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Foot Care Performance and Foot Self-Care Behaviors in Iranian Patients with Type 2 Diabetes: A Cross-Sectional Study

ABSTRACT

Objective: A diabetic foot ulcer is one of the preventable complications of diabetes that can lead to amputation, morbidity, and mortality and increase treatment costs. This study aimed to investigate the relationship between self-care behaviors, demographic-clinical variables and, foot care performance in patients with diabetes.

Materials and methods: This descriptive-analytical study was performed on 191 patients with type 2 diabetes in Asadabad (Hamadan province) in 2021. The demographic-clinical information form, the diabetic foot care performance scale, and the diabetic foot self-care behavior scale were used to collect data. The data were analyzed using descriptive and inferential statistics (multiple linear regression). Data analysis was performed using R software version 4.1.0.

Results: The mean age of the subjects was 50.58 ± 11.87 years, and the duration of diabetes was $8.55 \pm$

9.07 years. There was a significant relationship between foot self-care behavior and age ($p = 0.027$), primary and secondary education compared to university education ($p=0.042$), insulin use compared to use of oral agents and insulin ($p = 0.014$), the logarithm of the duration of diabetes ($p = 0.0001$), foot care performance ($p = 0.010$).

Conclusions: The status of self-care behaviors in patients with diabetes is unfavorable, and it is necessary to provide the necessary training to these patients to improve self-care and foot care. (Clin Diabetol 2022; 11; 5: 309–315)

Keywords: self-care, foot ulcer, diabetes, foot care performance

Introduction

Diabetes is the most common metabolic disease, and its prevalence is increasing worldwide. It is estimated that the number of patients with diabetes will increase 1.5 times, from 463 million patients in 2019 to 700 million patients in 2045 [1]. In addition, diabetes will become the seventh leading cause of death worldwide [2]. Although the prevalence rate of diabetes has decreased in developed countries, it has increased in developing countries such as Iran [3]. Diabetes mortality has increased from one million in 2000 to 1.6 million in 2015 [4]. Patients with diabetes are at risk of diabetes macrovascular and microvascular complications [5].

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Neuropathy often leads to diabetic foot ulcers (DFU) and amputations [6]. According to the meta-analysis of Sobhani et al. (2014), the prevalence of diabetic peripheral neuropathy in Iran was 53% [7].

Every year, 2.5% of these patients develop DFU, and 15% of patients develop DFU during their lifetime [8]. At the time of diagnosis of type 2 diabetes, more than 10% of patients have one or two risk factors (such as peripheral neuropathy and peripheral vascular disease) for diabetic foot ulcers [9]. Lower limb amputation is one of the potentially preventable complications of diabetes [10], which is 30 to 40 times more common in patients with diabetes than in people without diabetes [2]. Previous studies have revealed that good self-care behaviors can reduce patients' amputation rates by up to 50% [9, 11]. Patients with diabetes need to perform lifelong self-care behaviors to prevent short-and long-term complications of diabetes [12]. Self-care activities in patients with diabetes include behaviors that patients perform alone to manage the disease successfully [13]. Accordingly, foot self-care is performed to prevent foot ulcers and potential amputations. The basic principles of preventing DFU are identifying at-risk patients, regular examination, educating patients and families, wearing appropriate shoes, and treating pre-ulcerative signs [14]. Adequate self-care can reduce patients' risk of injury, infection, and amputation. Measures such as daily control of the feet, use of appropriate footwear and shoes, adequate daily hygiene, not walking bare-foot, wearing appropriate shoes, avoiding the use of abrasive materials, specialized primary care for open foot wounds and lesions, and routine foot examinations can reduce the chances of developing DFU. Foot self-care broadly includes knowledge, attitude, and behavior in addition to foot protection measures [15].

Because culture is a fundamental factor that shapes human behavior, it should be considered in all health promotion programs. In chronic diseases such as diabetes, cultural factors can affect patients' behavior by influencing their perception of the disease, risk factors, and how people react to it and its symptoms and manifestations. Given that self-care behaviors are influenced by the context and culture of each community and vary from community to community, this study aimed to investigate the relationship between demographic and clinical variables and foot-care performance with diabetes foot self-care behaviors.

Materials and methods

Design and participants

This descriptive-analytical study was performed on 300 patients with diabetes referred to Hamadan and Asadabad (Hamadan province) diabetes units in 2021,

and 231 questionnaires were received, of which 40 were incomplete and were excluded from the analysis. Therefore, the analyses were performed on 191 completed questionnaires. Assuming that a quarter of patients with type 2 diabetes will take care of their feet in the end, and with an accuracy of 0.05 based on the formula $n = p \times q (Z_{1-\alpha/2})^2$, the sample size was considered to be 300 people. The inclusion criteria were: the existence of confirmed type 2 diabetes, having a diabetes unit file, being literate, and willingness to participate in the study. Patients with untreated diabetic foot ulcers and uncompleted questionnaires were excluded.

Hamadan province is located in western Iran and is the fourteenth most populous province in Iran. According to the 2016 census, its population was 1,758,268 [16]. Participants were selected by a convenience sampling method. There are one or more diabetes units in all cities of Iran where patients go after being diagnosed with diabetes. These patients visit these units regularly, are visited by a doctor and check their test sheets. Also, different training classes are held for them.

Measures and data collection

The practice of foot care questionnaire

This questionnaire was designed by Dündar and Akinci (2017) and included 20 items with yes (score 1) and no (score zero) answers [17]. A higher score indicates better foot care performance. This questionnaire assesses several protective behaviors, such as regular foot control, foot washing, and wearing shoes or slippers with socks, and is not as complete as self-care. The items in this questionnaire focus on foot care knowledge, which is a subset of self-care.

Diabetes Foot Self-Care Behavior Scale (DFSBS)

The Persian version of the Diabetes Foot Self-Care Behavior Scale (P-DFSBS) was used to measure foot self-care behaviors, which was validated by Hassanpour Dehkordi et al. (2020) in Iran [6]. This scale has seven items, the first four questions of which assess the examination of the soles of the feet, toes, washing the feet, and drying the feet during the last week, and the answers are in the form of no day (score 1), 1 to 2 days (score 2), 3 to 4 days (score 3), 5 to 6 days (score 4) and the whole week (score 5). The score of this section varies between 4 and 20. The other three questions are about using lotions and examining shoes, and the answers are in the form of a five-point Likert scale from never (score 1) to forever (score 5). The score of this section ranges from 3 to 15, and the total score ranges from 7 to 35. The higher the score, the better the foot self-care [18].

Ethical considerations

Firstly, the study's objectives were explained to the participants, and their verbal consent to participate in the study was obtained. Completion of the questionnaires was entirely optional. The researcher reminded patients not to write down the names and characteristics that make them identifiable in the questionnaires. The questionnaires were distributed among eligible patients, and the return of the questionnaires was considered an indication of patient satisfaction. The participants were assured that all their information would remain confidential. The ethics committee of the Asadabad School of Medical Sciences has approved this study (IR.ASAUMS.REC.1399.030).

Statistical analysis

Data analysis was performed with R software version 4.1.0. Frequency and percentage were used to describe and report qualitative variables, and mean and standard deviation was used for quantitative variables. The relationship between foot self-care with demographic-clinical variables and performance was investigated using multiple linear regression. The significance level was considered to be 0.05 for all tests. Because duration of diabetes had a high skewness (min = 1, max = 40, mean = 8.56, SD = 9.07, median = 5) and its distribution was close to the log-normal distribution, it was converted to the normal variable by logarithmic transformation.

Results

General characteristics of participants

Out of 300 distributed questionnaires, 250 were returned, of which 59 were incomplete, so the analysis was performed on 191 completed questionnaires. The patients in the study were 104 males and 87 females, with a mean age of 50.58 (SD = 11.87) years. The duration of diabetes in these patients was 8.55 (SD = 9.07) years (log duration = 1.62 ± 1.04). Most of the respondents were male (54.5%), employed (50.3%), married (83.2%), and had primary and secondary education (46.1%). Also, more than two-thirds (68%) of the samples took blood glucose lowering oral agents. More information is reported in Table 1.

Diabetes foot self-care behavior

The mean (\pm SD) scores for diabetic foot self-care and performance were 17.81 (\pm 5.38) and 11.02 (\pm 3.09), respectively. By converting the raw score to the standard score, it was found that patients had obtained a 39% total foot self-care score and a 61% total foot care performance score, which are undesirable and desirable, respectively. Items #15 and #8 had the

Table 1. Demographic-Clinical Characteristics of the Studied Samples

Variable	N	%
Age* [years]	50.58 \pm 11.87	
Duration of disease* [years]	8.55 \pm 9.07	
Gender		
Male	104	54.5
Female	87	45.5
Marital status		
Single	32	16.8
Married	159	83.2
Education		
Primary School	88	46.1
High school	61	31.9
University	42	22.0
Employment status		
Employed	96	50.3
Un employed	95	49.7
Drug		
Insulin	45	
Oral agents	130	68.0
Insulin + Oral agents	16	8.4
Cigarette smoking		
Smokers	38	19.9
Non-smokers	133	69.6
Ex-smokers	20	10.5

*The variables of age and duration of diabetes are reported with a mean and standard deviation

highest and lowest performance scores, respectively. These items refer to carefully buying the right shoes and "changing socks daily, respectively. The mean score of diabetic foot self-care question items varied from 2.38 to 2.70 and, the lowest and highest self-care scores were related to items #1 (I examine the soles of my feet) and #7 (It takes me a while to feel comfortable in the new shoes I buy), respectively. More details are provided in Figure 1.

With each one-year increase in patients' age, the mean score of diabetes foot self-care behavior decreased significantly by 0.086 ($p = 0.027$).

Also, the average score of self-care behavior in people with primary and secondary education ($p = 0.035$) was 2.24 points lower than in people with university education. If the other independent variables in the model were constant, the mean score of diabetes foot self-care behavior in patients who took insulin alone was significantly lower ($p = 0.014$) than in patients who took insulin and oral agents. However, the mean self-care score in people who took only oral agents was not significantly different from those who took insulin

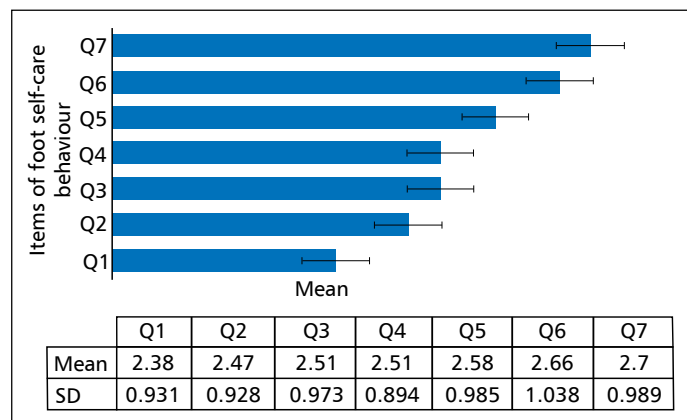


Figure 1. Bar Chart of Items of Foot Self-Care Behavior

Q1: I (my caregiver) examine the soles of my feet; Q2: I (my caregiver) examine between my toes; Q3: I (my caregiver) wash between my toes; Q4: I (my caregiver) dry between my toes after washing; Q5: If I feel dry on the skin of my feet, I (my caregiver) apply moisturizing cream on it; Q6: Before I wear my shoes, do I check the inside of my shoes (or does my caregiver do this); Q7: It takes me a while to feel comfortable in the new shoes I buy

and oral agents ($p = 0.189$). Also, the foot self-care score in employed patients was 1.71 points lower than in unemployed patients ($p=0.044$). According to the reported results, a 10% increase in the duration of the disease (year) significantly increases the self-care score by 12.6% ($p = 0.001$). In other words, if the other independent variables in the model are constant, for every five-week increase in the disease duration, the foot self-care score will increase by 0.12. Adding one point to patients' performance scores, if other independent variables of the model are stable, increases the mean score of foot self-care by 0.30 ($p = 0.010$) (Tab. 2).

Discussion

The findings revealed that the foot self-care status of patients participating in the present study was moderate because they had a low self-care score. The mean score of foot self-care in these patients was lower than the results of studies conducted in China [19] and Malaysia [20]. This difference appears to be due to demographic differences, access to health care facilities, and the training provided. One of the apparent reasons for the low foot self-care score of Iranian patients compared to Chinese and Malaysian patients is the poor access to health facilities. Some other studies in this field have pointed to other factors that can lead to reduced foot self-care. For example, in warm climates, patients are more likely to wear slippers than shoes or to walk barefoot [21]. Jayasinghe et al. (2007) also mentioned that access to health facilities might be higher in urban areas than in rural ones [22]. In the current study, the lowest self-care score was related to item #1 (examination between the toes). In the study of Baba et al. (2015), the lowest self-care score of the

foot was related to item #5 (use of moisturizing lotions) [23]. Daily examination of the bottom of the feet and between the toes is essential to identify problems such as blisters, corns, calluses, cuts, and other skin infections [23]. Also, the toes should always be dry as moisture and wetness between the toes can lead to bacterial infections [24]. The highest score of foot self-care behavior was related to item #7 (It takes me a while to feel comfortable in the new shoes I buy). In Muhammad Luthfi et al.'s study, half of the patients always checked the inside of their shoes before wearing them [25]. According to Bell et al., 54% of patients reported not checking the inside of their shoes before wearing them [26]. Wearing inappropriate shoes or walking barefoot can cause frequent local mechanical pressure on the feet. Therefore, it is recommended that patients with diabetes wear appropriate shoes to avoid putting too much pressure on their feet [27].

In this study, the self-care score of diabetic foot decreased with age, which is consistent with the results of the study by Miikkola et al. (2019) [28]. Patients experience varying movement limitations with age that can affect foot care behaviors. Also, with increasing age, the risk of developing complications of diabetes such as diabetic retinopathy may increase, making patients less able to self-care and unable to examine their feet as before.

Also, the self-care score in patients with university education was higher than in patients with primary and secondary education, which is consistent with the results of studies conducted in Nigeria [29], Jordan [30], Sudan [31] and, Canada [32]. Patients with higher education can more easily search for health-related information and solve their problems in this field, so

Table 2. Results of Multiple Linear Regression Analysis to Investigate the Relationship Between the Independent Variables and Diabetic Foot Care Scores

Parameter	Coefficient	Std. error	95% confidence interval		p-value
			Lower	Upper	
Intercept	21.750	2.663	16.531	26.969	0.000
Age	-0.086	0.039	-0.161	-0.010	0.027
Gender					
Male	-0.433	0.863	-2.125	1.259	0.616
Female	—*	—	—	—	—
Marital status					
Single	-1.023	1.006	-2.995	0.948	0.309
Married	—*	—	—	—	—
Education					
Elementary and middle school	-2.239	1.099	-4.395	-.084	0.042
High school	-1.989	1.032	-4.012	.033	0.054
University	—*	—	—	—	—
Drug					
Insulin	-3.529	1.431	-6.334	-0.723	0.014
Oral agents	-1.792	1.364	-4.466	0.882	0.189
Insulin and oral agents	—*	—	—	—	—
Smoking status					
Smoker	0.592	0.951	-1.273	2.456	0.534
Ex-smoker	-0.804	1.213	-3.181	1.572	0.507
Non-smoker	—*	—	—	—	—
Job status					
Employee	-1.713	0.849	-3.377	-0.049	0.044
Unemployed	—*	—	—	—	—
Log-duration	1.256	0.365	0.540	1.972	0.001
Performance	0.299	0.117	0.070	0.529	0.010

*reference

they have more health knowledge, which makes them practice healthier behaviors than patients with lower education [33, 34]. The mean score of foot self-care behavior in patients who took insulin alone was lower than in patients who took a combination of oral agents and insulin. Patients who use insulin to control their illness may take it more seriously than others, and their caregivers may focus more on self-care behaviors. In traditional Iranian society, there is this belief among chronic patients that if their medicine is in injectable form, their disease is more severe, and oral medicine gives them the impression that their disease is minor and mild. Also, the foot self-care score was higher in unemployed patients than in employed patients. Employed patients spend part of their time in the workplace, so they may not be able to check and examine their feet or wash them regularly. However, unemployed patients, in addition to examining their feet, can get help from other family members to take care of their feet. The mean foot self-care score increased with

increasing duration of diabetes, consistent with the results of various other studies [9, 31]. A study by Alsaleh et al. (2021) in Kuwait showed that patients with more than ten years of diabetes history had better foot care [35]. However, in the Magbanua and Lim-Alba study, foot care performance decreased with the increasing duration of diabetes [36]. Prolonged exposure to the disease is thought to increase patients' experience and improve self-care behaviors. Finally, by increasing patients' foot care performance score, the mean score of foot self-care increases by 0.32. In other words, there was a relationship between these two variables.

One of the strengths of this study is the standard and specific tools in this field that were able to measure the concepts well. This study was performed in Asadabad in western Iran, and due to cultural differences, the results cannot be generalized to patients in other provinces of Iran. One of the cultural differences is related to the use of shoes. For example, in some areas of Iran, such as Kurdistan, people use handmade

shoes, while most people use slippers in the southern and eastern regions of Iran. Iranians are also Muslims and pray five times a day. They must perform ablutions before praying. Shiite Muslims wipe their feet while performing ablutions, while Sunnis wash their feet up to the ankles and may examine their feet more thoroughly while washing. Considering that Iran is a country with different ethnicities and cultures, and different cultures influence the concept of self-care, it may not be possible to generalize the results of this study to patients living in other provinces of Iran.

Conclusions

There was a relationship between foot self-care score and age, education, type of treatment, occupation, duration of diabetes, and patients' foot performance. Foot self-care behaviors among patients with diabetes were moderate, and providing education to patients is essential for promoting foot self-care behaviors.

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Conflict of interest

None declared.

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