

Original Article

Foot Self-Care Behaviours and the Level of Perceived Risk of Amputation in Type 2 Diabetes

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Abstract

Background: Diabetic foot which is one of the complications of diabetes may develop in parallel with the frequency of diabetes. **Objective:** To determine the factors affecting foot self-care behaviours and amputation risk perception levels in individuals with type 2 diabetes. **Methods:** The descriptive and correlational study included 157 individuals who had been diagnosed with type 2 diabetes for at least six months and had no previous diabetic foot and previous amputation history. The data were obtained by using patient diagnosis form, Foot Self-care Behaviour Scale and perceived risk of amputation evaluation form. **Results:** The total score of the participants from the Foot Self-Care Behaviour Scale was found to be below the mean value (37.95±8.93). It was determined that individuals, who had the disease for more than ten years and were informed on the disease, foot health and care by physician or nurse, had better foot care behaviours (p<0.05). The average amputation risk perception evaluation score was found to be very low (4.87±10.08) and 61.8% stated that they had no risk for amputation. In addition, no significant difference was found between the glycemic control parameters and the amputation risk perception levels of the individuals (p>0.05). **Conclusion:** It was determined that the individuals did not have good foot self-care behaviours, that disease duration and being informed on foot self-care affected foot self-care behaviours and that their amputation risk perception level was very low.

Keywords: Amputation, diabetic foot, type 2 diabetes, risk perception, self-care

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Introduction

Diabetes is a chronic metabolic disorder requiring constant medical care in which the organism cannot make sufficient use of carbohydrates, fats and proteins due to insulin deficiency or defects in insulin action.¹ According to 2019 data, there are 463 million diabetics around the world between the ages of 20-79 and it is predicted that this number will increase to 700 million in 2045. It is also estimated that about half (49.7%) of all people living with diabetes are undiagnosed.^{2,3} In Turkey, it is stated that the prevalence of diabetes ranges between

17.3 and 12.3%.⁴ Increasing in parallel with the incidence of diabetes, diabetic foot, as one of the leading complications of diabetes, is characterized by peripheral neuropathy, by peripheral vascular disease that leads to the loss of protective sensation as a result of long-term high blood glucose levels, or by the combination of both that results in deterioration of skin functions.⁵⁻⁷ It is a clinical condition that can cause ulceration in further stages. Diabetic foot development in diabetic individuals not only prolongs hospitalization and recovery process, but also causes high rate lower extremity amputations, an important increase

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in treatment cost, deterioration in quality of life and an increase in mortality rate.^{1,5-12} Moreover, diabetic foot may have negative effects on daily activities of the individuals and cause difficulties in work environment due to walking problems, loss of labour force, restriction in social activities and psychosocial trauma.¹³ Despite the treatment methods and educational programs developed in the literature, it is reported that approximately 15-25% of all diabetic individuals have a risk of developing diabetic foot during their lifetime^{5,9-11} and 60-70% of the individuals with diabetic foot are exposed to lower extremity amputation;¹⁴ an amputation due to a diabetic foot complication is performed in the world every 30 seconds¹⁵ and the risk of death increases approximately 2.5 times in people with diabetes who have new ulcer in the foot.¹

The presence of peripheral vascular disease, peripheral neuropathy, previous ulceration, long duration of diabetes, poor glycaemic control, fungal infections of the foot and the inability to self-examine the feet are among the important risk factors in diabetic foot development.¹⁶ The essential purpose of the prevention of diabetic foot development is to provide primary protection. For this, it is necessary to identify individuals under risk, to teach how to examine the foot from the moment the patient is diagnosed, and to develop and evaluate preventive health behaviours.¹⁵ In addition to regular diabetic foot risk assessment performed with patient and healthcare worker training; diabetic foot problems and amputations can be significantly reduced and prevented by applying protective foot self-care behaviours such as daily self-examination and protection of the feet from injuries.^{5-7,9,10,17,18} However, in literature, it is observed that the behaviours of diabetic individuals regarding foot self-care are insufficient.^{14,15,19} In order to prevent the development of diabetic foot, which is a preventable complication, the nurse has an important role in helping patients gain preventive foot self-care behaviours through regular monitoring and training as from the diagnosis of diabetes.²⁰

Risk perception is important in preventing the development of complications in people with diabetes.^{21,22} In literature, risk perception is defined as the subjective judgement that people make about the characteristics and severity of a risk.²³ High level and accurate risk perception can affect individuals' willingness to take protective

behaviours,²⁴ and promote a healthy lifestyle such as healthy nutrition and adequate physical activity.²⁵ Motivation in foot self-care behaviour in individuals with diabetes can also be affected by risk perception.²⁶ In this context, it is necessary to measure the perceived risk in order to detect false perceptions that will adversely affect treatment or self-care practices.^{6,27}

When the literature is examined, it is seen that in Turkey, there are studies to determine the general situation related to diabetic foot care,^{11,12,15,28} but there are limited number of studies searching the risk perception of individuals towards diabetic foot development. Evaluation of foot self-care behaviours and perceived risk of amputation in diabetic individuals will contribute significantly to creating awareness about diabetic foot and to guide health professionals in preventing it.

Methods

This descriptive research carried out to determine foot self-care behaviours, affecting factors, and the level of perceived risk of amputation in type 2 diabetes. The population of the study consisted of patients diagnosed with type 2 diabetes who applied to Toyotasa Emergency Hospital Diabetes Polyclinic in Turkey between February and May of 2019. In this regard, 157 individuals diagnosed with type 2 diabetes for at least 6 months who were 18 or older, had no diabetic foot development, had no previous diabetic foot history, did not have an amputation due to diabetes, did not have a verbal communication barrier and agreed to participate in the research were included in the study. The data were obtained by using patient diagnosis form, Foot Self-care Behaviour Scale and perceived risk of amputation evaluation form. Patient diagnosis form consists of three sections. In the first part of the form, there are 10 questions that assess the socio-demographic characteristics of individuals and the habit of smoking and drinking alcohol. In the second part of the form, there are 12 statements including individuals' disease information. The third part of the form consists of two questions that assess individuals' glycaemic indicators. The glycaemic control parameters of the individuals were obtained from the laboratory results requested by the physician during the application to the outpatient clinic.

Foot Self-Care Behaviour Scale was first created by Borges as Foot Care Observation Guide in 2007 in order to improve foot self-care behaviours

in diabetes.²⁹ The validity and reliability study of the Turkish version of the scale was conducted by Biçer and Enç.³⁰ The 5-point Likert scale is scored according to the agree-disagree status and consists of 15 items. The lowest score that can be obtained from the scale evaluating foot self-care behaviour as a single dimension is 15 while the highest score is 75. The increase in the scale score indicates that the individual's foot self-care behaviours are better.³⁰ In the study, Cronbach's alpha of the scale was found as 0.83.

Perceived risk of amputation evaluation form consists of two items. The first item assesses individuals' risk of diabetes-related amputation. The evaluation was made with Visual Analogue Scale and it ranges between "0 = No risk" and "100 = Very high risk". Individuals were asked to mark in the 0-100 range for the perceived risk of amputation. The second question of the form assesses the level of fear individuals experience against diabetes-related amputation risk. Before collecting the data, the form was evaluated for clarity by three faculty members including a diabetes specialist and two nurses. After the arrangement of the form in line with expert opinions, a pilot study was conducted with 20 diabetes patient. As a result of this study, the data collection tool was given its final form in line with the feedback received and evaluated for clarity.

The data are interpreted in SPSS 22.0 package program. Socio-demographic and disease-related characteristics of individuals with diabetes and Foot Self-care Behaviour Scale mean score were assessed with percentage and average test; the relationship between socio-demographic and disease characteristics and Foot Self-care Behaviour Scale mean score was determined by student's t-test, one-way ANOVA, Mann-Whitney U test and Kruskal-Wallis H test; the relationship between HbA_{1c} and levels of perceived risk of amputation was evaluated by chi square test. In statistical evaluation, significance was accepted as $P < 0.05$.

Results

The mean age of the individuals included in the study was 59.06 ± 9.11 years (min = 37, max = 77), 64.3% were women, 82.2% were married and 65.6% were primary school graduates. 80.3% of the participants did not have an occupation and 85.4% considered their economic status as at medium level. 11.5% of the participants of whom

almost all benefit from social security (98.7%), lived alone, 19.7% were still smoking and 1.2% used alcohol. Disease-related characteristics of individuals are presented in Table 1.

It was determined that only 8.9% of individuals with type 2 diabetes received training on foot health and care from a physician or nurse, 93.6% applied to the physician for a foot ulcer and 6.4% self-managed the wound.

It was stated that the fasting blood glucose and HbA_{1c} values of individuals with type 2 diabetes were above the target value (80-130 mg/dl and HbA_{1c} <7%) accepted by the International Diabetes Consensus Group (3); especially 64.8% of them were found to be under risk in terms of developing complications related to diabetes (Table 2).

When the distribution of the Foot Self-care Behaviour Scale score averages of individuals with type 2 diabetes were examined, it was determined that the mean score was 37.95 ± 8.93 . In addition, individuals had the highest mean score (3.69 ± 0.85) for the expression "I wear socks that are not too tight or not too wide but fit my feet," yet the lowest mean score for the expression "I do not use sharp tools (razor, scissors etc.) for foot care" (1.42 ± 0.93) (Table 3).

When some sociodemographic and disease characteristics of the individuals and the Foot Self-care Behaviour Scale mean score were compared in the study, it was identified that there was no statistically significant difference between age, gender, education, employment status, presence of other chronic diseases and foot self-care behaviour level ($p > 0.05$). However, in the study, it was found that individuals with a disease duration of more than 10 years and those who received information about the disease, foot health and care from a physician or a nurse, had better foot self-care behaviours ($p < 0.05$) (Table 4).

It was found that diabetic individuals' risk assessment mean score for amputation was quite low (4.87 ± 10.08). Although 61.8% of the individuals stated that they did not have any risk of amputation, 45.2% of them were found to have a moderate level of fear and 19.1% had a high level of fear of amputation (Table 5).

When the glycaemic control parameters and the levels of perceived risk of amputation of individuals with type 2 diabetes were compared

in the study, no statistically significant difference was obtained ($p>0.05$) (Table 6).

Table 1. Disease-related characteristics of individuals with diabetes

Characteristics	n	%
Disease duration (year) (M±SD)	8.40±7.17 (min=1, max=35)	
Type of the treatment		
Oral antidiabetic therapy	95	60.5
Oral antidiabetic and insulin therapy	48	30.6
Insulin therapy	14	8.9
Regular use of medications		
Yes	42	26.8
Partially	90	57.3
No	25	15.9
Following the diet		
Yes	12	7.6
Partially	61	38.9
No	84	53.5
Regular exercise (walking etc. for at least 20 minutes every day)		
Yes	10	6.4
Partially	32	20.4
No	115	73.2
Presence of diabetes-related chronic complications		
*Yes	108	68.7
Retinopathy	14	8.9
Nephropathy	10	6.4
Neuropathy	97	61.8
Hypertension	84	53.5
No	49	31.3
The frequency of hospitalization due to diabetes or its complications in the past year		
Never	126	80.3
Once	26	16.6
Two or three times	5	3.1
Education received from a physician or a nurse about the disease		
Yes	39	24.8
No	118	75.2
Education received about foot health		
Yes	14	8.9
No	143	91.1
Presence of other chronic diseases		
Yes	98	62.4
No	59	37.6
General health assessment		
Good	46	29.3
Average	92	58.6
Bad	19	12.1

*The number n varies.

Table 2. Distribution of glycaemic control parameters of individuals with type 2 diabetes

Glycaemic Control Parameters	Min-Max	M ± SD	n	%
Fasting blood glucose (mg/dl)	89-564	200.71±81.88		
HbA _{1c}	5.20-15.90	9.14±2.43		
≤7			35	22.3
7-9			48	30.6
>9			74	47.1

Table 3. Distribution of Foot Self-care Behaviour Scale mean score of individuals with type 2 diabetes

Foot Self-care Behaviour Scale	M±SD
1. I check the temperature of the water I wash my foot.	1.66±1.05
2. I dry between my toes after washing my foot.	1.90±1.35
3. I use moisturizing cream for my feet.	1.80±0.98
4. I do not apply cream between the toes.	1.43±0.96
5. I cut my toenails straight.	2.32±1.44
6. I check my nails for thickening, ingrown toenail and length.	2.81±1.04
7. I check if there are peeling, fungus and claw toes due to the moist between the fingers.	2.59±0.97
8. I check under my feet for calluses, redness, blister or open wounds.	2.57±1.02
9. I check the inside of the shoes for foreign objects such as nails, dust, stones.	2.73±1.46
10. I don't walk anywhere barefoot (for example: at home, on the street, at the beach).	2.59±1.10
11. I wear shoes that fully grasp my feet, suitable for width, length and height.	3.37±1.00
12. I wear soft leather shoes with smooth inner surface.	3.31±1.00
13. I wear clean, cotton and soft socks.	3.68±0.84
14. I wear socks that are not too tight or not too wide but fit my feet.	3.69±0.85
15. I do not use sharp tools for foot care (razor, scissors etc.).	1.42±0.93
Total Score	37.95±8.93

Table 4. The comparison of some sociodemographic and disease characteristics of the individuals with type 2 diabetes and Foot Self-Care Behaviour Scale Mean Score

Characteristics	n	%	Foot Self-Care Behaviour Scale	Test, significance
Age				
36-64 years	107	68.2	38.30±9.43	t=0.723
65 years and above	50	50	37.20±7.76	p=0.470
Gender				
Female	101	64.3	38.45±9.07	t=0.942
Male	56	35.7	37.05±8.67	=0.348
Education				
Illiterate	15	9.6	39.26±7.06	KW=4.926 p=0.085
Elementary	103	65.6	36.93±8.56	
Secondary and Higher	39	24.8	40.15±10.10	
Employment status				
Works	31	19.7	36.93±7.99	t=-0.709
Does not work	126	80.3	38.20±9.15	p=0.480
Presence of other chronic diseases				
Yes	98	62.4	37.34±8.64	t=-1.101
No	59	37.6	38.96±9.37	p=0.273
Disease duration				
6 months- 5 years	70	44.6	36.75±7.59	F=6.042 p=0.003**
6-10 years	44	28.0	36.06±7.41	
11 years and above	43	27.4	41.83±11.11	
Education received from a physician or a nurse about the disease				
Yes	39	24.8	42.58±10.84	t=3.905
No	118	75.2	36.42±7.65	p=0.000**
Training received from a physician or a nurse on foot health and care				
Yes	14	8.9	43.85±11.75	Z=-2.040
No	143	91.1	37.37±8.43	p=0.049*

*p<0.05; **p<0.01

Table 5. Distribution of the level of perceived risk of amputation in individuals with type 2 diabetes

Parameters	n	%	Min-Max	M ± SD
Level of perceived risk of amputation			0-95	4.87±10.08
No risk (0 points)	97	61.8		
Risk at 1-10 points level	44	28.0		
Risk at 11-95 points level	16	10.2		
Level of fear of amputation				
I am not afraid	3	1.9		
I am slightly afraid	53	33.8		
I am moderately afraid	71	45.2		
I am extremely afraid	30	19.1		

Table 6. The relationship between the glycaemic control parameters and levels of perceived risk of amputation of individuals with type 2 diabetes

HbA _{1c} value	Level of Perceived Risk of Amputation			Test, Significance
	0 points n (97)	1-10 points n (44)	11-95 points n (16)	
≤%7	26 (74.3)	7 (20.0)	2 (5.7)	X ² =3.502 p=0.478
%7.1-9	29 (60.4)	8 (10.8)	6 (12.5)	
>%9	42 (56.8)	24 (32.4)	8 (10.8)	

Discussion

Due to the increase in the number of individuals with diabetes, studies on preventing and reducing other complications, especially diabetic foot, are gaining importance. The findings of the study conducted to determine the foot self-care behaviours, the factors affecting these behaviours and the level of perceived risk of amputation in individuals with type 2 diabetes, were compared and discussed in line with the literature.

As with other diabetic complications, it is very important to maintain glycaemic control in the prevention of diabetic foot, that is, to keep the HbA_{1c} value at the desired level. Because, with strict glycaemic control (HbA_{1c} <7%), the risk of amputation can be reduced by 35%.³ In the study, it was determined that the HbA_{1c} values of individuals were above the target value and approximately two-thirds of them were under risk in terms of developing complications related to diabetes. In other studies examining foot self-care behaviours in individuals with diabetes, the rate of individuals whose HbA_{1c} value was above the target value was found to be 47.3-100%.^{5,10,11} In a comparative study carried out with amputated and non-amputated individuals, the HbA_{1c} value of the amputated individuals was found to be significantly higher.³¹ The study finding shows that individuals with diabetes do not have good glycaemic control and it draw attention to the risk of amputation increasing along with poor glycaemic control.

Patient education, which is an important element of effective diabetes management in diabetic individuals, provides a significant improvement in knowledge, skills and self-care behaviours. Foot self-care training is also part of general diabetes management.³² In the study, it was determined that only 8.9% of the individuals received training on foot health and care from a physician or a nurse. In other studies, the rate of diabetic individuals who

received training on foot health and care was found to be quite low (8.5-18.4%).^{12,15} The findings of the study suggest that the educational step towards preventing diabetic foot development may have been omitted or may have been underestimated by the sick individual.

Poor foot self-care practices in individuals with diabetes are the most important risk factor for diabetic foot development.¹⁰ In the study, it was clear that the total score of the individuals obtained from the Foot Self-care Behaviour Scale was lower than the average value, and the individuals' foot self-care behaviours were not good. Although the study finding is lower than the work of Biçer and Enç (51.67±10.51),²⁰ it is in parallel with other studies.¹⁴ In other studies, it was found that only 6-17% of the individuals have good foot self-care behaviours.^{8,10,15,17,19} In studies conducted in South India and Malaysia, it was stated that more than one third of the participants had good foot self-care behaviours.^{18,33}

Foot self-care behaviours, including daily foot examination, observation of the changes in skin integrity, hygiene and appropriate footwear selection, help minimize foot complications.^{28,34} In the study, it was determined that individuals mostly comply with the behaviour of wearing socks that are not too tight or not too wide but fit the feet, and they comply with the behaviour of not using sharp tools for foot care least. In addition, individuals' control level of under feet in terms of calluses, redness, blister or open wounds was found to be moderate. The findings of the study are in line with the literature.^{11,12,28} In the study of Lamchahab et al, it was found that 29% of individuals use sharp tools while cutting the toenail, 50% never dry their feet, 58% wear tight socks and 35.5% wear unsuitable shoes.³⁵ Khamseh et al, stated that culture plays an important role in complying with foot care advice, and in this study, it was determined that Muslim individuals do not control

their feet carefully although they wash their feet on average three to five times a day.³⁶ In a study conducted in Pakistan, individuals' foot self-care behaviour was found to be quite low; the rate of those who dried their feet after washing was 28%, the rate of those wearing suitable shoes was 21.3% and the rate of those who examined their feet once a day was 35.3%.¹⁷ The study finding shows that individuals need training in foot self-care. However, we know that one of the steps of diabetes education is foot health. Nevertheless, the lack of foot self-care behaviours at the desired level supports the fact that there is not enough attitude towards this direction. For this reason, it is recommended to try new training methods to develop attitudes towards foot self-care and turn them into behaviours.

In the study it was found that individuals with a disease duration of more than 10 years and those who received information about the disease, foot health and care from a physician or a nurse, were better in foot self-care behaviours; however, it was determined that age, gender, education, employment status and presence of other chronic diseases did not affect foot self-care behaviour. In some studies, it was found that sociodemographic characteristics were not related to foot self-care behaviours.^{12,17-19} However, in similar studies it was identified that, individuals under the age of 60,¹⁰ individuals with higher education,^{8,10,15,19,35,36} individuals with diabetes duration of 1-5 years and 16 years and more,¹⁵ and individuals who received information about diabetic foot care from healthcare professionals previously had better foot self-care behaviours.^{8,15,17,19,33} It can be stated that individuals become more sensitive to the disease and preventive measures as the duration of the disease increases.

It is important to evaluate risk perceptions and correct biased information in order to encourage individuals with diabetes to adapt to the treatment and diabetes-related self-care behaviours.³⁷ In the study, it was determined that individuals' risk assessment means score for amputation was quite low, about two-thirds stated that they did not have any risk of amputation. In a study conducted with African Americans, it was found that the perceived risk of amputation in 12.6% of individuals with type 2 diabetes was high while 40.5% stated that they did not consider themselves under risk, and overall risk perception towards amputation was low.³⁸ In a qualitative study, it was reported that the

participants' risk perceptions of diabetic foot were quite low and they considered diabetic foot ulcers as a normal wound.²⁷ In another qualitative study, it was found that lower extremity amputation was more common in individuals with diabetes, but it was perceived as mainly caused by poor blood circulation in the feet and not related to foot ulcer.⁶ In a qualitative study with diabetic individuals who had no amputation but had lower extremity injuries, it was found that individuals responded to the question assessing their feelings about amputation by using the terms anxiety, fear, and end of the world.³⁹ The study finding shows that, despite the high glycaemic parameters in terms of diabetic foot and thus the risk of developing amputation, awareness among individuals is low.

It has long been argued that diabetic foot development can be prevented by providing foot care with the education of the diabetic individual, determining risk factors for diabetic foot, taking necessary measures and ensuring glycaemic control.¹¹ In a study, 79.3% of the participants stated that it is important to receive antidiabetic therapy to prevent foot complications.¹⁷ In the current study, no difference was found between the glycaemic control parameters and levels of perceived risk of amputation of individuals. It is thought that this situation may be due to the insufficient awareness of patients about the effects of glycaemic control on complications, especially on amputation.

Naturally, our study had some limitations. Since the research was conducted with diabetic individuals who applied to a single hospital in a certain time period and who agreed to participate in the study, it is an important limitation of the research that its results can be generalized to its own universe. Information about foot self-care behaviours and perceived risk of amputation is based on self-report of individuals. Besides, neurological examination of the foot was not performed in the study.

Conclusion

In line with the findings obtained in the study, it was determined that the individuals with type 2 diabetes did not have good foot care behaviours, the duration of the disease and the information obtained about foot care affects the foot self-care behaviour, and the perceived risk of amputation were quite low. In this context, beginning from the diagnosis of the especially health professionals providing home care services and diabetes

nurses, it is recommended to provide information about foot self-care behaviours in addition to the disease information, to raise awareness about the amputation that may occur as a result of insufficient foot self-care behaviours, to ensure the regular participation of the individuals in health checks and to evaluate their compliance with foot self-care behaviours, to provide visual training materials and reminder information to individuals with low level of education, to repeat foot care training regularly and to conduct studies examining the reasons why individuals with diabetes do not apply foot self-care behaviours.

Conflict of interest: None declared.

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