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RESEARCH ARTICLE

The predictors of the use of complementary and alternative medicine among type 2 diabetes patients based on the health belief model

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bstract

Objective The aim of this study was to determine the predictors of the use of complementary and alternative medicine (CAM) in patients with type 2 diabetes based on the health belief model (HBM).

Methods This cross-sectional study was performed in 2019 (from April to September) on 837 type 2 diabetic patients by multi-stage sampling method. Valid and reliable tools (questionnaire of using CAM modalities based on the HBM, self-care behavior section, and use of CAM section) were used to collect data. Data were analyzed using SPSS software version 24.

Results Based on the results, the constructs of the HBM were able to predict 37% of the variance of behavior using CAM. Constructs of perceived threat, perceived barriers, and cues to action had the most significant effect on predicting the behavior of using CAM *($p < 0.001$)*. In this study, the mean (±SD) of patients' self-care behaviors were 26.72 (±3.21) (out of a score of 40). Based on the results of the Pearson correlation, a significant positive correlation was observed between perceived threat ($r = 0.374$) and cues to action ($r = 0.303$) with using CAM modalities *($p < 0.001$)*. There was also a significant negative correlation between perceived barriers and using of CAM ($r = -0.589$, *$p < 0.001$*).

Conclusion Based on the obtained results, the HBM is useful in predicting the use of CAM, and due to the significant impact constructs of perceived threat, perceived barriers, and cues to action, it is better to pay more attention to these constructs in educational programs for patients with type 2 diabetes.

Keywords Complementary and alternative medicine · Type 2 diabetes · HBM · CAM · Health belief model

Introduction

Complementary and alternative medicine (CAM) is defined as a group of medical and health measures that are not currently considered as part of conventional medicine [1]. The National Centre for CAM (NCCAM) classifies CAM modalities into five distinct categories: mind-body medicine, natural products, body-based practices and manipulative, other CAM practices, and ancient medical systems [2].

There is evidence that the popularity of CAM is increasing worldwide and its treatments are widely accepted and widely used [2–5], for example, more than 98% of European citizens have used CAM in the last decade [6]. In Iran, along with other parts of the world, the use of CAM has recently

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received more attention than before. Evidence shows that between 42% and 66% of the people of Tehran use at least one of the CAM modalities [7]. The debate over the clinical efficacy of CAM modalities has been challenging among many medical professionals. This is mainly due to the lack of scientific data on many CAM treatments [8]. The use of CAM for the management of chronic diseases is increasing [9]. Diabetes is one of the chronic diseases in which the rate of CAM is higher in these patients than in other groups of diseases [10]. About 90 to 95% of diabetic patients have type 2 and it is one of the most common chronic diseases in the world [11]. The number of people with type 2 diabetes is increasing due to lifestyle changes, decreased mobility, and obesity [12–14]. It is estimated that by 2035, there will be about 522 million diabetic patients in the world [12].

The highest prevalence of diabetes in the world is in the Eastern Mediterranean region with a prevalence of 12.34% and Iran, which is one of the countries in this region, is facing a 9.9% prevalence of this disease [15]. Diabetes imposes a great burden on society's economy, so that the direct costs of this disease account for between 2.5% to 15% of the total health budget of countries [16]. Also, its indirect costs are several times and it causes complications such as ischemic heart disease, hypertension, retinopathy, neuropathy, and cataract [17, 18]. Also, some diabetic patients may stop their pharmacotherapy for reasons such as poor acceptance of insulin therapy, adverse drug reactions, risks of potential drug interactions, mismatches, and had inappropriate perceptions of their disease and use other methods to control their blood glucose [19, 20].

Based on the results, diabetic patients are at risk of developing problems such as depression, anxiety mild cognitive impairment, and dementia [21, 22]. Diabetic patients may be use different methods for controlling disease and preventing complications. The results of a systematic review and meta-analysis showed that the total vibration of the body was associated with blood flow in the legs, improvements in pain levels, fasting blood glucose levels, and glycated hemoglobin levels [23]. Also, the results showed that diabetic patients should be careful about choosing the dietary programs and not use any nutritional program to weight loss or control their blood glucose [24].

One of the behavioral models used to predict health behaviors associated with diabetes is the health belief model (HBM) [11]. The HBM is one of the models that try to explain and predict health behaviors [25–27]. Therefore, it focuses on the attitudes and beliefs of individuals and shows the relationship between beliefs and behavior [28]. Therefore, this model has been used as the main framework in this study so that we can study the behavior of diabetic patients in the use of CAM. This model is based on six constructs, perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action, and self-efficacy [29, 30].

According to this model, if a person has high perceived susceptibility and perceived severity, evaluates the benefits of performing the behavior positively (perceived benefits), there are few barriers to performing the behavior (perceived barriers), receives appropriate action guidance (cues to action), and finally believes in their ability to perform or quit the behavior (self-efficacy), the likelihood of doing a positive behavior or quitting a negative behavior increases [26]. Accordingly, this study was conducted to determine the predictors of the use of CAM in patients with type 2 diabetes based on the HBM.

Method

This study is a cross-sectional-analytical study that was conducted on 837 diabetes type 2 patients in Sabzevar, Iran in 2019 (from April to September).

Sample size

Based on the results of a similar study [31] and based on the formula below (considering the 95% confidence level, 80% test power, p/proportion 0.36, and d/accuracy 0.03), the sample size was calculated 1000 participants.

$$n = \frac{\left(z_{1-\frac{\alpha}{2}}\right)^2 p(1-p)}{(d)^2}$$

Sampling method

In this study, a multi-stage sampling method was used to enter the participants. In the first step, proportional stratified sampling was used and the number of health centers and the population of each center was determined. Then, each health center was considered as a category. Finally, the participants were selected based on the simple random sampling method from each center. Inclusion criteria included that the person lives in Sabzevar, at least one year has passed since the diagnosis of diabetes (based on the information registered in patients' medical records in health centers), the person has no complications of diabetes and the written consent form has been completed by the participant. Information was collected by a questionnaire and was completed by self-reported. In this study, questionnaires of illiterate participants were completed by the questioner.

Data collection

Data collection tools included 4 sections: demographics, questionnaire of using CAM modalities based on the HBM, self-care Behavior section, and CAM use section.

Demographic section This section included questions such as education level, gender, age, job status, diabetes complications, diabetes duration, and the age of diabetes begins.

Questionnaire of using CAM modalities based on the HBM Two studies of Jetland [32] and Chang [33] were used to design the questions of the questionnaire. This questionnaire with consists of 25 questions and six main constructs of the HBM were used to design this questionnaire. Perceived susceptibility construct (4 items, for example: I think diabetes is a dangerous disease if not treated), perceived severity construct (4 items, for example: If I do not control my diabetes, I will suffer from complications including blindness, stroke, and kidney failure), perceived benefits construct (3 items, for example: Using CAM methods helps control my blood sugar), perceived barriers construct (6 items, for example: I'm not sure about the effectiveness of CAM methods), self-efficacy construct (4 items, for example: I can easily find information on how to use CAM methods), and cues to action construct (4 items, for example: Hearing about a new treatment that interests me, makes me try it). The questions of all constructs were assessed on a 5-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree), a higher score in each construct indicates a more favorable status. The validity of this questionnaire was reviewed by 10 experts (CAM specialists and Health education and health promotion specialists) and the necessary corrections were made. The reliability of this questionnaire was evaluated using Cronbach's alpha test ($\alpha = 0.765$).

Self-care behavior section This questionnaire consists of 8 questions that examine patients' self-care behaviors during the last seven days and includes various aspects including diet, exercise, blood sugar testing, foot care, and smoking. The questions in this section were assessed on a 5-point Likert scale (very high, high, not at all, low, very low). These questions are based on the standard guide to self-care behaviors in diabetic patients [34].

Use of CAM modalities section Participants' use of 15 common modalities of CAM were examined (every day, once a week, once a month, I have not consumed at all).

Data analysis

The collected data were entered into SPSS software version 22. One-way ANOVA, Independent Samples t-Test, Pearson correlation coefficient, and linear regression were used to analyze the data.

Results

In this study, 163 questionnaires were not fully completed and were excluded from the study, the final analysis was performed on 837 and the response rate was 85%. The mean (± standard deviation) of the participants was 49.63 (± 8.09). 50.4% of participants ($n = 422$) were women and 49.6% ($n = 415$) were men. Other demographic information can be seen in Table 1.

Based on the results, no significant differences were observed between the constructs of the HBM with gender, age group, job, and duration of disease onset. There was a significant relationship between having diabetes complications and construct of the perceived threat and those who had diabetes complications had a significantly higher score in terms of perceived risk level *($p < 0.001$).* There was a significant relationship between the duration of the disease and the construct of the perceived benefits and people who had a long time from the onset of the disease had a higher score in terms of perceived benefits ($p < 0.05$)(Table 1).

Also, a significant relationship was observed between the level of education and construct of perceived barriers, and with the increase in the level of education, perceived barriers also increased (Table 1). In this study, the mean (± standard deviation) of all constructs of HBM was 112.45 (± 10.42). Also, the mean (± standard deviation) of CAM modalities used was 26.11 (±2.55) (out of a score of 64) and self-care behaviors were 26.72 (±3.21) (out of a score of 40). The mean (±standard deviation) of constructs of HBM and other variables can be seen in Table 2.

Based on the results of Pearson correlation, a significant positive correlation was observed between constructs of perceived threat ($r = 0.374$) and cues to action ($r = 0.303$) with using CAM modalities *($p < 0.001$).* There was also a significant negative correlation between the construct of perceived barriers ($r = -0.589$) and the use of CAM modalities *($p < 0.001$)(Table 3).* The results of the linear regression model showed that the constructs of the HBM were able to predict 37% of the variance of behavior using CAM modalities. Constructs of perceived threat, perceived barriers, and cues to action had a significant effect on predicting the use of CAM modalities and the most significant impact was related to the construct of perceived barriers *($p < 0.001$)* (Table 4).

Discussion

The aim of this study was to determine the predictors of the use of CAM in patients with type 2 diabetes based on the HBM. The results of this study showed that the constructs

Table 1 Demographic characteristics and their relation with HBM constructs

Variables		(*n* = 837)		Constructs of health belief model (HBM)									
				Perceived threat		Perceived benefits		Perceived barriers		Cues to action		Self-efficacy	
		n	%	Mean (SD)	*P* value	Mean (SD)	*P* value	Mean (SD)	*P* value	Mean (SD)	*P* value	Mean (SD)	*P* value
Gender*	Female	422	50.4	26.37 (3.96)	0.816	12.08 (2.11)	0.770	16.17 (3.69)	0.545	15.29 (3.200	0.068	26.11 (2.55)	0.998
	Male	415	49.6	26.43 (2.33)		12.04 (2.26)		16.02 (3.29)		14.88 (3.16)		26.11 (2.55)	
Age group*	≤ 49	422	50.4	26.35 (3.49)	0.698	11.95 (2.21)	0.140	16.20 (3.53)	0.058	15.06 (3.23)	0.389	16.34 (2.34)	0.608
	≥ 50	415	49.6	26.46 (4.02)		12.17 (2.15)		15.99 (3.46)		15.11 (3.14)		14.42 (2.19)	
Education level**	Illiterate	21	2.5	26.42 (5.23)	0.587	12.66 (1.93)	0.429	14.04 (3.66)	0.002	14.58 (3.35)	0.167	17.09 (1.70)	0.150
	Diploma and Under diploma	650	77.7	26.47 (4.05)		12.04(2.18)		16.29 (3.38)		15.20 (3.16)		16.31 (2.22)	
	Academic	166	19.8	26.12(3.53)		12.06(2.18)		15.61 (3.81)		14.68 (3.26)		16.57 (2.50)	
Job**	Housewife	330	39.4	26.48 (4.04)	0.571	12.12 (2.24)	0.827	15.99 3.21)	0.658	14.82 (3.18)	0.117	16.35 (2.29)	0.664
	Employee	132	15.8	26.34 (4.16)		11.97 (2.26)		15.99 (3.75)		15.53 (2.96)		16.25 (2.45)	
	Self-employee	312	37.3	26.48 (3.95)		12.01 (2.09)		16.29 (3.65)		15.24 (3.20)		16.50 (2.18)	
	Un employee	63	7.5	25.74 (3.45)		12.20 (2.17)		15.92 (3.62)		14.85 (3.51)		16.23 (2.16)	
Complications associated with type 2 diabetes *	Yes	406	48.5	26.85 (4.03)	<0.001	12.12 (2.10)	0.424	16.32 (3.61)	0.078	15.15 (3.20)	0.564	16.35 (2.37)	0.677
	No	431	51.5	25.98(3.89)		12.00 (2.26)		15.89 (3.37)		15.03 (3.14)		16.41 (2.21)	
The age of diabetes begins*	≤40	409	48.9	26.35 (4.03)	0.727	11.99 (2.23)	0.345	16.29 (3.50)	0.114	15.13 (3.20)	0.691	16.40 (2.33)	0.804
	>40	428	51.1	26.45 (3.94)		12.13 (2.14)		15.91 (3.49)		15.04 (3.17)		16.36 (2.20)	
Diabetes duration**	≤ 5	307	36.8	26.42 (3.99)	0.474	11.81 (2.13)	0.015	16.25 (3.58)	0.591	14.99 (3.34)	0.683	16.33 (2.37)	0.847
	6-10	354	42.4	26.52 (4.03)		12.13 (2.24)		15.98 (3.58)		15.19 (3.05)		16.40 (2.2)	
	>10	174	20.8	26.08 (3.85)		14.40 (2.08)		16.04 (3.50)		15.00 (3.05)		16.45 (2.11)	

*Independent samples- t test, ** One-way ANOVA

Table 2 The mean and score range of HBM constructs, self-care behaviors, and use of CAM modalities in type 2 diabetes patients

Variables		Mean	SD	Score Range
HBM Constructs	Perceived susceptibility	14.44	2.34	4-20
	Perceived severity	11.96	4.12	4-20
	Perceived threat	26.40	3.98	8-40
	Perceived barriers	16.10	3.50	6-40
	perceived benefits	12.06	2.18	3-15
	Cues to action	15.09	3.18	4-20
	Self-efficacy	16.38	2.27	4-20
	All constructs	112.45	10.42	25-125
Self-care behaviors		26.72	3.21	8-40
Use of CAM modalities		26.11	2.55	16-64

Table 3 Pearson correlation coefficient of HBM constructs and use of CAM modalities

Variables		a	b	c	d	e
HBM constructs	a. Perceived threat	1				
	b. Perceived benefits	−0.181*	1			
	c. Perceived barriers	−0.394*	0.262*	1		
	d. Cues to action	0.239*	−0.116*	−0.361*	1	
	e. Self-efficacy	−0.039	0.015	0.042	−0.014	1
f. Use of CAM modalities		0.374*	−0.202*	−0.589*	0.303*	−0.044

*$P < 0.001$

Table 4 The results of linear regression analysis in predicting use of CAM based on the HBM constructs among type 2 diabetes patients

Constructs of HBM	B	SE	Beta	t	*P* value	Adjusted R Square	F	*P* value
Perceived Threat (Perceived susceptibility and Perceived severity)	0.099	0.019	0.155	5.151	0.000	0.375	101.195	<0.001
Perceived barriers	−0.226	0.015	−0.487	−15.295	0.000			
Perceived benefits	−0.042	0.033	−0.036	−1.256	0.210			
Cues to action	0.069	0.024	0.086	2.917	0.004			
Self-efficacy	−0.017	0.031	−0.015	−0.562	0.575			

of HBM were able to explain 37% of the variance of the use of CAM modalities among type 2 diabetic patients, which is higher than the predictive power of this model on self-care behaviors among diabetic patients in another study in Iran [35]. The results of a study showed that there was a significant relationship between constructs of perceived threat, perceived barriers, and cues to action with the predicting of CAM method use in type 2 diabetic patients. In a study by Chang et al. [33], patients with a history of use of CAM modalities showed that they had fewer barriers to performing diabetes self-care behaviors. In this study, the construct of perceived barriers has the greatest impact on predicting the use of CAM. The results of Mohebi study also showed that the constructs of perceived benefits and perceived barriers are important variables in predicting self-care behavior [36]. Therefore, better understanding the possible barriers and reducing these barriers can play an important role in performing the behavior.

In contrast, several studies [37, 38] have pointed to the positive effect of self-efficacy on the health behaviors of diabetic patients. In this study, no significant relationship was found between self-efficacy and its role in predicting the use of CAM modalities. This discrepancy may be due to the low self-care score among diabetic patients. According to the results of a systematic review study, there was a positive correlation between self-efficacy and diabetes self-care behaviors, so that this construct can predict self-care behaviors in diabetic patients [39].

In this study, diabetic patients with complications showed a higher perceived threat. Given that about half of the subjects had complications from diabetes; a higher perceived threat was predictable. However, in the study

of Driver et al., the rate of lower limb amputation was reported due to the low perceived threat. The reason for this difference could be due to the type of complications of the disease [40]. Due to the many side effects of type 2 diabetes, most patients are worried about these complications and by experiencing some of the complications, they feel more at risk for other complications of the disease and try to protect themselves by taking self-care behaviors.

According to the results of this study, as the level of education increases, the person feels more obstacles in the use of CAM modalities. With the increase of perceived barriers, the probability of performing the desired behavior decreases, in which the role of the educational system in shaping people's opinions can be effective. According to the results of studies, short-term CAM training sessions in students 'curricula have made them even more frustrated with CAM, because with the increase of classical medical information, medical students' interest in CAM decreases [40, 41]. Therefore, medical beliefs that are specific to each society affect the beliefs of physicians and patients, so educational policies should be designed based on it [41]. Lack of adequate physician information about CAM modalities, their effects on diabetes, and the lack of appropriate training programs related to CAM also have a great impact in this regard [42].

There was a significant relationship between the duration of the diabetes disease and the perceived benefit construct, meaning that with increasing duration of the disease, patients' perceived benefits of using CAM modalities increased. The results of Melkamu study showed that there was a significant relationship between the duration of diabetes and performing self-care behaviors and those who have been ill for more than ten years perform self-care behaviors seven times more than other diabetic patients [43]. The results of another study showed that there was a significant relationship between perceived benefits and self-care behaviors in diabetic patients and with increasing perceived benefits, patients are more inclined to engage in self-care behaviors [44]. Patients are likely to learn more about diabetes, its complications, and the benefits of engaging in self-care behaviors as the duration of illness increases and are more likely to engage in self-care behaviors.

One of the limitations of this study was that the information was collected as a self-report and there may be some errors. One of the advantages of this study was the large sample size. One of the other strengths of this study was the use of health belief models to examine the status of patients with type 2 diabetes and predict the use of CAM modalities. It is recommended to use other models and theories of behavior change to predict the use of CAM modalities in patients with type 2 diabetes.

Conclusion

Based on the results of this study, the HBM is useful in predicting the use of CAM, and due to the significant impact constructs of perceived threat, perceived barriers, and cues to action, it is better to pay more attention to these constructs in educational programs for patients with type 2 diabetes. Also, since the construct of perceived barriers had the greatest impact on predicting the behavior of CAM using, it is necessary to pay more attention to this construct in educational programs for diabetes type 2 patients.

Abbreviations HBM: Health belief model; CAM: Complementary and alternative medicine

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Declarations

Ethical consideration This study is based on a research project approved by the Ethics Committee of Mashhad University of Medical Sciences with the code of ethics IR.MUMS.REC.1398.114. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declare that they have no conflicts of interest.

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