

# Diabetic Foot Self-Care Practices Among Adult Diabetic Patients: A Descriptive Cross-Sectional Study

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**Background:** Adequate foot care and regular foot examinations along with optimal glycaemic control are effective strategies to prevent foot ulceration.

**Aim:** The aim of this study was to describe the patterns of foot self-care practice among diabetic patients attending an ambulatory clinic.

**Methods:** A descriptive cross-sectional study was conducted at the ambulatory clinic of Jimma Medical Center. A consecutive sampling technique was used. The data were analyzed by SPSS version 20 and descriptive statistics were used to describe the findings.

**Results:** A total of 370 diabetic patients (55.9% male and 68.4% type 2) were interviewed. The mean ( $\pm$ SD) age of the patients was 46.47 $\pm$ 13.63 years. Over one-third (35.7%) of the patients had a previous history of foot ulcer. The majority of the patients self-inspect (92.5%) and wash (82.7%) their foot at least daily, respectively. In this study, 12.2% of the patients never inspected the inside of their footwear before putting them on and 42.4% of the patients never dry between their toes after washing. Most (63.5%) of patients never used moisturizing creams to lubricate the dry skin. In this study, 23.0% and 27.6% of the patients walk in sandals/slippers and in shoes without socks most of the time, respectively. Only 27.3% of the patients changed their socks daily. Majority (78.4% and 86.5%) of the patients never walk barefoot around and outside their house, respectively, and 75.1% of the patients never put their feet near the fire.

**Conclusion:** Diabetic patients were not adequately self-inspect and wash their foot at least daily, dry after wash and moisturize the dry skin. They walk barefoot, in sandals/slippers, and in shoes without socks. Therefore, clinicians should counsel every diabetic patient about the importance of foot self-inspection, foot hygiene, and the risk of walking barefoot, wearing sandals/slippers, and shoes without socks at every follow-up visit.

**Keywords:** diabetes mellitus, foot self-care, practice, Jimma Medical Center

## Background

Diabetes is a complex, chronic illness requiring continuous medical care with multifactorial risk-reduction strategies beyond glycaemic control.<sup>1</sup> Foot ulceration is a major complication of diabetes mellitus and is associated with high levels of morbidity and mortality, as well as significant financial costs. The lifetime incidence rate of diabetic foot ulceration is 19–34%, with a yearly incidence rate of 2%. After successful healing, the recurrence rates of diabetic foot ulcers (DFU) are 40% within a year and 65% within 3 years.<sup>2</sup>

Poor diabetic foot care increases the risk of ulceration, infection, and limb loss.<sup>3</sup> A study done in the UK highlighted, 18.5% (14.2–22.7) of diabetic patients failed

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to inspect their feet and 83% (79.1–86.9) did not have their feet measured when they last purchased shoes. Practices that put patients at risk included the use of direct forms of heat on the feet and walking barefoot.<sup>4</sup> Bell et al reported, the foot self-care behaviors performed with the highest frequency of 6–7 days were washing the feet (75.6%) and not soaking the feet (79.2%). Conversely, 23% of the participants reported not checking their feet at all, and 54% did not inspect their shoes before wearing them.<sup>5</sup>

In developing countries, foot ulcers and amputations are unfortunately very common. Poverty, a lack of sanitation and hygiene, and barefoot walking often interact to compound the impact of diabetic foot damage.<sup>6</sup> Wanja et al reported, among type 2 DM patients, the foot self-care practice done correctly by most respondents were washing feet daily by 85% and not wearing high-heeled shoes (>2.5inches) by 81.1% while the worst performed practice was wearing sandals when performing outdoor activities where only 15.7% were likely to have the correct practice and 84.3% were likely to have the incorrect practice.<sup>7</sup> Desalu et al reported 61.4% of the patients were unaware of the importance of inspecting the inside of the footwear for objects. Poor foot practices include; 89.2% not receiving advice when they bought footwear and 88.6% failing to get appropriate size footwear.<sup>8</sup>

A meta-analysis result among Ethiopian diabetic patients showed 58% (95% CI: 41–74%) of the patients had a good level of foot-care practice.<sup>9</sup> Seid and Isige reported, about 60.7% of the diabetic patients inspect their feet at least daily and 38.7% have never checked their shoes before they put them on. Also, 59.1% and 69.3% of the patients never had a habit of drying their feet and between toes, respectively. The majority of the patients (72.5%) reported never used the cream to moisturize their feet. About 66% of the patients cut toenails about once a month. The majority; 73.5% and 82.7% of the patients reported never walk barefoot in and outside the house, respectively. The majority of the patients (84.7%) have never put their feet near the fire.<sup>10</sup> Aklilu et al reported 80.2% of the patients inspected their feet regularly. However, only 31.0% of the patients inspect the inside of their footwear. The majority (94.1%) of the patients do not walk barefoot regularly.<sup>11</sup> Diabetic patients who had not practiced foot self-care were 2.52 times more likely to develop a diabetic foot ulcer.<sup>12</sup>

Diabetic patients and health care providers to diabetic patients should familiarize themselves with the principles of diabetic foot ulcer prevention.<sup>12</sup> A paradigm shift is

urgently needed to treat diabetic foot disease preventatively.<sup>6</sup> Prevention of these ulcers is of paramount importance to reduce the patient and economic burden.<sup>2</sup> Effective strategies for foot ulceration prevention include educating patients, their families, and healthcare workers about adequate foot care and regular foot examinations along with optimal glycemic control. Counseling patients regarding daily proper footwear and hygiene should be stressed during each clinic visit.<sup>13</sup>

Even though there are studies reporting foot self-care from different regions of Ethiopia, many of the reports were the numeric levels of foot self-care practice and associated socio-demographic and clinical factors;<sup>14–19</sup> only two studies<sup>10,11</sup> from the northern part of the country reported some elements of foot self-care practice. Identifying the specific elements of foot self-care will help clinicians to educate the patients about the foot self-care comprehensively. There was no similar study from our referral and teaching Medical center which reported the patterns of foot self-care practice. Therefore, the aim of this study was to assess the patterns of foot self-care practice among diabetic patients attending a follow-up visit at the ambulatory clinic, Jimma Medical Center.

## Materials and Methods

**Study area and period:** The study was conducted in Jimma Medical Center, Jimma, Oromia Region, Southwest Ethiopia between March 1 and April 5, 2019. Jimma Medical Center is located 352 kilometers away from the capital city of Ethiopia toward Southwest. The hospital provides service to 15 million people with 1600 staff members, 32 intensive care units, and 800 beds.<sup>20</sup> The Hospital provides service for approximately 3000 diabetic patients every Monday and Tuesday. The services are mostly provided by intern doctors.

**Study design:** A hospital-based descriptive cross-sectional study.

**Source population:** All diabetic patients attending follow-up at the ambulatory clinic of Jimma Medical Center.

**Study population and selection:** Diabetic patients aged greater than 18 years attending a follow-up visit during the data collection period at the ambulatory clinic of Jimma Medical Center were enrolled.

**Exclusion criteria:** Newly diagnosed DM patients ( $\leq 1$ month duration), gestational diabetes, not volunteered to participate, and patients with the previous amputation above the ankle were excluded.

## Sample Size and Sampling Technique

### Sample Size

The sample size was determined using a single population proportion formula. Here, we used the proportion (p) from a previously published study done in Felege Hiwot Referral Hospital, Bahir Dar city, North West Ethiopia.<sup>10</sup> According to this study, about 55.0% of the patients had good foot care practice with a 95% confidence interval (CI) and marginal error (d) of 5%.  $n = (z_{\alpha/2})^2 p \times (1-p) / d^2$ ,  $n = (1.96)^2 \times 0.55 \times (1-0.55) / (0.05)^2 = 380$ . Since the source population was less than 10,000, the sample size was adjusted using the correction formula to get a minimum sample size required for the study. And the total DM patients registered in the study hospital are 3000. Thus, the sample size was 337. Ten percent of the final sample size was added for non-respondents ( $n_f = 337 \times 0.1 + 337 \approx 370$ ). Therefore, the final sample size was 370.

### Sampling Technique

A consecutive sampling technique was used in which consecutive patients were interviewed until the required sample size was reached. To avoid double-counting of cases, the ID of the participants who had undergone the interview was documented each day and any patient coming to the clinic on a specific day was counter checked with the document before conducting the interview.

## Data Collection Techniques and Instrument

The Diabetic foot self-care practice questionnaire was adapted from a validated instrument of Nottingham Assessment of Functional Foot care (NAFF).<sup>21</sup> Fourteen items were selected out of 29. The rest of the questions were discharged after the pretest as they are inappropriate to measure the intended behavior in our context. The questionnaire was prepared in English and translated to the local language, Afan Oromo and Amharic, the translated version was again translated back to the English language to maintain the consistency in the meaning of words or concepts of the data collection tool. The Afan Oromo and Amharic versions were used for data collection. Data were collected through a face-to-face interview. The foot self-care practice among patients was responded to a set of practice questions of “always, often, sometimes, and rarely/never”. Cronbach’s alfa was calculated to check for the internal

reliability of the 14 pretested items. Thus, Cronbach’s alfa value was 0.65.

## Data Quality Assurance

A pretest was done before the actual data collection on the same population (10% of the final sample size) which did not include in the sample population. Correction and modification were made on the questionnaire before applied to the study depending on the result of the pretest. The data were checked for its completeness, accuracy, and consistency every day.

## Operational Definition

In this study, the adequate practice of foot self-care by patients was according to the recommendation by the International Working Group on the Diabetic Foot (IWGDF) for the prevention of foot ulcers in diabetic patients.<sup>2</sup> Diabetic patients should inspect daily the entire surface of both feet and the inside of the shoes that will be worn; wash the feet daily (with careful drying, particularly between the toes); use emollients to lubricate dry skin; cut toenails straight across. Diabetic patients should not walk barefoot, in socks without shoes, or in thin-soled slippers, whether indoors or outdoors.

## Data Analysis

The collected data were cleared, arranged, coded, checked for completeness, and then analyzed by SPSS version 20. The descriptive analysis was performed to summarize socio-demographic and other clinical data. The results were presented in means (SD), frequency, and percentage and narrated. Chi-square ( $\chi^2$ ) was used to compare the patients’ previous information about diabetic foot and the history of diabetic foot ulcer between both sexes.

## Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board committee of Jimma University. The Ethical Review Board of Jimma University accepted and approved verbal informed consent. Verbal informed consent was obtained from the study participants to confirm their willingness for participation after explaining the objective of the study. Privacy and confidentiality of the patients’ medical data were ensured during a patient interview by using code rather than their name. On top of this, participants were counseled about the proper foot care

measures that should be taken into account in their daily life during the data collection period.

## Result

### Socio-Demographic Characteristics

Among 370 study participants, 207 (55.9%) were males. The mean ( $\pm$ SD) age was (46.47 $\pm$ 13.63). Most of the patients were Muslim followers 292 (78.9%) and married 291 (78.6%). One hundred forty-five (39.2%) of the participants could not read and write. Regarding the occupational status of the respondents, 115 (31.1%) were farmers. More than half of the patients lived in the urban area, 197 (53.2). Quarter 92 (24.9%) of the respondents had a history of smoking (Table 1).

**Table 1** Socio-Demographic Characteristics of Diabetic Patients on Follow-Up at Ambulatory Clinic, Jimma Medical Center, 2019

Variables		Frequency (%)
Age (Mean $\pm$ SD), years: 46.47 $\pm$ 13.63		
Sex	Male	207 (55.9)
	Female	163 (44.1)
Marital status	Married	291 (78.6)
	Unmarried	44 (11.9)
	Divorced	15 (4.1)
	Widowed	20 (5.4)
Religion	Orthodox	57 (15.4)
	Muslim	292 (78.9)
	Protestant	21 (5.7)
Educational status	Cannot read and write	145 (39.2)
	Can read and write	53 (14.3)
	Grade 1–8	75 (20.3)
	Grade 9–12	44 (11.9)
	College and above	53 (14.3)
Occupational status	Farmers	115 (31.1)
	House wife	85 (23)
	Private employee	48 (13)
	Government employee	44 (11.9)
	Unemployed	30 (8.1%)
	Student	24 (6.5)
	Daily laborer	24 (6.5)
Residence	Urban	197 (53.2)
	Rural	173 (46.8)
Habit of smoking	Yes	92 (24.9)
	No	278 (75.1)

## Clinical Characteristics of Study Participants

Out of the 370 participants, 253 (68.4%) of them were type two diabetes. Around half (48.6%) of the patients had an illness duration of less than 5 years. The majority of the respondents (91.1%) had previous information about diabetic foot ulcer. Moreover, 132 (35.7%) of the patients had a previous history of foot ulcer. There was no significant difference in the proportion between male and female patients in having information about diabetic foot ulcer and the history of foot ulcer ( $P > 0.05$ ) (Table 2).

### Diabetic Foot Self-Care Practices

In this study, the practices of foot self-care were categorized into three domains.

#### Foot Inspection

The patients were asked how frequently they examine their feet, 73% of the patients were reported to inspect their foot more than once per day and 19.5% inspect their foot daily. However, regarding the inspection of their shoes before putting them on, 12.2% of the patients never check for objects impeded in their shoes (Table 3)

#### Foot Hygiene

About half (48.4%) and one-third (34.3%) of patients wash their feet daily and more than once daily, respectively. And, 42.4% of the patients never dried between their foot toes after wash. Regarding the use of moisturizing cream, 63.5% of the patients never used a moisturizing cream on their feet to lubricate the dry skin. Among patients who practiced moisturizing, 26.5% of the patients

**Table 2** Clinical Characteristics of Diabetes Patients on Follow-Up at Ambulatory Clinic, Jimma Medical Center (JMC), in 2019

Variables		Frequency (%)
Type of DM	Type 1	117 (31.6)
	Type 2	253 (68.4)
Duration of DM	<5 years	180 (48.6)
	5–10 years	137 (37.0)
	>10 year	53 (14.3)
Having previous information about DFU	Yes	337 (91.1)
	No	33 (8.90)
Previous history of foot ulcer	Yes	132 (35.7)
	No	238 (64.3)

**Abbreviations:** DFU, diabetic foot ulcer; DM, diabetic mellitus.

**Table 3** Frequency Distribution of Patients' Response to Questions Related to Foot Self-Inspection and Foot Hygiene Among Diabetic Patients on Follow-Up in Ambulatory Clinic, Jimma Medical Center, 2019

Practice Domains	Items	Response	Frequency	Percentage
Foot inspection	Examine (inspect) your feet	More than once a day	270	73.0%
		Once-daily	72	19.5%
4–6 times weekly		28	7.6%	
Once a week or less		28	7.6%	
Foot hygiene	Check shoes before put them on	Often	204	55.1%
		Sometimes	88	21.9%
		Rarely	33	8.9%
		Never	45	12.2%
Foot hygiene	Wash feet	More than once daily	127	34.3%
		Once-daily	179	48.4%
		Most days a week	45	12.2%
		Few days a week	19	5.1%
	Feet dry after washing	Often	161	43.5
		Sometimes	42	11.4%
		Rarely	48	13%
		Never	119	32.2%
	Dry between feet toes after washing	Always	147	39.7%
		Often	18	4.9%
		Sometimes	48	13%
		Never	157	42.4%
Use moisturizing cream on feet	Daily	108	29.2%	
	Once a week	21	5.7%	
	About once a month	6	1.6%	
	Never	235	63.5%	
Put moisturizing cream between feet toes	Daily	98	26.5%	
	Once a week	26	7%	
	About once a month	4	1.1%	
	Never	242	65.4%	
Cut feet toe nail	Once a week	47	12.7%	
	Once a month	256	69.2%	
	Less than once a month	54	14.6%	
	Never	13	3.5%	

put moisturizing cream between their feet toes daily. Two-hundred fifty-six (69.2%) of the patients cut their feet toe nails monthly (Table 3).

### Foot Self-Care Behaviors

Ideally, patients were encouraged never to walk bare-foot, in sandals/slippers, or in shoes without socks. In this study, 23.0% and 27.6% of the patients walk in sandals/slippers and shoes without socks most of the time, respectively. Only 27.3% of the patients changed their socks daily. Most of the patients never walk bare-foot around (78.4%) and outside (86.5%) their house,

respectively. And most of the patients never put their feet near the fire (75.1%) (Table 4).

### Discussion

Patients with diabetes mellitus are at increased risk for pedal ulceration due to microvascular, neuropathic, and biomechanical changes to the foot. All patients with diabetes should receive education on proper diabetic foot care. Prevention of diabetic foot complications includes identifying the at-risk foot, daily exam and inspection, patient/family/healthcare provider education, appropriate shoe gear, and proper and early treatment of pre-ulcerative lesions.<sup>3</sup> In this study, we



**Table 4** Frequency Distribution of Patients' Response to Questions Related to Foot Self-Care Behaviors Among Diabetic Patients on Follow-Up in Ambulatory Clinic, Jimma Medical Center

Foot self-care behaviors	Walk in sandals/slippers	Most of the time	85	23.0%
		Sometimes	118	31.9%
		Rarely	65	17.6%
		Never	102	27.6%
	Walk in shoes without socks	Most of the time	102	27.6%
		Sometimes	68	18.4%
		Rarely	59	15.9%
		Never	141	38.1%
	Change socks	More than once a day	9	2.4%
		Everyday	101	27.3%
		4–6 times a week	99	26.8%
		Less than 4 times a week	161	43.5%
	Walk bare foot around the house	Often	21	5.7%
		Sometimes	17	4.6%
		Rarely	42	11.4%
		Never	290	78.4%
	Walk bare foot outside the house	Often	18	4.9%
		Sometimes	5	1.4%
		Rarely	27	7.3%
		Never	320	86.5%
Put feet near the fire	Often	23	6.2%	
	Sometimes	29	7.8%	
	Rarely	40	10.8%	
	Never	278	75.1%	

assessed patterns of practice of foot self-care by diabetic patients on follow-up using the Nottingham Assessment of Functional Foot care tool.<sup>21</sup>

In this study, 35.7% of the diabetic patients on follow-up had a previous history of diabetic foot ulcer which is higher when compared to a study from North West Ethiopia, which reported 8.6% of the diabetic patients had a previous history of foot ulcer.<sup>18</sup> This might be because 55.6% of the patients in a study from Northwest Ethiopia had a diabetic duration of less than 5 years compared to 48.6% of the patients in this study. In our study, 35.7% of the patients had a previous history of foot ulcer. This finding was higher compared to a study reported by Deribe and Woldemichael, where, 14.8% of the diabetic patients had a previous history of foot ulcer.<sup>15</sup> This might be due to the most of the diabetic patients in

a study by Deribe and Woldemichael were government and non-governmental employees compared to patients in this study, where most of them were farmers and illiterate. Moreover, 25% of the diabetic patients on follow-up had a history of/current smokers, which might be the risk factor for the higher prevalence of a reported history of foot ulcer.

Regarding the frequency of inspection of their foot, 73% of patients were reported to inspect their foot more than once per day and 19.5% inspect their foot daily. The practice foot self-inspection in our study was higher when compared to a study by Seid and Isige, where 19.5% of the patients inspect their foot more than once daily and 41.2% inspect once daily.<sup>10</sup> Desalu et al from Nigeria also reported, 40.9% of the patients inspected their foot regularly.<sup>8</sup> However, our finding was comparable to a study by Aklilu et al.<sup>11</sup> Having previous information about diabetic foot self-care might be the reason for the discrepancy. In this study, 8.9% of the patients never had previous information about diabetic foot ulcer compared to 84.0% of the patients in the study by Seid and Isige.<sup>10</sup>

In this study, about 12% of the patients never check their shoes before putting them on for objects impeded in their shoes. Again, our finding was much lower when compared to 38.7%, 45.8% and 69.0% of the patients never inspect inside their footwear in the study by Seid and Isige<sup>10</sup> and Dikeukwu<sup>22</sup> Aklilu et al.<sup>11</sup> This might be his might be because the majority of the patients (91.1%) in this study had previous information about diabetic foot ulcer.

Concerning the frequency of foot wash, about half (48.4%) of the patients wash their foot once daily and 34.3% of the patients wash more than once daily. Seid and Isige reported comparable findings, 49.5% wash their feet more than once a day followed by once a day which accounts for 44.1%.<sup>10</sup> However, our findings were lower when compared to a study from South Africa and Kenya, where 86.7% and 89.2% of the patients washed their feet once daily.<sup>22,23</sup> This might be due to the patients included in both South Africa and Kenya studies were relatively elder adults. In our study, 32.2% of the diabetic patients never dry their feet after washing, which was lower compared to the report by Seid and Isige, where 59.1% of the patients reported never dry their feet after wash.<sup>10</sup> This might be related to information differences related to foot care practice. Regarding the practice of drying between toes, 42.4% of the patients never had the habit of drying between their feet toes after wash. From Egypt, 33.6% of the patients never dry between their toes after washing their feet.<sup>24</sup> The difference might be related to the socio-economic and

cultural differences between the two countries. Moreover, the patients from Egypt were more elders and had a longer disease duration compared to our patients.

Regarding the use of moisturizing cream for foot, 29.2% of the patients used a moisturizing cream on their feet daily. And 26.5% of the patients put moisturizing cream between their feet toes daily. However, Mbisi et al reported a higher number of patients (63.3%) use a moisturizing cream on their feet daily and a few patients (5.4%) use a moisturizing cream between their toes daily.<sup>23</sup> This might be due to a few patients in Mbisi et al's study has an informal education (18.2%) compared to this study where 39.2% of the patients cannot read and write.

Most of the patients (69.2%) cut feet toenail once monthly. Eighty-five (23.0%) of patients wear sandals/slippers most of the time. Our finding was higher than a report by Mbisi et al, where 45.5% of the patients cut their toenail once monthly. Similarly, 1.7% of the patients were reported to wear slippers most of the time.<sup>23</sup> The difference might be due to the age difference of patients between the studies, where most of the patients from the Kenyan study were elders.

Regarding the foot self-care behaviors, 38.1% of the patients never walk in shoes without socks. Wanja et al reported, relatively a lower number of patients (27.6%) never wear shoes without socks.<sup>7</sup> The difference might be related to the difference in residencies of the patients, where more than half (53.2%) of the patients in our study came from Urban compared to the patients from Wanja et al were 62% of them were rural dwellers. Most of the patients responded never walk barefoot by 78.4% and 86.5% of the patients around and outside their house, respectively. This finding was relatively lower when compared to a report by Aklilu et al, where 94.1% of the patients did not walk barefoot regularly.<sup>11</sup> Dikeukwu reported 75.0% of the diabetic patients reported not walking barefoot both in-home and outside.<sup>22</sup> The difference in walking barefoot among diabetic patients might be due to the difference in the socio-economic status between the populations.

The major limitations of this study are the authors did not assess the factors responsible for the patterns of practicing foot self-care and the recall bias by the patients/respondents.

## Conclusion

The practice of foot self-care by diabetic patients is not adequate. Patients were not adequately self-inspect and wash their foot at least daily, dry after wash and moisturize

the dry skin. They walk barefoot, in sandals/slippers, and in shoes without socks. Therefore, clinicians should counsel every diabetic patient about the importance of foot self-inspection, foot hygiene, and the risk of walking barefoot, wearing sandals/slippers and shoes without socks at every follow-up visit.

## Abbreviations

DM, diabetic mellitus; JMC, Jimma Medical Center; SD, standard deviation; DFU, diabetic foot ulcer.

## Data Sharing Statement

The investigators will provide data upon reasonable request to the corresponding author.

## Ethics Approval and Consent to Participate

Ethical clearance was obtained from the Ethical Review Board of Jimma University. The ethics approval was given in accordance with the Declaration of Helsinki. Patients were requested for verbal informed consent and confidentiality of the patients' data was maintained.

## Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors report no conflicts of interest for this work.

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