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Psychometrics of the questionnaire on the intention to use medicinal plants in patients with type 2 diabetes based on the developed theory of planned behavior

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Abstract:

BACKGROUND: Using medicinal plants as a complementary medicine in patients with diabetes with the aim of controlling the disease and managing its complications is increasing worldwide. Despite the widespread use of these types of drugs, the reasons for their use have not been investigated based on the theory of planned behavior. The present study was conducted with the aim of psychometrics of the questionnaire on the intention to use medicinal plants in patients with type 2 diabetes based on the theory of planned behavior (TPB).

MATERIALS AND METHODS: In this descriptive cross-sectional study, as many as 622 diabetic patients, referring to Yazd Research Center for Diabetes, were selected and included in the study by convenience sampling method based on the inclusion criteria defined for the study in 2022. The researcher's data collection tool was a questionnaire developed based on the TPB. Data analyzed via confirmatory factor analysis method using Smart PLS software (partial least squares structural equation modeling [PLS-SEM]) was used to confirm the structure of the questionnaire.

RESULTS: The questions of TPB constructs were examined using convergent validity criteria (AVE = 0.57–0.74) and discriminant validity using the Fronell–Larcker criterion and were confirmed. The reliability of TPB constructs was also measured within the approved range (rhoC = 0.86–0.95). Using the PLS-SEM algorithm approach, there is a significant relationship between the constructs of abstract norm ($\beta = 0.44$, $P < 0.001$), perceived behavioral control ($\beta = 0.25$, $P < 0.001$), and attitude ($\beta = 0.1$, $P = 0.006$) with intention; the construct of abstract norm was recognized as the most important predictor of intention in using medicinal plants.

CONCLUSIONS: The results of this questionnaire emphasize the importance of perceived norms, perceived behavioral control, and attitude in the inclination of patients with diabetes toward the use of herbal medicines. Thus, this tool can be used to measure diabetic patients' intention for using medicinal plants.

Keywords:

Diabetes mellitus, intention, medicinal, plants, psychometrics, theory of planned behavior, type 2 diabetes

Introduction

Diabetes, as one of the chronic diseases, has caused many problems for many

people around the world.^[1] Blood sugar control and management is one of the important responsibilities of the patient in reducing the complications caused

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by this disease.^[2] Macrovascular and microvascular complications such as retinopathy, neuropathy, kidney, and heart problems are among the complications of lack of blood sugar control that can occur in patients with diabetes.^[3-5] Many patients, while using common oral and injectable drugs, also use other methods to control blood sugar. Complementary and alternative medicine is one of the most common methods used in patients with diabetes; it has been increasing in the past few decades.^[6,7] In Iran, this type of medicine is also used by patients in the treatment and control of diabetes.^[8] One of the most common types of medicine is medicinal plants that are used by diabetic patients to control the disease and the complications associated with the disease. The rate of use of medicinal plants in diabetic patients in Iran has been reported to be 36–75% in several studies.^[6] Numerous studies have been conducted on investigating the reasons for patients' intention and willingness to use medicinal plants, and these studies have been conducted in two ways: qualitatively and quantitatively. In these studies, the recommendation of friends and family to use this type of medicine, as well as the belief that plants are effective in reducing blood sugar, are among the most important reasons for using such plants.^[9,10] Also, family culture and friends' recommendations were also mentioned as factors of patients' willingness to use medicinal plants. The recommendation of others and the opinions associated with using medicinal plants have been stated as reasons for using this type of medicine.^[11] Belief in a person's ability to control the disease by using medicinal plants was also mentioned in the studies, which can be considered as one of the reasons for their willingness and intention to use such plants.^[12] In studies related to health and health-related behaviors, various theories have been used in cognition and prediction. One of the theories of health behavior and health education used in predicting health behavior is the theory of planned behavior (TPB). The TPB is a broad concept of the theory of rational action that was developed by Ajzen and Fishbein.^[13] The TPB provides a framework for studying attitudes through behaviors. According to this theory, the most important factors determining a person's behavior is the person's intention, leading to conducting a behavior, and it is a combination of attitude toward conducting the behavior, mental norms, and perceived behavioral control.^[14] Attitude is defined as the degree to which a person evaluates the desired behavior as either favorable or unfavorable. Abstract norm is defined as the social pressure for conducting or not conducting a behavior. The meaning of the abstract norm is to understand the opinions of important people (families, close friends, colleagues, doctors, etc.) in the individual's life that can affect their decisions for conducting specific behaviors. Moreover, controlling perceived behavior is one of the important constructs of this theory. A person's understanding of the ease or difficulty of conducting a

behavior and finally a person's understanding of the ability to conduct that behavior is effective in predicting the intention for a specific behavior and also conducting that behavior.^[14] Given its strong predictive power, TPB is widely used as a model for predicting intentions and behaviors in various fields such as food consumption^[15,16] using medicinal plants in cancer patients,^[17,18] healthy eating, and other health-related behaviors.^[14] Since using medicinal plants in diabetic patients has not been yet conducted based on the TPB theory, this study was conducted with the aim of psychometrically measuring the intention to use medicinal plants in patients with type 2 diabetes based on the developed TPB. Thus, the utilization of the TPB in questionnaire design was one of the main features of this study.

Materials and Methods

Study design and setting

The current descriptive cross-sectional study was conducted with the aim of compiling and examining the psychometric characteristics of the questionnaire on the intention to use medicinal plants in patients with diabetes based on the developed TPB. In the first stage, according to the studies conducted in the literature of the research and also based on the qualitative study of content analysis by direct method (qualitative study), the content of the questionnaire was compiled based on the deductive (theoretical) method.

Study participants and sampling

To investigate the rate of using medicinal plants by diabetic patients, using the multiple ratio comparison formula, taking into account the frequency of 0.5, the difference of 0.08, the alpha of 0.05, and the beta of 20%, the sample size was determined to be 605 patients, and 632 people were included in the study with the possibility of sample attrition. The sampling method was a simple convenience method. The participation of the volunteer in completing the questionnaire was done voluntarily. Patients with type 2 diabetes who were interested in completing the questionnaire and were aware of the time and place were selected. The questionnaires were given to the participants and they were provided with the necessary explanations.

Data collection tool and technique

An interview was conducted with 18 patients diagnosed with diabetes who had experience with the permanent or temporary use of herbal remedies. The interviews were recorded and noted. Data analysis was performed starting from the first interview. The results of this study can be found in the research by Vaezi *et al.*^[10] For the subvariables of attitude, abstract norm, and perceived behavior control, a set of questions was made based on the guideline of the TPB questionnaire design.^[19] In the

next stage, the resulting questionnaire was checked for content validity by a group including 11 experts (Ph.D. of health education = 7, community medicine = 2, professor of endocrinology and metabolism = 2). To determine the validity ratio of the content, the group of experts (11 people) was asked to check each question based on a 3-point scale (necessary, useful but not necessary, and not necessary) and then based on the relevant formula $[(ne - (N/2)/(N/2))]$, its rate was measured and if it was higher than 0.79, it was considered as favorable.

To investigate the content validity index (CVI) of the Waltz and Basel method,^[20] the criterion of simplicity, specificity, and clarity for each of the questions was used based on the 4-point scale (1, 2, 3, and 4). For this purpose, the CVI score was calculated by summing up the positive scores for each question that were ranked 3 and 4 over the total number of experts. If the obtained index was 0.79 or higher, that statement would be accepted. According to the obtained results, content validity and CVI were measured to be higher than 0.79. Thus, the content validity and CVI of the questionnaire were confirmed. Also, at this stage, writing and content corrections were reviewed. Then, to ensure the clarity of the questions (pilot testing) and to identify ambiguous questions, as a preliminary study, the questionnaire was conducted on 33 individuals. At this stage, the feedback regarding the writing of the questions was investigated. At this stage, the reliability of the structures was confirmed (Cronbach's alpha above 0.8). Finally, in order to implement the questionnaire and estimate its psychometric indicators, diabetic patients referring to the diabetes treatment research center were used. The participation of the volunteer in completing the questionnaire was done voluntarily. Patients with type 2 diabetes who were interested in completing the questionnaire and were aware of the time and place were selected. The questionnaires were given to the participants and they were provided with the necessary explanations. The questionnaire included attitude, abstract norm, perceived behavioral control, and behavioral intention toward using medicinal plants.

1. The attitude consisted of 10 questions in two parts, that is, opinions about medicinal plants and also the importance of opinions, the opinions on medicinal plants were scored using a 5-point Likert scale (completely agree to completely disagree). Attitude is an indirect way of multiplying behavioral opinions (using a 5-point Likert scale) in the evaluation of behavior results. The questions were designed in pairs (five behavioral opinion questions and five behavior evaluation questions). For example, the use of medicinal plants lowers my blood sugar. The answer to this question is multiplied by the answer to the question "Is it important for me to reduce blood sugar due to the

use of medicinal herbs?" Three descriptive norms included three questions in a direct way. The abstract norm item was measured using a 5-point Likert scale. For example, my family, who are important to me, insist that I use medicinal plants. Also, the abstract norm in an indirect method included 12 items, six questions of which are related to the descriptive norm and six questions are related to the motivation to obey. Each descriptive norm question was paired with a motivation to obey the question. The descriptive norm addressed the behaviors of important individuals. An instance of this is the regular usage of medicinal plants by my family. The measurement of obedience motivation involves assessing the extent to which individuals are willing to engage in behaviors recommended or performed by significant individuals in their lives. For instance, it holds significance for me to follow the recommendations of my family. The assessment of perceived behavioral control involved three questions that directly measured this construct. Respondents were asked to rate their agreement or disagreement on a 5-point Likert scale. Additionally, perceived behavioral control was indirectly measured through 10 questions. Five of these questions focused on identifying barriers or facilitators of the behavior, while the remaining five questions measured the likelihood of engaging in the behavior in relation to the identified barriers or facilitators.

Data analysis

To examine the framework of the concept in this study, the partial least squares structural equation modeling (PLS-SEM) method was approved. The reflective measurement model was tested using SmartPLS statistical software. To evaluate the reliability of this study, Cronbach's alpha value and composite reliability larger than 0.7 were considered as reliable.^[21,22] Average variance extracted (AVE) was used to evaluate the convergent validity. If the AVE of the construct is more than 0.5, it means that the convergent validity of that construct is confirmed.^[23,24] The Fornell-Larcker criterion was also used to confirm the discriminant validity. In the Fornell-Larcker criterion, the square root of AVE of each construct must be greater than the highest correlation of that construct with other constructs in the model.^[25] SRMR index was also used for the fitness of the model. The SRMR index is defined as the difference between the observed correlation and the implied correlation matrix of the model. This index provides the possibility to evaluate the average magnitude of differences between the observed and expected correlations as an absolute measure of the fitness criterion (model). If the value of the SRMR index is less than 0.1, the fitness of the model is considered favorable.^[26]

Ethical consideration

Completing the informed consent and ensuring the confidentiality of patients' data as participants was one of the ethical considerations of this study. Ethical approval was obtained from the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd (Ethics code IR.ssu.rec. 1400.59).

Results

After the researcher went to the diabetes research center, the questionnaires were delivered to the patients with diabetes so that they could complete the questionnaires based on that. Data collection was conducted from May to September 2022. From out of the 633 questionnaires obtained, 622 questionnaires had been completely completed, which were used in the analysis of the results ($n = 622/633$, completeness rate: 98.3%). According to the results shown in Table 1, most of the participants in the study were in the age group of 51–64, and in terms of gender, they were in the female group.

As many as 48.6% of the participants in the study had elementary and middle school educational levels. The average duration of the disease was about 10 years and the age of being diagnosed with the disease was reported to be 45.7 years.

Table 1: Demographic and basic information of the participants in the research

Variable	Variable levels	Frequency (percentage)
Age	Less than 35 years	36 (5.8)
	36–50	138 (22.2)
	51–64	234 (37.6)
	More than 64	214 (34.4)
Gender	Male	262 (42.2)
	Female	360 (57.8)
Marital status	Single	40 (6.6)
	Married	494 (79.3)
	Widowed	81 (13)
	Divorced	6 (11)
Educational level	Illiterate	101 (16.2)
	Elementary and middle school	298 (47.9)
	High school	127 (20.4)
	Associate's degree	24 (3.8)
	Bachelor's degree	57 (9.2)
Disease control method	Master's degree and higher	15 (2.4)
	Pills	329 (52.9)
	Pills and insulin	130 (20.9)
	Insulin	112 (18)
	By following a diet	51 (8.2)
		Mean and standard deviation
Duration of disease (mean and standard deviation)		10.9 (9.4)
The age of being diagnosed with the disease (mean and standard deviation)		45.7 (13.7)

Table 2 shows the results related to the present variables as well as factor loadings. Factor loadings of opinion indicators were all reported above 0.6. Also, the results showed that the representative reliability and composite reliability of the two constructs of behavioral beliefs and the importance of beliefs are higher than 0.9; they were, thus, confirmed. The AVE of behavioral opinions and the importance of opinions were reported as 0.68 and 0.65, respectively; both of which were higher than 0.5. Therefore, the convergent validity of these two constructs was confirmed. The representative and composite reliability values of "descriptive norms" construct were reported as 0.88 and 0.85, respectively, indicating that the reliability of this construct is confirmed. The factor loading of three items, that is, 4, 5, and 6 of the descriptive norms construct was reported to be less than 0.7 and greater than 0.5. As the representative and composite reliability of these two constructs was higher than 0.7, these three items were not deleted. Also, the AVE value of this construct was reported to be more than 0.5, which made the convergent validity of this construct acceptable. Also, the factor loadings of items related to motivation for obedience, perceived (direct) behavior control, control beliefs, behavior control, and intention constructs were reported to be more than 0.7. Also, the representative and composite reliability values of the constructs and AVE are reported in Table 2, indicating that the constructs in question have convergent reliability and validity.

Table 3 shows the results of the discriminant validity of the constructs. As shown in Table 3, the square root of the AVE value of each construct is larger than the highest correlation of the construct with other constructs. Thus, the discriminant validity of all constructs was confirmed. Figure 1 shows the schematic of the constructs of the TPB and the value of predictors of intention to use medicinal plants.

The results showed that the constructs of descriptive norms (0.44), perceived behavior control (direct) (0.26), perceived indirect behavior control (0.19), and attitude (0.1) are, respectively, the best predictors of intention to use medicinal plants. Moreover, Table 4 shows the assumptions related to the relationship of the constructs. The results show that the relationship between the constructs in question has been confirmed. The goodness of fit of the model was also measured according to the SRMR criterion. The SRMR value in this model was 0.08. Therefore, the proposed model is a good fit.

Discussion

The main objective of this study was to develop and test a suitable TPB-based criterion for the intention to

Table 2: Characteristics of factor loadings, Cronbach's alpha, average variance extracted (AVE), and reliability of questionnaire constructs

Variable	Items	Factor loading	Composite reliability	Cronbach's alpha	AVE	Discriminant validity?
Behavioral opinions	1 Using medicinal plants at regular intervals lowers my blood sugar.	0.769	0.92	0.95	0.68	Yes
	2 I will feel good by taking medicinal plants.	0.857				
	3 I feel vitality and freshness after taking medicinal plants.	0.803				
	4 Medicinal plants are less harmful to my body than conventional drugs.	0.82				
	5 I feel relaxed after taking medicinal plants.	0.683				
Outcome evaluation	1 The reduction of blood sugar caused by the consumption of medicinal plants is important to me.	0.747	0.911	0.897	0.65	Yes
	2 I do not care about the pleasant feeling of taking medicinal plants	0.757				
	3 The feeling of freshness caused by the consumption of medicinal plants is important to me.	0.784				
	4 I do not care about the feeling of relaxation caused by taking medicinal plants.	0.847				
	5 I do not care about less damage to the body by taking medicinal plants.	0.742				
Descriptive norm	1 My family regularly uses medicinal plants.	0.750	0.887	0.858	0.57	Yes
	2 Diabetics I know use medicinal plants regularly.	0.783				
	3 It is important to my friends that I take medicinal plants.	0.615				
	4 The owners of shops providing medicinal plants do believe that I need to take medicinal plants.	0.586				
	5 My doctors confirm using medicinal plants.	0.620				
	6 The use of medicinal plants is approved by traditional medicine doctors.	0.750				
Motivation to comply	1 It is important to me to use medicinal plants according to my family's opinion.	0.783	0.912	0.896	0.664	Yes
	2 It is important for me to use what other diabetics recommend.	0.789				
	3 It is important for me to use medicinal plants according to the recommendations of my friends.	0.808				
	4 It is important for me to use medicinal plants according to the opinion of the owners of shops providing medicinal plants.	0.720				
	5 It is important for me to use medicinal plants according to the opinion of my doctors.	0.770				
	6 It is important for me to use medicinal plants according to the opinions of traditional medicine doctors.	0.783				
Perceived behavior control (PBC) Direct	1 I am sure that I can take medicinal plants every day along with common medicines.	0.8	0.879	0.863	0.65	Yes
	2 It is difficult for me to take two types of medicine (herbal and common medicines) on a daily basis.	0.65				
	3 I'm sure I can regulate the medicinal plants into my treatment plan.	0.87				
	4 It is easy for me to use medicinal plants along with common medicines to control diabetes.	0.89				
Control belief	1 There is a possibility that medicinal plants taste bad.	0.72	0.899	0.88	0.684	Yes
	2 Using medicinal plants requires planning, patience and forbearance.	0.81				
	3 Preparing medicinal plants requires enough time.	0.75				
	4 It is not possible to use medicinal plants at any time and place.	0.75				
Control behavior	1 The unpleasant taste of medicinal plants discourages me from using them.	0.73	0.92	0.9	0.735	Yes
	2 It is possible that impatience and lethargy prevent me from taking medicinal plants.	0.84				
	3 It is possible that the time-consuming preparation process of medicinal plants prevents me from using them.	0.87				
	4 The impossibility of taking medicinal plants at any time and place can reduce my desire to take them.	0.81				

Contd...

Table 2: Contd...

Variable	Items	Factor loading	Composite reliability	Cronbach's alpha	AVE	Discriminant validity?
Intention	1 I have planned to use medicinal plants in the next month.	0.87	0.916	0.914	0.745	Yes
	2 I plan to use the herbs along with the regular medications for the next two months.	0.88				
	3 Over the next month, the use of medicinal plants is of high value for me.	0.87				
	4 Over the next two months, it is valuable for me to use medicinal plants along with common medicines.	0.89				
	2 It is important for me to use what other diabetics recommend.	0.789				
	3 It is important for me to use medicinal plants according to the recommendations of my friends.	0.808				
	4 It is important for me to use medicinal plants according to the opinion of the owners of shops providing medicinal plants.	0.720				
	5 It is important for me to use medicinal plants according to the opinion of my doctors.	0.770				
Perceived behavior control (PBC) Direct	6 It is important for me to use medicinal plants according to the opinions of traditional medicine doctors.	0.783	0.879	0.863	0.65	Yes
	1 I am sure that I can take medicinal plants every day along with common medicines.	0.8				
	2 It is difficult for me to take two types of medicine (herbal and common medicines) on a daily basis.	0.65				
	3 I'm sure I can regulate the medicinal plants into my treatment plan.	0.87				
Control belief	4 It is easy for me to use medicinal plants along with common medicines to control diabetes.	0.89	0.899	0.88	0.684	Yes
	1 There is a possibility that medicinal plants taste bad.	0.72				
	2 Using medicinal plants requires planning, patience and forbearance.	0.81				
	3 Preparing medicinal plants requires enough time.	0.75				
Control behavior	4 It is not possible to use medicinal plants at any time and place.	0.75	0.92	0.9	0.735	Yes
	1 The unpleasant taste of medicinal plants discourages me from using them.	0.73				
	2 It is possible that impatience and lethargy prevent me from taking medicinal plants.	0.84				
	3 It is possible that the time-consuming preparation process of medicinal plants prevents me from using them.	0.87				
Intention	4 The impossibility of taking medicinal plants at any time and place can reduce my desire to take them.	0.81	0.916	0.914	0.745	Yes
	1 I have planned to use medicinal plants in the next month.	0.87				
	2 I plan to use the herbs along with the regular medications for the next two months.	0.88				
	3 Over the next month, the use of medicinal plants is of high value for me.	0.87				
	4 Over next two months, it is valuable for me to use medicinal plants along with common medicines.	0.89				

Cronbach's alpha, average variance extracted (AVE)

use medicinal plants in patients with diabetes. In this regard, the questionnaire is reliable with an analysis that provides strong support due to its psychometric properties. Also, further analyses strengthen the use of this questionnaire. TPB has emerged as a popular conceptual framework for the study of human behavior, with a wealth of supporting evidence for the model's efficacy as a predictor of intention and behavior, as well as a framework for designing and evaluating health behavior change interventions. Despite the high use of TPB in numerous studies, such as self-treatment

in patients with diabetes, self-treatment during pregnancy,^[27,28] or the use of medicinal plants in patients with cancer,^[29] this theory had not been used in predicting intention or the use of medicinal plants in patients with diabetes. Thus, this theory was designed to investigate the tendency to use medicinal plants in patients with diabetes, and its psychometric properties were evaluated. The results of this study have provided evidence of content validity, representative reliability, composite reliability, convergent validity, and discriminant validity of the TPB questionnaire. Based

Table 3: Evaluation results of the Fornell–Larcker criterion for the discriminant validity of the theory of planned behavior questionnaire

	Attitude (Ind)	Behavior control	Behavioral beliefs	Control beliefs	Intention	PBC (Indirect)	SBJN (Indirect)	Importance of beliefs	Descriptive norm	Motivation to comply	Behavior control
Attitude (Ind)	1.000										
Behavior control	0.115	0.858									
Behavioral beliefs	0.898	0.110	0.828								
Control beliefs	-0.085	0.527	-0.087	0.827							
Intention	0.555	0.189	0.562	0.016	0.863						
PBC (Indirect)	0.418	0.318	0.433	0.255	0.488	1.000					
SBJN (Indirect)	0.548	0.095	0.530	-0.062	0.675	0.337	1.000				
Outcome evaluation	0.896	0.105	0.638	-0.058	0.448	0.285	0.462	0.818			
Descriptive norm	0.459	0.089	0.456	-0.059	0.578	0.317	0.889	0.373	0.746		
Motivation to comply	0.518	0.104	0.497	-0.033	0.628	0.272	0.896	0.450	0.641	0.815	
Behavior control	0.515	0.350	0.489	0.121	0.585	0.403	0.450	0.446	0.403	0.401	0.806

Fornell–Larcker criterion

Table 4: Correlation matrix between variables

Hypothesis	Hypothesized direct effect	Path coefficient	<i>t</i>	<i>P</i>	Decision
H1	Attitude has a positive effect on the intention to use medicinal plants	0.1	12.25	0.006	Supported
H2	Perceived behavioral control (directly) has a positive effect on intention	0.498	6.39	<0.001	Supported
H3	Descriptive norm has a positive effect on intention.	0.436	12.2	<0.001	Supported
H4	Perceived behavioral control (indirect) has a positive effect on intention	0.253	6.4	<0.001	Supported
H5	Descriptive norm has a positive effect on perceived behavioral control	0.243	5.96	<0.001	Supported
H6	Attitude has a positive effect on perceived behavioral control	0.498	16.5	<0.001	Supported

Hypothesized direct effect. Path coefficient

on the results obtained, the internal reliability of the questionnaire constructs was measured to be between 0.85 and 0.92, indicating that the different parts of a test designed to measure the scales enjoy a good reliability. Composite reliability is one of the most important scales that express reliability. The composite reliability, which is calculated based on the internal coordination of the questions of each factor, was reported to be more than 0.87 in all constructs in this study, indicating the coordination of the questions in the measurement of a construct. The AVE was used to check the convergent validity. Also, the results of the present study showed that the questions of the questionnaire have an acceptable convergent validity ($AVE > 0.5$). Therefore, it can be claimed that a measure has a positive correlation with alternative measures of the same construct.^[30] The discriminant validity of the instruments was also confirmed based on the Fornell–Larcker criterion. Therefore, based on that, each of the constructs is really different from other constructs. If the researcher tests the hypothesized model without addressing the issue of discriminant validity, the interpretation

of the whole model can be misleading or useless. Therefore, the evaluation of discriminant validity is of high importance in designing the questionnaire, the validity of which has been confirmed in this study.^[31] In confirming its effectiveness in determining the use of plants, the hypothetical model was also evaluated. The results showed that the descriptive norm is the most predictive for the intention to use medicinal plants in patients with diabetes (0.49). Thus, the results of this study emphasize the importance of paying attention to the opinions of those around the patient and the important people in the patient's life in the individual's desire to conduct a specific behavior. It has also been confirmed in studies related to the effect of the descriptive norm on the willingness of patients to conduct a specific behavior.^[27,32,33] In the study conducted by Azizi-Fini *et al.*,^[9] one of the reasons for taking medicinal plants was the recommendation of others such as family. Also, in the study conducted by Karimian, the most important predictor of the intention to use medicinal plants during pregnancy was the descriptive norm; this is in line with the results of the

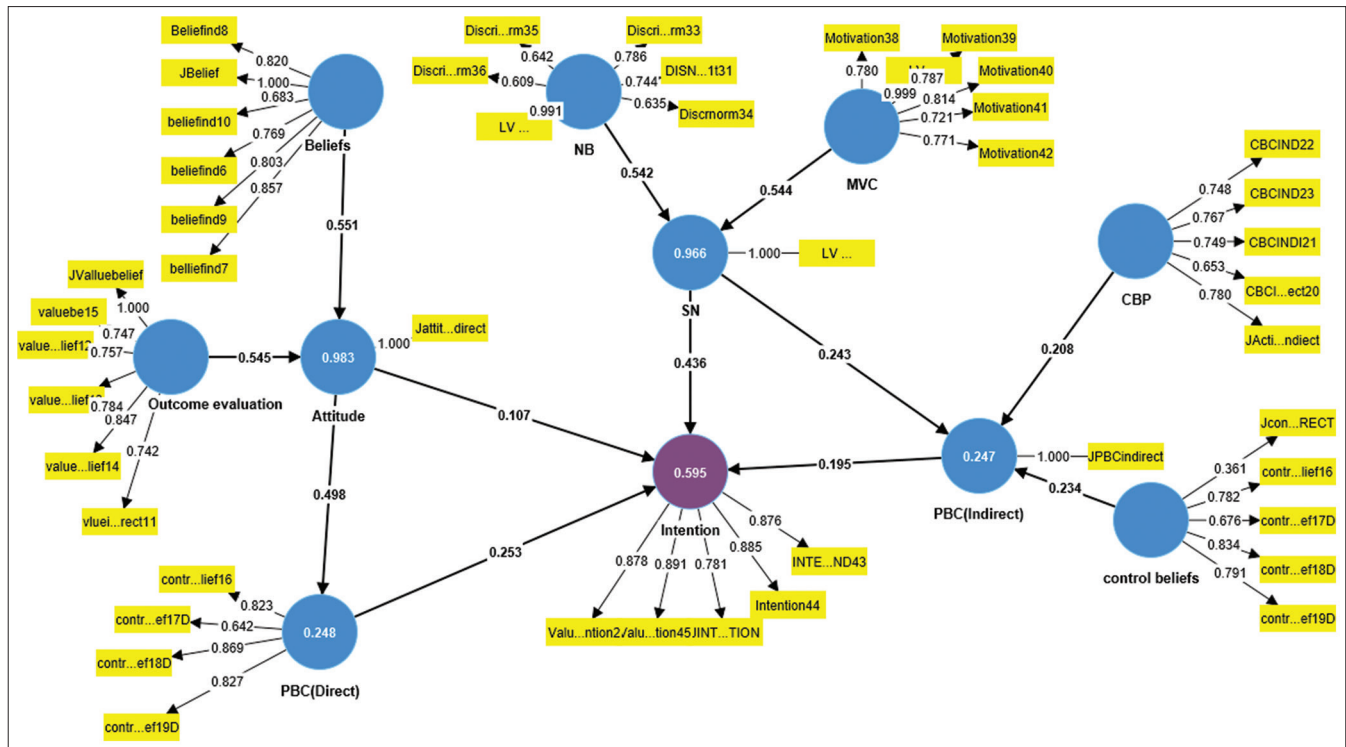


Figure 1: Structural model indicating the relationships between the measured variables of study

present study.^[27] There is also a positive and significant relationship between descriptive norm and perceived behavioral control. This result shows that people who have a higher average score of normative beliefs will probably have a higher score of behavioral control beliefs. This relationship can be due to the fact that people are influenced by others, and when they observe their behavior, they are more likely to do the same behavior. One of the influential factors in increasing self-efficacy is observing the behavior of others or vicarious self-efficacy. Vicarious self-efficacy refers to the fact that observing the behavior of others increases the probability of doing the behavior.^[34] Moreover, the construct of perceived behavioral control, which was measured in two direct and indirect ways, was a predictor of the intention to use medicinal plants. The previous studies also confirmed perceived behavioral control as one of the predictors of behavior and intention; this is in line with the results of the present study.^[35,36] Furthermore, in the current study, the attitude toward other predictive constructs exhibited a weaker association with the intention to use medicinal plants. Moreover, the findings of this study indicated that attitude was a significant predictor of perceived behavioral control, which aligns with the results of previous studies conducted in a similar context.^[27,37]

Limitations and recommendation

One of the most important features of the present study is the large sample size that is correctly selected. Also,

the study design was conducted before psychometrics. The study design was conducted using the questionnaire design guide. By using the qualitative research method, the questionnaire questions were extracted and then the content validity of the questionnaire was evaluated. However, the present study had some limitations. One of the limitations of the study was that the patients referring to the diabetes treatment research center were at a low socioeconomic level; explaining the purpose of the study and obtaining their willingness to complete the questionnaire were hard to be conducted. Therefore, we tried to complete the questionnaires more accurately by spending more time. It was also necessary to properly explain the purpose of the study to the participants and emphasize that the results of the study will not affect the treatment process.

Conclusion

This study was systematically conducted according to previous studies on the reasons for using medicinal plants by applying the TPB. Given its established reliability and validity, this questionnaire can be utilized for assessing self-reported usage and reasons for using or not using medicinal plants among individuals with diabetes who speak Farsi in different regions. Additionally, after translation, this questionnaire can be adapted for speakers of other languages. Also, in this study, the constructs of attitude, descriptive norm, and perceived behavior

control were confirmed in predicting the intention to use medicinal plants; this theory can, thus, be applied for using medicinal plants.

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Conflicts of interest

There are no conflicts of interest.

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