

Knowledge and Practice of Foot Care Among Diabetic Patients Attending Diabetic Care Center in Jeddah City

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ABSTRACT

Background: The feet of diabetic patients are at high risk of damage and infection due to poor blood supply and peripheral neuropathy. Nerve damage and reduced blood supply are being more likely to cause poor healing of the wounds which may lead to foot ulcers or gangrene, structural foot problems and reduced feeling in the feet. Foot care was recognized as the utmost important factor among diabetic patients. **Objective:** The objective of this study was to provide a realistic view of the knowledge level and daily practice among diabetic patients towards foot care, in Saudi Arabia. **Methods:** The present research is a cross-sectional descriptive study that was conducted at the Diabetic Care Center in Jeddah city in June 2014, among 308 diabetic patients. A pre-tested, structured questionnaire was used to interview the diabetic patients. The outcome variables were knowledge and practice regarding foot care. The knowledge and practice scores were classified as good if score $\geq 70\%$, satisfactory if within the range 50–69% and poor if the score was $< 50\%$. **Results:** Among the 308 diabetic patients, 38% had good knowledge about diabetic foot care, and 22% were found to be following good diabetic foot care practice. About knowledge, 85.4% of the patients were unaware of appropriate temperature to wash their feet, and 60.1% of the respondents were unaware of how often diabetic patients should inspect their feet. Further, about foot practice, 83.1% of diabetic patients did not receive any advice when they bought footwear, and 76.9% did not get appropriate size footwear. Finally, knowledge and practice of foot care about the degree of education and socioeconomic level revealed no significant difference. **Conclusion:** This study highlighted the gaps in knowledge of diabetic patients and their daily practice. Thus, there is a need to enhance patients' knowledge with a regular assessment to enforce healthy practice in foot care and to reduce diabetic foot ulcer and amputations.

KEYWORDS Diabetic foot, foot ulcer, diabetic care, knowledge, practice, Kingdom of Saudi Arabia, Jeddah

Introduction

Diabetes mellitus (DM) is one of the common chronic health problems affecting Saudi adults. The prevalence of DM in Saudi

Arabia in the last ten years has increased from 5% to 23.7% [1]. It is a metabolic disease characterized by hyperglycemia due to defects in insulin action, insulin secretion, or both. The chronic hyperglycemia in diabetes leads to dysfunction and damage in many organs mainly heart, eyes, nerves, kidneys and blood vessels [2]. The feet of diabetic patients are at high risk of damage and infection due to poor blood supply and peripheral neuropathy. Nerve damage and reduced blood supply are being more likely to cause poor healing of the wounds which may lead to foot ulcers or gangrene, structural foot problems and reduced feeling in the feet. Foot care was recognized as the utmost important factor among diabetic patients. Diabetic foot (DMF) is the "different degrees of neurological and vascular defects affecting

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the foot and lead to destruction, ulceration and infection towards deep foot tissue". DMF is one of the severe complications of DM and associated with high cost, mortality and morbidity. In general, 10-15% of diabetic patients are affected by DMF [1]. One of the common outcomes of diabetic foot complications is lower extremity amputation and subsequent physical and emotional problems. Diabetic patients are 10–15 times more likely to require lower extremity amputation than non-diabetic, with a 30% – 50% higher risk of undergoing a second amputation.

Furthermore, 6% is the mortality rate in patients with amputation. The cost of amputation is estimated to be around USD 40,000 to USD 75,000 per patient, which is expensive for the health care system and costly for the patients [3]. Risk factors that lead to the diabetic foot are old age, peripheral vasculopathy, poor knowledge of diabetic patients, poor metabolic control, foot deformities and long duration of diabetes [1]. To prevent complications and surgeries in the diabetic foot, and ultimately the high cost of the treatment intensive management and foot care education are helpful strategies [4]. Foot-specific patient education is considered as an essential part of the diabetic foot program in the health care system, though, it must be individualized due to cognitive dysfunction in individuals with long term diabetes. There are many diabetes-related pathologies among neuropathic patients that can be easily prevented. However, this requires appropriate knowledge and proper understanding [5].

Overall, neuropathy (nerve damage) is one of the big challenges among diabetic patients. Uncontrolled hyperglycemia might cause damage to the walls of the capillaries that supply blood to your nerves, particularly in legs. The nerve damage may result in numbness, tingling, pain or burning that typically instigates at the tips of the toes or fingers.

This reason makes it imperative to find the level of knowledge and practice about foot care among diabetic patients. The present study addressed the level of knowledge and practice with regard to foot care among diabetic patients and tried to find whether there are any gaps in knowledge of diabetic patients and their daily practice.

Material and Methods

Study design and settings:

The present study is cross-sectional and descriptive in nature. It was conducted at the Diabetic Care Center under the Ministry of Health, Saudi Arab, in Jeddah city. The study period of the complete study is 16 weeks.

Inclusion and exclusion criteria:

Diabetic patients attending Diabetic Care Center of the Ministry of Health in Jeddah city, during the data collection period (June 2014) who were diagnosed with Type I and Type II diabetes for at least six months and who had never developed foot ulcer were included in the study. While diabetes patients with gestational diabetes and other types of diabetes excluded from the study.

Sample size

The population size of all diabetic patients attending the Diabetic Care Center in 2014 was 24000, as per the registration department of the centre. The sample size was calculated by taking into accounts the finding of Al-Wahbi's study which puts the prevalence rate of diabetic foot disease in the Arab world in 2006 to be around 10-15% [6]. Finally, after keeping the confidence level at 95% and the margin of error to 5%, the sample size was estimated to be 308.

Sampling Technique:

The targeted population was the diabetic patients at Diabetic Care Center in Jeddah city. The participants were recruited using a convenience sampling technique in the waiting area for the patients from 8 a.m. to 12 p.m. daily until the desired sample size reached. This was done within the fieldwork period.

Data collection tool:

We used a pre-tested, structured questionnaire recommended by the American College of Foot and Ankle Surgeons and the Diabetes UK and has been used previously in a similar study [7]. The questionnaire consisted of mainly three parts: socio-demographic data, questions about knowledge of foot care, and questions about the practice of foot care. The questionnaire was further modified according to the results of the pilot study. The period of data collection was six weeks.

Scoring assessment:

The responses to questions on knowledge of, the practice of, and barriers to foot care were analyzed, and the knowledge and the current practice score of each respondent were determined. Further, their knowledge and practices score were classified as good, satisfactory and poor depending upon the score. If the score was greater than 70% (8-11) it was regarded as good if the score was in the range 50-69% (6-7) it was regarded as satisfactory and if the score was less than 50% (<6) it was regarded as poor.

Data collection technique:

The researcher interviewed each patient based on a questionnaire and documented the result. This was done in the working hours; care was taken to not disturb the researcher and patients. The researcher clarified any issue not understood by the patients. The whole interview was completed in one month. The data were verified by hand then coded and entered into a personal computer.

Data entry and analysis:

All data were entered into the computer and analyzed by statistical software SPSS version 19. Continuous variables were presented as mean and standard deviation (SD); categorical variables were presented as frequency and percentage. Chi-square test was used to compare two or more qualitative variables, Student's t-test to compare two independent quantitative variables, and ANOVA test to compare more than two independent quantitative variables. Significance was determined at p-value less than 0.05 ($p < 0.05$) and confidence interval of (95% CI). Other appropriate statistical tests were used as indicated; this was done with the assistance of a statistical advisor.

Pilot study:

A pilot study was conducted to test the validity of the questionnaire in Diabetic Care Center with ten patients, and the questionnaire was modified according to the pilot results.

Ethical considerations:

The present study collected information on diabetic foot care knowledge and daily practice. All demographic information was confidential, and no individual identity was disclosed. Informed consent was obtained beforehand by way of written consent form on the front page of the questionnaire mentioning that answering the questionnaire means the agreement of participation in the study. Further, participants were assured that

Table (1). Demographic characteristics of patients.

Variables	N (%)
<i>Sample size with age range</i>	
Data	308
Age range	(12-80) years
Mean ± SD	52.74±14.81
Gender	
Male	206 (66.9)
Female	102 (33.1)
Education	
None	59 (19.2)
High school degree and below	177 (57.5)
Bachelor degree and above	72 (23.4)
Income	
< 5000 S.R.	165 (53.6)
5000-10000 S.R	54 (17.5)
> 10000 S.R.	89 (28.9)
DM type	
Type I	39 (12.7)
Type II	269 (87.3)

individual identity would stay anonymous, and all information and aggregated data would be kept confidential and would not be accessed except for scientific research. Written permission from the Joint Program of Family & Community Medicine was obtained before conducting the research. Written permission from the concerned authority in the Ministry of Health and Diabetic Care Center was obtained too.

Results

Demographic characteristics:

The demographic characteristics of patients involved in the study are shown in Table 1. The total number of patients participating in the study is 308 with a response rate of 81%. Among all patients 206 (66.9%) were males, and 102 (33.1%) were females. The mean age of the respondents was 52.74±14.81 that ranges between 12 to 80 years. More than half of the study population had a high school degree or lower educational qualification. On the other hand, 20% of the study sample was illiterate. More than half the study population had income 5000 S.R (Saudi Riyals) or below. Most of the patients (87.3%) had Type II diabetes mellitus.

Knowledge of foot care:

The mean knowledge score was 6.29±2.11 for males and 7.86±1.81 for females. More than 75% of the studied sample had correct knowledge regarding the following points: diabetic patients should take medications regularly because they are liable to get diabetes mellitus complication, diabetic patients should look after their feet because they may not feel a minor injury to their feet, diabetic patients should look after their feet because wounds and infection may not heal quickly, diabetic patients should look after their feet because they may get a foot ulcer, and diabetic patients should wash their feet regularly. In contrast, more than 50% of the studied sample had incorrect knowledge regarding following points of care: how often they should inspect their feet, first thing to do if there is redness/bleeding, first thing to do if there is hard skin/corn, temperature of water feet should be washed with and how often the patient should inspect

the inside of their footwear for objects or torn lining. The distribution of the response to questions related to the knowledge of foot care is shown in table (2).

Finally, after classifying the knowledge score of the study participants, 115 (38%) had good knowledge of diabetic foot care (score ≥70%), 112 (36%) had satisfactory score (score 50–69%), and 81 (26%) had a poor knowledge of diabetic foot care (score <50).

The practice of foot care:

The mean practice score was 4.97±1.49 for males and 7.56±1.90 for females. About (70%) of the studied sample had correct practice in the following points: wash feet regularly, never walk on barefoot, never cleaning nails with sharp instruments and not adding irritants to water before cleaning feet. On the other hand, the studied sample had incorrect practice in the following points: inspect feet regularly, wash feet with warm water, trim toenails straight across, measured feet size when last time bought footwear, received advice when last time bought footwear, ever inspected inside of the footwear, wear elasticated hosiery. The distribution of the response to questions related to the practice of foot care is shown in table (3). Finally, after classifying the practice score of the study participants, only 68 (22%) had good practice of diabetic foot care (score ≥70%), 86 (28%) had satisfactory score (50-69%), and 154 (50%) had a poor practice of diabetic foot care (score <50).

Association of demographic factors with the knowledge and practice of foot care:

Knowledge and practice of foot care were significantly higher in female than male gender as shown in table (4). We found no significant difference between Type I DM and Type II DM patients regarding knowledge and practices of foot care. Knowledge and practice of foot care according to the type of DM between the studied groups are shown in table (4). Knowledge and practice of foot care about the degree of education reveal no significant difference even between illiterate patients and patients with a bachelor degree as shown in table (4). Further, knowledge and practice of foot care according to income level showed no

Table (2). Knowledge of foot care among diabetic patients.

Questions	Correct N (%)	Wrong/I don't know N (%)
DM patients should take medication regularly because they are liable to get DM complication	304 (98.7)	4 (1.3)
DM patients may not feel a minor injury to their feet	256 (83.1)	52 (16.9)
In DM patients, wounds and infection may not heal quickly	275 (89.3)	33 (10.7)
DM patients should look after their feet because they may get a foot ulcer	240 (77.9)	68 (22.1)
In DM patients, smoking causes poor circulation affecting the feet	173 (56.2)	135 (43.8)
How often DM patients should inspect their feet	123 (39.9)	185 (60.1)
The first thing to do if DM patients had redness/bleeding	134 (43.5)	174 (56.5)
What DM patients should do if they had a corn/ hard skin lesion	133 (43.2)	175 (56.8)
How often DM patients' feet should be washed	302 (98)	6 (2)
The temperature of water feet should be washed with	45 (14.6)	263 (85.4)
How often the DM patient should inspect the inside footwear for objects or torn lining	125 (40.6)	183 (59.4)

Table (3). The practice of foot care among diabetic patients.

Questions	Yes N (%)	No/I don't know N (%)
Inspect feet regularly	165 (53.6)	143 (46.4)
Wash feet regularly	301 (97.7)	7 (2.3)
Wash feet with warm water	85 (27.6)	223 (72.4)
Trim toenails straight across	122 (39.6)	186 (60.4)
Measured your feet size when last time you bought footwear	71 (23.1)	237 (76.9)
Received advice when last time you bought footwear	52 (16.9)	256 (83.1)
Ever inspected inside of the footwear	105 (34.1)	203 (65.9)
Walk regularly barefoot	81 (26.3)	227 (73.7)
Clean nails with sharp instrument	12 (3.9)	296 (96.1)
Add irritants to water before feet cleaning	50 (16.2)	258 (83.8)
Wear elasticated hosiery	103 (33.4)	205 (66.6)

Table (4). Comparison and significance of different variables for knowledge and practice of foot care

Variables	Knowledge of foot care		Practice of foot care	
	mean ± SD	p-value	mean ± SD	p-value
Gender				
Male	6.29±2.11	0.000*	4.97±1.49	0.000*
Female	7.86±1.81		7.56±1.90	
DM type				
Type I	6.74±2.33	0.825	6.41±2.08	0.060
Type II	6.82±2.12		5.75±2.02	
Education				
None	7.10±2.22	0.468	6.50±2.05	0.014*
High school degree and below	6.70±2.17		5.73±1.99	
Bachelor degree and above	6.84±1.9		5.52±2.06	
Income				
< 5000	7.02±2.16	0.157	6.20±2.07	0.000*
5000-10000	6.70±2.15		5.88±2.01	
> 10000	6.49±2.07		5.12±1.82	

*Statistically significant (p < 0.05)

significant difference. The related data is shown in table (4).

Discussion

This research revealed that the studied sample was knowledgeable about the following points : diabetic patients should take medications regularly because they are liable to get diabetes mellitus complication , diabetic patients should look after their feet because they may not feel a minor injury to their feet, diabetic patients should look after their feet because wounds and infection may not heal quickly, diabetic patients should look after their feet because they may have foot ulcer, and diabetic patients should wash their feet regularly. We assume this result due to advice from physicians and diabetic educators in the diabetic centre, Islamic custom of washing feet before praying and health education through television, radio and internet. Whereas, the study of Saurabh et al. showed that half of the patients were aware that diabetes could cause reduced foot sensation leading to ulcers [8]. Most of our patients were aware that diabetic feet could be prevented by diet, exercise and regular medication. Around two-thirds of the patients were aware that diabetes could affect the various organs of the body [8]. In Al-Khalidi et al. study, 57% of patients knew that DM hurt the foot [1]. Also, in the present study about half of the studied population was unaware or ignorant about the following points: how often they should inspect their feet, first thing to do if there is redness/bleeding, first thing to do if there is hard skin/corn, temperature of water to wash feet and inspection of the inside of their footwear for objects or torn lining. We assume this result due to superficial knowledge of foot care. On the other hand, in Desalu et al. research the diabetic patients were unaware that smoking causes poor circulation of the feet, the first thing to do when they found redness/bleeding between their toes and found a corn/ hard skin lesion, and were unaware of the importance of inspecting the inside of the footwear for objects or torn lining [7].

In this research, about two third of the studied sample had correct practice in the following points of care: wash feet regularly, never walk barefoot, never clean toenails with sharp instruments and not adding irritants to water before washing

of the feet. Identically, in Al-Khalidi et al. study there was good foot hygiene in 98% of the people with diabetes [1]. This good finding was the result of washing of the feet daily before prayer (i.e. wudu). Healthy toenail trimming was practised by 80% of the patients [1]. Also, In the study of Saurabh et al. it was found that most of the studied population use footwear outdoors, they reported that their footwear was fitting properly, they change their footwear whenever it gets damaged, washing and drying of feet and healthy nail trimming using a curved nail clipper [8].

On the other hand, this studied sample showed wrong practice in the following points of foot care: inspection of feet regularly, washing feet with warm water, trimming nail straight across, measurement of feet size when last bought footwear, receiving advice when last bought feet wear, inspection of the footwear and wearing elastic hosiery. Similarly, Desalu et al. showed that half of the respondents did not regularly inspect their feet, regularly wash their feet with warm water and inspect the inside of their footwear [7]. Comparable with Al-Khalidi et al. study, about half the diabetics (47%) did not check on their feet at all, and less than one fifth (19%) checked their feet daily, 18% walked barefoot [1].

In Desalu et al. study, the survey instrument used was a pre-tested, structured questionnaire prepared from the recommendation of the American College of Foot and Ankle Surgeons and the Diabetes UK. In the study of Qadi and Alzahrani, their result showed that 106 (30.1%) had good knowledge of diabetic foot care (with score $\geq 70\%$), 84 (23.9%) had satisfactory score (50-69%), and 162 (46.0%) had a poor knowledge of diabetic foot care (with score <50) [9]. Meanwhile, in the present study 115 (38%) had good knowledge of diabetic foot care (with score $\geq 70\%$), 112 (36%) had a satisfactory score (50-69%), and 81 (26%) had poor knowledge of diabetic foot care (with score <50).

Additionally, with regard to the practice score of the participants, only 68 (22%) had good practice of diabetic foot care (score $\geq 70\%$), 86 (28%) had satisfactory score (50-69%) and 154 (50%) had a poor practice of diabetic foot care (with score <50). Similarly, in the research of Desalu et al. 36 (10.2%) had good practice of diabetic foot care (score $\geq 70\%$), 142 (40.3%) had a

satisfactory score (50-69%) and 174 (49.4%) had a poor practice of diabetic foot care (with score <50) [7].

It is interesting to note that in contrast to the study of Desalu et al., we found a significant difference among male and female about the knowledge and practice of foot care with female scoring higher and consequently showing good knowledge and good practice of diabetic foot care. Similar to the above trend, we found that the degree of education and socioeconomic status revealed no significant relation with knowledge and practice of foot care, which is in complete contrast to the findings of study of Desalu et al. which poor associate knowledge and poor practice of foot care with low education status [7].

Limitations of the study

In the present study, there was limited access to the female section in diabetic care centre due to the centre policy that separates the male and female patients, which affects the data collection process. To overcome this barrier, a trained female lab technologist helped in collecting and completing the female patients' questionnaires. Future research should overcome this setting barrier.

Recommendations

Through this research, some recommendations can be summarised points for further development and improvement in future. Including the following: start structuring an educational program ensuring the good practice by coping the good knowledge; starting the social media campaigns regarding the importance of foot care among diabetics; multi-team educational approach that includes physicians, diabetic educators, dietitians, and nurses that help the patients in improving their knowledge and practice under the evidence-based updated guidelines.

Conclusion

This study highlighted the big gap that exists between knowledge of diabetic patients and their daily practice. Bridging this gap will reduce diabetic foot ulcer and amputations and as a result reduction in morbidity, mortality and high cost associated with the treatment of foot ulcer and amputations.

Competing Interests

The authors declare that there is no conflict of interest in this study.

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Appendix: (Diabetes Foot Care Questionnaire)

1. Demographic

- **Gender:** Male or Female
- **Age:** _____ (Your Age from the last birthday)
- **Education:** Illiterate, High school degree and below, Bachelor degree and above.
- **Socioeconomic status:** 5000 SR, 5000-10000 SR, or >10000SR
- **Type of DM:** Type 1 or Type 2

2. Knowledge of foot care

Questions related to knowledge of foot Care	Correct	Wrong
DM patients should take medication regularly because of they liable to get DM complication		
DM patients should look after their feet because they may not feel a minor injury to their feet		
DM patients should look after their feet because wounds and infection may not heal quickly		
DM patients should look after their feet because they may get a foot ulcer		
DM patients should not smoke because smoking causes poor circulation affecting the feet		
How often do you think you should inspect your feet (daily-twice week-weekly)		
If you found redness/bleeding between your toes what is the first thing you do (report doctor/nurse-dress wound-don't know)		
Even if you have never had a corn/ hard skin lesion, would you do if you had one (cut with blade-report doctor-don't know)		
How often do you think your feet should be washed (daily-twice week-weekly)		
What temperature of water do you think you should wash your feet in(cold-hot-warm)		
How often do you think you should inspect the inside of your footwear for objects or torn lining (daily-twice weekly-weekly)		
Wrong: false and don't know		

3. The practice of foot care

Questions related to the practice of foot care	Yes	No	Don't know
Do you Inspect feet regularly			
Do you wash feet regularly			
Do you wash feet with warm water			
Do you trim toenails straight across			
Do you measure your feet size when last you bought footwear			
Do you received advice when last you bought footwear			
Did you ever inspect inside of footwear			
Do you regularly walk barefoot			
Do you clean nails with a sharp instrument			
Do you add irritants to water before feet cleaning			
Do you wear elasticated hosiery			