Knowledge of diabetic foot complication, self-care beliefs and practices among patients attending a tertiary hospital in Eastern Uganda

Samuel Olowo [a], Jacob Stanley Iramiot [b,*], Lydia V. Ssenyonga [a]

[a] Department of Nursing, Busitema University Faculty of Health Sciences, P.O. Box 1460, Mbale, Uganda
[b] Department of Microbiology and Immunology, Busitema University Faculty of Health Sciences, P.O. Box 1460, Mbale, Uganda

ABSTRACT

Background: Non-communicable diseases are a stumbling block to global development. Among the diseases, diabetes mellitus in particular, features a major public health problem with increasing prevalence. Foot ulcer ranks first among the complication of diabetes mellitus preceded by cellulitis. This study aimed at determining knowledge about diabetic foot complications, foot care practices, and the beliefs of diabetic patients towards diabetes.
Materials and Methods: A cross-sectional survey using a validated structured questionnaire was conducted among 199 Type 2 adult diabetic patients (≥18 years) who visited the hospital clinic and the wards during the study period.
Results: More than half that is 118(59.3%) reported not to know that they may develop reduced blood flow in their feet, and 136(68.30%) reported unawareness of smoking as a contributor to reduced blood flow in their feet.
Less than half which is 90(45.2%) of the patients reported to dry their feet often after washing, than half that is 96 (48.2%) always inspecting the inside of footwear before putting on, and only 54(27.1 %) of the participants reported never to walk barefooted. The patients' beliefs on the causes of diabetes included; hereditary, bad dietary habits, inactivity, stress, being fat, punishment from God or gods, and witchcraft.
Conclusion: Diabetic patients demonstrated limited knowledge of diabetic foot complications and foot care practices. The patient's beliefs on the causes of diabetes included; hereditary, bad dietary habits, inactivity, stress, being fat, punishment from God or gods, and witchcraft.

1. Background

Non-communicable diseases are a great challenge to global development (Abebe et al., 2017). Studies have reported a global rise in the number of patients with diabetes from 108 million in 1998 to 422 million in 2014 (Adeloye et al., 2017). It was also estimated that the prevalence of diabetes would rise worldwide from 285 million adult people in 2010 to 439 million in 2030 (Shaw, Sicree, & Zimmet, 2010). Globally over 4.5 million people live with diabetes, of which 75% are in low and middle-income countries (Abebe et al., 2017). Foot ulcer ranks first as the most common complication in diabetes mellitus, preceded by cellulitis (Adeloye et al., 2017). The diabetic foot includes any infection, ulceration, or destruction of the foot's deep tissues associated with neuropathy and or peripheral arterial diseases of the lower limbs in diabetic patients. Diabetic patients have a 25 % chance higher risk of developing ulcers, and every 30 s a lower limb amputation in diabetes patients occurs globally (Raghav et al., 2018). Increased duration of having diabetes is associated with a 2–5 fold higher risk for diabetic foot ulcer (Sarfo-Kantanka, Kyei, Mbanya, & Owusu-Ansah, 2018). Prevention of diabetic foot ulcer development is reported as the best management option (Schreml & Berneburg, 2017).

Although several studies focusing on diabetic foot complications have been done globally, few studies have focused on foot care practices and beliefs in Uganda. Diabetic peripheral neuropathy is the most common cause of diabetic foot ulcers and has a prevalence of 29.4% among newly diagnosed patients at Mulago Hospital (Kisozi et al., 2017). One study found that diabetic foot ulcer influences quality of life among diabetic patients (Nyanzi, Wamala, & Atuhaire, 2014), and

another study found that most patients lacked knowledge as well as preventive measures and management (Mufunda, Albin, & Hjelm, 2012). This study aimed todetermine knowledge about diabetic foot complications, foot care practices, and beliefs of diabetic patients about diabetes.

2. Materials and methods

2.1. Study Design, Setting, participants, sample size, and sampling procedure

A cross-sectional survey employing a mixed methods approach was conducted in March 2019. A total of 199 adult patients ($\geq$18 years) with type 2 diabetes admitted in medical, surgical, and attending diabetic clinics in the Mbale Regional Referral hospital (MRRH) were recruited using a purposive sampling procedure. The hospital is a regional referral public teaching hospital located on Palisa Road, in the town's central business district. It is approximately 222 km (138 miles) by road, northeast of Kampala, Uganda's capital and largest metropolitan area. The hospital has a capacity of 400 beds. It serves eleven neighbouring districts in the Mbale sub-region as a referral hospital. Patients who were critically ill and those who were mentally impared were excluded from the study.

2.2. Sample size determination

This study used Kish and Leslie's formula for sample determination (Israel, 2013) when the proportion of a given attribute in a non-defined population is known. This study considered a 13.6% prevalence of adult diabetic foot which was found in a similar referral hospital in Ethiopia (Mariam et al., 2017). This study also considered a 10% non-response rate. The calculations were done and the final sample size required was 199 participants.

3. Data collection and management

3.1. For knowledge and practices

Data were collected using a pretested and validated questionnaire. The questionnaire was administered to 10 clients attending the outpatient department of Mbale Regional Referral hospital with a history of diabetes to determine clarity of the questions. Necessary adjustments were later on made on the questionnaire items. The pilot data were not included during the final data analysis. The interviewer administered the questionnaire through face-to-face interaction with the patients who consented to participate in the study. The questionnaire had four sections: social-demographic, Knowledge of diabetic foot disease, foot care practices, and beliefs about diabetes sections. The knowledge of diabetic foot complications section had 15 multiple choice questions and statements which assessed their awareness of diabetic foot complications. The tool items were adopted from those used in a study done by Algshanen (Algshanen et al., 2017) on diabetic foot awareness and Al-Hariri et al (Al-Hariri et al., 2017) in a study on knowledge, attitude, and practices regarding diabetic foot. The foot care practices section had 10 multiple choice questions that assessed their foot care practices. These items were adapted from that used in other studies elsewhere (Goweda et al., 2017; Qadi & Alzahrani, 2011; Solan et al., 2017). Finally, the beliefs section had open-ended questions allowing the participants to mention their beliefs about diabetes.

The questionnaire was written in English. The researchers could not access professional language experts to translate the data collection tools. However, the principal investigator worked with trained research assistants who understood English and were proficient in the native languages, which are Lugisu and Luganda. The collected data were stored in a locked file kept by the investigator himself and no unauthorized person had access to it.

In-depth interviews were conducted among the patients with type 2 diabetes between 1st March to 1st Aprill 2019. The research assistants were trained to collect information. For convenience, appointments were scheduled with the prospective interviewees who met the selection criteria at the time which was most convenient to them and each interview lasted between one to two hours. Before the interview commenced, the interviewer explained the study's aims and scope and obtained written informed consent from every participant who accepted to take part in the study. Face-to-face interviews were conducted with the aid of an interview guide that was prepared by the investigator, reviewed by co-investigators, and refined as the final tool for data collection before the analysis. The interviews were conducted in quiet private rooms free from any distraction. The private quiet rooms were deemed a neutral setting, encouraging participants to speak freely. A second observer experienced in qualitative research was also present in the interview room. Her presence as part of the team was explained to the participants prior to the interview to not hinder participants' freedom of expression. She aided in noting down the non-verbal cues as well as contributing to follow-up questions. The interviewer posed the open-ended questions to the participants and documented their responses in the local language directly on paper (to avoid individual bias of back translation into English). Likewise, for those participants who understood English notes were also taken directly on paper. Care was ensured to collect quality data from the participants' perspective. This was done by verifying unclear responses. Follow-up questions were asked were necessary for completeness of information. The interviewer also used follow-up 'probes' to encourage further elaboration. The interviewers debriefed each other directly after the interview. During back translation of those notes taken in the local languages, the interviewers again sat and agreed on what exactly the participants meant in their local languages back to English. These were done to ensure preservation of the original meaning from the participants' viewpoint. Considering the fact that the research assistants understood English and were proficient in the native languages, meanings of the interview guide items into the local language were discussed and agreements reached. What was strongly considered was the simplification of all complicated English words and medical jargon bringing them to the participants' understanding. Examples were always provided where necessary to facilitate better understanding. The participants were also assured that they are free to ask for clarity as much as they feel. The interviewers were also strongly encouraged during the training to be as simple and as clear as possible to the participants as the interview evolves.

3.2. Data analysis and presentation

Socio-demographic variables, knowledge and practice were coded, categorized, and entered in the Statistical Package for Social Sciences version 16. Descriptive statistics were applied that is mean, range, and standard deviation for age, duration of disease, knowledge and practice scores. Percentages and categorical data frequencies for sex, educational level, marital status, religion, occupation, current foot status, amputation history, knowledge of diabetic foot complications and practice of foot care. Cross-tabulation and the chi-square tests for independence were done to evaluate the association and strength of the interaction between two categorical variables. A variable with a p-value of $\leq$ 0.05 was taken to be statistically significant.

Qualitative content analysis was performed to discover and describe the variations in beliefs about diabetes. The responses were read several times thoroughly to achieve a better sense. The texts were broken into smaller textual units, after which each meaning unit was coded and grouped. Finally, a comparison of the codes for differences and similarities were performed and later sorted into the sub and main categories. The analysis focused on the variations while searching for irregularities, contradictions, and patterns by comparing the respondents' statements.

Data from the in-depth interviews were transcribed verbatim in the

English language by the trained research assistants and thematic analysis as described before was used to inform data analysis. For quality control, transcription was done by the first research assistant and the second research assistant reread the transcripts to recheck on the quality of the transcripts. Data analysis was done using the NVivo V12 qualitative data analysis software (QSR International (Americas) Inc). Emergent themes were identified, coded, and organized into concepts that were later developed into explanations. Data analysis involved a process of familiarization with the data by reading the transcript several times while noting ideas. The principal investigator performed the thematic content analysis and the co-investigators verified the themes and contents. Significant statements relating to knowledge, practice and beliefs of diabetic foot complication were identified and coded. The codes were clustered and themes were generated. Emergent themes generated were then discussed with co-investigators. The process of theme generation was reviewed and refined by going back and forth between the themes and codes, as well as between the themes and transcripts until the final themes were identified, defined and named. The final themes were discussed with some of the respondents in the process of member checking.

A model of Illness Causation (Lay Model) and the model for health-seeking behavior were used to categorize the participants' beliefs of the causes of diabetes and assess their health-seeking behavior, respectively. Illness can be perceived as caused by factors related to the individual, natural, social, and supernatural worlds (Mufunda et al., 2012) and health care sought from the popular (family members), folk (traditional healers, herbalists), and the professional sectors.

Ethical consideration

Approval to carry out the study was obtained from CURE Children's Hospital of Uganda Research and Ethics Committee and the administrative clearance sought from the Mbale Regional Referral Hospital administration. Informed consent was obtained from each of the study participants after detailed explanations and was free to terminate their consent at any time they wished. To maintain the study participants' anonymity, numbers were allocated to each of the study participants, and no identifying information was obtained.

4. Results

4.1. Participant's demographic characteristics

A total of 199 participants with diabetes mellitus participated in the study of which the majority 125(62.8%) were females. The participants' minimum age was 20 years and a maximum of 83 years with a mean of 55.37 and a standard deviation of 12.33. The majority of the participants 61(30.65%) were aged between 48 and 57 years. The disease's minimum duration since diagnosis was 1 day and a maximum of 30 years with a mean of 5.81 years and a standard deviation of 5.77. The majority of the participants 150(75.4%), lived with diabetes for less than 10 years of which 138(69.3%) were Christians. Several of them achieved education up to a primary level that is 101(50.8%) and the majority which is 156(78.4%) were married. Most of the participants 104(52.3%) were peasant farmers, 184(42%) reported not having any foot problems, while 42% had a history of amputation (Table 1).

4.2. Knowledge of diabetic foot complication

More than half of the participants that is 118(59.3%), reported not knowing they may develop reduced blood flow on their feet, and 136 (68.30%) of them were unaware of smoking as a contributor to the reduced blood flow on the feet. Also, 77(38.3%) reported not knowing they may develop foot ulcers. However, most participants 155(77.9%) believed that dietary measures have an important role in controlling diabetes mellitus and that they could live a normal life if they take appropriate steps to manage their diabetes. Most 136(68.3%) said that foot examination should be their responsibility yet most, 116(58.3%) of

Table 1
Social -Demographic characteristic of the study participants.

Social-Demographic Characteristic	Categories	n (%)
Sex	Male	74(37.2)
	Female	125(62.8)
Educational level	Primary	101(50.8)
	Secondary	39(19.6)
	Tertiary	34(17.1)
	No formal education	25(12.6)
Marital Status	Married	156(78.4)
	Widowed	24(12.1)
	Single	11(5.5)
	Divorced/Separated	8(4)
Religion	Christians	138(69.3)
	Muslim	61(30.7)
Occupation	Peasant	104(52.3)
	Business	43(21.6)
	Business	43(21.6)
	Unemployed	22(11.1)
	Salary Earner	23(11.6)
	Religious leader	4(2)
	Pensioners	3(1.5)
Current Foot Status	No Ulcer	184(92.5)
	Has Ulcer	9(4.5)
	Has Diabetic Foot complication	6(4.5)
Amputation History	No	195(98)
	Yes	4(2)

the participants had not received any previous form of diabetic foot care education from any source.

On diabetic foot care education, 122(56%) did not attend a session on foot care, and quite a number (59%) did not receive any education on foot care from any health worker (Table 2).

5. Foot care practices

Only 90(45.2%) reported drying their feet often after washing, and 96(48.2%) reported to always inspecting the inside of footwear before wearing. A few participants 54(27.1 %) reported never walking

Table 2
Knowledge of diabetic foot complication and Education on foot care.

Item	Response n = 199	
	Yes n (%)	Don't know n (%)
Diabetic patients may develop reduced blood in the feet.	81(40.7)	118(59.3)
Diabetic patients may develop a lack of feet sensations.	111 (55.8)	88(44.2)
Diabetic patients may develop foot ulcers.	122 (61.3)	77(38.7)
Diabetic patients may develop gangrene.	116 (58.3)	83 (41.7)
Smoking can reduce blood flow in the feet.	61 (31.70)	136(68.3)
Loss of sensations in the feet makes one prone to foot ulcers.	92 (46.2)	107(53.8)
Reduced feet blood flow will predispose one to foot ulcers.	81 (40.7)	118(59.3)
With foot infections, one may develop foot ulcers.	109 (54.8)	90 (45.2)
Diabetic patients are responsible for foot Self-examination.	136 (68.3)	63(31.7)
One can lead a normal life with diabetes.	155 (77.9)	44(22.1)
Diet controls diabetes.	155 (77.9)	44(22.1)
	Yes, n (%)	No n (%)
Attended a class on feet care	87(43.7)	112(56.30)
Received education on foot Care from a nurse	82(41.2)	117(58.80)
Received education on foot Care from a doctor	80(40.2)	119(59.80)

barefoot. Concerning trimming of toenails, 138(69.3%) reported to trim their nails curved and only 61(30.7%) reported to trim their toenails straight. There was a statistically significant association between gender and receiving advice before buying footwear (p = 0.026) (Table 3).

Table 3
Foot care practices.

Practice	Total N (%)	Male N (%)	Female N (%)	p value
Do you inspect your feet?				
Often	105(52.8)	42 (56.76)	63(50.4)	0.63
Sometimes	56(28.1)	20 (27)	36(28.8)	
Never	38(19.10)	12 (16.23)	26 (20.8)	
Do you wash your feet regularly?				
Yes	177(88.90)	68 (91.89)	109(87.2)	0.31
No	22(11.10)	6.0 (8.11)	16 (12.8)	
Do you wash feet with warm water?				
Often	32(16.10)	15 ((20.27)	17(13.6)	0.59
Sometimes	70(35.20)	31 (41.89)	39(31.2)	
Never	97(48.70)	28 (37.84)	69(55.2)	
Do you dry your feet after washing?				
Often	90(45.20%)	31 (41.89)	59(47.2)	0.69
Sometime	46(23.10%)	17 (22.97)	29(23.2)	
Never	63(37.10%)	26 (35.14)	37(29.6)	
How do you trim your toenails?				
Straight	61930.70%)	19 (25.68)	42(33.6)	0.24
Curved	138 (69.30%)	55 (74.32)	83(66.4)	
Do you know your Feet size?				
Yes	143(71.90)	55 (74.32)	88(70.4)	0.55
No	56(28.10)	19 (25.68)	37 (29.6)	
Did you Receive advice when last bought footwear?				
Yes	50(25.10)	12 (16.22)	38(30.4)	0.026
No	149(74.90)	62 (83.78)	87 (69.6)	
Do you inspect the inside of footwear before putting on?				
Often	96(48.20)	37 (50)	59(47.2)	0.53
Sometime	54(27.10)	22 (29.73)	32(25.6)	
Never	49(24.60)	15 (20.270)	34((27.2)	
Do you walk barefoot?				
Always	25(12.60)	6(8.11)	19(15.2)	0.21
Sometimes	120(60.30)	44 (59.46)	76(60.8)	
Never	54(27.10)	24 (32.43)	30(24)	
Do you clean nails with sharp instruments?				
Often	75(37.10)	6 0.0 (8.11)	19 (15.2)	0.46
Sometime	67(33.7)	44 (59.46)	76(60.8)	
Never	57(28.6)	24 (32.43)	30 (24)	

6. Foot care practices about gender

6.1. Knowledge and practice score group

For knowledge, a score of one (1) was given to a correct response and zero (0) for a wrong response. The knowledge level was determined from the total scores of correct responses where less than four was poor, 4–5 was moderate, and 6 and above was categorized as adequate. The findings showed that 61(30.70%) of the participants had adequate knowledge, 50(25.10%) had moderate knowledge, and 88(44.2%) had poor knowledge.

In the practice variable, a score of '1' was given to each question that a participant answered correctly regarding foot care practices and a score of '0', was given to each incorrect answer. The total score of the correct responses demonstrated a participant's foot care practice level was computed by summing up all the correctresponses to the questions asked.

The determinants were levels 5 and 7, the total items assessing practice were 10. Scoring of (practice) of less than 5 indicated 'poor' foot care practices, a score of greater or equal to 5, but less than 7, was considered 'moderate' foot care practices. A score $\geq$ 7 was considered as 'adequate' foot care practice.

The analysis was done, and the results are shown in Table 4 with which showed that 43 (21.60%) had adequate foot care practices, 76 (38.20%) had moderate foot care practices and 80(40.20%) had poor foot care practices.

This study found no statistically significant association between demographic variables and knowledge about diabetic foot complications. However, there was a statistically significant association between educational level (p = 0.05) and occupation (p = 0.016) with foot care practices (Table 5).

6.2. Association between knowledge of diabetic foot complication and foot care practices

There was a statistically significant association between knowledge of diabetic foot complications and foot care practices (p = 0.021) (Table 6 and 2a).

7. Beliefs about diabetes

The first question was assessing the participants' general beliefs about diabetes and it was a semi-structured question allowing the participants to give their own subjective beliefs about diabetes (Table 2a).

The question was, "Tell me what you think about diabetes?". We categorized the participants' responses about the causes based on the Model of Illness Causation (Lay Model) (Mufunda et al., 2012). This model states that illness can be perceived as caused by factors related to the individual, natural, social, and supernatural worlds.

7.1. Patients' beliefs on the potential causes of diabetes

According to the Model of Illness Causation (lay Model), analytical categories emerged from the open-ended interview questions and explanations of causes of diabetes mellitus evolved in discussions of a list of potential causes of diabetes mellitus. These were later categorized

Table 4
Knowledge and practice score group.

Knowledge level	Frequency	Percentage	Practice Level	Frequency	Percentage
Adequate	61	30.70	Adequate	43	21.60
Moderate	50	25.10	Moderate	76	38.20
Poor	88	44.20	Poor	80	40.20
Total	199	100	Total	199	100

Table 5

Association between demographic variables with knowledge of diabetic complications and foot care practices.

Variable	Knowledge level			P-value	Practice level			P-value
	Poor (88)	Moderate (50)	Adequate (61)		Poor (80)	Moderate (76)	Adequate (43)	
Age range								
18–27	1(1.14%)	2(4%)	2(3.28%)	0.68	4(4.55%)	0 (0%)	1(2.33%)	0.12
28–37	4 (4.55%)	0 (0%)	4(6.56%)		2(2.27%)	5 (6.58%)	1(2.33%)	
38–47	16(18.18%)	17(34%)	12(19.67%)		19 (21.59%)	13(17.11)	3(6.98%)	
48–57	23 (26.14%)	19 (38%)	19(31.15%)		23 (26.14%)	19(25%)	9(44.19%)	
58–67	27 (30.68%)	12 (24%)	14(22.95%)		20(22.735%)	23(30.26%)	10(23.26%)	
68+	17 (19.32%)	10 (20%)	10 (16.39%)		12(13.64%)	16(21.1%)	9 (20.93%)	
Sex								
Male	27 (30.70%)	19 (38%)	28(46%)	0.17	27 (33.75%)	29 (38.16%)	18 (41.86%)	0.66
Female	61 (69%)	31 (62%)	33 (54%)		53 (66.25%)	47(61.84%)	25(58.14%)	
Duration								
0–9	67 (76.14%)	38 (76%)	45(73.77%)	0.66	63(71.59%)	57 (75%)	30(69.77%	0.12
10–19	19(21.59%)	11(22%)	12(19.67%)		17(19.32%)	16(21.1%)	9(20.93%)	
20+	2(2.27%)	1 (2%)	4(6.56%)		0 (0%)	3 (3.95%)	4 (9.3%)	
Religion								
Christian	55(63%)	39 (78%)	44(72%)	0.14	52(65%)	53 (69.74%)	33 (76.74%)	0.4
Muslim	33(38%)	11(22%)	17 (28%)		28(35%)	23 30.26%)	10(23.26%)	
Education								
Non	14 (16%)	7(14%)	4.0(7.0%)	0.2	14(17.5%)	8.0(10.53%)	3(6.98%)	0.05
Primary	47(53%)	27 (54%)	27(44%)		44 (55%)	41 (53.95%)	16(37.21%)	
Secondary	14 (16%)	7(14%)	18 (30%)		11 (13.75%)	13(17.11%)	15 (34.88%)	
Tertiary	13 (15%)	9 (18%)	12 (20%)		11 (13.75%)	14 (18.42%)	9(20.935%)	
Marital status								
Single	4.0(5.0%)	4(8%)	3(5%)	0.7	5 (6.25%)	5 (6.58%)	1 (2.32%)	0.48
Married	69(78%)	38 (76%)	49(80%)		60 (75%)	59 (77.63%)	37 (86%)	
Divorced	2(2%)	2(4%)	4(7%)		3 (3.75%)	5(6.585%)	0(0%)	
Widowed	13 (15%)	6(12%)	5 (8.2%)		12 (15%)	7 (9.21%)	5(11.635%)	
Occupation								
Peasant	47 (53.10%)	25(50%)	32(52.46%)	0.4	53(66.25%)	35(46.1%)	16(37.21%)	0.016
Business	22 (25%)	9 (18%)	12(19.67%)		16 (20%)	15 (19.74%)	12(27.91)	
Salary	6.0 (6.82%)	8 (16%)	9(14.75%)		3 (3.75%)	11 (14.47%)	9(20.93%)	
Pensioner	2.0 (2.27%)	0 (0%)	1(1.64%)		1(1.25%)	1 (1.32%)	1(2.33%)	
Religious	1.0(1.14%)	3(6%)	0(0%)		0 (0%)	4 (5.26%)	0(0%)	
Non	10 (11.36%)	5 (10%	7(11.48)		7 (8.75%)	10 (13.56%)	5 (11.63%)	
Foot status								
No ulcer	83 (94.32%)	46(92%)	55(90.16%)	0.7	74(92.5%)	68(89.47%)	42(97.67%)	0.54
Has Ulcer	4.0(4.55%)	2(4%)	3(4.92%)		3(3.75%)	5 (6.58%)	1(2.33%)	
Foot Complication	1 0.0(1.14%)	2(4%)	3(4.92%)		3(3.75%)	3 (3.955)	0(0%)	
Amputation								
Yes	2 (2.27%)	1(2%)	1(1.64%)	0.9	2 (2.5%)	2(2.63%)	0 (0%)	0.57
No	86 (97.73%)	49 (98%)	60 (98.36%)		78 (97.5%)	74 (97.37%)	43 (100%)	

Table 6

Association between knowledge of diabetic foot and foot care practices.

Level	Knowledge	Practice	p-value
Poor	88(44.2%)	80(40.2%)	0.021
Moderate	50(25.1%)	76(38.2%)	
Adequate	61(30.7%)	43(21.6%)	

according to the Model of Illness Causation (Lay Model): Based on the factors related to the individual, the participants reported the following: Some believed that diabetes is a hereditary disease. They also pointed out that bad dietary habits would cause diabetes like fat-containing foods and mostly sugary things. Some participants also pointed out that sitting without performing any physical activity causes diabetes. This was particularly reported by peasants who had stopped digging. However, some believed that over activity caused the disease. Stress was also pointed out by some participants as a cause of diabetes while two participants pointed out diseases of the pancreases as a cause of diabetes.

........i believe that "Bilowoonzo'' (a native word meaning thinking alot), can cause diabetes................

Some participants reported punishment from God and witchcraft on the factors associated with supernatural spheres as a cause of diabetes.

.........Diabetes is "Bulwade bwa katonda'', (a native statement meaning sickness from God).....

The religious leaders reported beliefs about diabetes as a punishment from God. A few participants also reported diabetes to be a disease of the rich people, it is a natural disease; it is caused by cancer and a few participants reported nothing about diabetes. Based on the model of health-care seeking behaviors (Kuuire, Bisung, Rishworth, Dixon, & Luginaah, 2016; Mufunda et al., 2012) which states that health care is sought from popular (family members), folk(traditional healers, herbalists), and the professional sectors;

The question assessing this was open-ended so that the participants could give a subjective view of their health-care seeking behavior. We wanted to find out whether their beliefs influenced their health-care seeking behavior. This is because beliefs are reported to play an essential role in information seeking. After all, their beliefs define the limits of people's thoughts and motivations according to Johnson's comprehensive information seeking model (Lalazaryan & Zare-Farashbandi, 2014).

The participants were asked how they came to know that they had diabetes; Most participants started by reporting on their experiences of several symptoms like passing lots of urine, feeling thirsty, losing weight, sweating, and tiredness.

...........I suddenly started to urinate frequently, weakness in the joints, headache especially at the bark of the head, high body temperature,

Table 2a
Patients' beliefs on the potential causes of diabetes.

Main analytical category	Sub-category[b]	Quotation
Factors related to the individual[a]		
	Hereditary [b]	……. diabetes can be gotten from parents….
	wrong dietary habits [b]	……eating habits for example eating sweet and fried things, which we used to think its good eating habits causes diabetes…………
	Inactivity [b]	………...Over sitting without doing anything can cause diabetes…….. When I used to dig I was not having diabetes but soon as I stopped digging after a short time, the disease came……
	over activity [b]	………Doing too much work causes diabetes…..I think I got the virus for this disease from soil because I was digging without putting on a gum boosts……….
	Being fat [b]	……. diabetes is a disease of the fat people…………………
	Stress [b]	…….…...……I had a misunderstanding with my neighbor's son…….it caused me too much stress…..when I went to hospital , I was told I had diabetes………………
	Infections [b]	………at first I got malaria, this malaria would be treated and again come back….. the next time I went back to the hospital again for the malaria… I was told I had diabetes…….
	diseases of the pancrease [b]	
	Being rich [b]	………diabetes is a disease for the rich….. even me at first when I was poor I did not have diabetes…..but when I became a teacher and got some money, I found myself with the disease…….
	Other diseases [b]	…..Cancer can cause diabetes…….
Factors related to the supernatural spheres [a]		
	Punishment from God or gods [b]	……..........When God calls you and you refuse to obey him….. he can punish you….. For example by making you to have diabetes………………
	Influence of witch craft [b]	……..........when somebody bewitches you ………….. your body becomes weak and diabetes comes in……………
	Occurs naturally [b]	……..diabetes comes on its own……..
Did not know any cause		…….......... do not know about that disease……….

[a] Analytical categories, emerging from open-ended interview questions according to the Model of illness causation (lay Model).
[b] Explanations of causes of diabetes mellitus evolved in discussions of a list of potential causes of diabetes mellitus.

restlessness, brain disturbance, became forget -full most of the time, couldn't move long distance on foot, lack of sensations in the feet ……. so I went to the hospital and I was tested and told I had diabetes………………

Upon experiencing symptoms, the majority of the participants went directly to drug shops, medical clinics, health centers, and hospitals, which are the professional sectors according to the model of health. One participant reported having been told by her pastor about the condition's presence in her body…….............

When I started to drink a lot of water and feeling tired quickly… I went to my pastor and he prayed and told me I had diabetes ……..he then advised me to go to the hospital…….. I went and to the hospital ….tested and they told me I had diabetes…………………

Another participant said to have consulted her relative which are a popular sector (family members) at first according to the model of health-care seeking behavior upon experiencing some of the symptoms.

……….. Started sweating, feeling tired very fast, drinking a lot of water…I called my son ….he then told me he suspects diabetes and advised me to go to the hospital …….when I went ……they told me I had diabetes………

We also assessed the psychological feeling about the knowledge of the established diagnosis of diabetes. This assessment aimed to determine the participants' beliefs on the seriousness of the condition. Participants were asked how they felt when they first knew that they had diabetes. Most participants reported being scared, feelings of dying, and helplessness because they were told diabetes was an incurable disease, but later they were comforted after health education by health workers and interacting with other experienced diabetic patients.

I thought I would die soon and would be dead by now………but when I interacted with a friend who had lived with it for 10 years………….I started to have hope for life………………

A few participants reported no significant change in their psychological feeling. One participant responded defensively to this question of how she felt upon knowing she had diabetes; however, this patient had just had a major lower limb amputation a few days back due to diabetic foot complications.

We also assessed the hereditary nature of diabetes, which has been reported in some literature. To assess this, the participants were asked if they had any family member affected by the disease other than them (Are there other people in your family affected other than you?).

We assessed the relationship between having a family member affected by diabetes other than the patient and believing that diabetes is hereditary. Some participants reported having family members with diabetes and those who had at least one family member affected by the condition were more likely to believe that the condition was hereditary.

Concerning the cure of diabetes, a few participants believe that the disease is incurable, while others believed that diabetes was an expensive disease that caused them to spend a lot of money in hospital expenditure.

………..That disease is very bad…… it makes you stop eating some foods………….
……………………Diabetes is very expensive…..you need to buy some special foods. When drugs get over in the hospital ….you have to buy….and yet there is no money…………………………… This study also noted that most of the participants had other co-morbidities especially hypertension.

8. Discussion

8.1. Social demographic variable

Most participants in this study had no foot problems (foot ulcer and diabetic foot complication), contrary to the report in Ethiopia that indicated a high prevalence of diabetic foot ulcers (Tolossa et al., 2020) . This could be because they had lived with diabetes for less than 4 years after which which diabetic foot ulcers becomes a risk factor (Shahi et al., 2012).

The majority of the participants in this study were females that is 125 (62.8%) This could probably be because women make greater use of diabetic services and seek care more frequently than men (Siddiqui, Khan, & Carline, 2013). Women are also reported to visit their primary care physicians in response to health concerns to a larger extent than men (Thompson et al., 2016). In Uganda, studies have also reported that women tend to pay attention to their health concerns to a greater extent than their male counterparts and use government health facilities free of charge, unlike males who often turn to private facilities (Hjelm & Atwine, 2011). The majority of the participants in this study were of low social-economic class that is 104(52.3%), although the prevalence of diabetes mellitus is reported to be high among those with a high occupational class (Addo et al., 2017).

Knowledge of patients about diabetic foot complication

This study identified poor knowledge regarding diabetic foot complications.

The poor knowledge of diabetic foot complications found in this study is consistent with the study done in Uganda on the influence of beliefs about health and illness on foot care among persons with diabetic foot ulcers (Hjelm & Beebwa, 2013) where limited knowledge on the causes, management, and prevention of foot ulcers was noted. Another related study in Saudi Arabia (Al Odhayani, Tayel, & Al-Madi, 2017) also found a poor knowledge of diabetic foot disease and future complications. However, this study is contrary to studies done in Colombo that reported good knowledge about diabetic foot complications (Jinadasa & Jeewantha, 2011) and to studies in Pakistan (Haq, Durrani, Nasim, & Riaz, 2017) that reported more than half (58.8%) of the participants had adequate knowledge of diabetic foot complications. These differences could be due to different study designs and settings.

The poor knowledge of participants towards diabetic foot identified in this study could be due to health workers not providing adequate information on diabetic foot complications. There is therefore an urgent need to address this knowledge gap. This can be undertaken through incorporation of diabetic foot information in an array of community services available in the country for example sanitation sensitization, indoor residual mosquitoes spraying and mosquito net distributions, medical camps among others.

In this study, most participants believed that dietary measures play an important role in controlling diabetes mellitus, that they could live a normal life if they take appropriate measures to control their diabetes. Most reported that foot examination should be their responsibility. This study's results agree with that of a study done in South Africa (Goie & Naidoo, 2016). This demonstrates a good attitude towards diabetes self-care and also shows that the participants have accepted to live with diabetes since it has no cure. This should further be encouraged among diabetic patients as it leads to good quality of life. However, this study identified inadequate awareness of smoking as a contributor to reduction in blood flow to the feet; 136(68.3%) of the participants reported not being aware. This finding contradicts the findings of a study done in South Africa (Goie & Naidoo, 2016) where the participants were found to be aware of smoking as a significant contributor to reduction in blood flow to the feet. This difference could be because most of the participants in this study, before answering the question concerning smoking, most would say, "I do not smoke, so I do not know whether it can reduce blood flow in the feet''. However, this does not mean the study participants who reported good awareness of smoking as a contributor to reduction in feet blood flow were smokers. There is therefore a need to impart more knowledge to the participants about smoking as they could be only considering active smoking and not knowing that passive smoking is equally dangerous. They could therefore develop diabetic foot complication indirectly from passive smoking. Addressing this would improve and maintain their quality of life.

Foot care practices

This study identified poor foot care practices, which is consistent with studies in India (Sutariya & Kharadi, 2016) where the majority that is 53(51%) demonstrated poor foot care practices. The findings of this study are also consistent with that of studies in Pakistan (Haq et al., 2017) where the majority that is 227(62.4%) of participants had poor foot care practices.. Several other related studies (Abdulghani et al., 2018; Bohorquez Robles et al., 2017; Chiwanga & Njelekela, 2015; Desalu et al., 2011; Li et al., 2014) also found poor foot self-care practices among diabetic patients. However, this study findings is contrary to a study done in Saudi Arabia (Solan et al., 2017) among the Jizani population where a significant proportion that is 53.6% had moderate footcare practices. Another study done in Southern India (George et al., 2013) also reported a similar finding where more than half that is 67.0% had a good foot care practice score. These differences could be due to differences in the study settings and study designs.

More than half that is 105(52.8%) of the participants in this study reported inspecting their feet regularly, consistent with studies done in Jamaica (Gayle et al., 2012) where over 60% reported daily foot inspection.

This study recognized poor checking of the inside of footwear before putting them on. Only 96(48.2%) of the participants often checked the inside of the footwear. This finding is consistent with the finding in China (Li et al., 2014), where inside footwear inspection was noted to be poor among participants. This is extremely risky as one can get injuries from an expected sharp inside the footwear and end up with a foot ulcer. Therefore taking into consideration the poor wound healing among diabetic patients, this may end making one to loose a limb. . However, the findings are contrary to that in studies in the Colombo South teaching hospital (Wimalarathna, Jayasuriya, & Bulugahapitiya, 2021) where the majority that is 79.3% were found not to inspect the inside of footwear before putting it on. This difference could be due to different study settings and study designs.

Correct trimming of the toenails among participants was identified in this study as more than half that is 138(69.3%) of the participants reported to trim their toenails curved which is the recommended method.

8.1.1. Beliefs about diabetes

In this study, concerning the patients' beliefs about diabetes, on the possible causes basing on the Model of Illness Causation (Lay Model), factors related to the individual that is hereditary, bad dietary habits, inactivity, over-activity, being fat, stress, infections, and being rich were mentioned by the majority of the participants. In contrast, a few participants reported factors related to the supernatural spheres, including punishment from God or gods, witchcraft's influence, and naturally occurring. Notable, no participant reported social factors like the influence of evil people as suggested in the Model of Illness Causation (Lay Model).

In this study, some participants demonstrated that they do not know the causes of diabetes. Some participants reported severe psychological impact of the diagnosis of diabetes and reported feelings of dying and helplessness. This is probably due to the condition's perceived seriousness and possibly no prior test counseling was offered to the participants. This finding agrees with the result of a study done in Zimbabwe (Mufunda et al., 2012) on the differences in health and illness beliefs between men and women with diabetes, where a similar reaction after diagnosis was reported.

This study also noted the importance of patient-to-patient interaction and sharing experiences as some participants who reported feelings of dying and helplessness later gained a sense and hope for life upon interacting with other experienced diabetic patients. This finding therefore shows that isolation should be discouraged among patients as lots of information can be obtained from sharing with other experienced patients. It may also help them to form savings and credit cooperatives (SACCOs) among themselves which can help them in generating and lobbying for funds to support their livelihood given the fact that some of them believed that diabetes is a very costly disease.

Some participants in this study believed diabetes to be a very costly disease regarding its financial needs, nutrition and medication. This corresponds with findings from data estimates from the United States national population where people with diagnosed diabetes are reported to accumulate substantially greater lifetime medical spending than similar people without diabetes (Zhuo et al., 2014). There is therefore a need for planning how to support these patients especially those with low socioeconomic status as this will improve their quality of life.

This study also noted that some of the participants visited the hospital and other conventional health facilities as soon as they experienced a negative change in their physical health. This is consistent with studies done in Uganda, where many reported that they have consulted the diabetic clinic in the professional sector and desired longer opening hours to get health education and help (Hjelm & Beebwa, 2013).

9. Limitation of The Study

The audio recording was not done during data collection for the beliefs, and therefore, it is possible that writing just the participants' statements may not have captured all their views on the beliefs towards diabetes disease.

The researchers did not use professional language experts to translate the questionnaire into the native languages that are Lugisu and Luganda but used trained research assistants who understood both English and the native languages. It is therefore, possible that some words and statements were translated inappropriately to the participants.

10. Conclusion

Generally, the participants had poor knowledge of diabetic foot complications and poor foot care practices. This study notes that patient –to – patient interaction is essential for sharing knowledge and experience.

The beliefs of diabetic patients about diabetes on the possible causes based on the Model of Illness Causation (Lay Model). Most participants mentioned the hereditary individual's factors, bad dietary habits, inactivity, over-activity, being fat, stress, infections, and being rich. Few participants reported factors related to the supernatural spheres: punishment from God or gods, the influence of witchcraft, and occurring naturally. The participants generally believed diabetes to be a dangerous disease.

11. Recommendations

These participants demonstrated poor knowledge of diabetic foot complications and therefore, patients should be regularly educated about this significant complication of the disease. Health workers (nurses and doctors) who interact most of the time with diabetic patients should regularly offer health education to the patients about foot care, which is the best preventive remedy for diabetic foot complications hence improving the quality of life of diabetic patients.

The researchers are recommending pictures to be put on the hospital walls to remind these patients of diabetic foot complications and foot care to curb this 'frustrating' complication of the disease effectively.

12. Availability of data and materials

Data from this study will be made available by the corresponding authors on request.

13. Consent for publication

Not applicable.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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