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Original Article

Health literacy, knowledge and self-care behaviors to take care of diabetic foot in low-income individuals: Application of extended parallel process model

Elaheh Lael-Monfared [a], Hadi Tehrani [b], Zahra Esmati Moghaddam [c], Gordon A. Ferns [d], Maryam Tatari [e], Alireza Jafari [f, g, *]

[a] Ph.D Student in Health Education and Health Promotion, Student Research Committee, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[b] Health Education & Health Promotion, Social Determinants of Health Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
[c] Student Research Committee, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran
[d] Department of Medical Education Brighton and Sussex Medical School, Division of Medical Education, University of Brighton Falmer Campus, Brighton BN1 9PH, UK
[e] School of Health, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran
[f] Social Determinants of Health Research Center, Gonabad University of Medical Sciences, Gonabad, Iran
[g] Social Determinants of Health Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

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ABSTRACT

Aim: This study has been conducted with the aim of determining the relationship between health literacy, knowledge and self-care behaviors to take care of the diabetic foot in low-income individuals, based on the extended parallel process model (EPPM).
Methods: This cross-sectional study was conducted on 400 patients with type II diabetes referred to the Diabetes Clinic, using a random sampling method and using standard questionnaires. In this study, the constructs of knowledge, EPPM (perceived sensitivity, perceived severity, response efficacy, self-efficacy), and health literacy were significantly related to self-care behaviors ($p < 0.05$).
Results: Based on the linear regression results, the constructs of knowledge, health literacy, and constructs of EPPM were able to account for 43% of the variance to perform diabetic foot self-care behaviors. The maximum impact was related to the constructs of health literacy and self-efficacy ($p < 0.001$).
Conclusion: Based on these results, levels of knowledge and health literacy of patients were very poor overall, and the self-care behaviors were not appropriate. On the other hand, considering the great impact of health literacy in performing self-care behaviors, it is suggested that educational courses be held in this regard and proper strategies are employed to enhance the health literacy of diabetic patients.

1. Introduction

Diabetes mellitus is an important non-communicable disease which is increasing in prevalence due to the changing lifestyle of people worldwide. It is estimated that by 2030, around 366 million people will have type II diabetes mellitus [1]. It has been estimated that around 11.4% of Iranian adult population has diabetes mellitus, and by 2030, around 9 million Iranians will be at risk of developing diabetes mellitus [2]. Approximately 80% of diabetic patients in developing countries live in deprived and less developed regions [3]. Patients with diabetes are at risk of complications including macro- and micro-vascular disease [4].

Knowledge about diabetes is one factor involved in diabetes self-care methods. Furthermore, knowledge and performing self-care behaviors are associated with controlling blood glucose by diabetic patients. The patients who have knowledge about their disease are more likely to practice behaviors that adequately manage their disease. Thus, the higher the level of knowledge, the greater the probability of performing self-care behaviors will be in

* Corresponding author.Social Determinants of Health Research Center, Gonabad University of Medical Sciences, Gonabad, Iran.
E-mail addresses: elm.monfared@gmail.com (E. Lael-Monfared), Tehranih@mums.ac.ir (H. Tehrani), esmati.z97@gmail.com (Z.E. Moghaddam), g.ferns@bsms.ac.uk (G.A. Ferns), maryamtatary@yahoo.com (M. Tatari), jafaria962@mums.ac.ir, Jafari.ar94@gmail.com (A. Jafari).

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them [5]. Research has shown that there is a relationship between low social status as well as low income with level of knowledge about diabetes, low health literacy level, and poorer blood glucose control [4]. Low levels of knowledge and health literacy are more common in the elderly group, immigrants, illiterate people, low income people, and individuals with chronic diseases such as type II diabetes and hypertension, and these people are at more risk [6].

According to the definition by World Health Organization, health literacy refers to socio-cognitive skills involving motivation and ability of people in achieving understanding and use of information that the resulting preservation and promotion of good health [7]. The results of a national study in the US indicated that over 33% of people do not have adequate health literacy [8]. In Iran, only 31% of diabetic patients had adequate health literacy [9].

The most important factor determining mortality in diabetic patients is not practicing self-care behaviors [10]. The diabetic foot, due to vascular and neuropathic complications is preventable by effective self-care behaviors [11]. Self-care behaviors refer to the decisions and measures individuals take to control their healthcare problem [10]. Studies have indicated that the level of knowledge, health literacy, perceived sensitivity, perceived severity, and self-efficacy cause increased self-care behaviors in diabetic patients [12–15].

Studies show that one of the most suitable models for evaluating health associated behaviors is the extended parallel process model (EPPM). This model is one of the cognitive and effective models of response to fear. It seems that fear experiences are effective in changing the behaviors and self-care behaviors through health messages [16,17]. This model has four constructs including perceived sensitivity, perceived severity, response efficacy, and self-efficacy. The construct of perceived sensitivity refers to people's perceptions of developing a disease or a harmful condition. Perceived severity is related to people's perceptions about the breadth of damages and the risks resulting from developing a disease or harmful condition. Response efficacy means the person's belief about the effectiveness of proposed solutions to mitigate the consequences of a disease. Finally, self-efficacy refers to people's perception of their ability to perform healthy behaviors [18,19].

According to fear models such as EPPM, people tend to evaluate the consequences related to healthy behaviors and disturbance and then respond to them. They may appraise this message as a threat or efficacy, each of which results in three reactions: indifference, rejecting the message, and accepting the message [20].

Khaf city is one of the towns in the southeast of Razavi Khorasan province in Iran. In this town, the people's level of income is modest, and their level of knowledge is not high either. Furthermore, it is a deprived city in which access to all facilities is not possible. The results of a study on the social workers of this town indicated that these workers did not have adequate literacy levels [21]. This study has been conducted with the aim of determining the relationship between health literacy, knowledge and self-care behaviors to take care of diabetic foot in low-income individuals based on the EPPM.

2. Methods

This cross-sectional study was performed on 404 diabetic patients referred to the Diabetes Clinic in Khaf, a southeast city of Khorasan Razavi, Iran. The Inclusion criteria were: (a) individuals with type II diabetes mellitus, (b) not suffering from a diabetic foot, (c) having a low socioeconomic level. Power calculation indicated that a minimum sample size was 400 subjects for an 80% chance of a p-value of <0.05.

2.1. Data collection

Data were collected during the period from April 2017 to July 2017. The research sample was selected randomly from among the people who fulfilled the criteria for entering the study. Subsequently, after referring to the clinic and providing a complete explanation to the subjects and obtaining informed consent from them, questionnaires were provided to them and completed by self-report. It should be noted that people who can't read and write, questionnaires were completed by the interviewer. They are also assured that their information will remain confidential.

2.2. Validity and reliability of instruments

The data collection tools comprised four questionnaires including, (1) demographic questionnaire, (2) Health Literacy for Iranian Adults questionnaire (HELIA), (3) Diabetes knowledge questionnaire, (4) self-care behavior questionnaire based on EPPM.

(1) **Demographic questionnaire:** The questionnaire included questionnaires such as age, sex, level of education, occupation, marital status, the age of onset of illness, duration of illness and having complications from diabetes.
(2) **Health Literacy for Iranian Adults questionnaire (HELIA):** This standard questionnaire has 33 main items and including 5 constructs of reading skills [4 questions], access [6 questions], understanding [7 questions], assessment [4 questions] and decision making and behavior [12 questions]. The scoring scale of this questionnaire was used Likert 5 options, [reading skills: quite hard = 1 to quite easy = 5], [4 other skills: never = 1 to always = 5]. Reliability and validity of this questionnaire were evaluated by Montazeri [22] (Cronbach's alpha, from 0.022 to 0.89), and by Zareban [23] (Cronbach's alpha = 0.78 to 0.90).
(3) **Diabetes knowledge questionnaire:** 12 questions were used to measure knowledge (for example, the main cause of diabetic foot is the loss of sensation and bleeding disorder). Measuring questions as a three-dimensional scale were answered [Wrong = 0, I do not know = 1 and true = 2]. Validity and reliability of this questionnaire have already been confirmed (Cronbach's alpha = 0.80) [24].
(4) **Self-care behavior questionnaire based on the EPPM:** This questionnaire consists of four constructs and its validity and reliability have been measured [24]. Cronbach's alpha of constructs of perceived susceptibility, perceived sensitivity, response efficiency, and self-efficacy respectively, 0.80, 0.81, 0.78 and 0.79. In the present study, the Cronbach's alpha of all constructs was 0.85, which is acceptable.

To measure construct of perceived susceptibility (5 questions, for example: I'm worried about having an outbreak of diabetes mellitus in the future), perceived severity (4 questions, for example: if you have diabetes mellitus, I should stop), response efficiency (7 questions, for example: using diabetic footprint prevention recommendations increases my foot care skills), self-efficacy (12 questions, for example: I could control my blood glucose at any time). To measure these constructs, the five-point Likert scale was used (totally opposite = 1 to totally agree = 5). To assess Diabetes self-care behavior, 10 questions such as smoking, using a warm water bag, walking with naked feet, walking on hot surfaces and the use of candy was used.

2.3. Data analysis

The collected data were entered into the SPSS software version

20. Data analysis was performed through descriptive (Use of frequency, percentage and mean (SD)) and inferential statistics (ANOVA, Independent samples t-test, Pearson correlation, linear regression). The significance level was considered 0.05 for analysis.

3. Results

3.1. Participant characteristics

In this study, most of the participants were female (N = 238, 59.5%), married (N = 360, 96.5%), illiterate (N = 272, 68.9%) and the majority were housewives (N = 230, 57.9%) (Table 1). Most people used pills as their treatment method (382, 84.32%). The mean (SD) age, the age of onset of diabetes and duration of disease were 57.39 (11.99), 50.78 (11.72), 6.66 (3.79), years respectively.

The recommendation of health care personnel (n = 288, 73.1%) and self-care (n = 102, 25.9%) were the most important reasons for foot care. In this study, 224 (56%) and 137 (34.2%) of patients, respectively, had cardiovascular and hyperlipidemia. Participants ranked their highest health information through health personnel (n = 399, 79.16%), books and educational pamphlets (n = 41, 8.14%), journals and journals (n = 41, 8.14%), friends and acquaintances (n = 9, 1.78%), radio and television (n = 8, 1.58), Internet (n = 6, 1.20%).

Participants reported that their health information was greatest through health care personnel (n = 336, 84%), books, educational pamphlets, journals and magazines (n = 41, 10.25%), friends and acquaintances (n = 9, 2.25%), radio and television (n = 8, 2%), Internet (n = 6, 1.5%).

3.2. The relationship between demographic variables with health literacy and self-care and knowledge

According to Independent samples t-test, there was a significant relationship between gender with knowledge, health literacy and self-care behaviors, and men scored higher than women ($p < 0.05$). ANOVA test showed that there is a significant relationship between education level with knowledge, health literacy and self-care behaviors, and those with higher education have higher scores ($p < 0.05$). Also, the ANOVA test showed that job variables had a significant relationship with knowledge, health literacy and self-care behaviors, and the employed people had a better situation ($p < 0.05$). More information is presented in Table 1.

3.3. Self-care behaviors, health literacy, and EPPM

In this study, only 24 (6%) of the participants, performed all self-care behaviors and only 14 (3.5%) used warm water bags. Also, 393 participants (98.5%) reported that they had taken care of their feet in the last two months and 393 participants (98%) reported that Consuming sugar in the past week. In this study, only 63 subjects (15.8%), had good health literacy score and most of the participants (281%, 2.70%) had an inadequate health literacy score. Among the health literacy categories, the highest score was related to decision making and behavior of individuals (Table 2).

3.4. Factors associated with self-care behaviors/Pearson correlation between variables

Based on the results of independent samples *t*-test, the mean foot self-care behaviors in individuals who had observed diabetic foot ulcer in others was significantly higher ($p < 0.001$). Further, ANOVA test results showed that those who had a higher health literacy level indicated a significantly higher self-care behavior ($p < 0.001$). The obtained results showed that the subjects present in this study had a poor level of knowledge about diabetes and had also average levels of self-efficacy. Furthermore, the extent of self-efficacy behaviors was not desirable among the patients (Table 3). According to the results of Pearson correlation analysis, the constructs of knowledge, EPPM, and health literacy had a significant relationship with self-care behaviors ($p < 0.05$). Further, health literacy showed a significant correlation with the construct of knowledge and all constructs of EPPM (Table 3).

3.5. Results of multi-stage linear regression analysis in predicting self-care behavior of diabetic foot

According to the results obtained from the multistage linear regression, in the first stage, the constructs of EPPM predicts only 0.13 of the self-care behaviors. With addition of the construct of knowledge to the model constructs, the predictive power grows by around 16%, and in the third stage addition of the construct of health literacy to the previous stage predicted 43% of variances for performing foot self-care behaviors in diabetic patients, which is

Table 1
Relationship between demographic variables with health literacy and self-care behavior and knowledge.

Variables		Health literacy		Self-care		Knowledge	
		Mean (SD)	p	Mean (SD)	P	Mean (SD)	p
Gender	Male	50.49 (30.16)	<0.001[b]	8.53 (1.44)	<0.001[b]	2.75 (1.87)	0.02[b]
	Female	38.89 (25.73)		7.56 (1.50)		2.34 (1.79)	
Marital status	Married	42.78 (27.59)	0.304[b]	7.90 (1.54)	0.962[b]	2.49 (1.84)	0.707[b]
	Single	34.81 (21.15)		7.92 (1.32)		2.69 (1.60)	
Education level	Illiterate	26.27 (5.31)	<0.001[a]	7.38 (1.07)	<0.001[a]	1.66 (1.22)	<0.001[a]
	Diploma and Under diploma	79.90 (18.91)		9.17 (1.69)		4.27 (1.50)	
	Academic	98.43 (2.54)		10.07 (1.18)		5.53 (0.96)	
Job	Housewife	37.55 (24.35)	<0.001[a]	7.54 (1.49)	<0.001[a]	1.74 (1.48)	<0.001[a]
	Employee	72.19 (28.73)		9.16 (1.54)		3.30 (1.56)	
	Un Employee	30.73 (13.87)		7.86 (0.93)		1.10 (0.96)	
Age	≤60	55.13 (31.56)	<0.001[b]	8.38 (1.71)	<0.001[b]	3.14 (1.90)	<0.001[b]
	>60	27.42 (8.78)		7.35 (1.03)		1.59 (1.19)	
The age of diabetes begins	≤50	58.44 (31.89)	<0.001[b]	8.56 (1.70)	<0.001[b]	2.64 (1.76)	<0.001[b]
	>50	27.93 (9.38)		7.35 (1.06)		1.20 (0.9)	
Diabetes duration (mean years)	≤5	47.93 (30.53)	0.005[a]	8.10 (1.59)	0.276[a]	2.58 (1.81)	0.565[a]
	6–10	41.50 (26.62)		7.89 (1.47)		1.46 (1.81)	
	>10	34.65 (21.66)		7.76 (1.60)		2.45 (1.99)	

[a] ANOVA.
[b] Independent samples-*t*-test.

Table 2
Frequency distribution of health literacy scores and dimensions of its in diabetic people.

Variables		N (%)			
		Inadequate	Not enough	Enough	Excellent
Health literacy dimensions	Reading skills	281 (71.7)	24 (6.1)	26 (6.6)	64 (16.2)
	Access	292 (73.2)	7 (1.8)	34 (8.5)	66 (15.6)
	Understanding	280 (70)	9 (2.2)	37 (9.2)	74 (18.5)
	Assessment	301 (75.6)	20 (5)	18 (4.5)	59 (14.8)
	Decision-making and applying health information	3 (0.8)	11 (2.8)	262 (65.7)	123 (30.8)
All health literacy		281 (70.2)	20 (5)	36 (9)	63 (15.8)

Table 3
The mean (SD), range and Pearson correlation coefficient of variables.

Variables	1	2	3	4	5	6	7	Mean (SD)	Range
1-Knowledge	1							2.51 (1.83)	0–13
2-Perceived susceptibility	−0.006	1						18.02 (1.75)	5–25
3-Perceived severity	0.118*	0.623**	1					13.78 (1.84)	4–20
4-Response efficiency	0.372**	0.284**	0.258**	1				31.10 (2.37)	7–35
5-Self-efficacy	0.621**	0.149*	0.100*	0.441**	1			46.06 (7.21)	12–60
6-Self-care	0.499**	0.146*	0.191**	0.331**	0.250**	1		7.95 (1.5)	0–12
7-Health literacy	0.667**	0.198**	0.266**	0.502**	0.479**	0.650**	1	43.59 (28.16)	0–100
8-Diabetes duration	0.014	−0.084	−0.058	−0.203**	−0.122*	−0.064	−0.112*		

*$p < 0.05$, **$p < 0.001$.

statistically significant, where the maximum impact is related to the constructs of health literacy and self-efficacy ($p < 0.001$) (Table 4).

4. Discussion

This study has been conducted with the aim of determining the relationship between health literacy, knowledge and self-care behaviors to take care of diabetic foot in low-income individuals based on the EPPM. Based on the obtained results, the level of health literacy was very low and only a very few numbers of individuals practiced all self-care behaviors. It is justifiable given the low level of knowledge and the average level of perceived severity and self-efficacy of patients in this study.

The level of health literacy and self-care behaviors was higher among men than in women, which is consistent with the low score of women's knowledge compared to men. The results of a study on diabetic patients indicated that men had a significantly higher level of health literacy [9]. In another study, the results showed that the level of health literacy and self-care behaviors was higher among women than in men. The reason for this incongruence can be due to the type of instrument used and the different target population [10].

No significant relationship was observed between marital status with the variables of health literacy, knowledge, and self-care behaviors. Nevertheless, the status of married individuals was higher. The results of the study by Bohanny et al. on type II diabetic patients also indicated that although there was no significant relationship between marital status with the variables of health literacy, knowledge, and self-care behaviors, generally the status of married individuals was better [10].

There was a significant relationship between the level of education and health literacy, with those with higher literacy levels gained a higher score in terms of health literacy. The results of the study by Niknami showed that higher educational levels in diabetic patients had a significant relationship with higher health literacy levels in them [25]. The results of another study also showed that although there was no significant relationship between the level of education and self-care behaviors, with an increase in the level of education, self-care behaviors had also grown [10].

In this study, there was a significant relationship between the level of education with self-care behaviors. This means that those with higher levels of education showed better self-care behaviors. The individuals with a higher educational level have better access

Table 4
The results of linear regression analysis in predicting self-care behavior of diabetic foot.

Variables		B	SE	Beta	t	*P*-value	Adjusted R Square	F	*P*-value
Step 1	Perceived susceptibility	−0.023	0.056	−0.025	−0.409	0.683	0.136	16.093	<0.001
	Perceived severity	0.133	0.053	0.155	2.531	0.012			
	Response efficiency	0.154	0.036	0.236	4.283	0.001			
	Self-efficacy	0.030	0.011	0.139	2.646	0.008			
Step 2	Perceived susceptibility	0.070	0.051	0.077	1.365	0.173	0.293	32.878	<0.001
	Perceived severity	0.061	0.048	0.070	1.256	0.210			
	Response efficiency	0.106	0.033	0.163	3.221	0.001			
	Self-efficacy	−0.036	0.012	−0.167	−2.865	0.004			
	Knowledge	0.447	0.048	0.530	9.277	0.001			
Step 3	Perceived susceptibility	0.111	0.046	0.122	2.422	0.016	0.435	50.230	<0.001
	Perceived severity	−0.093	0.046	−0.108	−2.028	0.043			
	Response efficiency	0.017	0.031	0.026	0.545	0.586			
	Self-efficacy	−0.040	0.011	−0.188	−3.607	0.001			
	Knowledge	0.187	0.051	0.222	3.693	0.001			
	Health literacy	0.032	0.003	0.589	9.790	0.001			

to health-related information and can easily acquire the information they need [11].

There was a significant relationship between the variable of occupation with level of health literacy as well as self-care behaviors, where employed individuals acquired a higher score compared to others. The results of Eniko's study showed that although there was no significant difference between employment status and health literacy, the level of health literacy was higher in employed individuals [26]. The results of a study showed that those who are employed have better health literacy and self-care behaviors compared to others [10].

There was a significant relationship between the score of health literacy with self-care behaviors, where those with a higher health literacy score had practiced more self-care behaviors. The results obtained from path analysis of Leet al, conducted on type II diabetic patients indicated that health literacy can significantly affect self-care behaviors both directly and indirectly [27]. The results of previous studies indicated that although health literacy has no direct effect on self-care behaviors, it has a significant effect on the self-efficacy construct, where the self is the construct has a strong and effective role in performing self-care behaviors [10,13]. The results of the study by Bains on type II diabetic patients indicated that there was a significant relationship between health literacy and foot self-care behaviors [12]. Vassy et al. reported the effects of health literacy on self-care behaviors indicated that elevation of the health literacy in diabetic patients can cause enhanced self-care behaviors in them [28]. The results suggest that the individuals with lower health literacy have also lower knowledge; are less physically active; are least probable to control their blood sugar levels, and thus have higher blood sugar levels compared to those with higher health literacy [29].

According to the results obtained in this study, there was a significant relationship between the level of knowledge with health literacy of diabetic patients. The results of previous studies have also shown that there is a significant relationship between knowledge of diabetic patients and health literacy, where high health literacy is associated with increased knowledge of diabetic patients [12,30]. Low knowledge about diabetes mellitus is associated with low health literacy, self-control, and blood sugar control. It seems that to improve health literacy, enhancing self-control and increasing blood sugar control and enhancing the knowledge level of patients about diabetes would be effective [29]. Low health literacy is the problem of many patients influencing their ability in using healthcare systems and managing their chronic diseases. It is considerably associated with controlling blood sugar levels and aggravation of the disease in patients with type II diabetes [14].

According to the obtained results, there was a significant relationship between the constructs of knowledge, EPPM with health literacy. The results of previous studies have also shown that there is a significant relationship between health literacy with self-efficacy [10,27,31,32]. Health literacy and self-efficacy are interrelated, and health literacy is related to searching for information about healthcare and self-confidence to take part in health associated behaviors [33]. Self-efficacy in health necessitates believing in one's own abilities to perform recommended health management behaviors including complying with drug orders, following therapeutic diets, diet, exercise, and preventive cares [14,26].

According to the obtained results, there was a significant relationship between the construct of self-efficacy as well as response efficacy with performing self-care behaviors. Specifically, those who had a high self-efficacy level performed more self-care behaviors. The results of previous studies have indicated that the elevation of self-efficacy will result in a significant increase in performing self-care behaviors in diabetic patients [34,35]. The results of a review study indicated that self-efficacy provides a suitable framework to understand and predict commitments to performing self-care behaviors and effectiveness of self-care in treating diabetes disease [36].

The self-efficacy theory proposes that the confidence of patients affects their abilities in performing healthy behaviors on the behaviors they get involved in. Since diabetes self-care involves different behavioral, personal, and environmental factors dealing with the daily functioning of recommended activities, the concept of self-efficacy is suitable for improving self-care among diabetic patients [34,37]. Self-efficacy is one of the important factors in performing skills and behaviors, where those who believe in self-efficacy try to eliminate barriers and problems against performing the behaviors [35,38].

Based on the obtained results, there was a significant relationship between knowledge with self-care behaviors in diabetic patients. This suggests that increasing knowledge of individuals causes enhanced self-care in them. The results of the study by Li showed that there is a significant relationship between the level of knowledge of patients about diabetes and performance of the behaviors, where the patients with higher levels of knowledge better understood the importance of performing self-care behaviors [11]. The results of the study by Dinesh reveals that only a limited number of diabetic patients had a desirable level of knowledge [39]. Patients with type II diabetes with limited knowledge are less likely to evaluate their behaviors and mitigate their problems. However, those who improve their knowledge about diabetes are likely to change their behaviors [40]. Self-care behaviors are the final outcome of cognitive processes people employ during knowledge acquisition, where this acquisition is in turn, the outcome of a training and learning process [41]. Patients with diabetes are only willing to perform self-care behaviors when they acquire the necessary knowledge about prevention methods [11].

According to the obtained results, there was a significant relationship between perceived sensitivity with self-care behaviors. The results of studies have shown that high perceived sensitivity of individuals has a significant relationship with performing self-care behaviors of diabetic patients [42,43]. When people feel that they may develop a disease, they are more encouraged to adhere to health orders and perform self-care behaviors [44].

Based on the obtained results, there was a significant relationship between the constructs of perceived severity and self-care behaviors in the patients. In this regard, those who had a higher level of perceived severity also enjoyed a higher level of self-care behaviors. Also, those who had observed diabetic foot ulcer had significantly better self-care behaviors. The results of the study by Vazini showed that there is a significant relationship between perceived severity and performing self-care behaviors, where the perceived severity was one of the predictors of self-care behaviors in diabetic patients [15]. People's understanding of the possible serious risks of a disease for them and their life will result in an increased willingness to perform self-care behaviors [44].

The results of the present study showed that addition of the construct of health literacy significantly increased the predictive power of the model to predict self-care behaviors, where the health literacy construct was the strongest construct for predicting self-care behaviors. The results of the study by Lee indicated that the constructs of health literacy and self-efficacy were able to predict 60% of the variance of self-care behaviors [27]. In many chronic diseases, health literacy has been considered as the strongest predictor of health consequences [8,27]. It seems that increasing people's perceptions about their life being under control is the best strategy to improve the status of health and self-efficacy of diabetic patients [45]. The results of studies on diabetic patients showed that health literacy and self-efficacy had a significant relationship with reducing blood sugar levels of diabetic patients [31,46].

Researchers also proposed that the skills associated with health literacy including communication and critical literacy are among the essential and effective factors to perform self-care behaviors in diabetic patients. The reason is that these skills can enhance self-confidence and help develop effective communication between patients and healthcare providers. Eventually, such abilities can help patients to receive the required information through different communication channels, evaluate them, and finally perform those behaviors [47].

5. Conclusion

We found patients with diabetes mellitus had a very poor level of knowledge and health literacy, and the self-care behaviors were not desirable. On the other hand, considering the huge impact of health literacy in performing self-care behaviors, to enhance the level of knowledge and health literacy of patients, theoretical and practical educational courses should be held in this regard. Also, suitable strategies should be used to enhance the level of knowledge and health literacy of diabetic patients. Furthermore, since the studied region was classified as a deprived area, it is suggested that the necessary environmental facilities and conditions be provided to facilitate performing self-care behaviors in patients.

Conflicting interests

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Appendix A. Supplementary data

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