Elmer Press

Original Article J Endocrinol Metab. 2016;6(6):172-177

Diabetic Foot Care: Knowledge and Practice

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Abstract

Background: The increase in prevalence of diabetes mellitus (DM) is being associated with many complications among diabetic patients. Foot complications are a leading cause of mortality in developing countries. The aim of this study was to determine the knowledge and practice of foot care among diabetes patients attending the Diabetic Center in Jazan Region, Saudi Arabia.

Methods: Observational cross-sectional study was conducted among a random sample of 250 patients attending Jazan Diabetes Center. Structured questionnaires were administered by medical students to diabetic patients. The outcome variables were knowledge and practice regarding foot care. Descriptive statistics and inferential statistics based on Chi-square test were used for data analysis.

Results: The prevalence of diabetic foot (DF) among males and females was 58.0% and 52.9%, respectively, without significant difference between both sexes. Eighteen percent of study population reported history of foot ulcer. Almost 53.6% patients had good foot care knowledge. Gender, duration of DM, marital status and age had no significant association with knowledge. Males were more adherent to foot drying by 65.2%, while females are applying more attention to softening of skin by 72.3%. There were no significant differences between males and females regarding foot inspection, nail care, adherence to medication and shoes check.

Conclusion: In conclusion, the knowledge and practice of foot care among DM patients in our study participants were not adequate. The result of this study has highlighted the gaps in their knowledge and practice and underscores the urgent need for a patient friendly educational intervention. It is important to activate the role of health education to everyone who has direct contact with the patient, to minimize the DF complications.

Keywords: Jazan region; Complications; Diabetic foot care

Manuscript accepted for publication November 21, 2016

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doi: https://doi.org/10.14740/jem388e

Introduction

Diabetes mellitus (DM) is considered as one of the most challenging public health concerns, as globally 422 million adults were living with diabetes in 2014, compared to 108 million in 1980 [1, 2]. The global prevalence of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population [2].

One of the major complications associated with DM is the diabetic foot (DF) disease. This complication almost affects 50% of patients and accounts for nearly 80% of all non-traumatic amputations of the lower limb [3, 4]. The disease represents nearly 35% of all hospital admissions in diabetic specialized clinics [3]. DF complication is the major cause of a significant loss of quality and years of life of diabetic patients [4, 5]. In term of cost, it represents 12-15% of the overall cost associated with diabetes and up to 40% in developing countries [5, 6].

Proper patients' awareness about foot care is important defense line in preventing DF problems and amputation [7]. Correct practices of foot health care are essential for reducing the incidence of foot ulcers and complication [8].

Gulf Arabian countries are characterized by high and increasing diabetes prevalence. In Saudi Arabia, the prevalence of DM in adults was 25% [9]. Recent research in Saudi Arabia suggested that more than 44% of individuals aged 55 or older had severe to uncontrolled diabetes with long-term complications [10].

Although there are significant studies in Saudi Arabia about DF and its complication [11-15], studies in Jazan region are scanty. The main objective of this study was to measure the knowledge level among diabetic patients about DF and to assess the adherence level among diabetic patients to foot care.

Materials and Methods

Study design and place

This is an observational cross-sectional study conducted in Jazan town, the provincial capital of Jazan region. Jazan region is located in south-western part of Saudi Arabia. It is bounded to the north by Asir region and to the south by the State of Yemen and from the east Asir region and the State of Yemen, and the Red Sea to the west. Jazan Diabetic Center was established

Table 1. Background Characteristic of Study Population (n = 250)

Characteristics	Gender		Total
	Female	Male	
Age groups			
18 - 27	12 (8.7)	6 (5.4)	18 (7.2)
28 - 37	15 (10.9)	10 (8.9)	25 (10.0)
38 - 47	26 (18.8)	19 (17.0)	45 (18.0)
48 - 57	51 (37.0)	29 (25.9)	80 (32.0)
58 - 67	19 (13.8)	30 (26.8)	49 (19.6)
68+	15 (10.9)	33 (13.2)	18 (16.1)
Marital status			
Single	18 (13.0)	8 (7.1)	26 (10.4)
Married	94 (68.1)	103 (92.0)	197 (78.8)
Divorced	7 (5.1)	0 (0.0)	7 (2.8)
Widowed	19 (13.8)	1 (1.9)	20 (8.0)
Educational status			
Illiterate	67 (48.6)	20 (17.9(	87 (34.8)
Read and write	7 (5.1)	8 (7.1)	15 (6.0)
Primary	13 (9.4)	9 (8.0)	22 (8.8)
Intermediate	13 (9.4)	15 (13.4)	28 (11.2)
Secondary	14 (10.1)	18 (16.1)	32 (12.8)
University	24 (17.4)	42 (37.5)	66 (26.4)
Occupational			
Government employ	19 (13.8)	43 (38.4)	62 (24.8)
Private employed	0 (0)	7 (6.2)	7 (2.8)
Retired	11 (8.0)	37 (33.0)	48 (19.2)
House wife	94 (67.3)	0 (0)	94 (37.6)
Other	15 (10.9)	24 (21.4)	39 (15.6)
Income level			
< 3,000	65 (47.1)	30 (26.8)	95 (38.0)
3,000 - 10,000	49 (35.5)	49 (43.8)	98 (39.2)
> 10,000	24 (17.4)	33 (29.5)	57 (22.8)

to improve the lives of people with diabetes and its complications through innovative care, education, and research that will lead to prevention and cure of the disease. The center is semi-autonomous institution located within Jazan General Hospital.

Participants, recruitment and sampling procedure

Participants were recruited during October 2013 from patients attending Jazan Diabetic Center. Eligibility criteria included: 1) age of 18 years and above; 2) being diagnosed with DM; and 3) having clinical file in the Center. Patients who consented to participate in the study were asked to complete a questionnaire. A random sampling of 250 patients was calculated using prevalence of DF, 95% confidence interval and error not more than 7%. Systematic random sampling was used to select the participants.

Method for data collection and instrument

A pre-tested structured questionnaire was used as study tool. This tool was developed after consulting relevant studies conducted in Saudi Arabia [13, 14] and elsewhere [16, 17]. The final version of the questionnaire consisted of 47 classified into main five sections. Section one contained socioeconomic background characteristics questions. The second section includes information about DM like duration of the disease and type of DM. The third part asked questions on DF and its pattern, while the fourth and fifth sections include questions on

Table 2. Diabetic Foot Features and Attitudes According to Gender

Items	Gender		Total	P value
	Female, N (%)	Male, N (%)		
Prevalence of diabetic foot	65 (58.0)	73 (52.9)	138 (55.2)	0.417
History of foot ulcer	19 (17.0)	26 (18.8)	45 (18.0)	0.701
Previous slow healing wound	33 (29.5)	53 (38.4)	86 (34.4)	0.139
Tingling sensation	79 (70.5)	103 (74.6)	182 (72.8)	0.469
Previous knowledge of diabetic foot	65 (58.0)	73 (52.9)	101 (40.9)	0.417
Go to doctor in case of wound	83 (75.5)	63 (46.0)	146 (59.1)	0.000
Treat wounds by my self	27 (24.5)	74 (54.0)	101 (40.9)	0.000
Reading about foot care	51 (45.5)	41 (29.7)	92 (36.8)	0.010
Suitable shoes knowledge	44 (39.3)	56 (40.6)	100 (40.0)	0.835
Practicing sport	64 (57.7)	51 (37.0)	115 (46.2)	0.001
Using proper vitamins	67 (59.8)	75 (55.1)	142 (57.3)	0.495

DF knowledge and practice. Medical students collected the information using face to face interview.

Data management and analysis

Data were reviewed carefully to verify that there are no data mistakes and the errors were corrected immediacy. The Statistical Package for Social Sciences (SPSS) software program was used for data analysis. Frequency distributions were obtained and descriptive statistics were calculated. Knowledge was measured using 10 questions covering good foot care practice in the areas of feet washing techniques, skin and nail care and foot wear care. Each "yes" answer carried one [5] point and zero point for a "no". The points were then added up to provide total knowledge score. The level of knowledge, whether good or poor, was determined based on the mean score. Those who scored more than the mean were considered as good and scores lower than the mean were considered as poor. Another level of data analysis was conducted using Chi-square test to test some associations. A P value less than 0.05 was considered significant.

Ethical consideration

Ethical approval for the current study was obtained from the College of Medicine, Jazan University. Participants were told that they have the right to not participate in the study or to withdraw from the study if they wish at any time. The participant's privacy was respected, and data were kept confidentially and utilized for study purposes only. Participants were asked to read and sign a consent form.

Results

Table 1 presents some background information about the study participants. A total of 250 patients were included in this study (112 males and 138 females). Most patients were more than 48 years old (67.7%). A majority of the patients were married (78.8%) and 26.4% of the patients had received a university education degree. The prevalence of diabetes is higher among patients with lower to middle income (38.0% and 39.2%, respectively) and 42.4% live in traditional houses (Table 1).

According to Table 2, the prevalence of DF among males and females was 58.0% and 52.9%, respectively, without significant difference between both sexes. Eighteen percent of study population reported history of foot ulcer. Prevalence of tingling sensation was 70.5% among males compared to 74.6% for females, also without significant differences between the two groups. Regarding attitudes towards foot wounds, 75.5% of males said that they go to doctor, compared to only 46.0% of females, with significant difference between both sexes (P value less than 0.001) (Table 2).

The majority of patients who were attending Jazan Diabetic Center had moderate foot care knowledge, with 53.6% of them scoring more than the mean score. Gender, duration of DM, marital status and age had no significant association with knowledge and none of the variables had a P value of less than 0.05 (Table 3).

Table 4 shows the pattern of foot care among diabetic patients. There is no significant difference between males and females in foot inspection, nail care, adherence to medication and shoes check. But we found that males were more adherent to foot drying by 65.2%, while females are applying more attention to softening of skin by 72.3%.

Discussion

The aim of this study was to measure the knowledge level among diabetic patients attending Jazan Diabetic Center about DF and to assess the adherence level the patients to foot care.

An important result was that a significant proportion of the Jizani population had poor knowledge of foot care (46.4%).

Table 3. Analysis of Factors Associated With the Levels of Knowledge

Variables	Poor knowledge, N (%)	Good knowledge, N (%)	P value
Gender			0.993
Male	52 (46.4)	60 (53.6)	
Female	64 (46.4)	74 (53.6)	
Duration of DM			0.086
0 - 9	66 (52.8)	59 (47.2)	
10 - 19	38 (38.0)	62 (62.0)	
20+	11 (45.8)	13 (54.2)	
Marital status			0.176
Single	15 (57.7)	11 (42.3)	
Married	89 (45.2)	108 (54.8)	
Divorced	1 (14.3)	6 (85.7)	
Widowed	11 (55.0)	9 (45.0)	
Age groups			0.077
18 - 27	9 (50.0)	9 (50.0)	
28 - 37	16 (64.0)	9 (36.0)	
38 - 47	17 (37.8)	28 (62.2)	
48 - 57	37 (46.3)	43 (53.8)	
58 - 67	17 (34.7)	32 (65.3)	
68+	20 (60.6)	13 (39.4)	
Total	116 (46.4)	134 (53.6)	

There was no significant difference between males and females for this indicator. This finding was comparable with other related studies, which also reported the same pattern of scoring for knowledge and practice of foot care [16, 17]. Many other studies showed the presence of inadequate knowledge of self-foot-care in diabetic patients [18, 19]. In Saudi Arabia, a group of studies highlighted a lower level of foot care knowledge than the optimum [13, 20]. All researchers indicated the need for foot care education programs and improving the way of delivering it.

Tingling sensation is the first sign of foot problems and its increase with uncontrolled plasma glucose. In our study, there is high prevalence of tingling sensation reaching 72.8%. Although 57.3% of the patients taking vitamins, also taking vitamin B12 could improve foot nerve, but the longer patient has the disease, the more he suspected to have a neuropathy complication. We found that there is an inverse association between tingling sensation and sport practice. The tingling sensation decreases by an increase in exercise time because the exercise increases the circulations of the blood, so nerves have good nutrient.

It is well known that when clinicians are aware of a patient's very elevated risk for lower-extremity amputation, they were more likely to prescribe preventive foot care behaviors [21]. This fact is slightly against what we found, since 70.8% of our patients have a history of tingling sensation, 36.8% have a history of slow healing wounds, and 24.5% have a history of ulcer.

We found that there is no difference between males and females in foot inspection and nail care, because 90% of Arab populations are Muslims. They pray five times per day where the feet have to be washed before praying. These maneuvers help patients to inspect their feet as well as clean them. Washing feet before praying and the praying itself offer some sort of physical massage to the feet. Trimming the nails is a habit encouraged by Islam [22].

Our results revealed that generally foot care is inadequate since 68.0% inspect their foot regularly, 57.2% dry their fingers and foot properly, and 44.0% wake bare foot. This poor level of foot care practice in this study is in agreement with other previous studies [19, 23, 24]. Some of the inadequacies of foot care practice in our subjects include also non-inspection of inside of their footwear (23.8%) and wearing shoes without socks (29.6%). The poor practice of foot care in this study may be attributed to the lack proper knowledge of foot care among the participants.

Our results suggested a gender difference regarding attitudes towards foot wounds among study participants, as 75.5% of males said that they consult a doctor, compared to only 46.0% of the females. This result seems to be in contrast with the available literature on foot care, where there is either no gender difference between both sexes [16] or males are usually reluctant to acknowledge their health problems and seek professional care [25, 26].

The strength of this study is that it is the first study to discuss this important issue in Jazan region. Despite this strength,

Table 4. Practice of Foot Care Among Study Population

Practice	Total, N (%)	Male, N (%)	Female, N (%)	P value
Do you inspect feet regularly				0.295
Yes	170 (68.0)	80 (71.4)	90 (65.2)	
No	32 (28.6)	32 (28.6)	48 (34.8)	
Do you clean fingers with sharp instrument				0.146
Yes	227 (90.8)	105 (93.8)	122 (88.4)	
No	23 (9.2)	7 (6.3)	16 (11.6)	
Do you dry your fingers and foot				0.022
Yes	143 (57.2)	73 (65.2)	70 (50.7)	
No	107 (42.8)	39 (34.8)	68 (49.3)	
Did you ever inspect inside of footwear				0.341
Yes	189 (76.2)	87 (79.1)	102 (73.9)	
No	59 (23.8)	23 (20.9)	36 (26.1)	
Using skin lotion for foot				0.000
Yes	155 (62.2)	56 (50.0)	99 (72.3)	
No	94 (37.8)	56 (50.0)	38 (27.7)	
Foot Massage				0.987
Yes	143 (57.2)	64 (57.1)	79 (57.2)	
No	107 (42.8)	48 (42.9)	59 (42.8)	
Wearing shoes without socks				0.029
Yes	74 (29.6)	41 (36.6)	33 (23.9)	
No	176 (70.4)	71 (63.4)	105 (76.1)	
Walking bare foot				0.049
Yes	109 (44.0)	56 (50.9)	53 (38.4)	
No	139 (56.0)	54 (49.1)	85 (61.6)	
Checking the inside of the shoes				0.703
Yes	178 (71.5)	78 (70.3)	100 (72.5)	
No	71 (28.5)	33 (29.7)	38 (27.5)	
Sitting crossing legs				0.010
Yes	112 (45.0)	60 (54.1)	52 (37.7)	
No	137 (55.0)	51 (45.9)	86 (62.3)	

the study has some limitations that should be mentioned to facilitate the proper understanding of study outcomes. First, because the work is based on a cross-sectional survey design, the direction of relationships and causal relationships cannot be determined. Second, the result of this study should be interpreted carefully since it is based on a single center. Second, this is a clinic-based study. Hospital-based studies cannot provide true picture of DF care knowledge and practices of the community. Third, we used a questionnaire that is not validated among Arabian population.

Conclusion

In conclusion, the knowledge and practice of foot care among DM patients in our study participants were not adequate. The result of this study has highlighted the gaps in their knowledge and practice and underscores the urgent need for a patient friendly educational intervention. It is important to activate the role of health education to everyone who has direct contact with the patient, to minimize the DF complications.

Acknowledgments

The authors would like to thank the Diabetic Center of Jazan General Hospital for the support of this study. The authors also acknowledge, with much appreciation, the input and participation of all medical staff in the center for their support and encouragement. They also extend their thanks to the patients

who sacrificed their valuable time and actively participated in the survey.

Author Contributions

Amal Abduallah Al-Faify, Duaa Thiyabi Hakami, Mymona Abdullah Al Faifi, Abrar Wali Hakami, Abrar Humeed Hakami and Halimah Hamood Sharif conceptualized and designed the study, conducted data collection and wrote the report. Hala M. Kheir supervised the whole work and approved the final manuscript as submitted. Mohamed S. Mahfouz carried out the initial analysis, drafted the manuscript, reviewed and revised the manuscript, and approved the final manuscript as submitted. Yahya M. Solan supervised the work, critically reviewed the manuscript, and approved the final version of the manuscript. All of the study team approved the final version of the manuscript as submitted.

Conflicts of Interest

The authors declare no conflicts of interest.

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