related goals and with diabetes empowerment. Subjective norms had a significant positive relationship with all sub-scales of the Diabetes Empowerment Scale. Perceived behavioral control had a significant inverse relationship with diabetes empowerment, management of the psychological aspects of diabetes, and setting and achieving diabetes-related goals, but had a significant positive relationship with assessment of dissatisfaction and readiness for change. Awareness was also significantly inversely related to the sub-scale of management of the psychological aspects of diabetes but had a positive relationship with the assessment of dissatisfaction and readiness for change.

Discussion

In the present study, 451 patients with diabetes referring to public clinics in Ahvaz completed the Diabetes Empowerment Scale. The average score of diabetic empowerment and its sub-scales (score 1–5) was at a moderate level. The total empowerment score of patients with diabetes in Fitzgerald et al. (2015), Deakin et al. (2006), and Sigurdardottir and Jonsdottir (2008) was 3.9, 2.91, and 3.68, respectively, which is similar to the present study. Of course, it is important to take into account the effect of culture, educational attainment, and socioeconomic factors on baseline empowerment scores when comparing empowerment scores across different populations.

n the present study, the scores of the Diabetes Empowerment Scale and its sub-scales were significantly different in terms of gender. Men received higher scores in terms of management of the psychological aspects of diabetes and setting and achieving diabetes-related goals, whereas in the sub-scale of assessment of dissatisfaction and readiness for change, women obtained higher scores, indicating that women may have been more dissatisfied and prepared for change due to their lower diabetic empowerment. In addition, based on the results of logistic regression, the male gender was one of the predictors of diabetic empowerment. Consistent with the results of the present study, Sadeghi et al. (2015) reported that the empowerment of patients with diabetes in Shahroud was significantly different in terms of gender, with men having higher empowerment compared with women. This result was attributed to the cultural conditions prevailing in the Iranian society where men have more social connections and thereby probably obtain more information from their peers or healthcare workers about their disease, which has, in turn, improved their empowerment (Sadeghi et al. 2015). In a study by Rossi et al. (2015) on patients with diabetes in Italy, patients who were in the upper quadrant of empowerment were mostly male (Rossi et al. 2015). However, in the study of Azar et al. (2012) on patients with diabetes in Tehran, Iran (Azar et al. 2012) and the study of Nosratabadi et al. (2016) on patients with diabetes in Sirjan, Iran (Nosratabadi et al. 2016), no statistical relationship was observed between gender and diabetes empowerment. It seems that the empowerment constructs in the present study were related to gender; however, due to the different sample sizes of these two groups (72.5% of female patients) in the current study, results need to be interpreted with caution.

In the present study, the score of the Diabetes Empowerment Scale and two of its sub-scales were significantly different in terms of educational attainment, with the scores of management of the psychological aspects of diabetes and setting and achieving diabetes-related goals being higher in patients not having a high school diploma compared with those having a high school diploma or a university degree. However, the diabetes empowerment score and the above subscales were higher in patients with a higher educational attainment than in those having a high school diploma. The high empowerment score in patients without a high school diploma in the present study could be explained by their relatively less knowledge about diabetes, which led them to overestimate their empowerment, because no such finding was observed in patients with higher educational attainment. In addition, people with higher educational attainment than high school diploma were more empowered compared with people having this diploma as their top educational attainment. In most studies in this regard, the level of education has been

associated with improved diabetes empowerment. These include the study of Azar et al. on patients with diabetes in Tehran (Azar et al. 2012), the study of Nosratabadi et al. on patients with diabetes in Sirjan (Nosratabadi et al. 2016), Sadeghi et al.'s study on patients with diabetes in Shahroud (Sadeghi et al. 2015), and Rossi et al. (2015) study on patients with diabetes in Italy (Rossi et al. 2015).

In the present study, the score of Diabetes Empowerment Scale and its sub-scales were significantly related to income and occupation, with the scores of total diabetes empowerment, management of the psychological aspects of diabetes, and setting and achieving diabetes-related goals being higher among employed patients and those having a moderate or good income, whereas the scores of assessment of dissatisfaction and readiness for change were higher in low-income people. Consistent with the findings of the present study, Sadeghi et al. (2015) found that the empowerment of patients with diabetes in Shahroud was significantly different in terms of their income, with patients having sufficient income being more empowered than people with low incomes (Sadeghi et al. 2015). In the study of Arda Surucu and Buyukkaya Besen (2018), factors such as receiving education about diabetes, higher educational attainment, younger age, social support and employment status were the predictors of empowerment of patients with type 2 diabetes (Arda Surucu and Buyukkaya Besen 2018).

In the present study, the score of the Diabetes Empowerment Scale and two of its sub-scales had a significant relationship with age, with the score of total diabetes empowerment and the sub-scale of setting and achieving diabetes-related goals having a significant and positive relationship with age, but the sub-scale of assessment of dissatisfaction and readiness for change having a significant inverse relationship with age. This finding shows that older patients obtaining higher scores in diabetes empowerment and setting and achieving diabetes-related goals have lower scores in assessment of dissatisfaction and readiness for change. The lower empowerment score of younger patients in the present study may be due to their greater awareness and sensitivity to diabetes, which has led to their low empowerment and less satisfaction and readiness to change. Azar et al. studied the relationship between age and the dimensions of empowerment and found that there is a negative correlation between the dimension of readiness for change and age. In another study by Simonsen et al. (2021) in Finland, the youngest age group of individuals with diabetes (27–54 years) had lower empowerment scores than other age groups (55–64 and 65–75 years) (Simonsen et al. 2021). However, in Arda Sürücü et al. (Arda Surucu and Buyukkaya Besen 2018) and Sadeghi et al. (2015), age had a significant inverse relationship with diabetes empowerment, which is not consistent with the results of the present study and is probably due to demographic differences and the age range of patients.

In the present study, it was observed that patients' awareness had a significant inverse relationship with the score of the sub-scale of management of the psychological aspects of diabetes, had a positive relationship with assessment of dissatisfaction and readiness for change, but had no relationship with total empowerment score. This may indicate that patients with higher awareness of diabetes and its complications underestimate their awareness and management of the psychological aspects of diabetes but overestimate their dissatisfaction and readiness to change. Consistent with the findings of the present study, other studies have reported that patients' awareness of diabetes is significantly associated with their diabetes empowerment (Hernandez-Tejada et al. 2012). Empowerment refers to the ability to make decisions about controlling one's illness, which is defined by having the knowledge necessary to make informed decisions as well as the resources needed to implement those decisions (Arda Surucu and Buyukkaya Besen 2018).

In the present study, the relationship between the score of the Diabetes Empowerment Scale and the studied variables based on logistic regression analysis also showed that behavioral intention, subjective norms, and perceived behavioral control were among the predictors of diabetes empowerment. These findings indicate that the constructs of planned behavior (behavioral intention, subjective norms, and perceived behavioral control) are predictors of diabetic empowerment. In this regard, Didarloo et al. (2011) found in their study that the more pressure and coercion exerted upon patients by their family members and medical staff to adopt therapeutic behaviors, the higher the incidence of correct therapeutic behaviors. Therefore, in individuals who have a positive attitude toward performing a correct behavior, the more pronounced the supporting and facilitating role of subjective norms, the more likely they are to do that activity (Didarloo et al. 2011). In the study of Bagheri et al. (2019) on patients with type 2 diabetes in Zabol, Iran, the components of planned behavior such as perceived behavioral control, subjective norms, and attitudes had a significant relationship with the intention to follow a healthy diet (Bagheri et al. 2019). In the study of Dashtian et al. (2017) on patients with diabetes in Yasuj, Iran, among the planned behavioral constructs, perceived behavioral control showed a significant relationship with physical activity and drug adherence, and the results of multiple regression showed the same construct as a predictor of the level of physical activity and drug adherence among patients with type 2 diabetes (Dashtian et al. 2017). In another study by Hosseini et al. on patients with type 2 diabetes referring to a diabetes clinic in Arak, Iran, it was observed that the constructs of attitude, behavioral intention, and perceived behavioral control

explained 28% of the variance of self-care behavior (Hosseini et al. 2020). According to Rouhani et al.'s study (2015) on patients with type 2 diabetes, the constructs of perceived behavioral control, subjective norms, and perceived risk of diabetes complications had a significant relationship with the intention to follow a healthy diet, and behavioral intention had a statistically significant relationship with nutritional behavior. (Rohani et al. 2015). Also, Ferreira and Pereira (2017) reported that positive attitude and perceived control are strong predictors of sports behavior (physical activity) in patients with diabetes (Johnson 1996). A study by Lin et al. addressed the question "Can the theory of planned behavior explain the effect of empowerment training for people with type 2 diabetes?" Their results showed that behavioral intention is correlated with diabetes self-care behaviors such as doing exercise, blood sugar monitoring, and foot care. As a result, the effects of participating in empowerment sessions on exercise and foot care are likely to be mediated by behavioral intention (Lin et al. 2020). The results of the above studies along with those of the present study show that it is possible to enhance empowerment in patients with diabetes by implementing interventions based on planned behaviors, which will bring about positive results and outcomes.

Limitations

One of the limitations of this study is related to the fact that the questionnaires were completed by the participants in a self-report manner and some may not report their condition objectively and either underestimate or overestimate their condition. The cross-sectional design of the study was another limitation of the study, and future studies are recommended to examine the relationship between diabetes empowerment and planned behavior constructs based on a long-term follow-up dealing with drug adherence, as well as complications and outcome of patients with type 2 diabetes.

Conclusion

Diabetes empowerment and its sub-scales differed significantly in terms of gender, ethnicity, educational attainment, occupation, and income. The components of behavioral intention, attitude, and subjective norms had a significant positive relationship with the score of the Diabetes Empowerment Scale, but perceived behavioral control had a significant inverse relationship with the score of Diabetes Empowerment Scale. Based on logistic regression analysis, male gender, good income, behavioral intention, and subjective norms were the predictors of high diabetes empowerment, whereas perceived behavioral control was among the predictors of low diabetic ability.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10389-022-01798-w.

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Authors' contributions ShV and MA were supervisor of the study and designed the study. SS conducted the data collection. ML and MA were advisor of the study and helped with statistical analysis. All authors assisted in the preparation of the manuscript. All authors approved the final version of the manuscript.

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Data availability Upon request, onsite (Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran) access to the data can be provided.

Declarations

Ethics approval and consent to participate All participants were informed about the study and confidentiality protocols. Informed written consent was obtained from participants. This study was obtained from earlier research (U-98155). The Ethics Committee of Ahvaz Jundishapur University of Medical Sciences reviewed and approved the study (IR.AJUMS.MEDICINE.REC.1398.026).

Consent for publication Not applicable.

Competing interests The authors have nothing to declare.

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