

# Diabetes-related Foot Disease and Foot Self-Care Practices in Khartoum, Sudan: A Cross-sectional Study



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## ABSTRACT

**Background:** Diabetic foot complications are major health problems with substantial morbidity and mortality. Our study measured the frequency of patient-reported diabetes-related foot problems and foot self-care practices among Sudanese individuals with diabetes.

**Methods:** This was a cross-sectional health facility-based study conducted at Abdallah Khalil Diabetes Center, Khartoum state, Sudan. Data was collected in the period from January to March, 2021. A convenience sample of 194 Sudanese diabetic patients, aged 20 and above were enrolled in this study. A pretested interviewer-administered questionnaire was used to obtain data on socio-demographic and clinical characteristics, patient-reported foot problems and foot self-care practices.

**Results:** 194 patients were included in this study, mean diabetes duration 10.20±8.07 years, 60.3% were females, 47.4% were unemployed and 28.9% were illiterate. 80.4% reported having at least one or more sensory peripheral neuropathy symptoms, 36.6% reported one or more peripheral vascular disease symptoms in the previous month, and 29.4% had a history of foot ulceration. Reported foot self-care practices were suboptimal; poor scores were reported by 40.7%, average scores by 55.2%, while only 4.1% attained good scores. 52.5% never or rarely examined the bottom of their feet on a daily basis. HbA1c was found to be predictive of foot ulceration ( $P = 0.038$ ), while duration and peripheral vascular disease were found to be predictive of amputations ( $P = 0.001$  and  $0.021$ , respectively).

**Conclusion:** Diabetes related foot complications were frequently reported by our study participants, yet adoption of preventive foot self-care practices was of average levels. This highly suggests that continuous health education should be regularly provided to diabetic patients.

## BACKGROUND

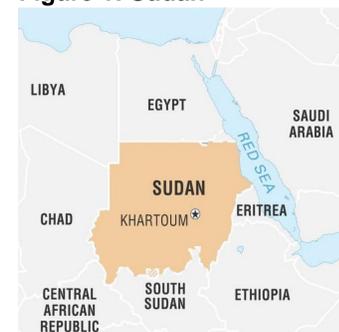
Sudan is located in northeastern Africa and the third-largest country on the continent. Khartoum is the capital and most populated city in Sudan (Figure 1).

The prevalence of diabetes in Northern urban Sudan is 19%. Diabetic foot ulceration affects around 18% of Sudanese individuals with type 2 diabetes [1].

Good preventive foot care measures, including patient education, regular foot examinations by health professionals and patient adherence to recommended foot self-care practices can reduce the risk of developing DFD by more than 85% [2].

Similar to other Arab and Muslim Northern African countries, the weather, customs, and religious practices are important factors affecting diabetic foot self-care in Sudan. These include wearing open traditional sandals, henna application, excessive consumption of dates and frequent religious feet washing (ablution).

Figure 1: Sudan



## METHODS

- A sample of 194 patients with diabetes attending Abdallah Khalil Diabetes Center, Khartoum state, Sudan, were invited to complete a pretested interviewer-administered questionnaire (6 domains) initially developed by Al-Busaidi *et al* [3].
- In this study, we report patient demographic and diabetes characteristics of participants, DRFD, and foot-self-care practices.
- Foot self-care was examined through 12 items. Responses for each item were scored as follows: never (0), rarely (1), once a month (2), once a week (3), and daily (4). Scores were reversed for negatively worded items ( $n = 4$ ). Foot self-care scores (range, 0–48) were divided into quartiles: good (37–48), average (25–36), poor (13–24), and very poor (12–0).
- Data were collected using Google Docs and exported into a pre-designed Excel spreadsheet for further analysis using the Statistical Packages for Social Sciences (Version 24, IBM, Armonk, NY, USA).
- Descriptive statistics were used to summarize most of the data. were calculated as appropriate for variables of interest. Comparisons were conducted using the Chi-square test for categorical variables. A two-sided  $P < .05$  denoted statistical significance.

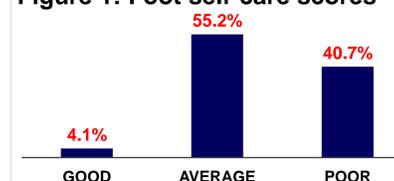
## RESULTS

- Most participants were female (60%), married (82%), urban residents (91%) with a mean age of 54.2±11.8 years. The mean duration of diabetes among the respondents was 10.2 ± 8.1 years (Table 1).
- The majority of the patients (80%) reported having at least one or more symptoms of sensory peripheral neuropathy (SPN) during the past month, while more than one third of the participants (37%) stated having one or more symptoms of peripheral vascular disease (PVD). In contrast, 7% and 4% received a professional diagnosis of SPN and PVD, respectively.
- Around one-third (30%) reported having one or more of the foot deformities with corns and calluses being the most frequently reported foot deformity (20%). A history of foot ulcer was reported by 29%, while 4% had a history of lower extremity amputation.
- Daily foot washing was the most commonly performed self-care activity (97%). More than half (58%) reported inspecting their shoes daily. However, 53% rarely or never inspected the bottom of their feet and 81% rarely or never dried between toes after washing their feet.
- Open footwear (flip flops and sandals) were the most preferred (75% and 80%, respectively. Just above half (53%) of the participants did not wear socks.

- The mean foot self-care score was 26.3 ± 5.7 (15– 45). Only 4% of participants attained a good score while 41% had a poor score (Figure 2).

Characteristic	N (%)
<b>Female gender</b>	117 (60.3%)
<b>Education level</b>	
Primary school	57 (29.4%)
High school	54 (27.8%)
College/University	22 (11.3%)
<b>Marital status</b>	
Single	8 (4.1%)
Married	160 (82.5%)
Divorced	7 (3.6%)
Widowed	19 (9.8%)
<b>Type of diabetes</b>	
Type 1	4 (2.1%)
Type 2	190 (97.9%)
<b>Diabetes treatment</b>	
Non-insulin drugs	114 (58.8%)
Insulin therapy	43 (22.2%)
Combination	37 (19.1%)

Figure 1: Foot self-care scores



## DISCUSSION

- The study aimed to describe the frequency of patient-reported DRFD and adoption of recommended foot self-care practices among adult Sudanese patients with diabetes.
- We found a large proportion of patients reported symptoms consistent with SPN and PVD. Likewise, foot ulceration was highly prevalent among this population (29%).
- These reported figures of SPN and PVD are in line with similar findings obtained from other Arab and African countries [3,4,5]. However, results from the UK and the US were much lower compared to our findings [6,7].
- Late diagnosis of diabetes, poor glycemic control and the poor quality of health care provided to the patients in Sudan could partly explain the high rates of vascular and foot complications among our study participants.
- It is worth mentioning that both SPN and PVD are exhibiting a pattern of gradual growth in Sudan over the past few decades [8,9,10]. This is in line with the overall increasing prevalence of diabetes in Sudan, which could be attributed to factors such as urbanization and changes in the life styles [11].
- Despite that DRFD were common in this population, levels of adherence to recommended foot self-care practices were poor. Just above half of the participants (55%) attained average scores, 41% were poor-category scores, and only 4% had good scores. Similar degree of foot self-care practices were reported in an urban Omani population [3], which is likely reflective of the shared similarities in socio-cultural customs and religious norms.
- The degree of adoption of some foot self-care behaviors (e.g., foot washing and wearing socks) is likely influenced by the dominant culture, religion and weather.

## SUMMARY

- Self-reported DRFD were common among the participants; SPN (80.4%), PVD(367%), diabetic foot ulceration (30%), and lower extremity amputations (4%).
- There was suboptimal adherence to recommended foot self-care practices.

## CONCLUSION

- Although DRFD were highly prevalent in this population, adoption of recommended foot self-care practices were suboptimal.
- Improving patients' knowledge and practice of proper foot care activities might be beneficial through culturally appropriate educational programs.

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