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Foot self-care in diabetes mellitus: Evaluation of patient awareness

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ABSTRACT

Aims: To assess diabetic patients' knowledge and practices regarding foot care.

Methods: This study was conducted as a cross-sectional study in 1030 patients between November 2017 and February 2018. The descriptive survey instrument was developed by the investigators. Survey content and format were based on prior surveys and guidelines. The survey sought socio-demographic characteristics of the patients and the level of knowledge about diabetic foot care practice.

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Results: 29.5% of patients had bad foot care, 49.6% of patients had moderate foot care and 20.8% of patients had good foot care. There were no significant differences between patient groups in regard to age, gender, foot infection history and having undergone amputation surgery. We found that patients who good at foot care had higher education status ($p < 0.001$), were more likely live in a city ($p < 0.001$), had higher income ($p < 0.001$), had been trained about foot care ($p < 0.001$) and were more likely to have type 1 DM ($p = 0.015$). Disease duration was longer in those who had good foot care compared to the other groups ($p = 0.010$).

Conclusions: The mean knowledge and practice scores of our patients were moderate, indicating that much is to be done for the education of patients on this matter. We also found that knowledge about the importance of this practice, education status and disease duration had significant influence on the practice of foot-care in patients with DM.

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1. Introduction

Diabetes is one of the most common metabolic disorders in the world, and its prevalence in adults has showed a trend of significant increase in the last few decades [1,2]. Major complications of diabetes mellitus include diabetic foot disease and this problem is an important cause of morbidity. Diabetic foot disease is typically defined to include ulcers or infections in the foot of a person with diabetes [3–5]. Important risk factors for the development of diabetic foot disease include neuropathy, peripheral vascular disease and poor glycemic control [6]. The lifetime risk of foot ulcer occurrence in diabetic patients is reportedly as high as 25%, and five-year mortality rates after new-onset diabetic ulceration have been reported to be between 43% and 55%, and up to 74% for patients with lower-extremity amputation [7,8].

Diet control, medication intake, exercise, blood glucose maintenance and foot care are essential in diabetes self-care. Foot care has been found to be effective in reducing the risk of neuropathy, foot ulcers and infections. The practice of foot care measures such as, daily foot washing and drying, daily foot examination, proper nail care, and footwear are important in the prevention or early detection of aforementioned complications [9]. As such, foot self-care should be taken seriously and seen as an ongoing process by patients. Optimal care for diabetic foot is likely to be the most cost-effective method, especially in resource-limited regions [10]. Therefore, both patients and health care providers should be aware of the advantages of proper foot care and must increase their knowledge regarding foot self-care.

The objectives of the current study were to assess patients' knowledge and practices regarding foot self-care among diabetic patients in Turkey.

2. Materials–methods

2.1. Study group

This is a cross-sectional study, reviewing the sociodemographic data of patients with diabetic foot disease in eleven different medical faculty hospitals (Istanbul Medeniyet University Goztepe Training and Research Hospital, Cerrahpasa

Medical Faculty, Health Sciences University Kartal Dr. Lutfi Kirdar Training and Research Hospital, Ankara University Faculty of Medicine, Health Sciences University Haydarpaşa Numune Training and Research Hospital, Dumlupınar University Faculty of Medicine, Health Sciences University Umraniye Training and Research Hospital, Health Sciences University Istanbul Training and Research Hospital, Bezmialem Vakıf University, Ordu University Faculty of Medicine and Yeditepe University Faculty of Medicine) from November 2017 to February 2018. Members of the Turkish Society of Clinical Microbiology and Infectious Diseases Diabetic Foot Study Group were informed about the survey and physicians who wanted to participate in the study were included in the study. Each physician participating in the study was asked to conduct a questionnaire on at least 50 patients. A total of 1030 patients were enrolled in this study. Inclusion criteria for the study were: being aged over 18 years, referring for any reason to the internal medicine polyclinic or diabetic foot polyclinic or infectious diseases clinic, and having a diagnosis of diabetes mellitus.

2.2. Ethical issues

During the conduct of the study, Good Clinical Practice Guidelines and the Declaration of Helsinki were followed. Istanbul Medeniyet University Goztepe Training and Research Hospital Ethics Committee approved the current study.

2.3. Data

Age, sex, working status, education level, socio-economic status, and the clinical features of the patients were evaluated and recorded. A survey was prepared to evaluate the knowledge of patients in regard to diabetic foot care and their practices. The survey included 10 questions which assessed daily activities for foot care (such as daily foot washing, drying and daily foot examination) and also other factors (such as nail care and footwear choice). Each correct answer was scored as 1 point and the maximum score obtainable from the survey was 10 points. After calculating total points, we divided patients into three categories: 0–4 points (meaning bad foot care), 5–7 points (meaning moderate foot care) and 8–10 points (meaning good foot care).

All analyses were performed on SPSS (Statistical Package for Social Sciences) v21 (IBM, Armonk, NY). For the normality check, the Shapiro Wilk test was used. Data were given as median (minimum–maximum) for continuous variables and frequency (percentage) for categorical variables. Comparison of continuous variables were made by the Mann Whitney U or the Kruskal Wallis test, depending on the number of groups compared. Categorical variables were analyzed with Chi Square tests. $P < 0.05$ values were accepted to show statistical significance.

3. Results

We included 1030 patients (547 males and 483 females) into our study, mean age was 57.73 ± 12.96 . We asked 10 questions about foot care to the participants. The results of the survey showed that 29.5% of patients had bad foot care (0–4 points), 49.6% of patients had moderate foot care (5–7 points) and 20.8% of patients had good foot care (8–10 points) (Table 1).

When patients' sociodemographic characteristics were evaluated with regard to foot-care results, we found that patients with good foot care knowledge had higher education ($p < 0.001$), were more likely to live in a city ($p < 0.001$), had higher income ($p < 0.001$) and were more likely to have type I DM ($p = 0.015$). Additionally, disease duration was longer in those who had good foot care compared to the other groups ($p = 0.010$). Also patients who had received training about foot self-care had significantly higher scores than those who did not receive training ($p < 0.001$). On the other hand, there were

Table 1 – Patients' survey answers and assessment results.

	Yes	No
Do you perform regular foot examinations?	707 (68.64%)	323 (31.36%)
Do you wash your feet daily?	695 (67.48%)	335 (32.52%)
Are you careful about the shape of your nails?	493 (47.86%)	537 (52.14%)
Do you walk barefoot?	731 (70.97%)	299 (29.03%)
Do you check the material of your socks?	651 (63.20%)	379 (36.80%)
Do you change your socks daily?	531 (51.55%)	499 (48.45%)
Do you check the insides of your shoes before wearing?	580 (56.31%)	450 (43.69%)
Are you careful about the material of your shoes, would you choose the shoe types below?		
Rubber shoes	162 (15.73%)	868 (84.27%)
Sandals	250 (24.27%)	780 (75.73%)
Do you use moisturizer for your feet?	276 (26.80%)	754 (73.20%)
Total points	6 (1–10)	
Foot care		
Bad	304 (29.51%)	
Moderate	511 (49.61%)	
Good	215 (20.87%)	

Data given as median (minimum–maximum) for continuous variables and frequency (percentage) for categorical variables.

no significant differences between the groups in terms of age, sex, history of foot infection, and having undergone amputation (Table 2).

Table 2 – Patients' characteristics regarding foot care groups.

	Foot care			P
	Bad	Moderate	Good	
Age	59 (18–91)	58 (18–88)	58 (19–90)	0.051
Sex				
Female	138 (45.39%)	236 (46.18%)	109 (50.70%)	0.443
Male	166 (54.61%)	275 (53.82%)	106 (49.30%)	
Education				
None	66 (21.71%)	65 (12.72%)	20 (9.30%)	<0.001
Primary school	129 (42.43%)	203 (39.73%)	85 (39.53%)	
Secondary school	48 (15.79%)	68 (13.31%)	28 (13.02%)	
High school	34 (11.18%)	81 (15.85%)	38 (17.67%)	
University	27 (8.88%)	94 (18.40%)	44 (20.47%)	
Residence				
City	267 (87.83%)	472 (92.37%)	210 (97.67%)	<0.001
Rural	37 (12.17%)	39 (7.63%)	5 (2.33%)	
Income (monthly, TL)				
<1500	150 (49.34%)	150 (29.35%)	61 (28.37%)	<0.001
1500–3000	137 (45.07%)	291 (56.95%)	121 (56.28%)	
>3000	17 (5.59%)	70 (13.70%)	33 (15.35%)	
DM type				
Type I	15 (4.93%)	28 (5.48%)	23 (10.70%)	0.015
Type II	289 (95.07%)	483 (94.52%)	192 (89.30%)	
Disease duration (year)	10 (1–41)	10 (1–40)	12 (1–46)	0.010
Foot infection history	75 (24.67%)	137 (26.81%)	59 (27.44%)	0.730
Foot care training	29 (9.54%)	120 (23.48%)	79 (36.74%)	<0.001
Amputation surgery	40 (13.16%)	49 (9.59%)	24 (11.16%)	0.287

Data given as median (minimum–maximum) for continuous variables and frequency (percentage) for categorical variables.

TL: Turkish Lira.

Table 3 – Distribution of educators for foot care.

	Frequency	Percentage
Internal disease specialist	73	32.02%
Family physician	30	13.16%
Infection diseases specialist	46	20.18%
Nurse	74	32.46%
Media, brochure, internet etc.	5	2.19%
Total	228	100.00%

A total of 228 (21.14%) patients had received foot self-care training. These patients were mostly educated by their primary healthcare providers; nurses (32.46%) and internal medicine specialists (32.02%) (Table 3).

Table 4 – Distribution of amputation levels.

	Frequency	Percentage
Toe	96	84.96%
Metatarsal	1	0.88%
Ankle	7	6.19%
Below knee	8	7.08%
Above knee	1	0.88%
Total	113	100.00%

One hundred and thirteen (10.97%) patients had undergone some form of lower extremity amputation surgery. Complete toe amputation was performed in 84.96% of patients and was the most common amputation level (Table 4).

Table 5 – Patients' characteristics regarding amputation surgery history.

	Amputation		Total	p
	Absent	Present		
Age	58 (18–90)	65 (25–91)	58 (18–91)	<0.001
Sex				
Female	448 (48.85%)	35 (30.97%)	483 (46.89%)	<0.001
Male	469 (51.15%)	78 (69.03%)	547 (53.11%)	
Education Status				
None	126 (13.74%)	25 (22.12%)	151 (14.66%)	0.062
Primary School	368 (40.13%)	49 (43.36%)	417 (40.49%)	
Secondary School	130 (14.18%)	14 (12.39%)	144 (13.98%)	
High School	139 (15.16%)	14 (12.39%)	153 (14.85%)	
University	154 (16.79%)	11 (9.73%)	165 (16.02%)	
Residence				
City	856 (93.35%)	93 (82.30%)	949 (92.14%)	<0.001
Rural	61 (6.65%)	20 (17.70%)	81 (7.86%)	
Income (monthly, TL)				
<1500	313 (34.13%)	48 (42.48%)	361 (35.05%)	0.149
1500–3000	493 (53.76%)	56 (49.56%)	549 (53.30%)	
>3000	111 (12.10%)	9 (7.96%)	120 (11.65%)	
DM type				
Type I	52 (5.67%)	14 (12.39%)	66 (6.41%)	0.011
Type II	865 (94.33%)	99 (87.61%)	964 (93.59%)	
Disease duration (year)	10 (1–45)	20 (1–46)	10 (1–46)	<0.001
Antiglycemic drugs				
None	35 (3.82%)	1 (0.88%)	36 (3.50%)	<0.001
Oral	330 (35.99%)	13 (11.50%)	343 (33.30%)	
Insulin	273 (29.77%)	47 (41.59%)	320 (31.07%)	
Both	279 (30.43%)	52 (46.02%)	331 (32.14%)	
Drug use duration (years)	8 (0.1–45)	15 (0.5–46)	9 (0.1–46)	<0.001
Foot infection history	167 (18.21%)	104 (92.04%)	271 (26.31%)	<0.001
Foot self examination	619 (67.50%)	88 (77.88%)	707 (68.64%)	0.033
Daily foot washing	619 (67.50%)	76 (67.26%)	695 (67.48%)	0.999
Walking barefoot				
Never	269 (29.33%)	30 (26.55%)	299 (29.03%)	0.768
Rarely	519 (56.60%)	65 (57.52%)	584 (56.70%)	
Frequently	129 (14.07%)	18 (15.93%)	147 (14.27%)	
Nail care	447 (48.75%)	46 (40.71%)	493 (47.86%)	0.130
Who cuts your nails?				
Himself/herself	736 (80.26%)	64 (56.64%)	800 (77.67%)	<0.001
Others	181 (19.74%)	49 (43.36%)	230 (22.33%)	
Try to choose suitable socks	564 (61.50%)	87 (76.99%)	651 (63.20%)	<0.001
Checking shoes before wearing	519 (56.60%)	61 (53.98%)	580 (56.31%)	0.688
Neuropathy	386 (42.09%)	89 (78.76%)	475 (46.12%)	0.001
Using moisturizer	249 (27.15%)	27 (23.89%)	276 (26.80%)	0.532
Foot care training	182 (19.85%)	46 (40.71%)	228 (22.14%)	<0.001

Data given as median (minimum–maximum) for continuous variables and frequency (percentage) for categorical variables.

When we evaluated patients' characteristics regarding amputation history, we found that patients with amputation were significantly older than those without ($p < 0.001$). Male sex was more common in the amputation group ($p < 0.001$), patients who lived in rural areas were more likely to get amputation surgery than those who lived in urban areas ($p < 0.001$), and the percentage of patients with type I DM was higher in the amputation group ($p = 0.011$). Also, patients with amputation had longer duration of disease ($p < 0.001$) and drug use ($p < 0.001$), as well as having a higher frequency of using insulin ($p < 0.001$). Additionally, the following parameters were found to be more frequent/higher in those who had undergone amputations: foot infection history, regular foot examinations, getting their nails cut by another person, choosing suitable socks, neuropathy findings, and receiving foot self-care training. There were no significant differences between our groups regarding education, income, daily foot washing, walking bare foot, checking the insides of their shoes before wearing, and using moisturizers for their feet (Table 5).

4. Discussion

In this study we evaluated the level of knowledge and practices regarding foot self-care in diabetic patients. As measured by our survey, we found that 29.5% of patients had bad foot care, 49.6% had moderate foot care and 20.8% had good foot care. We found that patients who were good at foot care had higher education and income, were more likely to live in an urban area, to have type 1 diabetes mellitus and to have received foot self-care training. Being able to perform appropriate foot care has been suggested to be positively influenced by patient education which in turn reduces the risk of foot ulceration and amputation in high-risk diabetics [11]. In our study, it was found that 24.9% of high school and university graduates had moderate and good foot care, while 36.2% of primary school graduates had moderate and good foot care. Also patients who had been trained about foot care were better in the practice of foot care than those who had not been trained. In a study conducted in India, it was concluded that bad foot care was common among those with poor formal education [12]. In other study from Italy, the presence of foot complications in those with diabetes mellitus was correlated with insulin treatment frequency, cigarette smoking and low levels of school education; thus confirming the suggested relationship between education level and proper foot care [13].

In our study, disease duration was longer in those with good foot care. Our results were consistent with a study conducted in Erbil by Saber et al., they also reported that practice scores were moderate in the majority of patients, and scores were associated with age, residency, socio-economic status, obesity, family history of DM, and duration of DM. [14]

Similarly, education status and duration of diabetes were among the factors that had significant influence on knowledge in studies from Tanzania by Chiwanga and Njelekela, from India by George et al., and from Saudi Arabia by Al-Asmary et al. [15–17].

In our study, there were no significant differences between patients' foot self-care levels in terms of age, sex, foot infection history, and amputation. Similarly, in a study by Desalu

et al., it was reported that patients with poor education and low socioeconomic status had significantly lower knowledge of foot care, while sex and age were not significantly associated with the knowledge of foot care [18]. Whereas, in a study by Aypak et al., it was shown that the percentage of patients who performed foot care was lower in younger patients in a group of diabetes mellitus patients aged over 65 years. In addition, foot care applications in female patients were found to be lower than male patients, but this difference was not statistically significant [19].

A total of 113 (10.97%) patients had undergone some form of lower extremity amputation. Toe amputations were the most common, with a percentage of 84.96%. In a previous study, Pollock et al., had shown that amputation prevalence was 2.09% (0.5–3.6) among their patients, while Poole and colleagues reported an even lower rate of 1.3% (0.6–2.0) [20,21].

Previous studies have shown that diabetic foot amputations are more common in males [22,23]. There is a relationship between the duration of diabetes and diabetic foot development, and as the duration of diabetes increases, the rate of cases requiring amputation also increases [24,25]. In the current study, we found that patients with a history of amputation were significantly older than those without, and similar to the literature, male sex was more common in the amputation group. Other disease-related factors, foot care knowledge and sociodemographic characteristics, such as disease duration, insulin use, foot examination, footwear choices and living in rural/urban areas, were also associated with amputation. These results may be associated with late diagnosis, inadequate health service and communication problems between healthcare workers and patients. In addition to providing appropriate training to diabetic patients for foot care, additional rules aimed at preventing certain practices should be explained and taught to patients. This is because, in various studies, it was found that diabetic patients used heating methods such as irons, stoves or hot water bags to heat their feet, and they were found to utilize inadvisable tools to cut calluses and dead tissues in their feet. In the literature, it is rather apparent that these practices can cause damage to the feet and could lead to infections and consequent complications. Continued smoking was also quite frequent among diabetic patients in several studies, which also increases the risk for the development of diabetic foot [19,26].

In our study, 228 (21.14%) patients were found to have received training about foot self-care. These patients were educated by nurses (32.46%) and internal medicine specialists (32.02%). Therefore, healthcare providers are crucial in improving the knowledge and practices of patients. In a study from Italy, more than 50% of the patients reported that they did not have their feet examined by their physician and 28% stated that they had not received training for foot self-care. Thus patients' knowledge and practices are strongly related to physicians' attitudes [13,14].

5. Conclusion

Diabetic patients from Turkey generally have poor foot care behavior. We found that knowledge, education status and disease duration significantly influenced patients' practice of

foot care. Consequently, this study shows the importance of increasing the awareness of diabetic patients about proper foot care practice in order to reduce the incidence of complications. This can be achieved through patient training, which can be done by primary care physicians and family physicians, who have better communication with patients. Although our study was conducted based on the results of a survey and did not include direct observation of patients' foot care behaviors, we believe this study is important in terms of demonstrating the importance of foot self-care and shows that patient training is still limited.

Conflict of interest

The authors state that they have no conflict of interest.

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