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ORIGINAL ARTICLE

# Foot care practices of diabetic patients in Saudi Arabia



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## KEYWORDS

Diabetes foot;  
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**Abstract** Diabetic foot is a serious complication that causes lower extremity amputations. The aim of this study was to identify the patient's awareness about risk factors for diabetic foot disease and to explore the knowledge and foot care practices among diabetic patients in a Saudi population. This cross-sectional study was conducted in King Khalid University Hospital (KKUH), King Abdulaziz University Hospital (KAUH), King Fahad Medical City, National Guard Hospital, Military Hospital, and Prince Salman Hospital capital city of Saudi Arabia. Patients were eligible if they had diabetes foot disease, signed the consent form, and completed the questionnaire. We selected 350 patients from different hospitals between November-2011 and April-2012. The majority of patients (68%) were selected from King Saud University hospitals. The mean age of patients was  $50.87 \pm 15.9$  years with a range of 20–90 years. The majority of patients were male (64.3%) and had a family history of hypertension (55.4%), high total cholesterol (58.6%), and other diabetes (58.9%). A family history of smoking, a major risk factor for diabetic foot, was found in 20.3% of cases. Sixty percent of the patients were using oral medications, 27.1% were using insulin therapy, 10% were using both oral and insulin therapies, and 10% were on diet. In our study, 19.4% of participants were illiterate while 80.6% had a high school or university level education. Our findings also revealed that some patients had a lack of knowledge concerning diabetic foot disease and future complications. Patients are unaware of the risk factors for diabetes foot and practice poor foot care. Awareness programs should be mandatory in all hospitals and diabetes clinics to help compensate for the lack of awareness and lack of podiatric educational services. Such programs may decrease the risk of diabetes foot disease.

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## 1. Introduction

Diabetes mellitus is a chronic metabolic multifactorial disorder associated with altered glucose homeostasis as well as macro and microvascular complications including preventable foot problems that are common occurrences in these patients (Khan et al., 2015; Bowling et al., 2015). Diabetic foot problems are a major cause of morbidity and premature mortality

and contribute substantially to health care costs (Guell and Unwin, 2015). Foot ulcerations are also a major complication in diabetes patients (~25%) and infected diabetic foot ulcers are responsible for 60% of nontraumatic lower limb amputations (Mottola et al., 2015). Previous studies have reported that early identification of people at high risk for foot problems and management of the risk factors could prevent lower extremity amputations and foot ulcerations (Ogrin and Sands, 2006; Schwegler et al., 2002; Wu et al., 2005; Elsharawy et al., 2012). Identifying the role of risk factors for foot ulceration will enable health providers to implement better prevention programs that could result in improved patient quality of life and, thus, reduce the economic burden for both the patient and the health care system (Al-Rubeaan et al., 2015). Many studies have been conducted in Saudi populations with risk factors for complications from diabetic foot (Schwegler et al., 2002; Wu et al., 2005; Hu et al., 2014; Al-Zahrani et al., 2014; Al-Wakeel et al., 2009; Al-Mahroos and Al-Roomi, 2007; Akbar et al., 2000); however, only one diabetic foot awareness program has been implemented in this population (Al-Wahbi, 2010). Based on the identified risk factors of diabetic foot disease, implementing an education and awareness program as well as providing prophylactic treatment will help prevent devastating complications in the diabetic population. Based on the earlier awareness programs implemented in Riyadh, Saudi Arabia, we designed and conducted a hospital-based study for Saudi Arabian patients with diabetic foot disease to explore the knowledge and foot care practice among diabetic patients.

## 2. Materials and methods

### 2.1. Patient enrollment

This study was a cross-sectional hospital-based study conducted between November 2011 and April 2012 in hospitals throughout Riyadh, Saudi Arabia. Hospitals such as King Khalid University Hospital (KKUH), King Abdulaziz University Hospital (KAUH), King Fahad Medical City, National Guard Hospital, Military Hospital, and Prince Salman Hospital participated in this study. We recruited participants from outpatient clinics in endocrine departments in participating hospitals. After signing the consent form, patients affected with diabetes foot responded to the study questionnaire. Patients who were not diabetic, were less than 18 years old, did not sign the consent form, or had an incomplete questionnaire were excluded from participation. Ethical approval was obtained from King Saud University, Riyadh and Saudi Arabia. Peripheral blood (2 mL) was obtained from each participant using ethylenediaminetetraacetic acid vacutainers, and glycated hemoglobin (HbA1c) tests were performed to confirm the presence of diabetes (Khan et al., 2014).

### 2.2. Statistical analysis

The statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) software (version 18.0, SPSS IBM Inc., Chicago, IL, USA). Data were analyzed using means, standard deviations, and cumulative frequency percentages.

## 3. Results

### 3.1. Patient selection

This hospital-based study was conducted with 350 subjects (225 males and 125 females) recruited from different hospitals in the capital city of Saudi Arabia. The selection process is described in Table 1. The majority of participants (68%) were recruited from King Saud University hospitals (40% from KKUH and 28% from KAUH).

### 3.2. Baseline characteristics

The mean age of participants was  $50.87 \pm 15.9$  years with a range of 20–90 years. The clinical and biochemical characteristics of each patient along with their family history are shown in Table 2. Almost two-thirds of patients were male (64.3% versus 35.7% female) and almost half of the patients (46.6%) smoked. The majority of participants (98%) were Saudi Arabians. Among the total sample, 50.6% had abnormal HbA1c values, 62.6% had hypertension, and 65.1% had a high total cholesterol (TC) level. Sixty percent of patients were taking oral medication, 27.1% were using insulin therapy, 10% of them were using both oral and insulin therapies, and 10% of the total sample was on a diet.

### 3.3. Risk factors associated with family history

More than half of the participants (58.9%) had a family history of diabetes and 20.3% had a family history of smoking. A family history of high TC (56.6%), hypertension (55.4%), and muscle cramps (49.7%) was also identified in this population. We also found a family history of sores/cuts (21.1%), foot ulcers (32%), amputation (7.7%), and joint identity (7.4%). Details regarding family history are shown in Table 3. In addition, diabetes foot risk factors were correlated with the family history and patients who had a family history of multiple risk factors were more prone to develop diabetes.

### 3.4. Level of risk

Fig. 1 shows the risk of diabetes in our patients. Sixty-four percent of patients had a high risk based on previous ulceration, amputation, or the presence of more than one risk factor (such as the loss of sensation or signs of peripheral vascular disease with callus or deformity). A moderate risk, indicated by a loss

**Table 1** Patient selection process.

| S.no | Hospital names                      | Total numbers (%) |
|------|-------------------------------------|-------------------|
| 1    | King Khalid University Hospitals    | 140 (40)          |
| 2    | King Abdulaziz University Hospitals | 98 (28)           |
| 3    | King Fahad Medical city             | 19 (5.4)          |
| 4    | National Guard Hospitals            | 28 (8)            |
| 5    | Military Hospitals                  | 31 (8.9)          |
| 6    | Prince Salman Hospitals             | 34 (9.7)          |

**Table 2** Clinical baseline characteristics of diabetic patients.

| Baseline characteristics | Total numbers ( <i>n</i> ) with percentages (%) |
|--------------------------|---|
| Age (years)              | 50.87 ± 15.9                                    |
| Gender (male:female)     | 225 (64.3): 125 (35.7)                          |
| Nationality              | 343 (98)  |
| Smoking                  | 163 (46.6)                                      |
| Hypertension             | 219 (62.6)                                      |
| Total-cholesterol        | 228 (65.1)                                      |
| HbA1c                    | 177 (50.6)                                      |
| Oral medications         | 210 (60)  |
| Rx (insulin)             | 95 (27.1)                                       |
| Rx (diet)                | 10 (2.9)  |
| Oral and insulin         | 35 (10)   |

**Table 3** Family histories of subjects involved in this study.

| Family histories       | Total numbers ( <i>n</i> ) with percentages (%) |
|------------------------|---|
| Smoking                | 71 (20.3)                                       |
| Other diabetes         | 206 (58.9)                                      |
| Hypertension           | 194 (55.4)                                      |
| Total-cholesterol (TC) | 198 (56.6)                                      |
| Sore cut               | 74 (21.1)                                       |
| Foot ulcer             | 112 (32)  |
| Amputation             | 27 (7.7)  |
| Cramps                 | 174 (49.7)                                      |
| Joint deformity        | 26 (7.4)  |

of sensation or signs of peripheral vascular disease without callus or deformity, was found in 16.6% of patients. A low risk, indicated by the absence of risk factors (i.e., no loss of sensation, no signs of peripheral vascular disease, and no other risk factors), was found in 7.1% of patients. Patients in the active risk group (12.3%) had complications such as active ulceration, spreading infection, critical ischemia, gangrene, or an unexplained hot, red, swollen foot with or without the presence of active pain.

#### 4. Discussion

Our current findings revealed a paucity of knowledge about foot care among diabetic patients. The overall mean score for knowledge was lower than the average in similar populations. The results of our study exposed that less educated patients are the least knowledgeable about foot care and an awareness program is required to increase the knowledge in Saudi Arabian populations. Our results are in accordance with the other studies conducted with different populations that also suggested the need for an awareness program (Khamseh et al., 2007; Viswanathan et al., 1999; Desalu et al., 2011; Hasnain and Sheikh, 2009; Agha et al., 2014; Somroo et al., 2011; Bell et al., 2005; Yavuz et al., 1999).

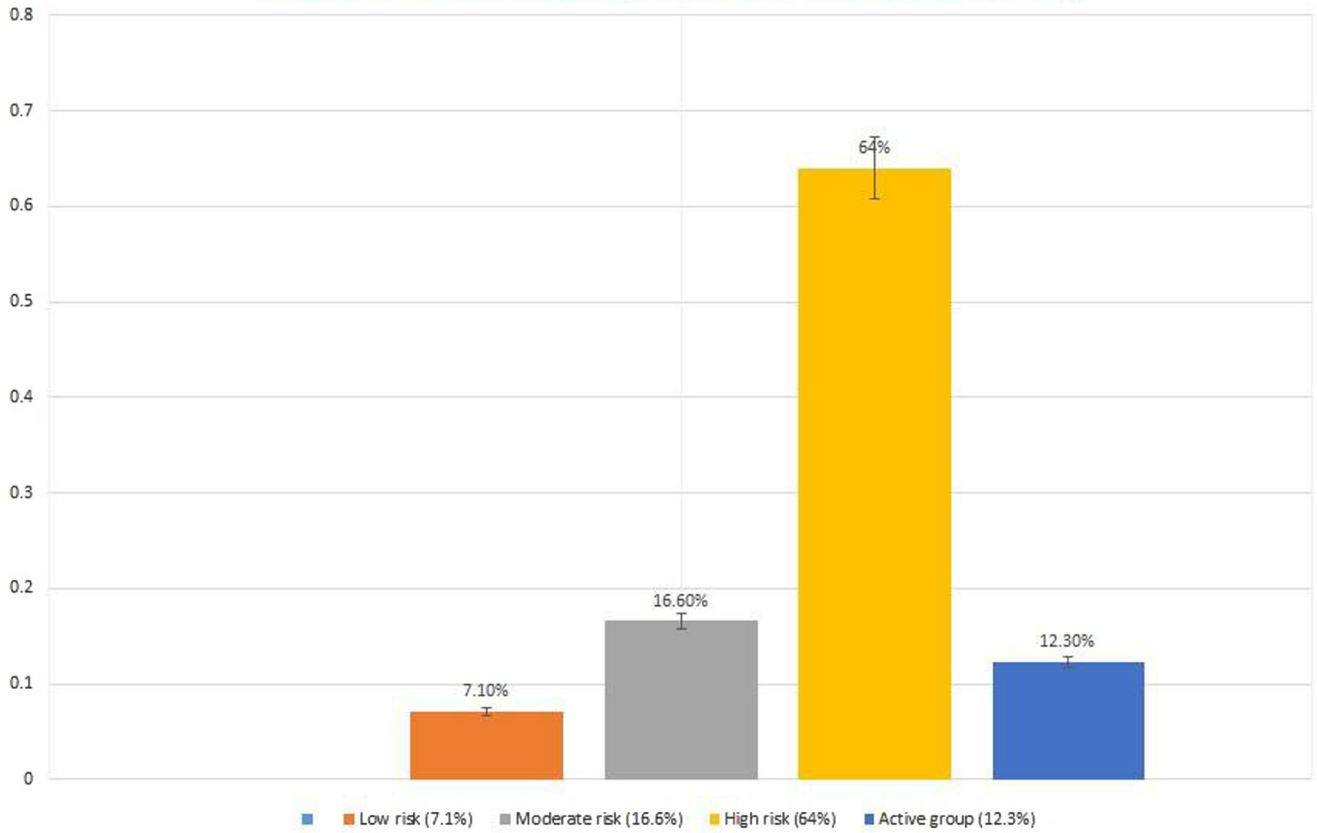
The second goal of our study was to identify the subjects who are having the knowledge in the diabetic foot diseases in the selected participants (*n* = 350). Based on this concept of our study, we have recorded the educational details.

Although the majority of participants (80.6%) received a high school (62.3%) or university level (18.3%) education, 19.4% of patients were illiterates (Fig. 2). In light of a study by Agha et al. (2014) confirming that the majority of diabetic subjects with foot complications are not following the recommended guidelines, particularly those with a low socioeconomic status or education level, we emphasized the importance of diabetes foot disease for all participants. However, illiterate participants received more attention in an effort to increase understanding regarding this disease and future complications.

The majority of participants (87.1%) were on regular medication through oral supplements (60%) or insulin therapy (27.1%). A smaller number (10%) received both oral medications and insulin therapy along with the diet modification (2.9%). Only 50.6% of the subjects were interested in verifying their glucose levels. A majority (71.7%) of patients received foot examinations every 6–12 months and 4% received an examination every 2 years, while 3.7% had not received an examination in more than 2 years. The remaining one-fifth (20.6%) of patients had never had a regular examination. Of the total sample, 27.7% of patients soaked their feet, 38.3% tested the water temperature before submerging their foot, 36.3% used medicated products for warts, corns, or calluses, 41.1% applied creams or lotion between their toes. About half (53.4%) of patients reported wearing shoes with socks, 36.0% inspected their shoes for foreign objects, 26.3% used a hot water bottle or heating pad, 40.6% reported not sitting with their legs crossed. A majority (88.6%) of patients regularly washed their feet and almost half (43.4%) dried their toes and wore shoes regularly (47.4%). Almost three-fourths of the patients will examine their feet; 46.8% will examine them when they feel a problem in the affected foot, 14% will examine them once a week, 12.9% will test 2–6 times per week, and 16.9% will check on regular basis. These practices were slightly higher among patients in the < 50 age group, female patients, and among patients with a higher level of education. Half (50.3%) of the subjects were aware and knowledgeable about diabetes disease foot care. Our results indicated that 42.6% will take regular care of their feet, 28.9% will find proper fitting footwear, and 28.3% will monitor their feet for minor injuries (Table 4). Our findings are in accordance with earlier studies conducted in both Turkish and English populations (Yavuz et al., 1999). Our findings also showed that the majority of patients reported obtaining knowledge of proper foot care from magazines (5.4%) or the internet (13.4%) indicating that awareness program are important and that such programs need to be implemented on hospital premises. Our study indicated that awareness programs should be implemented with educational classes for diabetes foot and sufficient scientific information should be available through electronic social media, brochures, and magazine articles in Arabic and English.

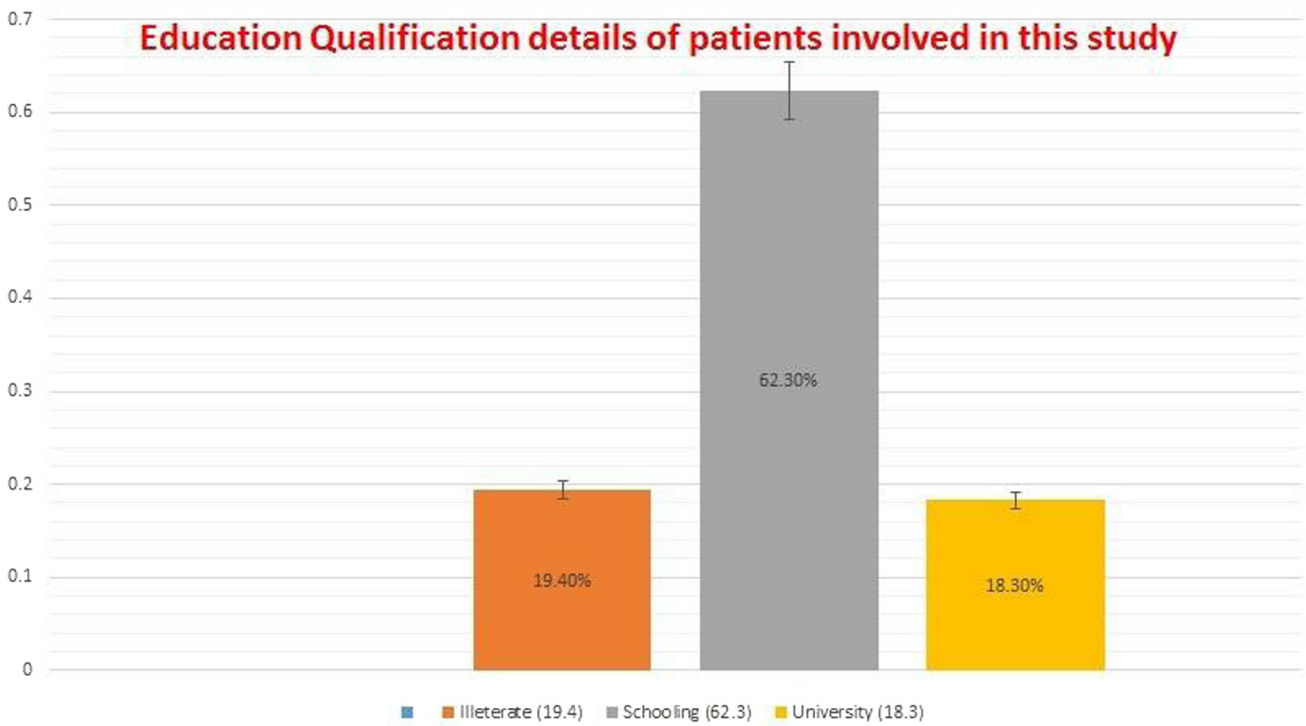
Although there are several strengths to this study, there are also some limitations. For example, a lack of communication between the patients and physicians was a major limitation and may be due to the low levels of education found among participants. Another limitation identified in this study was poor communication between patients and physicians due to a lack of information; only 13.4% of our patients received information regarding foot care from the chiropodist. In

### Risk status of diabetes patients involved in this study



**Figure 1** Level of risk in diabetic foot patients.

### Education Qualification details of patients involved in this study



**Figure 2** Qualification details of selected patients involved in our study.

**Table 4** Source of knowledge about diabetic foot disease.

|                         | n (%)      |
|-------------------------|------------|
| Regular foot care       | 150 (42.9) |
| Proper fitting footwear | 101 (28.8) |
| Minor injuries in feet  | 99 (28.3)  |

addition, we did not examine biochemical values in this study, which further limits the findings of our study.

## 5. Conclusion

The results from our study demonstrated that patients are unaware of diabetes foot risk factors and practice poor foot care. Awareness programs should be mandatory in all hospitals and diabetes clinics and help to compensate for the lack of podiatric educational services.

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