

Foot Care Practices among Type 2 Diabetics Mellitus Patients Attending Diabetes Clinics in Embu County, Kenya

Annastacia M. Mbisi¹, Lucy K. Gitonga¹, Silas Kiruki²

¹Department of Nursing, Chukka University, Nairobi, Kenya

²Department of Physical Sciences, Chukka University, Nairobi, Kenya

Email: annahmbisi@gmail.com, gitonga30@yahoo.com, kirusila@yahoo.com

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Abstract

Diabetes mellitus has become a global epidemic of 21st century with disproportionately high socioeconomic burden in the developing world. Foot ulcerations secondary to peripheral neuropathy and peripheral vascular disease have led to devastating health outcomes including amputations. A descriptive survey targeting a sample size of 301 was drawn from the selected health facility. Majority of the respondents were female and aged between 40 and 70 years old. The duration that a patient had lived with diabetes, history of smoking and respondents age was significantly associated with foot ulcers at P-value < 0.05. Walking bare foot in and out of the house, breaking into new shoes, poor inspection of feet were associated with the development of foot ulcers while dressing of blisters with sterile dressings was associated with the prevention of foot ulcers.

Keywords

Diabetes Type 2, Foot Ulcers, Foot Self Care

1. Introduction

Diabetes mellitus (DM) is a common disease worldwide public health problem and diabetic foot ulcer (DFU) is among the complex and complications in patients with diabetes mellitus [1]. Globally, it was estimated that DM affected 8.3% of the patients [2]. Epidemiological diabetes survey done by World Health Organization [3] indicated the figure had gone up to 422 million worldwide by 2014. IDF their study done in 2015 projected the figure to reach 642 million by 2040 [2]. It is clear that this number can continue to go high, making DFU a

major public health problem for the public. Diabetes mellitus is a chronic disease and is among the top four non-communicable diseases [NCDs]. Just like the other three NCDs (cardiovascular diseases (CVD), cancers, and chronic respiratory diseases), diabetes is of long duration and generally of gradual progression, World Health Organization [3].

2. Literature Survey

A meta-analysis study in various countries showed that the prevalence rate of DFU worldwide was 6.3%. North America had the highest prevalence rate of 13.0%, compared with Oceania with prevalence rate of 3.0%. In Europe, the prevalence rate was 5.1%, Australia had a prevalence rate of 1.5% and Belgium was found to have a prevalence of 16.6%. While Canada had (14.8%), USA had 13.0%. India reported a prevalence rate of 11.6% [4].

In Africa, the number of patients suffering from diabetes has increased significantly and there are expectations of doubling the number in the coming decades. In 2015, an estimate of 14.2 million persons with diabetes in Africa was made and if the current trend continues the overall prevalence of diabetic foot ulcers was projected to increase to 34.2 million by the year 2040 [2]. International Diabetes Federation [2] also indicated in Africa, 21.5 million people live with diabetes with annual estimate of 480,900 diabetes-related deaths.

The most populous countries in the continent had the highest numbers of people with diabetes, these countries include; Ethiopia (1.9 million), Nigeria (3.9 million), South Africa (2.6 million), and the United Republic of Tanzania (1.7 million). However, the prevalence of diabetic foot ulcer was reported to be high in the island of Reunion (15.4%), Seychelles (12.1%), Gabon (10.7%) and Zimbabwe (9.7%) in descending prevalence [2]. Recent meta-analysis study by Pengzi *et al.* [4] indicated that Africa showed a diabetes foot prevalence rate of 7.2% which is higher than Asia 5.5%. Another study done by Abbas & Archibald [5] indicated that the foot ulceration rates in Africa vary from one region to another and had been estimated to vary between 4% and 19%. In Nigeria, another Hospital-based study revealed that the prevalence of lower limb ulceration was between 11% and 19.1%, among individuals with diabetes [5] [6].

In Kenya, the prevalence of diabetes stood at 3.3% in 2011 [2]. McFerran [7] predicted to arise to 4.5% by 2025. Recent studies done by Oduori & Ondari [8] at Kenyatta national hospital indicate the overall prevalence of foot at risk was 76.1%. There are many complications that affect people with diabetes, the foot ulcer complications take lead [9]. According to Chu and Wang [10], some patients developed foot ulcer after 1, 3, and 5 years and when their prevalence was examined they were increasing from 27.3%, 57.2%, and 76.4%, respectively, this also led to increase in prevalence of foot amputations at 12.5%, 22.3%, and 47.1% respectively [10]. Other studies showed that the mortality rate as a result of diabetic foot amputation ranges from 13% to 40% within one year, at 3 years it was ranging from 35% to 65%, and at 5 years it was ranging from 39% to 80%, which was found to be worse than the mortality rate for most cancers [11]. Ac-

According to International Diabetes Federation [2], 50% of these amputations are preventable if the patients are taught on the recommended daily foot care practices.

Prevention of foot ulcers and prophylactic foot care practices has been championed to minimise patient morbidity, the use of costly resources, and reduce chances for amputations [12]. It might take time and effort to establish good foot care practices, but foot self-care is very important. Regular inspection of the diabetic foot by patients along with recommended health education for patients is known to be one of the easiest, less expensive, and more effective measures for prevention of future foot ulcer complications [13]. Despite there being a large amount of literature resources on diabetic foot care practices and the importance of self foot care, published ones are limited especially on diabetes foot care practices, among patients with type 2 diabetes in Sub Saharan Africa, especially in Kenya.

Thus, this study was done to establish the current foot self-care practices among those patients who attend their diabetic clinics in Embu County. The information obtained from the study informed the county on the current level of use of self-foot care practices associated with strategies geared towards diabetic foot prevention, and help to improve the quality of care given to diabetic patients to minimise the burden related to diabetic foot complications. Health educating the patients on recommended strategies was likely to be effective if the patients were aware of their current practice on self-foot care. An analysis was done for 6 years on the effectiveness of preventive foot care practices and it revealed that those diabetic patients who had high chances of developing foot ulcers and were compliant with preventive practices were 13 times less likely to develop foot ulcers compared to those patients who did not follow the recommended guidelines. Among the patients who complied with the recommendations, the total cumulative incidence of foot ulcer was rated at 3.1% compared to 31.6% among those who did not comply [14].

3. Problem Definition

In Embu, Foot complications are a major source of morbidity related to diabetes and leading cause of admission to hospital among Type 2 diabetes mellitus patients in this area. Foot complications can be prevented and effectively managed but unfortunately, type 2 diabetes mellitus patients in this area seek medical attention regarding their feet when it's too late hence risk being amputated. This study therefore seeks to establish the gap through assessing foot care practices among this population, as understanding the main reasons behind this situation would be a step towards devising ways to alleviate it.

4. Methodology

The study was carried out at all diabetic clinics in Embu County which offers the specialized clinic. Embu County lies some 120 kilometers northeast of Nairobi,

on south-eastern side of Mount Kenya. Embu County has four sub-county hospitals and one teaching and referral hospital. Out of the five hospitals only three offer diabetic clinic, that is, Kianjokoma and Runyenjes sub-county then the main referral hospital.

The study used a descriptive survey design to assess foot care practices among diabetic type 2 patients attending diabetic clinic in Embu County. The respondents of this study included all DM patients over 18years, who voluntarily consented to participate in the study and consent to give information.

The instrument of the study was a structured questionnaire, and direct observation/examination of the patient. The questionnaire contained socio-demographic data, and practice of foot self-care was administered to all the participants (patients) and the patients' feet were physically examined for foot ulceration to provide additional information on actual foot care practices.

The study population was 1413, with 954 attending Embu teaching and referral hospital, 234 attending Runyenjes sub-county hospital and 225 attending Kianjokoma sub-county hospital. The sample size was calculated using fisher *et al.* [15] formula through which a sample size of 301 participants arrived at.

During sampling, the researcher calculated proportional sample sizes per institution. A sample of 204 participants was drawn from Embu teaching and referral hospital, 50 participants were drawn from Runyenjes sub-county Hospital and 47 participants were selected from Kianjokoma sub-county hospital. In each facility, systematic random sampling was used to get the desired sample from daily type 2 register. The respondents signed informed consent before completing the questionnaire.

To ensure the reliability of the instrument, the research tools were pretested at Chuka general hospital on 10% ($n = 30$) of 301 study participant. Parallel form technique was used to check how well the form elicits the same responses to the issues raised. To determine the content validity expert opinion was sought to judge whether or not the content and format of the instrument are appropriate.

Data were analysed using SPSS statistical software version 24. Descriptive statistics were computed to establish the characteristics of participants. Proportions were also computed and reported as percentage of totals. Chi-square test was used to test the relationship between categorical variables. Statistical significance was set at $\alpha = 0.05$. A logistic regression model was used to predict the relationship between foot care practices and diabetes foot complication. Data was presented in summary tables.

Permission was sought from National Council for Science, Technology and Innovation ("NACOSTI") and Embu Teaching and Referral Hospital (ETRH) institutional research board committee before the execution of the research. Consent was obtained from the respondents in order to participate in the study; those not wishing to participate were not forced to participate in the study. Confidentiality of the information gathered from the subjects was maintained and no subject was required to write his or her name. Data collected was stored in

password database to prevent any unauthorized access.

5. Results Presentation

5.1. Socio-Demographic Profile of the Respondents

The ages of the respondents ranged from 40 to 89 complete years with a mean age of 63 years.

According to the results in **Table 1**, on social-demographic characteristic; More than half of the participants (51.2%) were aged between 50 and 70 years of age, while the remaining (10.8%) were aged between 40 and 50 years and 38% of the participants had their age above 70 years. Most of the patients were aware of the topic under study; however increase in age was associated with minimal or low level of awareness of diabetic foot care, on gender, 112 (37.7%) were male participants while the remaining 62.3% were female. More females were found to attend the diabetic clinics compared to their counterpart male patients. Expectedly majority of the respondents were married (70%), while the remaining

Table 1. Socio-demographic characteristics of the respondents.

Variable	category	frequency	percentage
Age in years	Above 70	113	38
	60 -70	97	32.7
	50 - 60	55	18.5
	40 - 50	32	10.8
Gender	Male	112	37.7
	Female	185	62.3
Marital status	Single	13	4.4
	married	208	70
	Separated, windowed and divorced	76	25.6
Level of education	Informal education	54	18.2
	Primary education	142	47.8
	Secondary education	82	27.6
	Tertiary education	19	6.4
Source of income	Farming	217	73.1
	Formal employment	15	5.1
	Informal employment	61	20.5
	Unemployed	4	1.3
Smoking	Past smoker	73	24.6
	Never smoked	224	75.4
Chewing or taking oral tobacco	Took in the past	5	1.7
	Never taken oral tobacco	292	98.3

25.5% were separated, widowed or divorced and the remaining 4.4% were single.

Majority of the respondents 142 (47.8) were of primary level of education, with 27.6% with secondary level of education and 6.4% with post-secondary level of education. In the same report a few of the respondents, 54 (18.2%) had informal level of education and the researcher had to translate the questionnaire for them to understand

On source of income, most of the respondents 217 (73.1%) reported to receive their main finances from farming, with 5.1% having formal employment, 20.5% with informal employment and 1.3% were not employed yet depended on support from other family members. It was evident that the patients regardless of the source of income, they were comfortable with the amount earned.

On their social life, 24.6% reported to have smoked in the past, 75.4% never smoked and none of the respondents voluntarily reported to be smoking currently. Smoking is associated with deposition of nicotine into blood circulation which impairs the normal circulation of blood. Those who ever smoked, reported to have smoked a range of one to twenty sticks of cigarettes per day. A non-significant proportion among the smokers had taken per oral tobacco, 5 (1.7%) but none reported to be taking oral tobacco currently.

On clinical characteristics of the patients as shown in **Table 2**, 35 (11.8%) had suffered from diabetes for less than 5 years, 25.9% between 6 and 10 years, 34% between 11 - 15 years and 28.3% above 15 years. On checking the body mass index (BMI) of the patients, 4.4% between 18.5 and 24.5 which was considered to be normal, 56.6% their BMI being between 24.5 and 30 which was regarded as overweight and 39% had their BMI above 30 which was interpreted as

Table 2. Clinical characteristics of the respondents.

Variable	Category	Frequency	Percentage
Duration since first time diagnosis as diabetic	<5 years	35	11.8
	6 - 10 years	77	25.9
	11 - 15 years	101	34
	>15 years	84	28.3
Current BMI	18.5 - 24.5	13	4.4
	24.5 - 30	168	56.6
	>30	116	39
Type of diabetes treatment on	Oral anti-diabetes	195	65.7
	Insulin	30	10.1
	combined	72	24.3
Had foot complication	Yes	215	72.4
	No	82	27.6
Had foot ulcer complication	yes	145	67.5
Had other foot complication	yes	70	32.5

being obese.

Majority of the patients 195 (65.7%) were on oral antidiabetics while the remaining proportion 24.2% were on combined therapy. It was reported that majority of those who were on insulin therapy 30 (10.1%) had been recently started on the therapy since oral medication had failed to control their blood sugars.

On history taking, 215 (72.4%) reported to have had foot complications, out of those who had foot complications 145 (67.5%) were found to have foot ulcer, 70 (32.5%) had other foot complication such edema, corns among others while others reported non-specific problems.

On checking association of socio-demographic and clinical characteristics factors with development of foot ulcer, **Table 3** shows the variables that were significantly associated with foot ulcer development among the respondent. Among the respondents, 113 patients were aged above 70 years, out of all these 68 had developed foot ulcer while 45 never had foot ulcer. Those of age bracket 40 - 50, 17 of them had foot ulcers while 15 were free of foot ulcers. In the age bracket of 50 - 60, 27 had foot ulcer with 28 without foot ulcers and those in the age bracket of 60 - 70 were 97, out of these, 39 had developed foot ulcers while the remaining had not suffered the complication. $\chi^2 (3, N = 297) = 8.464, P = 0.037$. This meant that age was a predictor of developing foot ulcer; those with advanced age were at risk of developing the foot ulcer.

Smoking is a risk factor for development of foot complications among patients with type 2 diabetes. This became evident in this study. Out of 297 respondents, only 73 had reported to be past smokers. 46 of the 73 respondents, who were past smokers, had developed foot ulcers. The numbers of those who were nonsmokers were averagely the same between those who developed foot ulcers and those who didn't. There was a strong association between smoking and history of smoking with development of foot ulcers $\chi^2 (1, N = 297) = 5.738 P$

Table 3. Significant socio-demographic and clinical factors associated with foot ulcer development.

Variable	category	Has foot ulcer		df	P-value
		Yes	No		
Age in years	>70	68	45	3	P = 0.037 X ² = 8.464
	60 - 70	39	58		
	50 - 60	27	28		
	40 - 50	17	15		
Smoking status	Past smoker	46	27	2	P = 0.017 X ² = 5.738
	Never smoked	105	119		
Number of years with diabetes	Less than 5 years	15	20	3	P = 0.003 X ² = 13.722
	6 - 10 years	33	44		
	11 - 15 years	46	55		
	Greater than 15 year	57	27		

= 0.017. Chewing or taking oral tobacco was not associated with development of foot ulcers.

The number of years a respondent had lived with diabetes was significantly associated with development of foot ulcers. Those who had lived for more than 15 years with diabetes were at a higher risk of developing foot ulcers. In this study, 35 respondents had lived with diabetes for less than 5 years and only 15 had developed foot ulcers. Those who had lived with diabetes for 6 - 10 years were 77 and 33 out of these had developed foot ulcers. A relatively high number of respondents 101, had lived with diabetes for 11 to 15 years, among these 46 had developed foot ulcers. Those who had lived with diabetes for more than 16 years were 84 and more than half of them, 57 had developed foot ulcers $\chi^2 (3, N = 297) = 13.722, P = 0.003$.

5.2. Practices of Foot Self-Care

On practice of foot self-care, the patient is expected to optimize their metabolic glucose levels, patients should be screened and educated on best foot self-care practices. These practices include but not limited to foot ulcer preventive practices such as washing the feet regularly, drying the feet and between the toes among others; examination of feet for any risk factors such as skin color, presence of infected toes, toe nail appearance etc. and appropriate foot wear. The participants were subjected to twenty-five multiple choice questions which were tailored to assess the actual practice of best foot self-care practices.

According to the results shown in **Table 4**, practice of foot care among the respondents was categorized into poor, moderate and good by calculating the sum of activities practiced by each respondent. Those who carried out between 0% - 57% were rated to have poor practice, those who carried out between 58% - 71% were rated to have moderate practice and those who carried between 72% and above were classified as to have good foot self-care practice. The number of respondents with poor practice was 45.1%, those with moderate practice were 41.4% and the remaining had good foot care practice. Generally, the respondents were found to have averagely good practice.

On checking the association between general practice and development of foot ulcer, **Table 5** shows the results. Whereby generally, out of 134 patients who had poor practice 81 of them developed foot ulcers. Out of 123 who moderately practiced self-foot care, 69 developed foot ulcers. Forty patients had good practice and only 16 of them developed foot ulcer. Therefore good practice of self-foot care was associated with prevention of foot ulcers $\chi^2 (2, N = 297) =$

Table 4. Level of practice of foot self-care.

Variable	Category	Frequency	Percentage
Level of practice of foot self-care	Poor	134	45.1
	Moderate	123	41.4
	Good	40	13.5

Table 5. Association between general practice and development of foot ulcer.

Variables	Category	Has foot ulcer		df	P-value
		No	Yes		
General practice of foot care	Poor	53	81	2	P = 0.010 $\chi^2 = 9.198$
	Average	54	69		
	Good	24	16		

9.198, P = 0.010.

The participants were exposed to 25 multiple questions and the results were as shown in **Table 6**, which is explained below.

The participants were asked on how frequent they examine their feet, majority of the respondents reported to have examined their feet once a day, 74.1%, 17.5% less than five times a week, 0.7% did it more than once a day, and 7.7% reported to examine their feet once a week or less. On checking the shoes for any object that can injure the feet, 8.8% reported to check their shoes often, 53.8% sometimes checked, 37.4% reported to rarely check their shoes before wearing. Majority of the respondents 160 (53.9%), reported to sometimes check their shoes before wearing them, 37.4% rarely checked, while 8.8% of the respondents often checked their shoes before wearing them. The patients are expected to check their shoes when taking them off to ensure there is no sharp object impeded on the shoes. Less than half of the participants 10 (3.4%), reported to often check their shoes when taking them off, 34% rarely checked, 60.3% sometimes checked, and 2.4% never checked.

Washing of the feet of a diabetic patient is of paramount importance, 1% of the respondents in this study reported to wash their feet more than once a day, 89.2% once a day, and 9.8% most days a week. Generally, 1% dries their feet often after washing, 48.8% sometimes dry their feet, 43.4% rarely dry their feet and 6.7% never dries their feet after washing. On probing further in drying between toes, after washing, 8.4% ensures their feet are dry especially between the toes always, 44.1% sometimes check if they are dry sometimes not, 19.2% often ensure that the space between their toes is dry and 28.3% never checks in between the toes to check if its dry.

It was found that 63.3% of the participants use a moisturizing cream on their feet daily, 17.2% use the cream once a week, 13.1% once a month and 6.4% never use a cream between their toes. In the same line, 5.4% use a moisturizing cream between their toes daily, 34.7% once a week, 3% once a month and 56.9% never applied the cream between their toes at all.

The respondents reported to trim their toenails as they grew longer. 3% reported to trim their nails most of the time, 45.5% once a month, 48.8% less than a month and 2.7% never trimmed their toe nails. 1.7% reported to wear slippers with no fasteners most of the time, while 78.1%, 13.8%, 6.4% wear them sometimes, rarely and never respectively. It was reported that some patient wear trainers. On this, 0.7% proportion of the respondents was found to wear trainers

Table 6. Specific diabetic foot self-care practices among the respondents.

Variable	Category	Frequency	Percentage
Examination of feet	Once a week or less	23	7.7
	Less than 5 times a week	52	17.5
	Once a week	220	74.1
	More than once a day	2	0.7
Checking shoes before wearing them	Rarely	111	37.4
	Sometimes	160	53.8
	often	26	8.8
Checks shoes when taking them off	Never	7	2.4
	Rarely	179	34
	Sometimes	101	60.3
	Often	10	3.4
Frequency of washing feet	Most days of the week	29	9.8
	Once a day	265	89.2
	More than once a day	3	1
Ensures feet are dry after washing	Never	20	6.7
	Rarely	129	43.4
	Sometimes	145	48.8
	Often	3	1
Ensures between toes are dry	Never	84	28.3
	Sometimes	131	44.1
	Often	57	19.2
	Always	25	8.4
Use of moisturizing cream on feet	Never	19	6.4
	Once a month	39	13.1
	Once a week	51	17.2
	Daily	188	63.3
Use of moisturizing cream between toes	Daily	16	5.4
	Once a week	103	34.7
	Once a month	9	3
	Never	169	56.9
Frequency of washing feet	Most days of the week	29	9.8
	Once a day	265	89.2
	More than once a day	3	1
Ensures feet are dry after washing	Never	20	6.7
	Rarely	129	43.4
	Sometimes	145	48.8
	Often	3	1

Continued

Ensures between toes are dry	Never	84	28.3
	Sometimes	131	44.1
	Often	57	19.2
	Always	25	8.4
Use of slipper with no fastening	Most of the time	5	1.7
	Sometimes	232	78.1
	Rarely	41	13.8
	Never	19	6.4
Frequency of trimming toe nails	Never	8	2.7
	Less than once a month	145	48.8
	Once a month	135	45.5
	Most of the time	9	3
Wearing of trainers	Never	42	14.1
	Rarely	178	59.9
	Sometimes	75	25.3
	Most of the time	2	0.7
Wearing shoes with lace-up strap fastening	Never	6	2
	Rarely	140	47.2
	Sometimes	139	46.8
	Most of the time	12	4
Wearing pointed shoes	Most of the time	10	3.4
	Sometimes	128	43.1
	Rarely	74	24.9
	Never	85	28.6
Wearing of flip –flop or mules	Most of the time	4	1.3
	Sometimes	223	75.1
	Rarely	48	16.2
	Never	22	7.4
Breaking in new shoes gradually	Never	82	27.6
	Sometimes	159	53.5
	Most of the time	55	18.5
	Always	1	0.3
Wearing artificial fiber socks	Most of the time	2	0.7
	Sometimes	169	56.9
	Rarely	73	24.6
	Never	53	17.8
Wearing shoes without socks	Often	29	9.8

Continued

	Sometimes	152	51.2
	Rarely	65	21.9
	Never	51	17.2
Frequency of changing socks	Less than 4 times a week	1	0.3
	4 - 6 times a week	23	7.7
	Daily	271	91.2
	More than once a week	2	0.7
Walking in the house bare foot	Often	6	2
	Sometimes	210	70.7
	Rarely	66	22.2
	Never	15	5.1
Walking in the house bare foot	Often	6	2
	Sometimes	271	70.7
	Rarely	66	22.2
	Never	15	5.1
Walking outside the house barefoot	often	4	1.3
	Sometimes	153	51.5
	Rarely	108	36.4
	Never	32	10.8
Use of hot bottles in the bed	Sometimes	73	24.6
	rarely	32	10.8
	Never	192	64.6
Use of radiator to warm body	often	1	0.3
	sometimes	119	40.1
	rarely	38	12.8
	Never	139	46.8
Use of remedies when one has a cones	often	14	4.7
	Sometimes	187	63
	Rarely	53	17.8
	Never	43	14.5
Use of dry dressing on blisters	Never	27	9.1
	Rarely	153	51.5
	sometimes	103	34.7
	often	14	4.7
Use of dressing when one has a cut, gaze or burn	Never	34	11.4
	Rarely	139	46.8
	Sometimes	100	33.7
	Often	24	8.1

most of the time, 25.3% sometimes wear trainers, 59.9% rarely were they found wearing trainers and 14.1% never wore trainers at all.

On the type of shoes worn by the participants, 4% wore shoes with lace-up or strap fasteners most of the time, 46.8% sometimes wore such shoes, 47.2% rarely wore shoes with fasteners or lace-ups and 2% never wore such shoes. It was also reported that there was the use of pointed shoes among the participants, 3.4% reported to have worn pointed shoes most of the time, 43.1% some times, 24.9% rarely and 28.6% never wore pointes shoes. Use of mules or flip-flops wear was also assessed whereby 1.3% reported to have worn the mules most of the time, 75.1% some times, 16.2% rarely and 7.4% never wore mules.

New shoes were considered to be tight, therefore the frequency of wearing or breaking in new shoes was assessed. Gradual breaking in of new shoes was reported to be the good practice for diabetic patients, 0.3% reported to gradually break in new shoes always, 18.5% most of the time, 53.5% sometimes and 27.6% rarely or never.

The type of socks worn by an individual affects blood circulation especially to the foot. In this study, 0.7% was found to wear artificial fibre socks (nylon) most of the time, 56.9% reported to wear artificial fiber socks sometimes, 24.6% rarely wore nylon socks and 17.8% never wore artificial fiber socks. Majority of the respondents, 51.2% sometimes wore shoes without socks, 21.9% rarely wore shoes without socks, 17.2% never wore shoes without socks or tights and 9.8% often wore shoes without sock or stockings or tights. The participants were asked to indicate the frequency of changing their socks and 0.7% reported to change their socks more than once a week, 91.2% daily change their socks, 7.7% 4 - 6 times a week and 0.3% reported to change their socks less than four times a week.

It was also noted that a number of participants were walking bare foot at home. 2% reported to often walk bare foot in the house, 70.7% sometimes walk bare foot in the house, 22.2% rarely walk bare foot and 5.1% never walk bare foot in the house. 1.3% reported to often walk bare foot outside the house, 51.5% sometimes walk bare foot outside the house, 36.4% rarely walk bare foot and 10.8% never walk bare foot outside the house. Hot water bottles use in bed is a practice that helps to promote blood circulation especially the lower extremities. In this study, the participants were found to be aware on the same. 24.6% sometimes use the hot water bottle, 10.8%, 64.6% rarely use and others never use the hot water bottle respectively.

Warming oneself especially during a cold season is crucial to avoid numbness, in this study it was found that 0.3% of the participants often put their feet near the fire or on a radiator; 40.1% sometimes put their feet near the fire or radiator while 12.8% rarely put their feet near the fire or on a radiator. A relatively high proportion, 46.8% was reported never put their feet near the fire or on a radiator.

Use of corn remedies, corn plaster or paints is common among the general population especially in treating a corn. This practice was evaluated among the

diabetic patients who participated in this study. 4.7% were found to have often used corn remedies/corn plaster or paints, 17.8% rarely used the corn remedies, 63% sometimes and 14.5% never used the corn remedies. It was also reported that 4.7% often use a dry dressing on a blister or burn when they get one, 34.7% sometimes puts a dry dressing on the blister in case they get one, 51.5%, 9.1% rarely and never uses a dry dressing to cover a blister when they get one.

In case a respondent had a cut, gaze or burn it was recommended to use a dry dressing. In the study, 11.4% reported to never use, 46.8% to rarely use, 33.7% sometimes used and 8.1% of the respondents were willing and other used it often.

The twenty five multiple questions on foot care practices that participants were subjected to, only a few were found to be significantly associated with development of foot ulcer. **Table 7** indicates specific foot self-care practices associated with development of foot ulcer.

Table 7. Specific foot self-care preventive practices associated with development of foot ulcer.

Variables	Category	Has foot ulcer		df	P-value
		No	Yes		
Drying of the feet after washing	Never	7	13	3	P = 0.037 X ² = 8.510
	Rarely	56	73		
	Sometimes	80	65		
	Often	3	0		
Drying feet between toes	Never	26	58	2	P = 0.000 X ² = 27.822
	Sometimes	62	69		
	Often	38	19		
	Always	20	5		
Applying moisturizing cream between the toes	Daily	3	13	3	P = 0.022 X ² = 9.672
	Once a week	51	52		
	Once a month	2	7		
	Never	9	5		
Walking barefoot	Rarely	43	25	3	P = 0.012 X ² = 11.024
	Sometimes	93	116		
	Often	1	5		
	Never	31	20		
Wearing shoes without socks	Rarely	36	29	3	P = 0.000 X ² = 18.281
	Sometimes	75	77		
	Often	4	25		
	Never	7	21		
Putting a dressing on a blister	Rarely	76	77	3	P = 0.006 X ² = 12.336
	Sometimes	51	50		
	Often	12	3		

Drying of the feet after washing, three respondents were often drying their feet and none of them got foot ulcer. 145 respondents sometimes ensured their feet were dry after washing and 65 of them developed foot ulcer. 129 respondents rarely ensured their feet were dry and 73 of them got foot ulcers. This implied that, those who rarely dry their feet were at risk of getting foot ulcers. 20 respondents stated that they never dry their feet after washing. Out of the 20, 13 developed foot ulcers. Therefore the practice of drying feet after washing them was considerably linked to the prevention of foot ulcers development. Those who dry the feet were less likely to develop foot ulcer with a Phi Cramer's value of 0.169. On Chi-square the results were significant $\chi^2 (3, N = 297) = 8.510, P = 0.037$.

Drying the feet between toes was also assessed. 84 participants never dried their feet between the toes. Majority of those who didn't dry the feet between their toes (58) developed foot ulcers. Out of 131 participants who sometimes dried their feet between the toes 69 developed foot ulcers. There were those who often dried their feet between toes. Among the 57 who ensured they often dry their feet between toes, only 19 developed foot ulcers. This indicates that drying of feet between toes prevents development of foot ulcers. These results were significantly associated with development of foot ulcer $\chi^2 (3, N = 297) = 27.822, P = 0.000$. Nominal by nominal association between those participants who dry their feet between the toes and those who developed foot ulcers was significant at Phi Cramer's value of 0.306, $P = 0.000$. Application of moisturizing cream on feet between the toes was also significantly associated with development of foot ulcers $\chi^2 (3, N = 297) = 9.672, P = 0.022$.

Walking bare foot was associated with development of foot ulcers. Out of 6 respondents who often walked bare foot, 5 developed foot ulcer. 209 respondents sometimes were walking bare foot, and 116 of them developed foot ulcers. Out of 14 respondents who never walked bare foot, only five developed foot ulcer. 68 participants rarely walked bare foot and amongst them 25 developed foot ulcer. It was evident from the findings that walking bare foot predisposes an individual to develop foot ulcer $\chi^2 (3, N = 297) = 11.024, P = 0.012$.

Wearing of socks is important among diabetic patients. On assessment, 29 (9.8%) of the respondents were wearing shoes without socks often. Out of these 25 developed feet ulcers. Out of 152 who sometimes wore shoes without socks, 77 developed foot ulcer. 65 participants rarely wore shoes without socks and only 29 developed foot ulcer. For the 51 who never wore shoes without socks, only 20 developed foot ulcers $\chi^2 (3, N = 297) = 18.281, P = 0.000$.

The respondents were asked if they put a dressing on any blister they develop. From the responses, out of 28 who never put a dressing on the blister, 21 developed a foot ulcer from the blister. Out of 153 who rarely put a dressing, 77 developed foot ulcer. However, out of 15 who often ensure that the blister is dressed, only 3 developed foot ulcer. These findings indicate that if all the blisters are dressed, the risk of developing foot ulcer decreases. Dressing of the blister was significantly associated with prevention of foot ulcer development $\chi^2 (3,$

$N = 297) = 12.336, P = 0.006.$

5.3. Risk Factors for Developing Foot Ulcer

In this study, some risk factors were found to be positively associated with development of foot ulcers.

The participant were further done examination on their feet using a checklist, the results are as indicated in **Table 8**. Surprisingly majority (85.9%) of the participants had their nails not cut to the shape of the toe, followed by quite a number, 224 (75.4%) whose the skin between the toes were moist. The moist skin predisposes the patient to development of sore between the toes. This tends to support the idea of the large number with sores, 122 (41.1%) and other foot complication, 212 (71.4%) respectively. It was also observed that, considerable number 180 (60.6%). of the patient had present of rough edges or corner on their toe nail, others had callus, 124 (41.8%), fissures 76 (25.5%), dry skin 50 (16.8%) on their feet.

5.4. Type of Foot Wear Used by Respondents

On checking the type of foot wear used by the respondents, **Table 9** presents the results that, 25.3% had shoes with soft upper wear, 36.4% soft insoles, 26.3% wore lace up shoes, 0.3% wore boots, 38.7% were on sneakers or rubber shoes, 0.3% had were in high heeled shoes, 5.1% were wearing sandals, 28.3% wore rubber slippers/flip-flop, 0.7% had custom made shoes and 0.3% were wearing plastic shoes.

6. Discussion of Results

In this study, walking bare foot and dressing of blisters with sterile dressing was

Table 8. Risk factors for development of foot ulcer.

Variable	Frequency	Percentage
Presence of fissures	76	25.6
Presence of infected toe nail	12	4
Presence of callus or corn	124	41.8
Presence of blisters	2	0.7
Presence of abrasion	3	1
Presence of sores	122	41.1
Has other foot complications	212	71.4
Dry skin	50	16.8
Moist skin between the toes	224	75.4
Toe nails not cut to the shape of the toe	255	85.9
Presence of rough edges or corners	180	60.6
Presence of ingrown	21	7.1
Presence of infected ingrown	8	2.7

Table 9. Type of shoes used by the respondents on the time of study.

Variable	Frequency	Percentage
Soft upper foot wear	75	25.3
Soft insoles	108	36.4
Lace up closed shoes	78	26.3
Wore boots	1	0.3
Wearing sneakers/ rubber shoes	115	38.7
Wearing high heeled shoes	1	0.3
Wearing sandals	15	5.1
Wearing rubber slippers/flip-flop	84	28.3
Wearing custom made shoes	2	0.7
Wearing plastic shoes	1	0.3

significantly associated with foot ulcers. Those patients, who reported to be walking bare foot in and out of the house, were prone to develop foot ulcers compared to those who wore shoes. Walking bare foot was linked to risk of foot injury which can develop into foot ulcer. Out 14 who never walked bare foot only 5 developed foot ulcer but those who sometimes walked bare foot out of 209,116 developed foot ulcer. These results concur with those reported by Tak-sande, Thote, & Jajoo [16] in a study on attitude, practice, and knowledge on foot care among patients with diabetes at central rural India which showed that bare foot walking increases chance of developing foot ulcer.

Those patients who reported presence of a blister to a health care worker and had it dressed, rarely developed foot ulcers compared to those patients who ignored the blister to heal on its own. 4.7% often applied a dressing while 34.7% sometimes dressed a blister with sterile dressing. Foot blisters which were not dressed were prone to infection that led to foot ulcers. Dressing of such blisters was significantly associated with prevention of foot ulcers. These results are similar to those reported by Amogne, Reja, & Amare [17] in a study on diabetic foot diseases in Ethiopia.

Few patients reported to check inside their shoes before wearing them. However, this was not significantly associated with development of foot ulcers. In a study done in a rural area by Selvakumar & Shah [18] revealed that none of the patients checked inside their shoes before wearing them.

On the practices of foot care, in this study, using Lukewarm water for washing feet, daily changing of socks, skin care of the feet, and not to apply cream between toes was significantly associated with good practice of foot care. In Malaysia, similar results were reported however in that study checking of temperature of water used to wash the feet was poorly done [19].

Wearing of shoes with socks often, often ensuring the feet and between the toes are dry were significantly associated with increased prevention of foot ulcers. In this study, few patients were practising these ideal practices. This was

associated with knowledge deficit on ideal foot care practices.

7. Conclusion

Based on the researchers findings, religion, source of income, level of education and gender did not affect significantly the practice of the ideal self foot care practice. The age of the respondent, their smoking status and the duration they had lived with the diabetes disease significantly determined the development of foot ulcers. On practice of foot care practices, wearing shoes without socks, walking bare foot was associated with risk of developing foot ulcers while dressing of blisters with a sterile dressing, drying feet after washing and drying in between the toes was associated with the prevention of developing foot ulcers.

8. Recommendations

The Government of Kenya through the Ministry of Health should engage the county government to carry out intensive campaigns on practice of the recommended diabetic foot care practices in management of diabetes to reduce the burden on drug procurement and promote good health of her citizens.

The health care provider to ensure availability of the charts used to demonstrate ideal foot care practices.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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