ARE DIABETIC PATIENTS AWARE OF THEIR RESPONSIBILITIES IN PREVENTING DIABETIC FOOT DISEASE?

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Abstract

Objectives: Identifying the risk factors that lead to diabetic foot disease and taking precautions is associated with a reduction in the occurrence of diabetic foot ulcers and the rate of amputation. The patient plays the most important role in that regard. This study aimed to investigate the knowledge, attitudes, and behaviors of diabetic patients, who underwent follow-up at a tertiary health center, about foot care and diabetic foot disease.

Materials and Methods: The study included 327 patients aged over 18 years, who presented to the Endocrinology and Metabolic Diseases clinic and outpatient clinic of a tertiary health center. The data were obtained using socio-demographic information and laboratory results of the subjects, information about diabetes, and responses to the diabetic foot disease awareness scale in this descriptive study.

Results: The patients were grouped based on diabetic foot behaviors as follows: 79 (24.15%) patients as low-score, 144 (44.03%) patients as medium-score, and 104 (31.80%) patients as high-score. There were significant differences between the groups by education and employment status, body weight, body mass index (BMI), waist circumference, type of diabetes mellitus (DM), duration (years), diabetes education, foot care education, treatment, exercise, and diabetic foot examination statuses.

Conclusion: Diabetic foot awareness was low in our patient group. The most important factor to increase awareness of diabetic foot disease and to prevent diabetic foot ulcers is to ensure that individuals with diabetes receive education on general diabetes and foot care and to incorporate their learnings into their behaviors.

Keywords: Diabetes mellitus, diabetic foot disease, awareness, education.

Introduction

Diabetic foot disease is a clinical condition, characterized by coexisting neuropathy and vascular disease of varying severity in diabetic patients, which can include a range of complications, including lower extremity infection, ulcer formation, and/or deep tissue damage. Epidemiologic studies reported the prevalence and incidence of diabetic foot ulcers as 5-10% and 6.3%, respectively, with an annual incidence of 1-4%.[1] Neuropathy (approximately 55%), arterial (10%), and neuro ischemic causes (approximately 35%) predispose to the development of the condition. Structural disorders of the foot, including inappropriate mechanical loading on the tissues, foot deformities, and limitation of joint movements are also considered among the risk factors for diabetic foot disease.[2,3]

Diabetic foot ulcers may lead to impaired quality of life, lower extremity amputations, and increased rate of mortality. The cure rate of diabetic foot disease upon 12 weeks of treatment was reported as 24-82%, with a recurrence rate of 60%.[4,5] The other extremity in more than half of the patients is amputated within 3-5 years after the first amputation. It is well-established that the risk of mortality increases 2.5-fold in individuals with DM, who have new foot ulcers.[2] Diabetic foot is also considered the most common cause of hospitalization associated with diabetes.[1] Given that the duration of hospital stay in diabetic patients is longer and more expensive compared to individuals without diabetes, diabetic foot disease is also associated with increased economic burden.[6,7]

Despite all these adverse outcomes, diabetic foot disease is considered a preventable condition. Identifying the risk factors, that pave the way for diabetic foot disease, and taking precautions can lower the rate of disease and amputation.[2] The most important point in this regard is the assessment of patients' foot care behaviors and correct them as necessary. Patient education on foot care should be started immediately upon diagnosis of diabetes and this education should be repeated periodically. Diabetes and foot care education was shown to have reduced wound occurrence and amputation rate and decreased morbidity by 50%.[8]

This study investigated the knowledge levels, attitudes, and behaviors about foot care and diabetic foot disease in diabetic patients, who underwent follow-up at a tertiary health center.

Materials and Methods

The study included 327 patients aged over 18 years, who presented to Ankara Bilkent City Hospital Endocrinology and Metabolic Diseases Clinic and Outpatient Clinic between 20.02.2021 and 20.07.2021. Required approval as obtained from the Ethics Committee of Ankara Yıldırım Beyazıt University (AYBU) (Date: 16.02.2021, No: 13) before the onset of the study.

A three-part questionnaire was administered to patients, who volunteered to participate in this descriptive study. The first section included socio-demographic information and laboratory results of the subjects, whereas the second and third sections included information about diabetes, and items about diabetic foot knowledge level, respectively.

Height, weight, body mass index (BMI), and waist circumference were measured in all the patients, who participated in the study. A calibrated classical scale was used for weight measurement, a stadiometer was used for height measurement, and finally, BMI was calculated using the following formula: "weight (kg)/height (m^2)".[9] Waist circumferences were measured with a tape measure.

Laboratory results, including fasting plasma glucose (FPG), HbA1c, creatinine, triglycerides, total cholesterol, LDL (low-density lipoprotein) cholesterol, and HDL (high-density lipoprotein) cholesterol were retrieved from the hospital information system.

During the study, informed consent forms were collected from the participants and the questionnaire was administered utilizing face-to-face interviews held with the patients.

Diabetic Foot Disease Awareness Scale

There is no generally accepted scale used to determine diabetic foot awareness in the literature. The present study "Diabetic Foot Disease Awareness Scale" developed by the researchers consists of 32 items, each related to a different variable, and was prepared as a semi-structured scale to directly collect information.[10] For diabetic foot evaluation, positive behaviors are scored as '2', negative behaviors are scored as '1', and inadequate and unknown behaviors are scored as '0'. The reverse items (2, 8, 11, 13, 14, 15, 21, 24, 28, 29, 30, and 31) were scored as Yes=1, No=2, Don't know=0. The sum of the scores ranged between 0 and 64 (minimum-maximum). It was predicted that as the score increases, diabetic foot awareness increases and decreases as the score decreases. As a result of the research, the scores were divided into 3 segments based on median values for statistical evaluation to facilitate calculation. In this way, the findings obtained from the measurement tool were concretized by enabling item analysis. Accordingly, the total score obtained was grouped as "Low score"

if it was between 0-28; "Medium score" if it was between 29-50; and "High score" if it was between 51-64. An increase in the scores indicated an increased level of knowledge about diabetic foot disease, while a decrease indicated a low level of knowledge.

Statistical Analysis

The study data was analyzed using the Statistical Package for the Social Sciences (SPSS) Version 20 software program. The normal distribution hypothesis for the numerical data was tested by the Kolmogorov-Smirnov test. Normally distributed numerical data was expressed in mean ± standard deviation and non-normally distributed data was given in median (minimum-maximum). Categorical data were expressed in numbers and %. Student's t-test was used for numerical variables and Chi-squared test was used for categorical variables for the group comparisons. A P value below 0.05 was considered statistically significant.

Results

Of the 327 patients included in the study, 196 (59.93%) were female, 131 (40.06%) were male, and the median age was 57.00 years (minimum 19- maximum 91). 41(12.53%) of the patients had Type 1 DM and 286(87.46%) had Type 2 DM. According to their behaviors regarding diabetic foot disease, 79 (24.15%) patients were grouped as low-score, 144 (44.03%) as medium-score, and 104 (31.80%) as high-score. Socio-demographic characteristics of all the patients and separate groups are given in Table 1.

Table 1. Socio-demographic characteristics of all the patients and separate groups as points.

	All Patients n=327 (100%)	GROUPS by SCORE			P
		Low (0-28) n=79 (24.15%)	Medium (29-50) n=144 (44.03%)	High (51-64) n=104 (31.80%)	
Gender					
Female	196 (59.93%)	47 (59.49%)	88 (61.11%)	61 (58.65%)	0.923
Male	131 (40.06%)	32 (40.50%)	56 (%38.88%)	43 (41.34%)	
Social Security					
Yes	316 (96.63%)	77 (97.46%)	137 (95.13%)	102 (98.07%)	0.401
No	11 (3.36%)	2 (2.53%)	7 (4.86%)	2 (1.92%)	
Place					
Urban	304 (92.96%)	74 (93.67%)	134 (93.05%)	96 (92.30%)	
Town	15 (4.58%)	3 (3.79%)	4 (2.77%)	8 (7.69%)	0.107
Village	8 (%2.44)	2 (2.53%)	6 (4.16%)	0 (0.00%)	
Education					
İlliterate	23 (7.03%)	9 (11.39%)	10 (6.94%)	4 (3.84%)	
Primary	177 (54.12%)	45 (56.96%)	92 (63.88%)	40 (38.46%)	**<0.001**
High School	68 (20.79%)	16 (20.35%)	26 (18.05%)	26 (25.00%)	
Faculty	59 (18.04%)	9 (11.39%)	16 (11.11%)	34 (32.69%)	
Marital Status					
Married	258 (78.89%)	65 (82.27%)	115 (79.86%)	78 (75.00%)	
Single	39 (11.92%)	8 (10.12%)	15 (10.41%)	16 (15.38%)	0.709
Others	30 (9.17%)	6 (7.59%)	14 (9.72%)	10 (9.61%)	
Working Status					
Employee	29 (8.86%)	6 (7.59%)	10 (6.94%)	13 (12.50%)	
Officer	22 (6.72%)	2 (2.53%)	6 (4.16%)	14 (13.46%)	
Self-employment	19 (5.81%)	6 (7.59%)	7 (4.86%)	6 (5.76%)	
Retired	97 (29.66%)	20 (25.31%)	48 (33.33%)	29 (27.88%)	**0.035**
Housewife	140 (42.81%)	40 (50.63%)	66 (45.83%)	34 (32.69%)	
Others	20 (6.11%)	5 (6.32%)	7 (2.14%)	8 (7.69%)	
Economic Status					
Bad	25 (7.64%)	3 (3.79%%)	10 (6.94%)	12 (11.53%)	
Normal	185 (56.57%)	41 (51.89%)	82 (56.94%)	62 (59.61%)	0.127
Well	117 (35.77%)	35 (44.30%)	52 (36.11%)	30 (28.84%)	
Smoking					
Yes	74 (22.62%)	16 (20.25%)	31 (21.52%)	27 (25.96%)	0.602
No	253 (77.37%)	63 (79.74%)	113 (78.47%)	77 (74.03%)	
Alcohol					
Yes	15 (4.58%)	4 (%5.06)	3 (2.08%)	8 (7.69%)	0.111
No	362 (95.41%)	75 (%94.93)	141 (97.91%)	96 (92.30%)	
DM in Family					
Yes	184 (56.26%)	42 (53.16%)	81 (56.25%)	61 (58.65%)	
No	143 (43.73%)	37 (46.83%)	63 (43.75%)	43 (41.34%)	0.760
Chronic Diseases					
No	108 (33.02%)	25 (31.64%)	47 (32.63%)	36 (34.61%)	
CVD	40 (12.23%)	9 (11.39%)	21 (14.58%)	10 (9.61%)	
Hyperlipidemia	18 (5.50%)	6 (7.59%)	7 (4.86%)	5 (4.80%)	
Hypertension	79 (24.15%)	21 (26.58%)	37 (25.69%)	21 (20.19%)	
COPD	10 (3.05%)	3 (3.79%)	4 (2.77%)	3 (2.88%)	
Asthma	20 (6.11%)	6 (7.59%)	10 (6.94%)	4 (3.84%)	
CRD	20 (6.11%)	2 (2.53%)	5 (3.47%)	13 (12.50%)	
Liver Diseases	6 (1.83%)	2 (2.53%)	3 (2.08%)	1 (0.96%)	
Stroke	1 (0.30%)	0 (0.00%)	0 (0.00%)	1 (0.96%)	0,332
Rheumatohlogic D.	4 (1.22%)	1 (1.26%)	0 (0.00%)	3 (2.88%)	
Cancer	5 (1.52%)	0 (0.00%)	5 (3.47%)	0 (0.00%)	
Others	16 (4.89%)	4 (5.06%)	5 (3.47%)	7 (6.73%)	
Drugs					
Yes	157 (48.01%)	38 (48.10%)	70 (48.61%)	49 (47.11%)	0.973
No	170 (51.98%)	41 (51.89%)	74 (51.38%)	55 (52.88%)	

In a comparison of the patient groups by scores, there was no difference by age, gender, social security status, place of residence, marital status, income status, smoking and alcohol use, family history of DM, chronic disease status, and medications in use. There was a significant intergroup difference by educational status and employment status (p<0.001, p=0.035, respectively). Accordingly, as the educational level of the patients increased, their level of knowledge about diabetic foot also increased. Furthermore, the rate of actively employed patients was higher in the group with a higher level of knowledge.

Upon comparison of anthropometric measurements, the body weight, BMI, and waist circumference were highest in the low-score group and lowest in the high-score group (p=0.053, respectively, p=0.007, p=0.003). There were no significant intergroup differences by arterial blood gas (ABG), HbA1c, creatinine, triglycerides, total cholesterol, LDL-cholesterol, and HDL-cholesterol (Table 2). Upon comparison of the patient groups by score based on diabetes-related characteristics, there was no intergroup difference by self-measurement of blood glucose, occurrence of known microvascular complications, medical nutrition therapy, and occurrence of diabetic foot ulcer and amputation.

There was a significant intergroup difference by the type of diabetes (p=0.003). The rate of patients diagnosed with Type 1 DM was highest in the high-score group and the rate of patients diagnosed with Type 2 DM was highest in the medium-score group (21.15% and 78.84%, respectively). There was a significant intergroup difference by DM duration (years) (p=0.004). Patients with a longer duration of diabetes were mostly included in the high-scoring group.

The difference between the groups by diabetes education was significant (p=0.009). The rate of patients, who received diabetes education was highest in the high-scoring group (75.96%) and the rate of patients, who did not receive diabetes education was highest in the low-scoring group (45.56%). There was a significant intergroup difference by foot care education status (p=0.003). The rate of patients, who received foot care education was highest in the high-score group and the rate of patients, who did not receive foot care education, was highest in the low-score group (30.76% and 89.87%, respectively).

There was a significant intergroup difference in the treatment the patients were receiving (p=0.009). The rate of patients, who took only oral anti-diabetics (OAD) was highest in the low-scoring group (58.22%), the rate of patients using OAD plus insulin was highest in the medium-score group (24.30%), and the rate of patients using insulin was highest in the high-scoring group (47.11%).

The difference between the groups was significant by exercise in the patients included in the study (p=0.003). The rate of patients, who did not exercise was highest in the medium-score group, the rate of patients, who exercised was highest in the high-score group, and the rate of patients, who exercised irregularly was highest in the medium-score group (29.16%, 45.13%, and 42.30%, respectively).

Table 2. According to the diabetic foot disease awareness scale score distribution in diabetic patients age, anthropometric measurements and laboratory data

| | All Patients n=327 (100%) | GROUPS by SCORE | | | P |
		Low (0-28) n=79 (24.15%)	Medium (29-50) n=144 (44.03%)	High (51-64) n=104 (31.80%)	
Age (Year)	57.00 (19-91)	57.00 (19-78)	59.00 (21-91)	55.00 (20-78)	0.109
Height (cm)	165.00 (145-186)	164.00 (145-186)	165.00 (148-185)	165.00 (148-185)	0.235
Weight (kg)	81.00 (40-168)	85.00 (42-130)	80.00 (40-140)	80.00 (42-168)	**0.053**
BMI (kg/m²)	29.96 (13.84-65.83)	31.64 (15.06-50.78)[a]	29.73 (13.84-52.05)	29.00 (16.71-65.63)	**0.007**
Waist (cm)	102.00 (36-160)	108.00 (36-160)[a]	103.00 (60-154)[b]	100.00 (42-142)	**0.003**
FPG (mg/dL)	139.00 (25-586)	131.00 (81-266)	142.50 (36-586)	141.00 (25-399)	0.461
HbA1c (%)	7.60 (2.10-18.90)	7.00 (2.90-14.30)	7.60 (2.10-18.90)	7.85 (3.60-17.80)	0.168
Creatinine (mg/dL)	0.80 (0.00-63.00)	0.78 (0.00-3.80)	0.77 (0.19-6.30)	0.83 (0.46-63.00)	0.483
Triglyceride (mg/dL)	144.00 (50.00-659.00)	146.00 (71.00-659.00)	141.50 (50.00-529.00)	145.00 (56.00-633.00)	0.842
Total Cholesterol (mg/dL)	175.00 (53.00-401.00)	179.00 (60.00-291.00)	171.00 (97.00-401.00)	174.00 (53.00-343.00)	0.895
LDL Cholesterol (mg/dL)	101.00 (11.20-420.00)	96.00 (16.40-207.00)	105.00 (11.20-395.00)	99.50 (22.20-420.00)	0.550
HDL Cholesterol (mg/dL)	55.00 (3.19-247.00)	65.00 (5.10-247.00)	53.00 (3.19-246.00)	53.00 (3.25-236.00)	0.374

BMI: Body Mass Index, FPG: Fasting plasma glucose a. It indicates that there is a statistical difference between patients with high scores and patients with low scores. b. It indicates that there is a statistical difference between patients with medium scores and low scores.

There was a significant intergroup difference by diabetic foot examination status (p<0.001). The rate of diabetic foot examination was highest in the high-score group (25.96%) and the rate of non-performance was highest in the low-score group (94.93%).

The numbers and percentages of the responses given to the diabetic foot disease awareness scale in the present study are shown in Table 3.

The diabetic foot disease awareness scale and scores by groups are shown in Table 4.

Table 3. Disease-related findings according to diabetic foot awareness scale distribution in patients diagnosed with diabetes

	All Patients n=327 (100%)	Low (0-28) n=79 (24.15%)	Medium (29-50) n=144 (44.03%)	High (51-64) n=104 (31.80%)	P
Type of DM					
Type 1 DM	41 (12.53%)	4 (5.06%)	15 (10.41%)	22 (21.15%)	**0.003**
Type 2 DM	286 (87.46%)	75 (26.22%)	129 (89.58%)	82 (78.84%)	
Duration of DM (Year)	10.00 (1-47)	7.00 (1-30)[a]	10.00 (1-47)[b]	10.00 (1-35%)	**0.004**
Education of DM					
Yes	217 (66.36%)	43 (54.43%)	95 (65.97%)	79 (75.96%)	**0.009**
No	110 (33.63%)	36 (45.56%)	49 (34.02%)	25 (24.03%)	
Treatment					
OAD	136 (41.59%)	46 (58.22%)	57 (39.59%)	33 (31.73%)	
OAD+Insulin	70 (21.40%)	13 (16.45%)	35 (24.30%)	22 (21.15%)	**0.004**
Insulin	121 (37.00%)	20 (25.31%)	52 (36.11%)	49 (47.11%)	
Self-monitoring					
Yes	279 (85.32%)	65 (82.27%)	120 (83.33%)	94 (90.38%)	0.205
No	48 (14.67%)	14 (17.72%)	24 (16.66%)	10 (9.61%)	
Microvascular complications					
No	280 (85.62%)	72 (91.13%)	118 (81.94%)	90 (86.53%)	
Retinopathy	12 (3.66%)	3 (3.79%)	6 (4.16%)	3 (2.88%)	
Nephropathy	10 (3.05%)	0 (0.00%)	7 (4.86%)	3 (2.88%)	
Neuropathy	14 (4.28%)	4 (5.06%)	6 (4.16%)	4 (3.84%)	0.575
Nephropathy+Neuropathy	5 (1.52%)	0 (0.00%)	3 (2.08%)	2 (1.92%)	
Retinopathy+ Nephropathy	4 (1.22%)	0 (0.00%)	2 (1.38%)	2 (1.92%)	
Retinopathy+ Nephropathy +Neuropathy	2 (0.61%)	0 (0.00%)	2 (1.38%)	0 (0.00%)	
Nutrition therapy					
No	82 (25.07%)	20 (25.31%)	42 (29.16%)	20 (19.23%)	0.257
Yes	114 (34.86%)	24 (30.37%)	46 (31.94%)	44 (42.30%)	
Irregular	131 (40.06%)	35 (40.30%)	56 (38.88%)	40 (38.46%)	
Physical activity					
No	113 (34.55%)	30 (37.97%)	55 (38.19%)	28 (26.92%)	
Yes	86 (26.29%)	22 (27.84%)	24 (16.66%)	40 (38.46%)	**0.003**
Irregular	128 (39.14%)	27 (34.17%)	65 (45.13%)	36 (34.61%)	
Foot care training					
Yes	69 (21.10%)	8 (10.12%)	29 (20.13%)	32 (30.76%)	**0.003**
No	258 (78.89%)	71 (89.87%)	115 (79.86%)	72 (69.23%)	
Foot examination					
Yes	48 (14.67%)	4 (5.06%)	17 (11.80%)	27 (25.96%)	**<0.001**
No	279 (85.32%)	75 (94.93%)	127 (88.19%)	77 (74.03%)	
Diabetic foot disease					
Yes	32 (9.78%)	5 (6.32%)	14 (9.72%)	91 (12.50%)	0.380
No	295 (90.21%)	74 (93.67%)	130 (90.27%)	13 (87.50%)	
Amputation					
Yes	8 (25.00%)	1 (20.00%)	2 (14.28%)	5 (38.46%)	0.336
No	24 (75.00%)	4 (80.00%)	12 (85.71%)	8 (61.53%)	

a. It indicates that there is a statistical difference between patients with high scores and patients with low scores. b. It indicates that there is a statistical difference between patients with medium scores and low scores.

Table 4. The diabetic foot disease awareness scale and scores by groups

	All Patients n=327 (100%)		
	Yes n/Percent	No n/Percent	No idea n/Percent
1. Ulcers or wounds that occur on the feet of diabetic patients are defined as diabetic feet.	169 (51.68%)	44 (13.45%)	114(34.86%)
2. *Small wounds on the feet of diabetic patients are not important and should not be taken into consideration.	60 (18.34%)	202 (61.77%)	65 (19.87%)
3. Diabetic foot occurs due to diabetes	201 (61.46%)	36 (11.00%)	90 (27.52%)
4. Long-term diabetes is an important factor in the development of diabetic foot.	212 (64.83%)	30 (9.17%)	85 (25.99%)
5. High blood sugar levels are effective in the formation of diabetic foot.	200 (61.16%)	25 (7.64%)	102 (31.19%)
6. Numbness, tingling, and loss of sensation in the feet of diabetic patients are effective in the formation of diabetic feet.	212 (64.83%)	30 (9.17%)	85 (25.99%)
7. Irregular and uncontrolled blood sugar for a long time disrupts the structure of the capillaries in the feet.	200 (61.16%)	28 (8.56%)	99 (30.27%)
8. *Dry feet in diabetic patients do not pose a risk for diabetic feet.	68 (20.79%)	129 (39.44%)	130 (39.75%)
9. Sweating of the feet in diabetic patients may cause diabetic foot.	123 (37.61%)	50 (15.29%)	154 (47.09%)
10. When diabetes is not controlled, toes, feet, or legs may have to be amputated.	222 (67.88%)	26 (7.95%)	79 (24.15%)
11. *After amputation of a toe, foot, or leg due to uncontrolled diabetes, there is no risk for the other foot.	56 (17.12%)	142 (43.42%)	129 (39.44%)
12. Hyperbaric oxygen therapy can be applied to wounds in diabetic patients.	82 (25.07%)	34 (10.39%)	211 (64.52%)
13. *Deformity of the feet in diabetic patients is not important in the formation of diabetic feet.	53 (16.20%)	110 (33.63%)	164 (50.15%)
14. *Clogging in the leg veins of diabetic patients does not affect the formation of diabetic foot.	54 (16.51%)	125 (38.22%)	148 (45.25%)
15. *In diabetic patients, a small scratch, cut, sting, or shoe bump on the foot does not cause diabetic foot.	69 (21.10%)	126 (38.53%)	132 (40.36%)
16. Feet and between the toes should be checked every day for redness, swelling, cuts, and calluses.	205 (62.69%)	36 (11.00%)	86 (26.29%)
17. If necessary, a mirror can be used to see the sole of the foot.	207 (63.30%)	27 (8.25%)	93 (28.44%)
18. Feet should be washed with warm water every day and dried thoroughly.	231 (70.64%)	19 (5.81%)	77 (23.54%)
19. The temperature of the water must be controlled to protect the feet of diabetic patients from burns.	212 (64.83%)	25 (7.64%)	90 (27.52%)
20. It is important to dry the feet, especially between the toes.	230 (70.33%)	27 (8.25%)	70 (21.40%)
21. *Calluses on the feet of diabetic patients can be treated at home. Callus medicine can be used. There is no need to go to the doctor.	76 (23.24%)	155 (47.40%)	96 (29.35%)
22. Toenails should be cut straight across.	196 (59.93%)	38 (11.62%)	93 (28.44%)
23. Diabetic patients should not cut their toenails deeply and should not have a pedicure.	175 (53.51%)	43 (13.14%)	109 (33.33%)
24. *Walking barefoot prevents diabetic foot formation. Therefore, there is no need to constantly use slippers at home.	86 (26.29%)	112 (34.25%)	129 (39.44%)
25. To avoid foot sores, durable shoes that are easy to put on, not tight, with soft leather, thick soles, and wide toes should be chosen.	212 (64.83%)	24 (7.33%)	91 (27.82%)
26. Before wearing the shoes, the shoes should be turned inside out and shaken to see if there is a foreign object inside.	228 (69.72%)	19 (5.81%)	80 (24.46%)
27. Seamless, cotton, or woolen socks should be preferred in diabetic patients to avoid wounds on their feet.	206 (62.99%)	33 (10.09%)	88 (29.91%)
28. *Socks do not need to be changed every day. It can be changed every two or three days.	76 (23.24%)	178 (54.43%)	73 (22.32%)
29. *Diabetics should rest their feet in a warm place to warm them. (Heating, stove, foot warmer, pad, etc.)	65 (19.87%)	162 (49.54%)	100 (30.58%)
30. *Diabetic patients with visual impairment do not need to have their feet checked by a relative.	50 (15.29%)	182 (55.65%)	95 (29.05%)
31. *It does not matter if there is fungus on the feet or nails. It does not need to be treated.	45 (13.76%)	191 (58.40%)	91 (27.82%)
32. To increase the blood flow in the feet, it is necessary to sit and raise the feet every two or three hours.	176 (53.82%)	28 (8.56%)	123 (37.61%)

* It indicates distracting substances.

Discussion

Diabetic foot disease, one of the important complications of DM, decreases the patient's quality of life, increases the likelihood of amputation and mortality, and increases treatment costs.[11] This study aimed to investigate the level of knowledge and behaviors of patients about diabetic foot, 24.15% of the patients had low, 44.03% had medium, and 31.80% had high scores. Therefore, the patients with low and moderate levels of knowledge about diabetic foot constituted 68.18% of the study group.

A study by Kalaycı et al investigated the knowledge, attitudes, and behaviors of patients with diabetes about foot care and diabetic foot and reported that half of the patients thought that foot care was important.[8] A study by Goie et al. found that awareness of diabetic foot very quite low.[12] A study by Singh et al. from India reported that there was a great lack of awareness about diabetic foot among the general population in and around Wardha.[13] In a study by Dhandapani et al. from South India, which investigated the practices and associated factors related to foot care of patients with diabetes, 64.2% of the participants had a satisfactory knowledge level and 63.6% maintained satisfactory practices about diabetic foot. The knowledge and practice levels of patients with diabetes regarding foot care were assessed as low and it was emphasized that educational plans should be implemented.[14] In a study by Çolak et al., which measured the knowledge levels of patients about diabetic foot care and diabetic foot ulcers, it was reported that 58.5% of the patients gave correct answers to the questionnaire items, but they were undecided about some distracting questions, including the use of vaseline and cream in foot care, cutting the nails straight, and choosing a shoe model. In daily practice, 61.4% of the patients performed correct applications.[15] The results of the present study are consistent with those reported by previous studies in the relevant literature.

In this study, a comparison of patients with low, medium, and high scores by diabetic foot behaviors, it was seen that there was no intergroup difference by age, gender, social security status, place of residence, marital status, income status, smoking and alcohol use, family history of DM, chronic disease status, and medications in use. A study by Yücel et al., which investigated the knowledge, attitudes, and behaviors of diabetic patients about diabetic foot and foot care, did not find any effect of gender, education, DM education, and treatment type on knowledge, attitudes, and behaviors. The same study reported that the duration of diagnosis, frequency of control, and risk status for diabetic foot did not affect the level of knowledge, while attitude and behavior scores were higher in the participants, who were followed up for 10-20 years, who had regular control visits, and who were at high risk for diabetic foot.[16]

In the present study, upon a comparison of patients with low, medium, and high scores, there was a significant difference between the groups by educational status and employment status. A study by Alharbi et al. found a statistically significant relationship between a good level of knowledge and patients' age, education level,

monthly family income, duration of diabetic disease, and prior knowledge about foot care.[17] A study by Ergözen et al. suggested that there might be a positive correlation between educational status and patients' awareness of diabetic foot and the importance they attached to the subject.[18] In a study by Alshammari et al., it was found that patients with higher education levels had better awareness of diabetic foot care.[19] A study by Çelik et al. reported that the education level and treatment type of individuals were the factors that significantly affected foot care behaviors and these factors explained 7% of the total variance at the level of foot care behavior.[20] Another study emphasized that patients with secondary education and above had good practice scores as in many other previous studies.[21] Upon a review of the above studies, it is seen that the level of education increased diabetic foot awareness consistent with the present study.

As regards the employment status in this study, the rate of workers and civil servants was higher in the high-scoring group. This may be attributed to the high level of education and income among workers and civil servants. The reason why the rate of self-employed and housewives was higher in the low-score group and the rate of retired people was highest in the middle-score group might again be associated with the level of education and lifestyle. In other similar studies, low income and low educational status were suggested to have increased the risk of diabetic foot disease.[22-25]

In the present study, body weight, BMI, and waist circumference levels were highest in the low-score group and lowest in the high-score group. There were no significant intergroup differences by FPG, HbA1c, creatinine, triglycerides, total cholesterol, LDL-cholesterol, and HDL-cholesterol. This may be because the majority of our study group consists of patients who are under treatment and regularly followed up. A study by Vibha et al. found that anthropometric measurements, including BMI, waist circumference, clinical parameters such as HbA1c, and presence of comorbidities such as hypercholesterolemia were not significant for diabetic foot awareness as in the present study.[26] However, in this study, HbA1c and cholesterol levels could not be measured in all patients, and this was reported as a limitation of the study.

In this study, upon a comparison of disease-related results by diabetic foot behavior score distribution in patients diagnosed with diabetes, it was seen that there was no intergroup difference by blood glucose self-measurement status, known microvascular complications, medical nutrition therapy, and occurrence of diabetic foot and amputation, which was consistent with the previous studies in the relevant literature.[16] There was a significant intergroup difference by the type of diabetes. The rate of patients diagnosed with Type 1 DM was highest in the high-score group and the rate of patients diagnosed with Type 2 DM was highest in the medium-score group. The high level of awareness in patients diagnosed with type 1 DM may be explained by the long duration of diabetes, younger age, and higher educational level.[19] There was a significant intergroup difference by duration of diabetes. As the duration of diabetes increases, awareness of diabetic foot increases and this is consistent with the literature.[16,17]

There was a significant intergroup difference in diabetes education. The rate of patients, who received diabetes education, was highest in the high-score group (75.96%), while the rate of patients, who did not receive DM education was highest in the low-scoring group (45.56%). Previous studies suggested that patients, who received good education about diabetes and diabetic foot care, were more knowledgeable and adopted more positive attitudes towards diabetic foot care.[13,17,19,27]

In the present study, there was a significant intergroup difference in treatment received by the patients. The rate of patients, who took OAD was highest in the low-score group, the rate of patients on OAD+insulin was highest in the medium-score group, and the rate of patients on insulin was highest in the high-score group. A study by Shaki et al. reported that there was a significant relationship between patients on insulin and combination therapy and peripheral neuropathy and the occurrence of foot ulcers.[27] There is a similarity between our study and the previous studies in the relevant literature.

In this study, there was a significant intergroup difference in participants' exercise status. The rate of patients, who did not exercise was highest in the medium-score group, the rate of patients, who exercised was highest in the high-score group, and the rate of patients, who exercised irregularly was highest in the medium-score group. This result confirmed that patients, who exercised, were more aware of diabetic foot.

Education is an important tool to improve foot care awareness in individuals with DM. In the present study, there was a significant intergroup difference by foot care education status. The rate of patients who received foot care education was highest in the high-score group and the rate of patients who did not receive foot care education was highest in the low-score group, and this result was consistent with those of the previous studies in the relevant literature.[28] There was also a significant intergroup difference by status of foot examination. The rate of performing diabetic foot examination was the highest in the high-score group (25.96%), and the rate of not performing diabetic foot examination was the highest in the low-score group (94.93%).[13,17] As in the literature, performing foot examinations during visits is a factor that increases disease awareness.[16,17]

The most important limitation of the present study is that the data were obtained based on patient declarations based on responses to questionnaire items. The foot care behaviors of the individuals were not observed by the researchers. Another limitation is that the study was single-centered. Future studies that would include the general population can help with obtaining detailed information and ensure that public awareness is better measured. In addition, if awareness of some issues is not sufficient even in patients diagnosed with diabetes who present to endocrine clinics and outpatient clinics, it can be expected that awareness would be much lower in a study to be conducted in the general population. Another limitation of our study is that although a comprehensive assessment was made, the scale in use was not standardized.

In conclusion, diabetic foot disease, which is the most common cause of hospitalization and prolonged hospital stay in patients with DM, decreases the quality of life of the patients, increases treatment costs, and leads to an increase in the likelihood of amputation and mortality. In light of the results of the present study, diabetic foot awareness is inadequate in the patient group included in the study. The most important point in the prevention of diabetic foot disease is to improve foot care behaviors. Accordingly, it is necessary to raise awareness of patients, especially in the risk group, utilizing diabetes and foot care education and to repeat these trainings periodically before the occurrence of diabetic foot.

Ethical Considerations: Ankara Bilkent City Hospital Endocrinology and Metabolic Diseases Clinic and Outpatient Clinic between 20.02.2021 and 20.07.2021. Required approval as obtained from the Ethics Committee of Ankara Yıldırım Beyazıt University (AYBU) (Date: 16.02.2021, No: 13)

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