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Evaluation of Knowledge, Attitudes and Behaviors Regarding Foot Care in Patients Diagnosed with Type 2 Diabetes Who Applied to A Family Health Center

Aile Sağlığı Merkezine Başvuran Tip 2 Diyabet Tanısı Almış Hastaların Ayak Bakımı Hakkında Bilgi, Tutum ve Davranışlarının Değerlendirilmesi

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ABSTRACT

Objective: Diabetic foot ulcers are one of the most common causes of non-traumatic lower extremity amputations. This complication can be prevented by providing diabetes patients with the right information and attitude about foot health and by providing appropriate diagnosis, treatment and follow-up. The aim of the study is to evaluate the foot health, knowledge, attitudes and behaviors of patients with type 2 diabetes mellitus (DM) who applied to a family health center regarding diabetic foot.

Material and Methods: The study was cross-sectional in nature and conducted with 382 type 2 DM patients. Participants are type 2 DM patients who applied to the Adana Yüreğir Afetevleri Family Health Center for any reason. In the research, the participants were interviewed face-to-face and the questions in the diabetes foot self-care behavior scale and the questions evaluating the participants' socio-demographic and clinical situations were answered.

Results: The average age of the participants was 60±11, 52.1% of the participants were women, and 69.1% of the participants had at most primary school education. According to the diabetes foot self-care behavior scale in the study, the participants were 73.11% successful in diabetic foot self-care. While young patients and women were more successful in diabetic foot self-care, patients who had diabetic foot ulcers at some point in their lives were found to be less successful (p=0.004). Apart from this, no relationship was found between the type of medication used, family characteristics, income status, presence of non-DM diseases, frequency of DM control and diabetic foot self-care.

Conclusion: Participants did not have the desired level of knowledge regarding diabetic foot self-care. This condition was negatively affecting the diabetic foot self-care behavior. For this purpose, we think that blood sugar regulation can be achieved with appropriate treatments for the individual, regular health checks and frequent patient education can be provided, and diabetic foot self-care can be increased.

Keywords: Type 2 diabetes, diabetic foot, self-care, family health center

ÖZ

Giriş: Non-travmatik alt ekstremite ampütasyonlarının sık karşılaşılan sebeplerinin başında diyabetik ayak ülserleri gelmektedir. Diyabetli hastaların ayak sağlığı konusundaki doğru bilgi ve tutumu; buna bağlı olarak uygun tanı, tedavi ve takibin sağlanması ile bu komplikasyonun önüne geçilebilir. Araştırmanın amacı bir aile sağlığı merkezine başvuran tip 2 diabetes mellituslu (DM) hastaların ayak sağlığını, diyabetik ayak konusundaki bilgi, tutum ve davranışlarını değerlendirmektir.

Gereç ve Yöntemler: Araştırma kesitsel nitelikte olup 382 tip 2 DM'li hasta ile yürütülmüştür. Katılımcılar Adana Yüreğir Afetevleri Aile Sağlığı Merkezi 01.01.2025-30.04.2025 tarihleri arasında herhangi bir sebeple başvurmuş olan tip 2 DM hastalarıdır. Araştırmada katılımcılarla yüz yüze görüşülmüş, diyabetik ayakta öz bakım davranışı ölçeğindeki sorular ile katılımcıların sosyo-demografik ve klinik durumlarını değerlendiren sorular cevaplanmıştır.

Bulgular: Katılımcıların ortalama yaşı 60±11 idi, %52,1 katılımcı kadındı, %69,1 katılımcı en fazla ilkokula gitmişti. Araştırmada diyabetik ayakta öz bakım davranışı ölçeğine göre katılımcılar diyabetik ayak öz bakımında %73,11 oranında başarılıydılar. Genç hastalar ve kadınlar

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ÖZ

diyabetik ayak öz bakımında daha başarılıyken kendisinde yaşamının bir döneminde diyabetik ayak yarası olan hastalar daha başarısız bulundular (p=0,004). Bunun dışında kullanılan ilaç türü, aile özellikleri, gelir durumu, DM dışı hastalık varlığı, DM kontrol sıklığı ile diyabetik ayak öz bakımı arasında ilişki bulunamadı.

Sonuç: Diyabetik ayak öz bakımı konusunda katılımcılar istenilen seviyede bilgili değillerdi. Bu durum diabetik ayak öz bakım davranışını olumsuz etkilemekteydi. Bu amaçla kişiye uygun tedavilerle kan şekeri regülasyonunu sağlanması, düzenli sağlık kontrolleri ve sık tekrarlayan hasta eğitimleri yapılabilir, diyabetik ayak öz bakımının artırılması sağlanabilir düşüncesindeyiz.

Anahtar Kelimeler: Tip 2 diyabet, diyabetik ayak, öz-bakım, aile sağlığı merkezi

INTRODUCTION

According to World Health Organization data, at least 43 million people worldwide died from non-communicable diseases in 2021. At least two million of these deaths were attributed to diabetes-related causes (1).

Diabetes mellitus (DM) constitutes a significant public health challenge due to its prevalence, associated complications, and the burden of comorbid diseases. The prevalence of DM is rising rapidly; according to the International Diabetes Federation there were 463 million people living with diabetes in 2019, a figure projected to reach 700 million by 2045 (2).

This increase is particularly pronounced in low-to-middle-income countries. A similar upward trend observed in Türkiye reinforces the necessity for preventive education and monitoring in primary care settings (2-4).

Peripheral vascular disease and DM-related wounds are the leading causes of non-traumatic lower-extremity amputations. However, achieving glycemic control in the early stages and providing patients with appropriate diabetes education may help reduce the incidence of diabetic foot cases (5).

Family health centers are the healthcare facilities most accessible to patients, where they can receive medical care for all health concerns (6). Therefore, it is of vital importance to perform standardized foot examinations for diabetic patients in family medicine practices and to inform patients about foot care (7). Screening appropriate patients with DM wounds at family health centers can help many patients receive an early diagnosis.

This study aims to evaluate foot health and the knowledge, attitudes, and behaviors regarding diabetic foot care among patients with type 2 DM presenting to a family health center.

MATERIALS and METHODS

This cross-sectional study was conducted with 382 patients diagnosed with type 2 DM. The sample size was calculated to be 384, assuming a 50% prevalence of adequate foot care, a 5% margin of error, and a 95% confidence level; 99.45% of the targeted sample size was reached.

Participants were patients with type 2 DM who presented to Adana Yüreğir Afetevleri Family Health Center for any reason between January 1, 2025, and April 30, 2025. Inclusion criteria were: A known diagnosis of type 2 DM; presentation to the specified family health center within the designated dates; age 18 years or older; and provision of written and verbal informed consent to participate in the study. Individuals who did not meet one or more of these criteria were excluded.

Data were collected through face-to-face interviews, during which participants completed the diabetes foot self-care behavior scale (DFSBS) along with a questionnaire regarding their socio-demographic and clinical characteristics. The DFSBS was developed by Chin and Huang (8); it is a 5-point Likert-type scale consisting of seven items across two subdimensions. Total scores range from 7 to 35; higher scores indicate better self-care behaviors. The Turkish adaptation and psychometric evaluation of the scale were performed by Bakır and Samancıoğlu Bağlama (9). Permission to use the scale was obtained by email from the authors of the Turkish validity and reliability study. The items of the DFSBS are as follows:

1. I examine the soles of my feet.
2. I examine the interdigital spaces of my toes.
3. I wash between my toes.
4. I dry between my toes after washing.
5. If my skin is dry, I apply a moisturizing lotion to my feet.
6. Before putting on my shoes, I check the inside of each shoe.
7. I gradually break in new shoes.

Ethical approval for the research was obtained from the University of Health Sciences Türkiye, Adana City Training and Research Hospital Scientific Research Ethics Committee, dated December 5, 2024, with protocol/approval number 254. Verbal and written informed consent was obtained from all patients.

Statistical Analysis

IBM SPSS Statistics version 30.0 was used for data analysis. Statistical significance was set at $p<0.05$. Descriptive statistics were expressed as frequency, percentage, mean, median, standard deviation, minimum, maximum, and range. Normality of the data distribution was assessed using the Kolmogorov-Smirnov test. Categorical variables were evaluated using chi-square and Fisher's exact tests, while numerical variables were analyzed using the Mann-Whitney U test.

RESULTS

In our study, participants ranged in age from 22 to 92 years, with a mean age of 60±11 years; 52.1% (n=199) were female and 47.9% (n=183) were male. Educational attainment was generally low, with primary school graduates and those with no formal schooling accounting for 69.1% (n=264) of

the population. For 94.5% of the participants, income was less than or equal to their expenditures. Regarding living arrangements, 88.5% lived with their families, while 11.5% lived alone.

Participants reported attending physician examinations for diabetes-related reasons once every 5±3 months on average, with a range of 1 to 12 months.

The duration of type 2 DM ranged from 1 to 40 years. Obesity was prevalent among the evaluated individuals, with a mean body mass index of 30.40±4.84.

Selected diabetes-related data of the participants are presented in Table 1.

The status of regular antidiabetic medication use among participants was compared across gender, age, and presence of DM wounds. The results are shown in Table 2.

Participants' total scores from the scale ranged from a minimum of 7 to a maximum of 35, with a mean score of 25.59±6.2 and an overall success rate of 73.11%. The distribution, mean, and standard deviation of responses to individual items are presented in Table 3.

The Cronbach's alpha for the "DFSBS" was 0.758. As shown in Table 3, participants most frequently performed "washing between the toes", while the least frequently performed behavior in the case of dry skin was "applying moisturizing lotion to the feet".

Table 1. Selected DM data of the participants

		Frequency	Percent
Presence of chronic diseases other than DM	No	135	35.3%
	Yes	247	64.7%
DM drug use	OAD only	303	79.3%
	Insulin only	42	11.0%
	No medication used	6	1.6%
	OAD and insulin	31	8.1%
Regular use of DM medication	Doesn't use it regularly	44	11.5%
	Uses it regularly	338	88.5%
Dietary adjustments due to DM	No	92	24.1%
	Yes	290	75.9%
Has anyone in your family/close circle had DM wounds?	No	297	77.7%
	Yes	85	22.3%
History of diabetic foot amputation in family/close social circle	No	344	90.1%
	Yes	38	9.9%
Presence of DM wounds	No	359	94.0%
	Yes	23	6.0%
Current active DM wound?	No	364	95.3%
	Yes	18	4.7%

DM: Diabetes mellitus, OAD: Oral antidiabetic drugs

Regarding smoking habits, 100 participants (26.17%) were smokers, while 282 participants (73.82%) were non-smokers. No statistically significant relationship was found between smoking status and foot care scores (p=0.323).

Furthermore, no statistically significant correlation was observed between time since diabetes diagnosis and foot care scores in diabetic patients (p=0.092).

Among diabetic patients, female participants scored higher than male participants on foot inspection scores, and younger participants scored higher than older participants. However, the result is not statistically significant. The distribution is presented in Table 4.

Having an individual with a DM wound in the person's family or social circle, or having a history of diabetes-related amputation in the family or social circle, was not associated with foot care scores (p=0.995 and p=0.811, respectively).

In contrast, the results varied with respect to the presence of a personal history of DM wounds. Participants who had never experienced a DM wound in their lifetime scored a total of 25.79±6.08, while those with a history of DM wounds (n=23, 6.02%) scored a total of 22.3±7.18. The relationship between these groups, shown in Table 5, was statistically significant (p=0.020). Additionally, the distribution of the participants' scores is provided in Table 5.

At the time of the study, 18 participants (4.71%) had active DM wounds. These individuals scored a total of 20.77±7.20, whereas those without an active DM wound scored a total of 25.82±6.05 (p=0.004). The score distribution of the participants is shown in Table 6.

The high prevalence of active diabetic wounds (4.71%) and lifetime history of diabetic wounds (6.02%) are noteworthy. These rates indicate that DM wounds constitute a serious public health problem.

When participants were categorized into three groups based on income (income less than expenses, equal to expenses, and greater than expenses), no statistically significant relationship was found between income status and diabetic foot care scores (p=0.727).

Similarly, when family type was categorized as nuclear family, extended family, or living alone, there was no statistically significant relationship between family type and diabetic foot care scores (p=0.187).

Participants were also divided into three groups based on the medications used for type 2 DM: Those using oral antidiabetics only, those using insulin only, and those using a combination of oral antidiabetics and insulin. No statistically significant relationship was observed between the type of medication used and diabetic foot care scores (p=0.246).

Various socio-demographic characteristics of the participants were compared with their foot care scores. Foot care scores were higher among participants with higher education levels, those who used their medications regularly, those who adhered to a diabetic diet, and those who underwent

Table 2. Evaluation of regular antidiabetic medication adherence among participants				
		Does the patient take their diabetes medication regularly?		
Variable	Category	No	Yes	p*
Gender	Male	21 (11.5%)	162 (88.5%)	1.000
	Female	23 (11.6%)	176 (88.4%)	
Age	<65	22 (11.2%)	174 (88.8%)	0.981
	⩾65	22 (11.8%)	164 (88.2%)	
Presence of DM wound	Yes	10 (43.5%)	13 (56.5%)	**0.004**
	No	34 (9.5%)	325 (90.5%)	
*: Fisher's exact test, DM: Diabetes mellitus				

Table 3. Distribution of scores and items of the diabetes foot self-care behavior scale		
Scale questions	Mean	Standard deviation
1. I inspect the bottoms of my feet.	3.94	1.30
2. I inspect between my toes.	4.02	1.22
3. I wash between my toes.	4.26	1.09
4. I dry between my toes after washing.	3.86	1.41
5. If my skin is dry, I apply moisturizing lotion to my feet.	2.86	1.61
6. Before putting on my shoes, I check the inside of my shoes.	3.28	1.51
7. I break in new shoes gradually.	3.35	1.45

Table 4. Comparison of total foot scale scores by gender and age					
Variable	Category	Minimum score	Maximum score	Mean ± standard deviation	p*
Gender	Female	7	35	26.23±6.38	0.011
	Male	10	35	24.89±5.92	
Age	<65	9	35	25.67±6.10	0.791
	⩾65	7	35	25.44±6.37	
*: Mann Whitney U test					

regular health check-ups for DM. The median and p-values are presented in Table 7.

DISCUSSION

In our study, participants demonstrated a 73.11% success rate on the DFSBS. Although this rate may appear high, it remains below expectations, considering that all participants were patients with type 2 DM receiving active treatment and attending regular medical follow-ups.

The study included 382 patients with type 2 DM, of whom 18 (4.71%) had active DM wounds. Additionally, five patients had a history of resolved diabetic foot lesions. Globally, 18.6 million people are affected by DM wounds annually, and approximately 20% of these cases result in amputation (10). It is crucial for healthcare professionals to maintain awareness of DM wounds; patients with DM should undergo a foot examination by a physician or podiatrist at least once a year (11). In this study, participants reported attending diabetes-related health check-ups at an average interval of five months (range, 1-12 months). Regular foot examinations at every visit, regardless of follow-up frequency, could help minimize gaps in care.

According to our research results, the rate of regular antidiabetic medication use among participants was 88.5%. This result was based on the participants' self-reports. While this indicates a positive outlook, it should be noted that self-report scales may overestimate adherence due to recall and social desirability biases (12,13).

While no significant differences were found between genders or among age groups regarding regular use of DM medications, adherence was significantly lower in those with active DM wounds (p=0.004). This finding is consistent with studies showing no significant gender-based differences in medication adherence and research reporting a weak or insignificant relationship between age and adherence (14,15). Furthermore, it aligns with literature indicating that treatment non-adherence and irregular medication use in patients with DM wounds or infections can delay healing (16,17).

In our study, when the distribution of total scale scores was examined according to various participant characteristics, no

Table 5. Analysis of diabetes foot self-care behavior scale scores between participants with and without a history of DM wounds				
Those who have never had DM wounds	**N**	**Mean****	**Std. deviation****	**p***
Item 1	359	3.98	1.29	0.020
Item 2	359	4.05	1.21	
Item 3	359	4.29	1.07	
Item 4	359	3.89	1.41	
Item 5	359	2.89	1.62	
Item 6	359	3.30	1.52	
Item 7	359	3.37	1.46	
Total	**359**	**25.79**	**6.08**	
Those who have had DM wounds at some point in their lives	**N**	**Mean****	**Std. deviation****	
Item 1	23	3.26	1.35	
Item 2	23	3.60	1.33	
Item 3	23	3.73	1.28	
Item 4	23	3.39	1.37	
Item 5	23	2.43	1.30	
Item 6	23	2.86	1.32	
Item 7	23	3.00	1.31	
Total	**23**	**22.30**	**7.18**	

*: The mean total scores obtained from the diabetic foot self-care behavior scale were compared between participants who had and did not have diabetes mellitus (DM) wounds at some point in their lives. The Mann-Whitney U test was used, **: Data were divided into two groups using the split-file method: Those who had experienced DM wounds at some point in their lives and those who did not. The scores obtained by the participants from the diabetic foot self-care behavior scale were calculated as mean ± standard deviation

significant differences were found based on smoking status, family or social DM-related wounds or amputation, or duration since diagnosis. In contrast, scale scores were significantly lower among individuals with active or prior DM wounds. This decline in scale scores likely reflects inadequacies in foot-care-related knowledge and self-care behaviors, or psychosocial factors such as concomitant burnout. Current guidelines recommend an integrative prevention approach for individuals at risk of ulceration, comprising structured education, appropriate footwear, and professional foot care; it has been shown that isolated, limited educational interventions do not always reduce hard clinical outcomes (18-21). Conversely, according to the findings of the team in Taiwan that developed the diabetic foot care scale, patients who had experienced a DM wound at some point in their lives scored higher than those who had never had one (8). It is estimated that patients with a history of DM-related wounds in that sample group gained access to the aforementioned integrative prevention approach.

Furthermore, a systematic review of 11 studies on DM wounds reports that short-term foot care education alone positively influences patient knowledge and behaviors in the short term but is ineffective in preventing DM wounds (20). However, it has been reported that structured, integrated, and repetitive education, achieving glycemic control, and regular patient follow-up can prevent diabetic foot pathologies (20). These results are consistent with our findings.

As in our research, the study by Bakır and Samancıoğlu Bağlama (9) found that the item with the most correct responses was "I wash between my toes", while the item with the most incorrect responses was "If my skin is dry, I apply moisturizing lotion to my feet". The high rate of washing between the toes observed in both studies is estimated to be attributable to socially accepted hygiene standards and the participants' religious beliefs. Additionally, providing education on all foot self-care behaviors, especially for those in high-risk groups, may help increase these rates.

In our study, the rate of inspection of the soles of the feet was slightly higher among women and younger participants. This is consistent with findings in the literature reporting that plantar inspection is somewhat more frequent in women and that the relationship with age is weak/unstable, while the relationship with DM duration remains inconsistent (21,22).

Our DM wound prevalence is close to the global prevalence (23), and due to the high lifetime risk (19-34%) emphasized by the International Working Group on the Diabetic Foot, primary prevention and early risk screening must remain clinical priorities (18).

Table 6. Analysis of diabetes foot self-care behavior scale scores between participants with and without active DM wounds					
Those without existing DM wounds		**N**	**Mean****	**Std. deviation****	**p***
	Item 1	364	3.98	1.29	
	Item 2	364	4.06	1.21	
	Item 3	364	4.30	1.07	
	Item 4	364	3.90	1.41	
	Item 5	364	2.87	1.63	
	Item 6	364	3.31	1.52	
	Item 7	364	3.37	1.46	
	Total	**364**	**25.82**	**6.05**	
Those with existing DM wounds		**N**	**Mean****	**Std. deviation****	0.004
	Item 1	18	3.11	1.36	
	Item 2	18	3.22	1.30	
	Item 3	18	3.44	1.29	
	Item 4	18	3.00	1.28	
	Item 5	18	2.55	1.24	
	Item 6	18	2.55	1.14	
	Item 7	18	2.88	1.32	
	Total	**18**	**20.77**	**7.20**	

*: The mean total scores obtained from the diabetic foot self-care behavior scale were compared between participants who currently had diabetes mellitus (DM) wounds and those who did not. The Mann-Whitney U test was used, **: Data were divided into two groups using the split-file method: Those with and without existing DM wounds. The average scores obtained by the participants from the diabetic foot self-care behavior scale were calculated separately and as a total

Table 7. Comparison of median total diabetes foot self-care behavior scale scores according to selected socio-demographic and clinical characteristics			
Variable		**Median**	**p***
Education	Primary school and below	26	0.054
	Middle school and above	28	
Employment status	Employed	27	0.239
	Unemployed	27	
Presence of chronic diseases other than DM	Yes	27	0.491
	No	27	
Using DM medication regularly	Use regularly	27	0.053
	Doesn't use regularly	26	
Making dietary adjustments	Regular nutrition	27	0.006
	Not regular nutrition	25.5	
DM control frequency	The patient goes for regular diabetes checkups.	27	0.015
	The patient does not go for regular diabetes check-ups.	25	

*: Mann-Whitney U test, DM: Diabetes mellitus

Study Limitations

The limitations of this study include its single-center design, its sample size of 382, and its cross-sectional nature. A single-center design limits generalizability; self-reported data may be subject to social desirability bias; a cross-sectional design precludes causal inference. The results cannot be generalized to the entire population; therefore, further studies are needed to draw broader conclusions on this subject.

CONCLUSION

Several factors influencing diabetic foot self-care were identified in this study. Rates of diabetic foot self-care behaviors were higher among younger patients, patients with higher education levels, female patients, and patients with better medication adherence and dietary compliance.

Furthermore, patients with a history of DM wounds had significantly lower rates of self-care behaviors.

To reduce diabetic foot complications, we believe increasing the frequency of health check-ups would be beneficial, particularly for high-risk diabetic patients—specifically those who are of advanced age, have lower education levels, poor dietary compliance, and/or medication adherence issues.

Additionally, it may be beneficial for physicians to perform a foot examination at least once a year for every diabetic patient who presents to family health centers, and to provide education on diabetic foot self-care behaviors at every visit. In addition, patients with a history of DM wounds and poor medication adherence may be evaluated more frequently.

Ethics

Ethics Committee Approval: Ethical approval for the research was obtained from the University of Health Sciences Türkiye, Adana City Training and Research Hospital Scientific Research Ethics Committee, dated December 5, 2024, with protocol/approval number 254.

Informed Consent: Verbal and written informed consent was obtained from all patients.

Footnotes

The article was written as a thesis on the salvation of Hasan Gürsel Ulusoy (2025, University of Health Sciences Türkiye, Adana City Training and Research Hospital).

Authorship Contributions

Concept: H.G.U., H.H.K., Z.A., Design: H.G.U., H.H.K., Z.A., Data Collection or Processing: H.G.U., H.H.K., Z.A., Analysis or Interpretation: H.G.U., H.H.K., Z.A., Literature Search: H.G.U., H.H.K., Z.A., Writing: H.G.U., H.H.K., Z.A.

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