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Applying the health belief model in identifying individual understanding towards prevention of type 2 diabetes

Fateme Afrasiabi[1], Fateme Behesht Aeen[1], Marzieh Kargar Jahromi[1,2]
[1]Student research committee, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran
[2]Community Health Nursing, Faculty Member, Gerash University of Medical Sciences, Gerash, Iran

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ABSTRACT

Diabetes is a prevalent metabolic disorder, which leads to numerous complications. This disease can be prevented by training people and increasing their awareness via the health belief model. This descriptive study aimed to determine the diabetes prevention behaviors based on the health belief model among high-risk individuals. There were 220 randomly selected individuals at risk of type 2 diabetes completed a 65-item questionnaire based on the constructs of the health belief model. Data were analyzed by statistical package for the social sciences (SPSS). The mean score of knowledge among respondents was 5.54±2.60, which indicated that 50.36% of the participants had gained the maximum score of knowledge. The results indicated that the constructs of the health belief model determined 19% of the variance in type 2 diabetes prevention behaviors. Perceived barriers, perceived self-efficacy, and knowledge were the significant positive predictors of diabetes prevention behaviors. In addition, a significant relationship was observed between age, economic status, and education level and some constructs of the health belief model. The results indicated that the high-risk patients obtained moderate mean scores in type 2 diabetes prevention behaviors. These results could improve educational programs with regard to beliefs, attitudes, and behaviors to promote type 2 diabetes prevention and self-care behaviors among at-risk populations.

Corresponding Author:

Fateme Behesht Aeen
Student Research Committee, School of Nursing and Midwifery, Shiraz University of Medical Sciences
Fars Province, Shiraz, Zand, Iran
Email: fbeheshtaeen@yahoo.com

1. INTRODUCTION

Diabetes is one of the most important metabolic disorders [1] with increasing prevalence around the world [2]. According to the International Diabetes Federation (IDF), 537 million adults were living with diabetes in 2021. This number is expected to increase to 643 million by 2030 and 783 million by 2,045. Over 3 in 4 adults with diabetes live in low- and middle-income countries [3].

Diabetes mellitus (DM) is now one of the major health problems [4], which has resulted in a decrease in the efficiency and quality of human resources [5], [6]. This disease has imposed direct and indirect expenditures on health systems [7], [8]. At least 5–10% of high-risk individuals develop diabetes every year. Hence, assisting them through lifestyle modification is increasingly an important public health issue [9]. Generally, low knowledge level and low priority for starting an appropriate prevention program have been regarded as the main problems against diabetes management [6], [10]. By increasing knowledge and perception of its trend, predisposing factors, and complications, it can be prevented among high-risk individuals [11]. Maintaining a healthy lifestyle is essential for reducing the risk factors of diabetes

complications [12], [13]. In order to enhance the efficiency of such trainings, proper behavioral models like the health belief model (HBM) should be employed [14].

HBM is a comprehensive model, which shows the relationships between beliefs and behaviors and plays a significant role in prevention of diseases [15]. This model emphasizes how individual perceptions and beliefs about the fear of health problems and the evaluation of the benefits and barriers to preventive behaviors lead to the adoption of behaviors [16]. According to this model, people's participation in the prevention, early detection, and treatment of a specific health problem depends on their understanding in which they are at risk of the disease even if they do not have any symptoms (perceived susceptibility), In addition they should understand the depth and seriousness of the disease (perceived severity) [17], [18]; they ought to believe that the benefits of the preventive behaviors (perceived benefits) are greater than the expected barriers (perceived barriers). Moreover, they should understand that they are able to obtain a healthy lifestyle and perform protective behaviors (self-efficacy) [18], [19]. In addition, the model proposed that cues to action can activate health behavior when appropriate beliefs are held [17].

In the present study, HBM was selected as the theoretical framework since it is among the most effective health education models, which focuses on the prevention of diseases [20]. Considering the importance of diabetes and its complication, preventing this disease is a priority. Hence, the present study aimed to determine the role of the HBM in the prevention of type 2 diabetes among high-risk Iranian individuals.

2. RESEARCH METHOD

This descriptive, cross-sectional study was conducted on individuals who were at risk of type 2 diabetes at Imam Reza Clinic in Shiraz for six months from June 2021 until September 2021. Based on previous studies [21], minimum effect size of 0.08, was expected. So considering alpha of 0.05, desired statistical power of 0.90 and six predictors, a minimum sample size was estimated at 207, using power analysis and sample size (PASS) 15 statistical package for calculating sample size [22]. The participants were selected via random sampling. In doing so, a list of eligible people was prepared and 300 ones were selected using the online table of random numbers. After all, 220 individuals were enrolled in the research. The inclusion criteria included: participants who were aged 30 years or above, a history of diabetes in the first-degree relatives (mother, father, brother, and sister), body mass index (BMI)$\geq$30 kg/m^2, and willing to participate in the study. All individuals who met these criteria and agreed to take part in the study were enrolled. The exclusion criteria were incomplete questionnaires, patients with mental disorders with cognitive impairment such as dementia, Alzheimer's disease and visual or auditory disorders that make it difficult to complete the questionnaires. After obtaining permission from the ethical research committee and clinic officials, all the participants were informed about the study objectives and the confidentiality of their information and their informed consent forms were obtained.

In this study, the HBM framework was utilized to identify the relationships between the health beliefs and performance of prevention behaviors. The study data were collected using a standard 65-item questionnaire designed by Mazloumi *et al*. [21]. The questionnaire is composed of two sections; i.e., demographic information and items related to the HBM, including perceived susceptibility (8 items), perceived severity (5 items), perceived benefits (7 items), perceived barriers (11 items), perceived self-efficacy (12 items), cues to action (5 items), knowledge (11 items), and prevention behaviors (6 items). These behaviors included regular performance of physical activities, consumption of low-fat food, consumption of fruits and vegetables, adherence to a healthy diet, and measurement of weight and blood pressure. All items were responded via a four-option Likert scale ranging from completely agree to completely disagree.

The study data were collected through self-report. Then, the data were entered into the statistical package for the social sciences (SPSS) software and were analyzed using descriptive (frequency, percentage, mean, and standard deviation) and inferential statistics (one-way ANOVA, Tukey's post-hoc test, and multiple regression analysis). $P<0.05$ was considered statistically significant.

3. RESULTS AND DISCUSSION

3.1. Results

The study results indicated that the mean score of knowledge was 5.54$\pm$2.60, which proved that 50.36% of the participants had obtained the maximum score of knowledge. The frequency distribution of the study participants based on sex, marital status, education level, and economic status has been presented in Table 1. The mean, standard deviation, minimum, and maximum scores of male and female participants have been depicted in Table 2. Accordingly, no significant difference was found between the male and female participants with respect to the constructs of the HBM and type 2 diabetes prevention behaviors. Based on the

results presented in Table 3, the HBM components determined 19% of the variance of type 2 diabetes prevention behaviors. Among the constructs, perceived barriers, perceived self-efficacy, and knowledge were the significant predictors of diabetes prevention behaviors.

The study findings demonstrated a significant negative relationship between age and knowledge level ($r=-0.24$, $p<0.0001$). However, no significant relationship was observed between age and other model constructs as well as the rate of prevention behaviors. Furthermore, the results revealed that respondents who were single had higher knowledge levels, higher perceived severity, and lower perceived barriers in comparison to the married ones. However, no significant relationship was found between sex and the means of HBM components and prevention behaviors. The study revealed that the participants' economic status was associated with the perceived severity ($p<0.05$) and knowledge level ($p<0.01$). Tukey's post-hoc test showed that the participants with a moderate economic status had a higher perceived severity. Moreover, individuals with low socioeconomic status had a lower level of knowledge compared to those with moderate and good socioeconomic statuses.

Table 1. Frequency distribution of demographic data of participants

Variable		n	%
Sex	Female	121	55
	Male	99	45
Marriage	Single	25	11.36
	Married	195	88.64
Education	Under diploma	87	39.54
	Diploma	70	31.82
	Academic	62	28.18
	Non-responder	1	0.45
Economic status	Poor	47	21.36
	Moderate	160	72.73
	Good	12	5.45
	Non-responder	1	0.45
Total		220	100

Table 2. Mean and standard deviation of HBM based on sex

Variables	Male				Female				Total			
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Age	30	83	48.46	12.44	30	78	46.42	10.41	30	83	47.34	11.39
Perceived susceptibility	15	32	24.60	3.74	15	32	25.13	3.89	15	32	24.88	3.82
Perceived severity	5	20	16.01	2.98	5	20	16.26	2.78	5	20	16.15	2.87
Perceived benefits	20	28	24.46	2.62	16	28	24.01	2.92	16	28	24.21	2.80
Perceived barriers	18	44	31.36	5.11	17	44	31.09	4.92	17	44	31.21	4.99
Perceived self-efficacy	26	48	39.92	5.90	28	48	39.17	5.42	26	48	39.51	5.64
Knowledge	0	10	5.56	2.38	0	11	5.52	2.77	0	11	5.54	2.60
Preventive behaviors	1	17	9.84	3.77	2	18	9.91	3.20	1	18	9.88	3.45

Table 3. Multiple regression for predicting preventive behaviors on basis of health belief model

Predictors	B	ß	R	R^2	T	P
Perceived susceptibility	-0.08	-0.09			-1.04	0.30
Perceived severity	-0.11	-0.10			-1.25	0.21
Perceived benefits	-0.09	-0.08	0.44	0.19	-0.93	0.36
Perceived barriers	0.17	0.25			3.07	0.002
Perceived self-efficacy	0.15	0.26			3.34	0.001
Knowledge	0.26	0.20			2.44	0.02

One-way ANOVA showed a significant relationship between the respondents' education level and perceived susceptibility, perceived benefits, knowledge level, and prevention behaviors. According to the results of Tukey's post-hoc test, the individuals with academic degrees gained higher mean scores of perceived severity compared to those with below diploma degrees. The individuals with academic degrees also had higher knowledge levels in comparison to those with diplomas and below diploma degrees ($p<0.0001$). Moreover, the mean of prevention behaviors was higher among the individuals with diplomas compared to those with below diploma degrees.

3.2. Discussion

The present study aimed to determine type 2 diabetes prevention behaviors based on the HBM. The results indicated that among the model constructs, perceived barriers, perceived self-efficacy, and knowledge were the significant predictors of type 2 diabetes prevention behaviors. Perceived barriers include the negative aspects of a health action and the obstacles to undertaking a behavior. These barriers include eating differently from other family members, the social stigma of diabetes, poor economic status, lack of healthcare, time, and cultural differences [23]. Financial barriers and lack of insurance could impede high-risk individuals from screening.

Accordingly, increase in knowledge and self-efficacy and decrease in perceived barriers resulted in an increase in type 2 diabetes prevention behaviors. In the same line, Mazloumi *et al*. disclosed that diabetes prevention behaviors were associated with perceived susceptibility, perceived severity, perceived barriers, and perceived self-efficacy [21]. Soltani *et al*. also explored the factors related to adherence to treatment among the patients suffering from type 2 diabetes. The findings demonstrated that adherence to treatment was associated with perceived severity, perceived susceptibility, perceived benefits, perceived barriers, and HbA_1C. In addition, the components of the HBM, such as perceived benefits and perceived barriers, determined 29% of the variance of adherence to treatment. These results are in agreement with those of the current investigation [24]. Farahani *et al*. also conducted a study in order to investigate the factors affecting medication adherence among patients with diabetes in Arak based on the HBM. The findings revealed that perceived susceptibility, perceived barriers, and internal cues to action were the strongest predictors of adherence to treatment among patients [10].

Moreover, Sadeghi *et al*. carried out research in 2014 regarding the application of the HBM for improvement of knowledge, attitude, and performance of the individuals taking part in the diabetes screening program. They showed that the utilization of this model enhanced the individuals' knowledge level, attitude, performance, and participation in the program [25]. Furthermore, Calhoun *et al*. conducted a study in North Carolina in 2020 in order to assess the relationship between the demographic factors and risk of diabetes, perception, and prevention behaviors. The results indicated no significant relationship between the demographic features and perceived susceptibility, which was consistent with the present study findings. The results also revealed a reverse relationship between the participants' age and consumption of high-fat meals and decreased activity (non-adherence to treatment) at baseline and three months later ($p=0.02$), which showed the role of decreased knowledge in diabetes prevention behaviors [26].

This study showed that the HBM constructs determined 19% of the variance of type 2 diabetes prevention behaviors. In the study carried out by Vazini, the constructs of the HBM determined 29.6% of the variance in self-care behaviors among patients with type 2 diabetes. In addition, self-efficacy, perceived susceptibility, perceived severity, and perceived barriers were the most important predictors of self-care behaviors [7]. The findings of the present study revealed a significant relationship between the respondents' education levels, some HBM constructs and prevention behaviors. In the same line, Tafti et al. reported that higher education levels were accompanied by increased self-care behaviors [20]. In general, higher education levels can improve health literacy, eventually promoting the people's abilities for conducting prevention behaviors. In this context, previous studies indicated that lack of knowledge and literacy resulted in the reduction of belief in the perceived susceptibility and perceived severity of the disease complications [19] as well as lack of irresponsibility towards health care [20]. Studies showed that education level has a positive and significant correlation with healthy lifestyle behaviors [13]. On the contrary, Adijoh [27] and Mazloumi [21] stated that increased knowledge levels did not lead to better management of diabetes. Also, disease-related knowledge is essential but it is not sufficient to promote patients' health behavior. Only by transforming enhanced knowledge into health beliefs they adopt the health behavior [28].

Our study results revealed a negative relationship between age and knowledge. In contrast, Khiyali *et al*. performed a study on prevention behaviors among the patients with gestational diabetes using the HBM and reported a significant direct relationship between age and diabetes prevention behaviors [15]. Overall, it seems that younger individuals with higher education and knowledge levels, perceived susceptibility, and perceived severity can conduct prevention behaviors more efficiently. Perceived barriers include physical, mental, or financial obstacles, which impede accurate health behaviors [29]. In the current research, the participants with moderate and good economic statuses had higher perceived severity and knowledge levels. The findings of the previous studies also demonstrated that the prevalence of chronic disorders like type 2 diabetes was affected by environmental factors, such as inappropriate habits, poverty, and weak socioeconomic status [30].

4. CONCLUSION

This study revealed that the participants obtained a moderate mean score of type 2 diabetes prevention behaviors. The HBM provides high-risk individuals with a beneficial framework for better perception of the disease and its prevention behaviors. In this study, perceived barriers, perceived self-efficacy, and knowledge were the significant predictors of diabetes prevention behaviors. These results could help improve educational programs by taking beliefs, attitudes, and behaviors into account. In this way, promotion of self-care and type 2 diabetes prevention behaviors could enhance the quality of life among high-risk people.

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BIOGRAPHIES OF AUTHORS

Fateme Afrasiabi has MSc degree in critical care nursing, Shiraz University of Medical Sciences. Her favorite research subjects are diabetes, heart disease. She published books and articles in these areas. She can be contacted at email: afrasiabif2012@gmail.com.

Fateme Behesht Aeen is a Ph.D. student of nursing in Shiraz University of Medical Sciences. She has submitted and published a number of articles in national and international journals. She has published four books in the field of critical care. She can be contacted at email: fbeheshtaeen@yahoo.com.

Marzieh Kargar Jahromi is a Ph.D. student of nursing in Shiraz University of Medical Sciences and Faculty Member of Gerash University of Medical Sciences. She has published over 40 peer-reviewed scientific articles on the subjects of nursing and health. She has written two books. She can be contacted at email: marzeiah.marziah66@gmail.com.