

Individual-Related Factors Influencing Diabetic Foot Ulcer Prevention Practices Among Patients with Type 2 Diabetes Mellitus Attending Embu Level 5 Hospital in Kenya

Everlyne Lumumba^{1*}, Lucy Gitonga¹, Cornelius Muendo¹, Kainga Stephen¹, Linda Bonface¹

¹School of Nursing and Public Health, Chuka University, Kenya

¹Corresponding author email: evesayo28@gmail.com

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Abstract

Diabetic foot ulcer is among the main causes of hospitalization and lower extremity amputations among patients with diabetes mellitus, contributing significantly to morbidity and mortality. This study, therefore, aimed to identify the individual factors influencing preventive practices for diabetic foot ulcers among patients with type 2 diabetes mellitus attending Embu Level Five Hospital. The study used an analytical cross-sectional survey design and collected data from 234 patients with type 2 diabetes mellitus. Quantitative data were collected using a semi-structured questionnaire, and qualitative data were collected using a key informant interview guide. Descriptive statistics, Chi-square test, and regression analysis were used to analyse quantitative data using the Statistical Package for the Social Sciences. Qualitative data were analysed thematically using NVivo 14.0. Data were presented in tables and narrative form. The study found that 164 (70.1%) of the respondents had poor preventive practices for diabetic foot ulcers. Sex ($p = 0.034$), level of education ($p = 0.006$), and knowledge ($p < 0.001$) were the individual-related factors influencing diabetic foot ulcer prevention practices among patients with type 2 diabetes mellitus attending Embu Level 5 Hospital in Kenya. Male respondents and those who were not knowledgeable were 1.887 and 10.876 times more likely to have poor diabetic foot ulcer preventive practices, respectively, compared to females and those who were knowledgeable. The study recommended that the Embu County government institute awareness campaigns specifically designed for men that emphasize the importance of foot care in the context of diabetes.

Keywords: *Individual-Related Factors, Diabetic Foot Ulcer Prevention Practices, Type 2 Diabetes Mellitus, Embu Level 5 Hospital*

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1. Introduction

Diabetic foot ulcer is among the common and serious complications of diabetes mellitus, which leads to an increase in cases of lower limb amputations, causing a negative impact on the quality of life among patients with DM (Chamberlain *et al.*, 2022). Globally, the prevalence of Diabetic foot ulcers (DFUs) is 6.3%, affecting approximately thirty-three million people, with the highest prevalence rates observed in Africa and South American countries (McDermott *et*

al., 2023). Each year in England, it is estimated that 2 percent of patients living with diabetes mellitus will develop a new foot ulcer; this indicates that DFU is a significant health concern. Similarly, research studies conducted in Pakistan indicate that between 4 and 10 percent of patients diagnosed with diabetes experience the development of diabetic foot ulcers (Boulton *et al.*, 2020).

The International Working Group on Diabetic Foot Ulcers recommends identifying the foot that is at risk of developing an ulcer, frequent examination and inspection of the foot that is at risk of developing an ulcer, educating patients and family members on foot care, and wearing appropriate footwear as some of the strategies for preventing diabetic foot ulcers (IWGDF, 2023). The Ministry of Health in Kenya recommends an interdisciplinary approach to preventing and managing diabetic foot ulcers, including infection control, biomechanical control (footwear), vascular management, wound care, blood glucose control, lipid control, and smoking cessation (Ministry of Health, 2018). One important practice is daily foot examination, where healthcare providers advise patients to check their feet daily for cuts, swelling, redness, or abnormal nail conditions. In addition to foot inspections, patients with diabetes mellitus should maintain proper foot hygiene (IWGDF, 2023).

Despite these guidelines, diabetic foot ulcers remain common. Despite implementing various foot-care guidelines, globally, 15-25% of patients with diabetes develop foot complications, including foot ulcers, at some point in their lives. While precise data may be limited, the proportion of diabetic patients could be higher in Sub-Saharan Africa, ranging from 4-61% (IWGDF, 2023). The prevalence rate of diabetic foot ulcers, according to various studies in Kenya, is between 9 and 13 percent among patients with diabetes mellitus. Various studies from Sub-Saharan countries, including Kenya, still show poor awareness of foot care and inadequate preventive practices for diabetic foot among Diabetic patients, which contributes to the development of DFUs (Kiprono *et al.*, 2023; Ngari *et al.*, 2020; Wanja *et al.*, 2019). In Kenya, studies from Meru and Embu Counties indicate limited knowledge of diabetic foot ulcer prevention practices, resulting in a high prevalence of these ulcers among patients with diabetes mellitus. A study conducted in Nyeri found a prevalence of diabetic foot ulcers of 9.04% (Maingi *et al.*, 2020). In Meru County, 48% of patients with type 2 diabetes mellitus had a previous history of foot ulcers (Wanja *et al.*, 2019). A study in Nakuru County found that out of 63 % of patients with foot complications, 6.9% had gangrene (Kones *et al.*, 2016). In Embu County, the prevalence of diabetes mellitus is 5.6% (Hussein *et al.*, 2021). According to Nduati *et al.* (2022), Embu County has a high prevalence of diabetic foot ulcers, and 45.1% of patients with diabetes mellitus had poor foot care practices.

Factors influencing preventive practices for foot ulcers among patients with diabetes mellitus may be patient- or health facility-related (Sayampanathan *et al.*, 2017). Recommended foot care practices for patients with diabetes mellitus are strongly influenced by individual patient-related factors. One critical factor is patients' awareness and knowledge about diabetes and the foot complications, including diabetic foot ulcers. Patients who understand the importance of daily foot inspections, proper hygiene, and the risks of untreated injuries are more likely to follow recommended daily foot care practices (Shivaram *et al.*, 2023). Socioeconomic status also plays a role, as economically constrained individuals may struggle to afford appropriate footwear, moisturizers, or regular medical check-ups (Kuguyo *et al.*, 2020). Behavioral factors,

such as motivation, self-discipline, and the ability to incorporate foot care into daily routines, also impact adherence. Furthermore, comorbidities such as visual impairment or mobility issues can hinder patients' ability to perform self-foot examinations or maintain proper foot hygiene. Psychological factors, including denial of the disease or fear of discovering foot problems, may also prevent patients from practicing the recommended foot care practices (Woo & Cui, 2023). This study, therefore, sought to identify individual-related factors influencing diabetic foot ulcer prevention practices among patients with type 2 diabetes mellitus attending Embu Level 5 Hospital in Kenya.

2. Methods

2.1 Study Design

This study adopted an analytical cross-sectional survey design. The design was appropriate because it enabled the researcher to assess the individual factors influencing DFU prevention practices among patients with type 2 diabetes mellitus at a given point in time. This design was most appropriate because it enabled the researcher to collect data from many study participants at a single point in time and test relationships among variables (Thomas, 2021).

2.2 Study Population

The target population for this study was patients with type 2 diabetes mellitus. According to hospital records, the clinic sees approximately 600 patients with type 2 diabetes mellitus monthly (Embu Level 5 Hospital, 2023). The study included all male and female patients with type 2 diabetes mellitus attending the Embu Level 5 Hospital diabetic clinic and aged 18 years and above. However, newly diagnosed patients and those with active DFU were excluded from the study. Additionally, those in critical condition at the time of the study and those unable to provide consent were excluded.

2.3 Sampling

Cochran's formula (1977) for calculating sample size for a prevalence study was used.

$$n = \frac{z^2 P(1 - P)}{e^2}$$

Where:

n = the sample size

Z = the standard normal deviation at the desired confidence interval (taken as 1.96 at 95% confidence level)

P= proportion of patients undertaking Diabetic foot ulcer prevention practices. Since the proportion was not known, p was taken as 50% (0.5)

q-proportion of patients not undertaking diabetic foot preventive practices=1-p

e = Desired level of statistical significance set at 5% (0.05) in this study.

Therefore,

$$n = \frac{1.96^2 \times 0.5(1-0.5)}{0.05^2}$$

$$n = \frac{3.8416 \times 0.249856}{0.0025} = 384$$

Since the population is < 10000, the sample size was adjusted using the formula as shown below

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

where:

n is the sample size when the population is < 10,000

n₀ is the desired sample size when the population is >10,000

N is the estimated population size

$$n = \frac{384}{1 + \frac{384 - 1}{600}} = 234$$

n = 234

Therefore, the sample size was 234 patients. Systematic random sampling was used to select participants from the diabetic clinic after the physician had reviewed them. The first participant was selected at random from the diabetes type 2 register using a lottery method, as the first patient to arrive. Since 600 patients with type 2 diabetes were attended to monthly, the sampling frame of 600 was divided by the sample size of 234 to obtain a sampling interval of 2. Purposive sampling was used to select the health care providers from the diabetic clinic who participated in the interview as key informants. Using purposive sampling, 2 specialists, 1 general doctor, 4 nurses, and 2 nutritionists working in the diabetic clinic were selected because of their extensive knowledge in the management of type 2 diabetes mellitus and patients' DFU preventive behaviors.

3.4 Data Collection

The researcher developed and administered a semi-structured questionnaire to collect quantitative data. The researcher used a key informant interview guide to collect qualitative data from 9 key informants. The researcher preferred key informant interviews over focus group discussions (FGD) because they allow the researcher to obtain in-depth answers to sensitive questions (Kothari *et al.*, 2020). The study instruments were pretested at Meru Level Five Hospital. Meru Hospital was preferred for the pretest because it is at the same level as Embu Level 5 Hospital; therefore, the study participants' characteristics were likely to be comparable. Twenty-three (23) study participants, representing 10% of the sample, were used for the pretest, as recommended by Mugenda and Mugenda (2003). The pre-test findings were used to improve the study instruments before the main data collection. The researchers demonstrated content validity by developing the semi-structured questionnaire and key informant interview guide after a thorough review of the literature and existing tools used in similar studies. The study addressed construct validity by aligning the study's variables and measurement tools with established theoretical frameworks and concepts related to diabetes self-management and preventive practices. To ensure instrument validity, two physicians and two doctors who treat diabetic patients at the Diabetic Clinic also reviewed the questions. Their inputs were used to improve the instruments. Reliability was ensured through the test-retest

method. Test-retest reliability measures the consistency of a measurement or test when it is administered repeatedly to the same individuals over time. The questionnaire was administered to the pretest group twice. The findings were analysed to determine Cronbach's alpha coefficient, and sets of questions with an alpha coefficient of 0.7 or higher were considered reliable (Kothari, 2017). In the pilot, the instrument obtained a coefficient of 0.83, indicating reliability.

The researcher sought ethical clearance from Chuka University's ethics and research committee. The researcher also obtained a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). The researcher got informed consent from the prospective participants after explaining the purpose of the study. The researcher then asked the questionnaire questions as participants filled in their answers. After the last question, the researcher answered any questions from the study participants and then thanked them. The questionnaire was administered after the patient had attended and took about 15-20 minutes to complete. The key informant interview was conducted in an outpatient room, with seating and a table arranged. The study interviewed the healthcare workers in the diabetic clinic. Participants signed the consent form after agreeing to participate. The key informant filled out a form with demographic data. The researcher then conducted the interview using the interview guide. After each question, the interviewer asked follow-up questions to gather more information. During the interview, the researcher took detailed notes and audio-recorded it with the participant's consent. At the end of the interview, the researcher debriefed the participant and answered any questions they may have had. Finally, the researcher thanked the participant and allowed the participant to leave. The interviews were conducted in English and lasted about 30-45 minutes each.

3.5 Data Analysis and Presentation

Data were cleaned manually by checking for incomplete, incorrect, and duplicate information. The questionnaires were then coded and entered into the computer for analysis. Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) 29.0. Descriptive statistics (frequencies and percentages) summarized diabetic foot preventive practices. To distinguish respondents with proper foot care practices from those without, we scored responses on preventive practices for diabetic foot ulcers. We assigned a score of 2 to proper foot care practices and 1 to poor foot care practices. We then calculated total scores; those scoring 60% or more were categorized as having proper foot care practices, and the rest were labeled as having poor foot care practices. Chi-square test and Fisher's exact test were used for bivariate analysis of the association between independent variables (diabetic foot preventive practices). Multinomial logistic regression analysis was then used for multivariate analysis. Factors that yielded a p-value of 0.2 or below in the bivariate analysis were included in the regression analysis. Qualitative data were analysed thematically following the Braun & Clarke (2006) framework for qualitative data analysis. NVIVO version 14 computer software was used to facilitate qualitative analysis. The researcher transcribed the data verbatim. Then, familiarization with the data was conducted by reading and re-reading the transcript, coding by highlighting significant sentences or phrases, and labeling them with shorthand labels. Themes were then generated by searching for patterns that capture something significant about the research question. Themes were then reviewed to ensure none were missing and refined for

clarity; finally, themes were defined and named. Data were then presented using tables and narrative form.

3. Result and Discussion

A total of 234 patients with type 2 diabetes mellitus attending the diabetic clinic at Embu Level 5 Hospital participated in the study. This represents a maximum (100%) response rate.

3.1 Demographic Characteristics of the Study Participants

Most respondents (128, 54.7%) were female. As shown in Table 1, 82 (35%) respondents were aged 51 to 60 years, while 50 (21.4%) and 36 (15.3%) were 61 to 70 years and 71 to 80 years, respectively. The mean age was 60 years. The vast majority (229, 97.9%) of respondents were Christians. Most respondents (180, 76.9%) were married. Regarding education, 80 (34.2%) and 60 (25.6%) respondents had primary and secondary education, respectively. A third of respondents, 78 (33.3%), were farmers, while 89 (38%) earned income from informal employment. These results show that the sample consisted mostly of lowly educated, unemployed, married women aged 61 to 70 years.

Table 1: Respondents' Demographic Characteristics

Variable		N	%
Sex	Male	106	45.3%
	Female	128	54.7%
Age	31-40 years	22	9.4%
	41-50 years	35	15.0%
	51-60 years	82	35.0%
	61-70 years	50	21.4%
	71-80 years	36	15.4%
	Over 80 years	9	3.8%
Religion	Christian	229	97.9%
	Others	5	2.1%
Marital status	Single	31	13.2%
	Married	180	76.9%
	Divorced	5	2.1%
	Widowed	18	7.7%
Level of education	No formal education	47	20.1%
	Primary	80	34.2%
	Secondary	60	25.6%
	Tertiary	47	20.1%
Source of income	Formal employment	32	13.7%
	Informal employment	89	38.0%
	Farmer	78	33.3%
	Others	35	15.0%

3.2 Diabetic Foot Ulcer Preventive Practices

This section presents the analysis of data collected on preventive practices for diabetic foot ulcers among patients with type 2 diabetes mellitus attending Embu Level 5 Hospital.

3.2.1 Foot Care Practices

To identify preventive practices for diabetic foot ulcers, the researcher sought to understand the respondents' foot-cleaning and examination practices. Results show that 56 (23.9%) and 69 (29.5%) reported examining their feet daily and once per week, respectively. However, 66 (28.2%) never examined their feet. Similarly, when asked whether they inspected the inside of their shoes before putting them on, 60 (25.6%) indicated sometimes, 50 (21.4%) rarely, and 50 (21.4%) never inspected the inside of their shoes. Slightly below half, 106 (45.3%), indicated they trimmed their toenails straight across and smoothed them with a nail file sometimes, and 92 (39.3%) indicated they did so often. Regarding foot washing, most (87%) reported washing daily. After washing their feet, most (180, 76.9%) indicated they dried them daily. However, 88 (37.6%) sometimes dried between their toes, and 75 (32.1%) never did. Slightly above half (135, 57.7%) applied lotion daily, 15.8% once per week, and 56 (23.9%) never used lotion. The results show that while some aspects of foot care, such as daily washing and lotion application, are well executed, there is room for improvement in foot examination, shoe inspection, and toe drying to better prevent diabetic foot ulcers.

Table 2: Foot Care Practices Among Respondents

Variable		n	%
How often do you examine your feet?	Never	66	28.2%
	Once per week	69	29.5%
	2-4 times per week	43	18.4%
	Daily	56	23.9%
Do you inspect the inside of your shoes before putting them on?	Never	50	21.4%
	Rarely	50	21.4%
	Sometimes	60	25.6%
	Often	74	31.6%
Do you trim your toenails straight across and smooth them with a nail file?	Never	2	0.9%
	Rarely	34	14.5%
	Sometimes	106	45.3%
	Often	92	39.3%
How often do you wash your feet	Once per week	2	0.9%
	2-4 times per week	28	12.1%
	Daily	201	87.0%
What water temperature do you use when you wash your feet?	Cold water	64	27.4%
	Hot water	12	5.1%
	Warm water	158	67.5%
How often do you dry your feet after washing them?	Rarely	8	3.4%
	Sometimes	46	19.7%
	Daily	180	76.9%
How often do you dry in between your toes?	Rarely	75	32.1%
	Sometimes	88	37.6%
	Often	71	30.3%
How often do you apply any lotion on your feet?	Never	56	23.9%
	Once a month	6	2.6%
	Once a week	37	15.8%
	Daily	135	57.7%

3.2.2 Footwear and Shoe Inspection Practices

The researcher assessed respondents' footwear practices to identify preventive measures for diabetic foot ulcers. Results show that 102 (43.6%) often wore shoes with heels less than 2 inches, and 92 (39.3%) wore them daily. The majority (152, 73.1%) never wore high-heeled shoes. Slightly above half (119, 56.7%) often wore shoes made of a breathable material, such as leather. Similarly, 141 (63.8%) often wore well-fitting shoes with comfortable insoles. The results show that 62 (37.6%) never wore, and 36 (21.8%) rarely wore, closed-toe sandals without straps between the toes. Regarding sandals with open toes and straps between the toes, 101 (48.3%) wore them daily, and 64 (30.6%) wore them often. For walking barefoot outdoors, 90 (41.3%) rarely did so, and 95 (43.6%) never did. The results also show that 80 (37.7%) often walked barefoot indoors, but 64 (30.2%) rarely did so, and 62 (29.2%) never did. These findings show that while respondents were aware of and followed key diabetic foot ulcer prevention footwear practices, such as wearing well-fitting, breathable shoes, notable gaps remain in sandal use and avoiding barefoot walking.

Table 3: Footwear Practices Among Respondents

	Never		Rarely		Often		Daily	
	N	%	n	%	n	%	N	%
Shoes with heels less than 2 inches	15	6.4%	25	(10.7%)	102	(43.6%)	92	(39.3%)
High-heeled shoes	152	73.1%	32	(15.4%)	21	10.1%	3	1.4%
Shoes with a breathable material, such as leather	13	6.2%	57	27.1%	119	56.7%	21	10.0%
Well-fitting shoes with comfortable insoles	13	5.9%	26	11.8%	141	63.8%	41	18.6%
Sandals with closed toes and without straps between toes	62	37.6%	36	21.8%	30	18.2%	37	22.4%
Sandals with open toes and straps between the toes	6	2.9%	38	18.2%	64	30.6%	101	48.3%
Walking barefoot outdoors	95	43.6%	90	41.3%	30	13.8%	3	1.4%
Walking barefoot indoors	62	29.2%	64	30.2%	80	37.7%	6	2.8%

The researcher also examined respondents' use of socks and foot exercises. Slightly below half, 110 (47.6%), broke in new shoes gradually, sometimes, while 90 (38.5%) never did. Similarly, 77 (32.9%) always wore shoes with socks, while 106 (45.3%) wore them only sometimes. Most (169, 88.5%) wore cotton socks. Most respondents (176, 76.2%) reported never practicing foot exercises. Overall, respondents exhibit poor practices regarding sock use and foot exercises. While some wear socks, the high rates of not breaking in new shoes gradually and not engaging in foot exercises are concerning.

Table 4: Use of Socks and Foot Exercises Among Respondents

	Response	n	%
How often do you break in new shoes gradually?	Never	90	38.5%
	Sometimes	110	47.0%
	Always	34	14.5%
Do you wear shoes with socks?	Never	51	21.8%
	Sometimes	106	45.3%
	Always	77	32.9%
What type of socks do you wear?	Cotton	169	88.5%
	Nylon/Artificial	22	11.5%
How often do you practice foot exercises?	Never	176	76.2%
	Once per week	47	20.3%
	2-4 times per week	5	2.2%
	Daily	3	1.3%

Results therefore show that the majority, 148 (63.2%), of respondents had poor foot care practices. Similarly, 179 (76.5%) of respondents had poor footwear and shoe inspection. Overall, 164 respondents (70.1%) had poor preventive practices for diabetic foot ulcers.

Table 5: Summary of Diabetic Foot Ulcer Preventive Practices Among Respondents

Practice	Good		Poor	
	n	%	N	%
Foot care	86	36.8	148	63.2
Footwear and shoe inspection	55	23.5	179	76.5
Total	70	29.9	164	70.1

3.2.3 Knowledge of Proper Foot Care Practice

Respondents were asked to indicate what proper foot care practice meant to them. Analysis of responses showed that most respondents were knowledgeable about proper foot care practices. The respondents were generally knowledgeable about basic hygiene, foot inspection, injury prevention, and nail care. However, significant knowledge gaps exist in comprehensive diabetic foot care practices, particularly among those who reported no education on the subject. Several respondents mentioned washing and drying feet as part of foot care. A few respondents emphasized foot inspection and injury prevention. Some responses also included moisturizing the feet. A small number of respondents mentioned trimming nails, showing some understanding that untrimmed nails can cause injury or infection. However, many respondents explicitly stated they didn't know about foot care, and some said they had never been educated about it. Some of the responses included "*washing and drying feet*", "*avoid injury, use gumboots when farming*", "*trimming nails, avoid foot injury*", and "*I have never been educated about foot care*". The researcher sought to identify where respondents learned proper foot care practices. Table 6 summarises the results.

Table 6: Source of Information on Proper Foot Care Practice

Source	n	%
Health care providers	221	94.5%
Social media	8	3.7%
Others	4	1.8%
Total	234	100.0%

The vast majority of respondents, 156 (94.5%), reported receiving information on proper foot care practices from healthcare workers. This result demonstrates a lack of diversity in the sources of information regarding proper foot care practices. Respondents were then asked to name the proper foot care behaviours they knew. Data was analysed using descriptive statistics, and the results were summarised in Table 7.

Table 7: Proper Foot Care Behaviours Known to Respondents

Response	N	%
Daily foot inspection	70	29.9
Washing feet with warm water	39	16.7
Wearing cotton socks with shoes	6	2.6
Wearing socks to keep the foot warm at night	2	0.9
Drying feet, including between toes, after washing	9	3.8
Trimming toenails appropriately when necessary	18	7.6
Avoid walking barefoot	20	8.5
Don't know	70	29.9
Total	234	100.0

The results show that 70 (29.9%) of respondents knew some proper foot care practices, whereas 70 (29.9%) indicated that they did not know any proper foot care behaviors. These results demonstrate that most patients had knowledge of proper foot care behaviours. The researcher was also interested in whether the respondents were knowledgeable about the risk factors for DUF. Respondents were therefore asked to name factors that can predispose someone to developing a diabetic foot ulcer. Table 8 summarises the results.

Table 8: Knowledge of Risk Factors of Foot Ulcer

Response	n	%
Age more than forty years	36	15.4
Duration of diabetes more than 5 years	5	2.1
Smoking cigarette /tobacco	13	5.6
High blood pressure	2	0.9
Loss of peripheral sensation	8	3.4
Previous foot ulcer	9	3.8
Don't know	161	68.8
Total	234	100.0

The majority (161, 68.8%) indicated they did not know any risk factors. Among those who knew, 36 (15.4%) indicated age greater than 40 years, while 9 (3.8%) and 8 (3.4%) cited a previous foot ulcer and loss of peripheral sensation, respectively. These results show a deep lack of knowledge regarding the risk factors for diabetic foot ulcers. The researcher sought to determine, from the health workers in the KII, indicators or observations that suggest diabetic patients' level of knowledge regarding the prevention of diabetic foot ulcers. The most frequently mentioned indicator of patient knowledge was whether patients were wearing appropriate footwear. Healthcare workers reported that most patients adhered to the recommendation to wear the correct shoe size and avoid tight shoes and slippers, which are critical to preventing foot injuries and ulcers. However, some patients still failed to follow this advice, especially when treating corns or blisters at home. Foot care practices, such as drying between the toes and applying lotion, were also common indicators of knowledge. Toenail trimming was another important indicator. Patients who regularly had their toenails properly trimmed during follow-up visits showed higher foot-care knowledge. Avoiding home treatment of corns or blisters was also an indicator of patients' knowledge. Many patients demonstrated their knowledge by applying what they learned during educational sessions. Therefore, diabetic patients' knowledge of diabetic foot ulcer prevention was indicated by their footwear choices, foot care practices, toenail trimming, and tendency to avoid self-treating foot conditions. Additionally, adherence to health education on diabetic foot care clearly indicated knowledge. Some of the responses were: *"patients implement whatever they have been taught"*, *"When they come for follow-up visits and have their nails trimmed, a few patients like 10 Out of 50 patients do not trim their toenails as recommended"*, *"Some patients wear right shoes while a few don't"* and *"Avoiding injuries, some don't wear tight shoes, slippers and drying feet"*

The researcher sought to determine how healthcare providers educated respondents about foot care to prevent ulcers. Many respondents reported not receiving any education on foot care. A common educational message from healthcare providers, mentioned by several respondents, was to wash and dry feet regularly. A few respondents mentioned being educated on the importance of inspecting their feet for signs of ulcers. Some respondents were educated on the importance of wearing appropriate shoes and socks to avoid injury. A few respondents mentioned trimming toenails and avoiding injuries. Several respondents mentioned being advised to moisturize their feet. Some of the responses included "not educated," "I was not taught," washing and drying feet," "wearing protective shoes," and *"applying lotion."* Therefore, while some patients received instructions on basic practices such as washing and

drying feet, inspecting feet, wearing appropriate shoes, trimming toenails, and moisturizing, many respondents reported not receiving any education.

In the KII, the most commonly mentioned guideline concerned footwear. Patients were advised to wear the right shoe size, avoid plastic shoes, and buy recommended shoes. Patients were strongly encouraged to inspect their feet regularly, particularly those at risk of developing ulcers. This includes using a mirror to check the feet for any abnormalities. The guidelines stressed the importance of properly trimming toenails with a nail cutter and filing sharp edges to avoid injuries. Additionally, patients are advised to treat corns at a hospital rather than attempting home remedies, as improper treatment may lead to complications. Patients were advised to avoid foot injuries and seek professional care if they occur. They were encouraged to moisturize their feet with lotions rather than solid oils after washing and drying them. Although less frequently mentioned, patients were also advised to exercise their feet as part of their foot care routine. In summary, guidelines included wearing the right footwear, daily foot inspection and hygiene, nail and corn care, injury prevention, and using appropriate moisturizing products. Some of the responses included: *“Wearing night shoe size, frequent clinic visit foot inspection, wash feet & dry between toes, use gumboot when farming, avoid plastic shoes, no smoking cigarette trimming toe nails using nail”, “Avoiding foot injuries, treating corns at hospital and not at home, wearing appropriate shoes, avoid walking barefoot”* and *“ Avoid injuries on foot, avoid cigarette, cutting the nails with nail cutter use lotion instead of solid oil on foot after washing and drying foot, avoid plastic shoes, inspect foot using mirror”*

3.3 Association of Individual -Related Factors with DFU Prevention Practices

To examine the association between individual-related factors and diabetic foot ulcer prevention practices, we conducted chi-square tests. Results show that gender ($p=0.034$), education ($p=0.006$), and knowledge ($p<0.001$) were significantly associated with diabetic foot ulcer prevention practices. Analysis showed that being female, educated, and knowledgeable were associated with a higher likelihood of engaging in effective DFU prevention practices. However, respondents' age ($p=0.423$), marital status ($p=0.916$), and source of income ($p=0.376$) were not significant.

Table 9: Association of Individual Related Factors with Diabetic Foot Ulcer Prevention Practices

Patient-Related Factor	Value	Df	P
Gender	6.703	1	0.034
Age	4.942	5	0.423
Education	10.064	2	0.006
Marital status	0.514	3	0.916
Source of income	3.104	3	0.376
Knowledge	12.3	1	0.000

The study conducted a multinomial logistic regression to assess the association between sex and knowledge of diabetic foot ulcer preventive practices. Results show that sex ($p=0.038$) and knowledge ($p=0.029$) were statistically significant. According to the results, males were 1.887 times more likely than females to engage in poor preventive practices. Respondents who were

not knowledgeable were 10.876 times more likely to have poor DFU preventive practices than those who were.

Table 10: Factors Influencing Diabetic Foot Ulcer Prevention Practices

Practice ^a	B	Std. Error	Wald	Df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Poor Intercept	62.890	1234.491	0.003	1	.959			
[Sex=1]	.635	.306	4.306	1	.038	1.887	1.036	3.438
[Sex=2]	0 ^b	.	.	0	.	.	.	.
[Knowledge=1]	2.387	1.093	4.771	1	.029	10.876	1.278	92.588
[Knowledge=2]	0 ^b	.	.	0	.	.	.	.

- a. The reference category is: Good.
b. This parameter is set to zero because it is redundant.

3.4 Discussion

The study found that most patients had poor preventive practices for diabetic foot ulcers. This was consistent in both patients’ questionnaire responses and healthcare workers’ KII responses. A study in India found similar results, with only 40.7% practicing proper foot care by wearing recommended footwear (Mitra *et al.*, 2023). Similarly, Kiprono *et al.* (2023) found that only 40% of the participants practiced proper foot care by wearing recommended shoes with socks. Acelya *et al.* (2021) in Turkey found similar results, with only 13.7% practicing foot exercises. However, a study in Saudi Arabia found contrasting results: 60% of participants reported inspecting their shoes before wearing them (Alshammari *et al.*, 2019). In a similar study in Ghana, the percentage of participants who inspected their shoes before wearing them was similar to that in Saudi Arabia, with 61% of participants practicing shoe inspection, compared with the current study (Tuglo *et al.*, 2022). Several factors may explain why most patients had poor DFU preventive practices. One possible explanation is lower health literacy among the patients, which makes it challenging for them to fully understand the mechanisms of their condition and the importance of preventive measures. Additionally, financial constraints may play a significant role, as many patients could not afford the recommended footwear and therefore could not consistently adhere to proper foot care practices. Poverty not only limits the ability to purchase appropriate shoes but also increases transportation costs, affecting patients’ ability to attend follow-up visits regularly.

Bivariate analysis showed that gender (p=0.034), education (p=0.006), and knowledge (p<0.001) were significantly associated with diabetic foot ulcer prevention practices. Gender and knowledge remained significant in the regression analysis. Analysis showed that being female was associated with a higher likelihood of engaging in good DFU prevention practices. This aligns with Indrayana *et al.* (2019), who found that females have better preventive practices, whereas other studies found that males have better foot care practices than women. Similarly, a study in China found a correlation between gender and foot care practices, with women exhibiting better practices than men (Jia *et al.*, 2022). However, the result disagrees with the findings of Tuglo *et al.* (2021) that male diabetic patients had poor foot care practices

and were three times more likely to develop diabetic foot ulcers compared to women. In contrast, a Korean study on foot care practices found that foot care practices were significantly associated with gender, with men more likely to engage in proper foot care than women (Kim & Han, 2020). Women may have stronger social support networks, which can provide encouragement and help manage diabetes and prevent complications.

Education level was also significant in the chi-square tests. According to the results, educated patients with secondary or tertiary education were more likely to engage in good DFU prevention practices than those with no education or primary education. This result aligns with a study in Ethiopia by Bekele et al. (2022), which found that patients with diabetes who completed education were three times more likely to practice proper preventive care than those who had not received education. Similarly, Mekonen and Demssie et al. (2022) found that patients with DM who demonstrated poor foot care practices were two to three times more likely to have not completed primary school-level education than those who completed tertiary school-level education. In addition, an Integrative review of factors influencing diabetic foot care behaviors by Woo and Cui (2023) reported that patients with higher educational levels and literacy demonstrated improved diabetic foot care behaviors. However, education did not predict DFU prevention practices in studies by Azmi *et al.* (2020), Sertsu *et al.* (2023), and Tuha *et al.* (2021). The finding that patients with secondary or tertiary education were more likely to engage in good DFU prevention practices than those with no education or only primary education may reflect higher health literacy among educated patients. Individuals with more advanced education can better understand and process health information, leading to more consistent adherence to preventive practices. This may also reflect greater access to information, as educated patients may be more proactive in seeking knowledge about diabetes management and the importance of foot care.

Knowledge of DFU prevention practices was also associated with diabetic foot ulcer prevention practices among patients with type 2 diabetes mellitus attending Embu Level 5 Hospital in Kenya. According to the results, patients who were knowledgeable about DFU and DFU prevention practices were more likely to practice good diabetic foot ulcer prevention practices than those without this knowledge. Similarly, Jia *et al.* (2022) observed a significant positive association between knowledge and foot care practices among the participants. Wanja *et al.* (2019) also found that patients with diabetes who had higher knowledge practiced better foot care than those with poor knowledge. A similar study in India reported low overall knowledge of washing feet daily, using moisturizers, trimming toenails straight across, and using proper footwear (Mitra *et al.*, 2023). However, Jia *et al.* (2022) found that 63.5% of participants had poor foot care knowledge, which differs from the current study's results. This may reflect increased knowledge and understanding of how proper foot care practices can reduce the risk of complications. Patients who understand DFU and its prevention are more likely to recognize the risks of neglecting proper foot care, which motivates them to adopt preventive practices consistently. Additionally, knowledgeable patients are likely to better understand the long-term consequences of poor foot care, such as infection or amputation, which further encourages adherence to preventive practices.

4. Conclusion

Preventive practices for diabetic foot ulcers among patients with type 2 diabetes mellitus attending Embu Level 5 Hospital in Kenya were poor. Respondents exhibited poor practices in foot care and footwear inspection. Patient-related factors influencing diabetic foot ulcer prevention practices among patients with type 2 diabetes mellitus attending Embu Level 5 Hospital in Kenya included gender, level of education, and knowledge. Being female and knowledgeable were associated with a higher likelihood of engaging in effective DFU prevention practices.

5. Recommendations

The diabetic foot ulcer (DFU) prevention practices were generally found to be poor among patients diagnosed with type 2 diabetes mellitus attending Embu Level Five Hospital. This highlights the urgent need for healthcare practitioners to devise and implement effective strategies to continuously remind patients to practice proper foot care daily. Given poor practices among men, campaigns specifically designed for men are needed to emphasize the importance of foot care in diabetes management. The Ministry of Health ought to collaborate with local male groups to reach men in their communities and provide education on DFU prevention. Training programs for healthcare providers on how to effectively communicate with male patients about DFU prevention could also be beneficial. The health system needs to use more communication channels to convey the importance of foot care in diabetes, to avoid overreliance on healthcare workers. This could include radio, television, and billboards. The study found that patients who perceived health workers as having an encouraging attitude were more likely to engage in effective DFU prevention practices. Therefore, county governments need to foster a supportive, positive work environment that encourages healthcare providers to deliver high-quality care.

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