

# Knowledge, attitude, and practice regarding diabetic foot care among Saudi and non-Saudi diabetic patients in Alkharj

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#### Abstract

**Context:** There is a high prevalence of diabetes mellitus in Saudi Arabia. Also, the diabetic foot complication rate is alarmingly high with many patients ending in amputation. **Aims:** To assess the knowledge, attitude, and practices regarding diabetic foot care among Saudi and non-Saudi diabetic patients in Alkharj. **Settings and Design:** It is a cross-sectional study conducted from May 22<sup>nd</sup>, 2019 to April 1<sup>st</sup>, 2020 at Diabetic clinic, Military Hospital in Alkharj. **Methods and Materials:** Non-randomized, non-probability convenience sampling technique was used to collect data from 224 patients by using a validated and confidential questionnaire in either face-to-face interviews or as an electronic survey. All adult patients over 18 years of age of both sexes having type 1 and 2 diabetes mellitus were included. The patients who were unable to provide the requested information were excluded. **Statistical Analysis:** The data were analyzed using SPSS version 24. **Results:** The mean age of patients was 49.37 years with 58.5% male and 41.5% female patients. About 58% of patients had diabetes for more than 10 years. More than half of the patients reported some foot problems, while 9.4% have had active or healed ulcerations. The mean scores for knowledge, attitude, and practice were 8.576, 4, and 13, respectively, all statistically significant. **Conclusions:** Our study population has sufficient knowledge about diabetes and its foot complication, and they also had a positive attitude towards its management. However, they were lagging in the practices required for diabetic foot management.

Keywords: Amputation, diabetes mellitus, diabetic foot, foot ulceration

## Introduction

Diabetes mellitus (DM) refers to a chronic progressive metabolic disorder characterized by hyperglycemia, caused by either deficiency or resistance to the insulin hormone. It is a global public health problem.<sup>[1]</sup> Its worldwide prevalence among adults aged 20–79 years in 2019 was approximately 463 million cases, which was expected to rise to 578 million people in 2030, and up

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to 700 million by 2045.<sup>[2]</sup> The World Health Organization (WHO) statistics ranked Saudi Arabia as second for diabetes prevalence in the Middle East, and seventh globally.<sup>[3]</sup> Even more alarming, is the increasing pattern of diabetes in Saudi Arabia. Besides, WHO reports that the prevalence of diabetes was 14.4% (14.7% among males and 13.8% among females) leading to 5% of death in Saudi Arabia.<sup>[3]</sup> Furthermore, local studies showed the prevalence of diabetes and prediabetes in males was 9.2% and 27.6%, respectively, whereas the prevalence in females was 3.8% and 18.8%, respectively, in the Alkharj study population.<sup>[4,5]</sup>

The diabetic foot, which is one of the most common complications of diabetes, leads to considerable financial consequences on the

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patients, their families, and society.<sup>[6]</sup> Diabetic foot care cost reached up to \$13 billion in the United States in addition to the cost of management of DM itself which clearly illustrates how much financial impact is laid on diabetic foot management.<sup>[7]</sup> The risk factors of the diabetic foot include old age, duration of diabetes, and hypertension, however, neuropathy leading to sensory loss and peripheral vascular disease causing ischemia were major risk factors that result in foot ulcer and ultimately foot amputation.<sup>[6,8]</sup> Other previous studies showed that diabetic patients demonstrated discrepancies between knowledge and practice which found good knowledge in contrast with poor practice as well as lack of education about a diabetic foot, hence, knowledge was gained through relatives or social media.<sup>[9-11]</sup>

## Subjects and Methods

#### Study design and duration

It is a descriptive, cross-sectional study, conducted over 14 months from May 22<sup>nd</sup>, 2019 to April 1<sup>st</sup>, 2020.

## Study setting and subjects

The study was conducted at Diabetic Clinic in theMilitary Hospital in Alkharj, Saudi Arabia. The inclusion criteria were: all adult patients over 18 years of age, Saudis as well as expatriates, of both sexes with type 1 and type 2 DM. The exclusion criteria were: patients who were unable to understand or provide requested information such as elderly patients or patients with cognitive impairment.

## Sampling technique and sample size

A non-randomized, non-probability convenience sampling technique was used for data collection.

## Data collection

The data was collected by using a validated and confidential questionnaire [Table 1] in a face-to-face interview and a part of that was obtained by an electronic survey to enlarge the circle of participants. The questionnaire contained four sections of questions: demographic information, patients' knowledge about diabetes, its complications and management, patient's attitude, and patient practices. The questionnaire was translated into the Arabic language with modifications to be culturally accepted. Informed consent was taken from all patients and confidentiality and privacy was ensured. An authorization letter was obtained from the hospital administration for the questionnaire distribution. The proposal was approved by the Ethics Committee of Prince Sattam Bin Abdulaziz University Institutional Review Board. Data from 160 participants were collected by a personal interview method, while for another 65 patients it was collected by an electronic survey among Al-Kharj populations.

## Statistical analysis

The data record was initially made in Microsoft Office Excel and later transferred to Statistical Package for the Social Sciences (SPSS)

## Table 1: Questionnaire items for knowledge, attitude, and practices regarding diabetic foot care Knowledge

Diabetics are likely to develop foot ulcers:

Diabetics are likely to develop reduced blood flow in their feet:

Diabetics are likely to develop reduced sensation in their feet:

It is important to look at the soles because diabetics have reduced sensations It is important to inspect the feet, as wounds and infections may not heal quickly:

Poor circulation in feet may result from smoking:

It is important to look after the feet because they are more prone to be flat foot:

Taking medication regularly will reduce DM complication:

It is important to examine the inside of footwear for any object or tear: Foot gangrene is one of the diabetic foot complication:

Do you think doing exercise will help you prevent diabetic foot? Uncontrolled diabetes can lead to foot deformity?

#### Attitude

Can you perform regular exercise and change your food habits to prevent further diabetic complications?

Can you take the responsibility of daily examination of your feet and foot-wear, as well as regular foot-care specialist consultation? Can you use special foot-wear advised by the foot-care specialist? Will you wear footwear indoors as advised by your foot-care specialist? Can you be able to live a normal life with appropriate measures for diabetes?

#### Practices

Do you examine your feet daily?				
Do you use comfortable, closed, and soft footwear?				
Do you examine your shoes before wearing them?				
Do you walk barefoot, outside?				
Do you continuously wear cotton socks?				
Do you change your socks daily?				
Do you examine your feet for any marks resulting from shoes/socks?				
Do you daily wash your feet with warm water?				
Do you carefully dry the cleft between toes after washing?				
Do you apply moisturizer daily on your feet?				
Do you cut your toenails regularly?				
Do you regularly visit a physician for foot check-ups?				
Do you regularly change footwear, even without damage?				

version 24 for statistical analysis. Each response regarding knowledge, attitude, and practice were assigned a score (0–2): correct knowledge 1, no knowledge or incorrect knowledge 0, positive attitude 1, negative attitude 0, full practice 2, incomplete practice 1, and no practice 0. The means were calculated from a total KAP score of 43, knowledge score 12, attitude score 5, and practice score 26. One-way analysis of variance (ANOVA) was used to plot means. The means were observed with a 95% confidence interval (CI) and a *P* value of <.05 was considered significant.

## Results

The demographic characteristics are summarized in Table 2. A total of 224 participants were interviewed with a response of 100%. The age range was 20–90 years, with a mean of 49.37 (SD 1.165), while the sex distribution was 131 (58.5%) male and 93 (41.5%) female, with the majority of patients being

Table 2: Patients' demographics and diabetes-related				
clinical characteristics	8			
Characteristics	All (n=224)			
Age, y, mean (SD)	49.37 (1.165)			
Gender, <i>n</i> (%)				
Male	131 (58.5)			
Female	93 (41.5)			
Nationality, n (%)				
Saudi	220 (98.2)			
Non-Saudi	04 (1.8)			
Smoking, n (%)	18 (8)			
Duration of diabetes, n (%)				
$\leq 10$ years	94 (42)			
11-20 years	75 (33.5)			
21-30 years	32 (14.3)			
>30	23 (10.3)			
HbA1c, $n$ (%)	50 (0( 0)			
Controlled $(<7.0\%)$	59 (26.3)			
Uncontrolled (7.0%-8.5%)	61 (27.2)			
Highly uncontrolled (28.6%)	52 (23.2)			
Unknown Di lana (%()	52 (25.2)			
Diabetes treatment, $n(\%)$	14 (6 2)			
Diet	14(0.3) 101(45.1)			
Ural agent (s)	101(45.1) 20(17.4)			
Insum Insulin and and acont	39(17.4) 70(21.2)			
East as malaire a (9/)	70 (31.3)			
Foot complains, <i>H</i> (70)	10 (4 5)			
Current foot ulcor	10(4.3) 11(4.0)			
Elat foot	5(22)			
None	198 (88.4)			
Sensation problem in foot $n$ (%)	170 (0011)			
Numbness	31 (13.8)			
Foot pain during walking	14 (6.3)			
Foot pain at rest (especially at night)	14 (6.3)			
Tingling or pricking	13 (5.8)			
Multiple problems	50 (22.3)			
None	102 (45.5)			
Amputation, $n$ (%)	5 (2.2)			
Hypertension, n (%)	105 (46.9)			
Renal disease, $n$ (%)	16 (7.1)			
Heart disease n (%)	32 (14.3)			
Dyslinidemia $n \left( \frac{0}{2} \right)$	133 (59.4)			
Retinopathy n (%)	60 (26.8)			
Received advice on fact care, $p(\theta_{i})$	117(52.2)			
Source of advice on 1000 care, $\Pi$ (70)	11/ (32.2)			
Dhysicians	74 (22)			
Media	(4 ( <i>33</i> ) <b>22</b> (0.8)			
Relative	22(9.0) 26(11.6)			
Multiple sources	14 (6 3)			
None	88 (39.3)			

Saudis 220 (98.2%) and non-smokers (82%). Most patients (42%) had a diabetes history of fewer than 10 years, followed by 33.5% for 11–20 years, 24.6% for more than 20 years. About half of the patients (50.4%) had uncontrolled diabetes in terms of hemoglobin A1c (HbA1c).

Moreover, only 6.3% of patients reported diet only as their treatment modality, while about 45.1% required oral agent (s) only, and 48.7% of patients required insulin injection. Regarding foot problems, more than half had feet sensations problems, while 9.4% of patients had an ulcer (either active or healed), with 2.2% ends in amputation. Besides, many patients had other body systems affected as well: retinopathy (26.8%), dyslipidemia (59.4%), heart disease (14.3%), renal disease (7.1%), and hypertension (46.9%). About half of the patients (52.2%) had received advice and education regarding the management of diabetes and its foot complications, whereas 39.3% did not receive any advice.

The statistical analysis of KAP regarding diabetic foot care is summarized in Table 3. Some of the important highlights from the questionnaire data are given below. The mean knowledge score (8.576) from a maximum of 12 indicates that the majority of patients have sufficient knowledge about diabetes and its foot complications. About 69.2% of patients were aware that diabetics are likely to develop foot ulcers and 62.5% were aware of the risk of reduced blood flow in their feet and 66.1% knew that smoking would compound poor circulation. About 71.4% were aware of the risk of reduced feet sensations, 70.5% of patients knew the importance of regular sole inspection, and 74.5% of patients knew the importance of inside footwear inspection. About 87.5% of patients knew the importance of taking medicines regularly as it can reduce diabetic complications, and 81.7% of patients knew that foot gangrene is one of the diabetic complications. About 81.3% of patients acknowledged the importance of exercise in preventing diabetic foot.

The mean attitude score (4) from a maximum of 5 indicates that most patients have a positive attitude towards the management of diabetes and its foot complications. About 70.5% of patients agreed to change food habits and perform regular exercise. About 77.2% of patients were willing to take the responsibility of self-foot examination, 81.3% of patients were willing to use special foot-wear, and 82.1% were willing to wear footwear indoors. About 88.8% of patients thought that they can live a normal life with appropriate measures for diabetes.

Table 3: Statistical analysis of Knowledge, Attitude, and Practice (One-Sample Test and ANOVA)						
	Sig.	Mean	95% Confidence Inter	95% Confidence Interval of the Difference		
	(2-tailed)	Difference	Lower	Upper		
Knowledge score	<.001	8.576	8.15	9.01		
Attitude score	<.001	4.000	3.82	4.18		
Practice score	<.001	13.004	12.33	13.68		
Total KAP score	<.001	25.580	24.56	26.60		

The mean practice score (13) from a maximum of 26 indicates that the patients were lagging in the management of diabetes and its foot complications, despite better understanding and positive attitude. Only 26.8% of patients were performing the daily self-foot examination, whereas 43.3% of patients had never examined their feet. About 49% of patients reported the use of comfortable, closed, and soft footwear, and only 37.9% were checking shoes before wearing. Most patients (54%) never walked outside barefoot. Only 32.1% of patients regularly wore cotton socks, whereas 17.9% never wore cotton socks. About 50.4% of patients were changing socks daily. Only 29% of patients were checking whether their shoes/socks left any marks on their feet, and 27.7% of patients were regularly changing footwear even without damage. About 38.4% of patients were washing their feet daily with warm water, and only 27.2% were careful in drying between toes after the wash. Most (73.7%) patients were regularly cutting their toenails, and 30.8% of patients were using moisturizing cream regularly. About 73.2% of patients were not visiting physicians for foot check-ups. Figures 1, 2, and 3 show the plotting of means of knowledge, attitude, and practice against the total KAP score.

## Discussion

The risk of developing diabetic foot ulcers is high among DM patients, with the potential of leading to infection, gangrene, amputation, and ultimately death due to sepsis and multiorgan failure syndrome.<sup>[12,13]</sup> Therefore, a proactive approach is required to prevent the development of diabetic foot ulcers by appropriate education of patients and clinicians. This study shows that our diabetic patients have good knowledge as well as attitude regarding their diabetic foot care; however, they are lagging behind the diabetic foot care practices, as reflected by the mean score of knowledge, attitude, practice of 8.576 out of 12 (71.6%), 4 out of 5 (80%), and 13 out of 26 (50%), respectively. The gap between the knowledge and practice score could be due to poor compliance of the patients. Similar findings of lower practice scores than the knowledge score were also noted by other relevant studies.<sup>[9-11]</sup> The majority of patients (77%) in this study did not receive proper advice about diabetic foot management from the physicians, which may reflect poor foot care. This may be attributed to a low level of diabetic foot education among physicians, and so there is a need to reinforce it by regular refresher courses or workshops. Also, we found other previous local studies show similar results which indicate the lack of education of patients about foot care.<sup>[9,14]</sup>

In this study, the prevalence of comorbidities such as dyslipidemia, neuropathy, heart disease, hypertension, and retinopathy were relatively high. Besides, the synergism effect of these diseases with long-term diabetes has an either direct or indirect impact on blood vessels and blood flow, especially the peripheral one, which is increasing the risk of ischemic changes and foot ulcer incidence and amputations.<sup>[15,16]</sup> Moreover, in our study the rate of foot ulcers (healed or active) was moderately high 9.4% which is



Figure 1: Mean plot of Knowledge score vs. total KAP scores (One-way ANOVA)



Figure 2: Mean plot of Attitude score vs. total KAP scores (One-way ANOVA)



Figure 3: Mean plot of Practice score vs. total KAP scores (One-way ANOVA)

relatively close to the range of the prevalence of foot ulcers in Asia and Europe (10%-15%). However, the global incidence of diabetic

foot ulcers is (6.3%) which is lower than in this study (9.4%), according to the systemic review and meta-analysis.<sup>[16]</sup>

The current issues draw attention to the need for educating and giving advice to all patients with DM to prevent the complications of the diabetic foot. Moreover, with each clinic visit, it is necessary to encourage and motivate the patients to improve their practice of foot care. Several studies reveal the impact of patient education regarding diabetic foot which leads to an improvement in their practices and changes in patient's behavior and motivation, as well as a decrease in the burden of diabetic foot ulcers. Education is also critical to help diabetic patients' families to handle the lifestyle needed to modify and giving psychological and dietary support.<sup>[17-20]</sup>

Unfortunately, the majority of patients were not visiting physicians for foot check-ups. Also, the majority acknowledges taking the responsibility of self-foot examination and use special foot-wear. However, only 26.8% of patients were performing the daily self-foot examinations, whereas 43.3% of patients had never examined their feet. Fortunately, visiting the diabetic clinic early can reduce the risk for patient's admission and amputation. Our study suggests patients want the doctors to examine their foot willingly rather than ask them to do it.[21,22] Therefore, it is being emphasized that the physicians need to give time to the patient and advise them about diabetic foot practices to improve practice scores. One study from India also recommended a diabetic foot education program for doctors so that they can develop effective clinical practice and best use the clinical tools for the diagnosis, prevention, and treatment of the diabetic foot.<sup>[23]</sup> As primary care physicians are usually the first station in the management pathway of diabetic foot patients, they must understand the risk factors, pathogenesis, assessment, and management of diabetic foot. This paper will serve as a good medium to raise the understandings of primary care physicians to better manage diabetic foot patients. In summary, this study shows adequate knowledge and attitude about a diabetic foot by the patients themselves. However, there is a need to increase the level of practice, which can be achieved by providing refresher courses to primary care physicians.

#### Conclusions

Our study population has sufficient knowledge about diabetes and its foot complication, and they also had a positive attitude towards its management. However, they were lagging in the practices required for diabetic foot management.

#### **Recommendation and limitation**

This study was mainly performed at a single hospital at Al Kharj, so it is not a true reflection of the whole city; however, we did try to address this issue by internet survey among the Alkharj population.

Another limitation of this study was the questionnaire answer design for knowledge and attitude, asking only yes or no. We believe that it would be easy for the patients to answer a close-ended question; however, the participant may give agreement answers (yes) to these yes/no questions when they did not know the answer, therefore, this is may be the possible cause of why they had good knowledge and attitude. We have tried to reduce this bias as much as possible by providing a choice "I do not know."

We recommend providing a structured educational program about diabetic foot care for both patients and physicians lead by the Saudi Ministry of Health. Besides, providing a diabetic foot care clinic in each healthcare facility is also a critical point.

#### **Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

#### **Key Message**

As the patients are lagging behind the practices for diabetic foot management inspite of sufficient knowledge and positive attitude, there is a need for special education regarding diabetic foot management.

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## **Conflicts of interest**

There are no conflicts of interest.

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