DETERMINANTS OF DIABETIC FOOT ULCER AMONG ADULT DIABETIC PATIENTS ATTENDING THE DIABETIC CLINIC IN TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA, 2019.

BY:

GUESH TEKLU (BSc.)

A THESIS TO BE SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCES IN ADULT HEALTH NURSING.

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ADDIS ABABA UNIVERSITY

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APPROVAL SHEET

I, the undersigned MSc student, declare that I have submitted my original work on a title "Determinants of Diabetic Foot Ulcer Among Adult Diabetic Patients Attending the Diabetic Clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019", done under the guidance of my advisors and has not been submitted for a degree in any other university. All sources materials used for the thesis have been duly acknowledged.

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This thesis work has been submitted for examination with our approval as an advisor.

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APPROVAL BY THE BOARD OF EXAMINATION

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ABBREVIATIONS AND ACRONYMS

AOR:	Adjusted Odds Ratio
BMI:	Body Mass Index
BP:	Blood Pressure
CI:	Confidence Interval
DBP:	Diastolic Blood Pressure
DFU:	Diabetic Foot Ulcer
DM:	Diabetes Mellitus
FBS:	Fasting Blood Sugar
HDL:	High Density Lipoprotein
Hgb A1C:	Glycosated Hemoglobin
HMIS:	Health Management Information System
LDL:	Low Density Lipoprotein
OR:	Odds Ratio
RBS:	Random Blood Sugar
SBP:	Systolic Blood Pressure
SD:	Standard Deviation
SPSS:	Statistical Package for Social Sciences
TASH:	Tikur Anbessa Specialized Hospital

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ABSTRACT

Background: Diabetic foot ulcer is among the commonest complications of diabetic mellitus attributing to a significant number of morbidity and mortality in diabetic patients, and enormous economic loss to the families and the country. Nowadays, the incidence of diabetic foot ulcer is increasing due to the increased prevalence of diabetes, prolonged life expectancy of diabetic patients and lifestyle change. However, the risk factor of the problem is less studied in Ethiopia.

Objective: To assess determinants of diabetic foot ulcer among diabetic patients attending diabetic clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.

Methods: An institution based unmatched case-control study was conducted on 161 diabetic patients. Cases were selected from diabetic patients with foot ulcer by consecutive sampling technique and controls from diabetic patients without diabetic foot ulcer by systematic random sampling technique. Binary logistic regression model was used to assess the association between the dependent and independent variables. All variables with P-value < 0.25 were included in the multivariable analysis. The magnitude of the association was measured by using an Odds Ratio with its 95% confidence interval. Statistical significance was declared at P- value < 0.05.

Results: In this study, among the 53 diabetic patients with foot ulcer and 108 diabetic patients without foot ulcer, 28 (33.7%) in cases and 55 (66.3%) in controls were males. Taking insulin alone [AOR: 2.75, 95% CI: 1.04-7.23], having peripheral neuropathy [AOR: 7.56, 95% CI: 2.82-20.24], not inspecting feet daily [AOR: 5.61, 95% CI: 2.24-14.05], and using moisturizing cream between toes [AOR: 3.35, 95% CI: 1.35-8.32], were positively associated with diabetic foot ulcer. Whereas, employed [AOR: 0.35, 95%CI: 0.14-0.87], and combined treatment (insulin and oral hypoglycemic agents) [AOR: 0.11, 95%CI: 0.02-0.57] were negatively associated with diabetic foot ulcer.

Conclusion and Recommendations: Diabetic foot ulcer was significantly associated with occupation, kind of treatment of diabetes mellitus taking, peripheral neuropathy, inspecting feet daily and putting moisturizing cream between toes. It will be helpful if diabetic patients inspect their feet on daily bases and do not put moisturizing cream between their toes.

Key words: Diabetic Foot Ulcer, Determinants, Addis Ababa

1. INTRODUCTION

1.1. Background

Diabetes mellitus (DM) is a group of metabolic disorders that is characterized by increased levels of glucose in the blood (hyperglycemia) that results from defects in insulin secretion, insulin action, or both (1).

The incidence of diabetes mellitus is increasing worldwide. The number of people with diabetes aged from 20-79 years was 424.9 million in 2017, and it is estimated that by 2045, it will grow up to 628.6 million due to the change in life expectancy, lifestyle, and diet of the people (2). In the United States, an estimated 1.5 million new cases of diabetes (6.7 per 1,000 persons) were diagnosed among adults aged 18 years or older in the year 2015 (3).

Diabetes mellitus causes macro-vascular and micro-vascular complications. Diabetic foot ulcer (DFU) is among the long-term and micro vascular complications of diabetic mellitus that have life time risk up to 25%, though many of the occurrences could be prevented (1, 4).

Diabetic foot ulcer is among the overwhelming complications of diabetic mellitus and causes diabetes related foot deformities that play a great role in the development of further diabetic foot ulcers (5).

People who are at greatest risk of diabetic foot ulceration can easily be identified by careful physical examination of the feet while giving the routine care on their follow ups. Foot problems in diabetic patients account for more hospital admissions than any other long-term complications of diabetes mellitus. Foot problems also resulted in increasing diseases and death among diabetic patients (6).

Diabetic foot ulcer causes minor and major lower extremity amputations and death among diabetic patients (7). So that people with diabetes who has peripheral neuropathy should be screened for a history of foot ulceration or lower-extremity amputation, peripheral artery disease, foot deformity, pre-ulcerative signs on the foot, poor foot hygiene and ill-fitting or inadequate footwear in order to prevent these devastating complications (8).

Though diabetic foot ulcer can be prevented by a multidisciplinary health professional's approach, it is important to teach and instruct diabetic patients to protect their feet by wearing

properly fitting footwear, not to walk barefoot or in socks only, whether at home or when outside. They should also be taught and instructed to inspect their feet and the inner side of their shoes, wash their feet (with careful drying particularly between the toes) on daily basis, use emollients to lubricate dry skin for a better outcome (8).

The risk of diabetic foot ulcers or amputations are high in people who have previous amputations, history of past foot ulcer, peripheral neuropathy, foot deformity, visual impairment, poor glycemic control and cigarette smoking (9). Therefore diabetic patients with either of these problems should attain special care to minimize the possible complications.

1.2. Statement of the problem

A diabetic foot ulcer is a non-traumatic lesion of the skin (partial or full thickness) on the foot of a person who has diabetes mellitus (4).

The global prevalence of diabetic foot ulcer was 6.3%, which was higher in males and in type 2 diabetic patients. The prevalence of diabetic foot ulcer in Africa was 7.2% (10). The prevalence of diabetic foot ulcer was 18.1% among patients with type two diabetes mellitus who are on treatment in Khartoum, Sudan (11). According to the studies conducted in different regions of Ethiopia, the prevalence of diabetic foot ulcer was: 14.8%, 13.6%, 12%, and 4.4% in Arbamich, Gondar, Mekelle, and Dessie respectively (4,12–14)

Diabetic foot ulcer is the major cause of lower extremity amputations in diabetic patients. Every 30 seconds a lower limb or part of a lower limb is lost to amputation somewhere in the world as a consequence of diabetes (2). The study conducted in Turkey revealed that 41.4% of diabetic patients with diabetic foot ulcer underwent an amputation (15). Moreover, diabetic foot ulcer accelerates mortality rate among diabetic patients as shown by the retrospective cohort study conducted in Saudi Arabia stating deceased patients increased by almost twofold in diabetic patients with foot ulcers compared to diabetic patients without foot ulcers (16). Similarly, a study from the United Kingdom also revealed higher rate of mortality among DM patients with DFU compared to those without DFU. Among the diabetic patients who developed new onset foot ulcer, 8.1% died within 12 months of their diabetic foot ulcer follow up, and the 5–year death rate for people with diabetic foot ulcer was 42.2% (17).
Diabetic foot ulcer compromises the quality of life as indicated by the study conducted in India on the impact of diabetic foot ulceration on Health-Related Quality of Life, in which patients with diabetic foot ulcer were having low scores of health-related quality (18).

The economic burden of diabetic foot ulcer should not be undermined as it requires much expense for treatment purpose. The study conducted in Canada shows that the annual average resource utilization associated with diabetic foot ulcer for acute institutional care was $358.6 million (19).
The study done in Singapore among diabetic patients with diabetic foot problems shows 28% had minor surgery, 22.9% had minor amputations, and 23.8% had major amputations. Their

annual average costs for the surgeries were $486.07, $397.57 and $1192.74 respectively (20). So it can be imagined that diabetic foot ulcer not only affects the quality of life of an individual but also has great burden in economic aspect of individuals.

According to the study done in Tikur Anbessa Specialized Hospital, nearly one-third of the diabetic patients were admitted with the problem of diabetic foot ulcer which implies that diabetic foot ulcer has higher admission rates compared with the other complications of DM (21).

Several factors have contributed to the development of diabetic foot ulcer. Which includes foot deformity, prior amputation, trauma, peripheral arterial disease, peripheral neuropathy, hypertension, duration of diabetes mellitus for greater than ten years, male gender, age greater than 45 years old, Non-noticeable repetitive trauma, longer duration of past foot ulcers were significant factors for the development of diabetic foot ulcer (22–24).

Patients who received integrated foot care, health education regarding diabetic foot, therapeutic footwear and Custom-Made Footwear were showing less percentage of diabetic foot ulcers and their foot care behaviors were improved after health education (25–27).

Patients with diabetic foot infections require some form of podiatric care in addition to the medical, surgical or nursing care they receive. Podiatric care is particularly aimed at preventing foot complications which includes debridement of callus and necrotic tissue, nail care (especially with Onychomycosis) (28).

Several studies have attempted to identify risk factors for diabetic foot ulcer, but did not assess the status of putting moisturizing cream between toes, family support during foot care and physical activity (exercise) status of the individual as possible risk factors for the development of diabetic foot ulcer. Therefore this study was intended to incorporate the status of putting moisturizing cream between toes, family support during foot care and physical activity status of the individual in the questionnaire which play a role for the development of DFU in diabetic patients.

1.3. Significance of the study

The number of people with diabetes mellitus is increasing due to lifestyle change and living condition, overweight, obesity and hypertension, and the numbers of lower extremity amputations are more among diabetic patients (29,30)

The incidence of diabetic foot is increasing due to the increased prevalence of diabetes and the prolonged life expectancy of diabetic patients. Amputation in people with diabetes is 10 to 20 times more common compared to those of non-diabetic people (2). Hence studying risk factors of diabetic foot ulcer is essential for minimizing the morbidities and complications taking place secondary to DM.

This study assessed the status of putting moisturizing cream between toes, family support during foot care and physical activity (exercise) status of the individual which play a role for the development of DFU in diabetic patients that are not studied in other studies as possible risk factors for DFU. This study was also conducted in a previously unstudied area.

Diabetic foot ulcer can be prevented if the risk factors are identified and appropriate measures are implemented to maintain skin integrity. Once it occurs, it may extend from pain and suffering to end of life.

This study assessed determinants of diabetic foot ulcer among diabetic patients which can help nurses in planning nursing care for diabetic patients and diabetic patients will be benefitted from the interventions provided by nurses and can be an input for researchers, community planners, and policymakers for their future interventions and activities.

In addition, this research is expected to produce a crucial output since there are no studies conducted on determinants of diabetic foot ulcer in Tikur Anbessa Specialized Hospital

2. LITERATURE REVIEW

2.1. Introduction

Nowadays, the number of people with DM is increasing due to aging, lifestyle change, obesity, and physical inactivity. Foot ulceration is one of the common complications of DM that is associated with an increased risk of death (17). The retrospective study done in the Johns Hopkins Hospital, Baltimore, United States of America showed that the general ratio of foot ulcer admissions was considerably higher in patients with diabetes than those without diabetes (11.2, 95% CI 10.8–11.5; P < 0.001) (31). Hence studying risk factors of DFU is essential for minimizing the morbidities and mortalities occurring secondary to DFU.

2.2. Socio-demographic factors of diabetic foot ulcer

The case-control study conducted in Poland states that DFU was high among male diabetic patients (OR = 2.83, 95% CI: 1.86-4.28, p = 0.00001) (32), this finding is similar to the cross-sectional study conducted in Saudi Arabia that states, male gender was a significant risk factor for the development of DFU (23), but it is inconsistent with the cross-sectional study done in Australia that states, female gender OR 1.52 (1.08-2.14) was a significant risk factor that contributes to the development of DFU (33).

The systematic review and meta-analysis study done in China showed that patients with DFU were older (10), this finding is similar to the cross-sectional study done in Iraq that shows, older age was significantly associated with the development of DFU (34).

The case-control study done in Malaysia among diabetic patients with foot ulcer and without foot ulcer states, patients in the age group of < 60 years were five times more likely to develop DFU [OR 4.5] (35), which is inconsistent to the cross-sectional study conducted in Saudi Arabia that states age > 45 years were significant risk factors for the development of DFU (23).

According to the cross-sectional study done in Arbamich Hospital, Ethiopia, diabetic patients who live in rural areas were 4.074 times more to develop DFU than those living in urban (AOR 4.07, 95% CI 1.262-13.151). Diabetic patients who were farmers were 6.54 times more to develop DFU than other employees (AOR 6.542, 95% CI 2.841-49.035) (4).

2.3. Clinical factors of diabetic foot ulcer

According to the comparative cross-sectional study done in Brazil, the proportion of men were having poorer glycemic control compared to women (HgbA1C 9.23 ± 2.03 vs. 8.35 ± 1.99; $p < 0.001$) (36).

A retrospective study done in two Maltese Health Centre catchment areas, Malta showed 71.2% of the diabetic patients were having hypertension. Besides 49.4% and 39% of the patients were having hallux valgus and hammer toes foot deformities (37).

The systematic review and meta-analysis study done in China showed that patients with diabetic foot ulcer were having longer diabetic duration, more hypertensive than diabetic patients without a diabetic foot (10).

The case-control study done in Malaysia states that HgbA1C level > 6.5% was a significant determinant of DFU (35), this finding is similar to the cross-sectional study conducted in Saudi Arabia that states, poor glycemic control was a significant risk factors for the development of DFUs (23).

According to the cross-sectional study done in Australia, some of the significant risk factors contributing to the development of DFU were peripheral neuropathy OR 1.77 (1.09-2.86) (33), this finding in lines with the prospective cohort study done in Iran that reveals, distal neuropathy OR = 3.37 (1.40–8.09), P = 0.007] was having statistically significant relationship with the incidence of DFU (38).

According to the study in Eastern Indonesia; deformity was significant in the control group and dry skin was significantly associated in the case group for the development of DFUs (39), which is similar to the prospective cohort study done in Iran that reveals foot deformity OR = 3.02 (1.10–8.29), P = 0.032] was having statistically significant relationship with the incidence of DFU (38), this finding is also similar to the cross-sectional study done in Australia, that states, patients with foot deformity were 1.44 times more likely OR 1.44 (1.02-2.04) to develop DFUs (33).

The prospective cohort study done in Iran reveals that, insulin usage OR = 5.78 (2.37–14.07), P < 0.01] was having a statistically significant relationship with the incidence of DFU (38),

this finding is inconsistent with the cross-sectional study conducted in Saudi Arabia that states, insulin use was no significant risk factor for the development of DFU (23), and with the cross-sectional study done in Iraq showed that using a combination of insulin and oral antidiabetic agents were significantly associated with the development of DFUs (34), but the case-control study done in Malaysia that showed both insulin and oral hypoglycemic agents were not significantly associated with DFU (35), and with a cross-sectional study conducted in University of Gondar Referral Hospital, Ethiopia, that showed taking insulin was not significantly associated with DFU (12).

The comparative cross-sectional study done in Iraq showed that, long history of DM (greater than 10 years), was significantly associated with the development of DFU (34), this is similar to the case-control study done in Malaysia that states, patients with chronic DM lasting more than ten years were seven times more likely to develop foot ulcers [OR 6.7] (35), which is also similar to the cross-sectional study conducted in Saudi Arabia that states, duration of diabetes mellitus > 10 years were significant risk factors for the development of diabetic foot ulcer (23), and also similar to the cross-sectional study done in Arbamich Hospital, Ethiopia, that states diabetic patients with DM for greater than 10 years were 8.452 times more to develop DFU than those with less than 10 years (AOR, 8.452, 95% CI 2.305, 30.994) (4).

According to the comparative cross-sectional study done in Lahore General Hospital, Pakistan, co-morbid conditions were significantly associated with the development of DFUs among patients with DFUs (40), this finding is inconsistent with the cross-sectional study done in Iraq that showed the presence of comorbid diseases was not significantly associated with the development of DFUs (34).

The cross-sectional study conducted in Saudi Arabia states that peripheral vascular disease (PVD), coronary artery disease (CAD), and hypertension were significant risk factors for the development of diabetic foot ulcers (23).

The Retrospective study conducted in Nigeria in One hundred and seven diabetic patients with foot ulcer/gangrene reveals that Tinea pedis (fungal infection) 5.1% was the identified risk factors for DFU among the patients (41).

The cross-sectional study conducted at the University of Gondar Referral Hospital, Ethiopia, reveals that diabetic patients with type II DM were 2.58 times more to develop DFU than those with type I DM (AOR = 2.58; 95% CI: 1.22, 6.45) (12), which is similar with the cross-sectional study conducted in Saudi Arabia that states, DFU more occurred in type II diabetic patients (23).

According to the comparative cross-sectional study done in Lahore General Hospital, Pakistan, obesity was significantly associated with the development of DFUs among patients with DFUs (40), which is similar to the retrospective, cross-sectional study done in Selebi Phikwe Government Hospital, Botswana that shows, more than half of the patients had a BMI above the median value (28 kg/m2) (42), which also has similar finding with the cross-sectional study conducted in the University of Gondar Referral Hospital, Ethiopia, that reveals diabetic patients who were overweight were 2.12 times more to develop DFU than those of normal weight (AOR= 2.12; 95% CI: 1.15, 3.10). Obese diabetic patients were 2.65 times more to develop DFUs than those with normal body mass index (AOR = 2.65; 95% CI: 1.25, 5.83) (12). But inconsistent with the systematic review and meta-analysis study done in China that showed patients with DFU were, having a lower body mass index compared to diabetic patients without a DFU (10).

2.4. Behavioral factors of diabetic foot ulcer

The retrospective study done in two Maltese Health Centre catchment areas, Malta showed that 56% of the diabetic patients wear unsuitable footwear, and 54% of the patients never had any prior foot care education (37), this finding is similar to the retrospective study conducted in Nigeria in One hundred and seven diabetic patients with foot ulcer/gangrene that reveals ill-fitting footwear 6.2% was the identified risk factors for DFU among the patients (41).

The systematic review and meta-analysis study done in China showed that patients with DFU were having a higher percentage of smoking than diabetic patients without a DFU (10), which in lines with the cross-sectional study conducted in Saudi Arabia states that smoking was significant risk factors for the development of diabetic foot ulcers (23).

According to the study in Eastern Indonesia; daily foot inspection, entirely foot inspection and supported for foot inspection by family members were significant in the control group for the development of DFUs (39).

The comparative cross-sectional study done in Iraq showed that physical activity was significantly associated with the development of DFUs (34).

2.5. Biological factors of diabetic foot ulcer

The case-control study conducted in Poland states that hyperlipidemia OR = 0.54, 95% CI: 0.36-0.81, p = 0.01 was a factor that helps to protect DFUs in type II diabetic patients (32).

The case-control study conducted in the United Arab Emirates reveals that the mean values of lipid profiles i.e. HDL was high and statistically significant among cases compared to controls. But the mean value of postprandial blood glucose was significantly higher for diabetic patients without foot ulcers (43).

2.6. Conceptual framework for determinants of diabetic foot ulcer

This conceptual framework describes factors that are related to the development of diabetic foot ulcer among diabetic patients. These factors includes: Socio-demographic factors like age, sex, occupation; Clinical factors like type of DM, duration of DM, history of foot ulcer, history of amputation; Behavioral factors like walking barefoot, appropriate wear, inspecting, washing feet daily smoking, alcohol intake, and Biological factors like cholesterol. As identified by reviewing different studies, these factors have an association with diabetic foot ulcer (4,12,13,23,33–36,38–44).

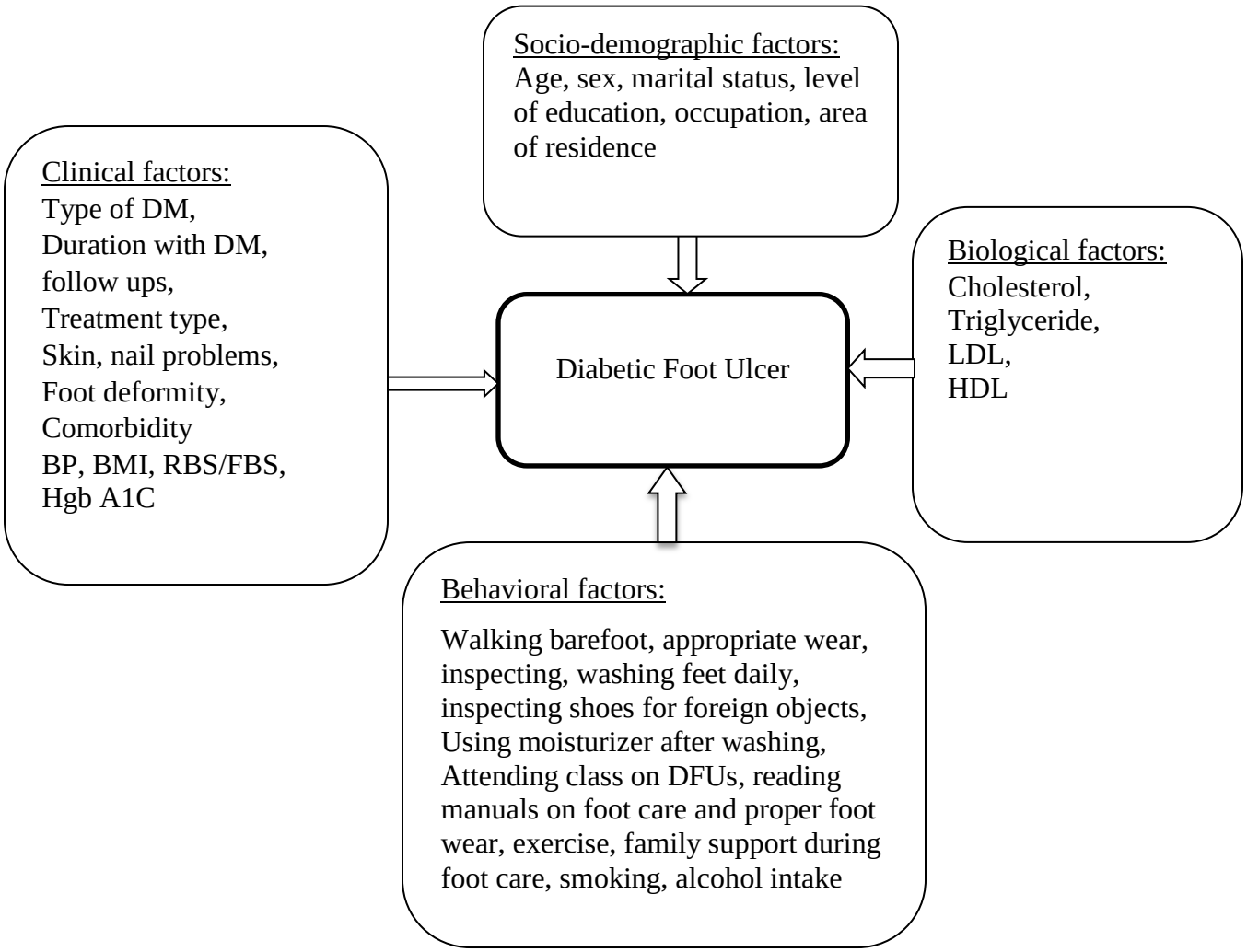

Figure 1: Conceptual framework for determinants of diabetic foot ulcer among diabetic patients in TASH, Addis Ababa, Ethiopia, 2019.

3. OBJECTIVES

3.1. General objective

- To assess determinants of diabetic foot ulcer among diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.

3.2. Specific objectives

- To describe the socio-demographic characteristics associated with diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.
- To identify the clinical factors associated with diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.
- To identify the behavioral factors associated with diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.
- To determine the biological factors associated with diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted in Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia, from March 27 – May 13 /2019. According to data from the hospital's administrative unit; the hospital was inaugurated in 1972. TASH is a specialized referral teaching hospital which is managed by Addis Ababa University. The hospital provides multi-dimensional aspects of care to clients who need health care service including pediatrics, medical, surgical, gynecological and other services. The hospital also has special units (referral clinics); those are Chest, Renal, Neurology, Cardiology, Dermatology and Sexually Transmitted Diseases, Gastrointestinal, Infectious Diseases, Orthopedics, General Surgical, Gynecologic and Obstetrics, Diabetic, Hematology, and Medical Intensive Care Unit. This hospital sees approximately 370,000 – 400,000 patients a year. It has 625 beds with 130 specialists, 50 non-teaching doctors, and 836 nurses.

The diabetic center of TASH is a separate unit which was inaugurated in 1994 by Professor Dr. Giuseppe PINO Grimaldi, president of the International Association of Lions Clubs. The report from Health Management Information System (HMIS) shows, the diabetic center provides an outpatient and inpatient service for around 11000 diabetic patients annually.

4.2. Study design

Institution based unmatched case-control study design was employed.

4.3. Population

4.3.1. Source population

The source populations for this study were all adult diabetic patients attending the diabetic clinic in TASH.

4.3.2. Study population

4.3.2.1. Cases

Adult diabetic patients who developed diabetic foot ulcer that was diagnosed by a physician and attending the diabetic clinic in TASH during the study period.

4.3.2.2. Controls

Adult diabetic patients who did not develop diabetic foot ulcer and attending the diabetic clinic in TASH during the study period.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

Cases: All adult DM patients who developed DFU and attending the diabetic clinic in TASH were included.
Controls: All adult DM patients who did not develop DFU and attending the diabetic clinic in TASH were included.

4.4.2. Exclusion criteria

Diabetic patients who had traumatic ulcer due to car accident or any injury and those who are severely ill and unable to communicate and patients with incomplete laboratory records were excluded.

4.5. Sample size determination

Sample size was determined by using Epi Info Version 7 statistical software to determine two population proportion by using 95% CI, power 80%, control to case ratio 2, OR = 3 which is the ratio of odds of dry skin among diabetic patients with diabetic foot ulcer to odds of dry skin among diabetic patients without diabetic foot ulcer, probability of exposure to dry skin among diabetic patients without diabetic foot ulcer =19.6% and probability of exposure to dry skin among diabetic patients with diabetic foot ulcer as 43.3% (39).

The calculated sample size was 147 (49 cases and 98 controls). By adding 10% non-response rate, the total sample size was 162 (54 cases and 108 controls).

4.6. Sampling technique and procedures

Diabetic patients with a foot ulcer and without foot ulcer were taken from the HMIS database and from the diabetic clinic registry book.

Since diabetic patients without foot ulcer and with foot ulcer were appointed in different day, they were selected differently as follows.

Controls were selected from diabetic patients without diabetic foot ulcer using systematic random sampling technique with every 9^{th} interval (K=N/n) until the predetermined sample size was obtained. The first control was selected using lottery method, and it was the 5^{th} participant. Cases were selected from diabetic patients with foot ulcer using consecutive sampling technique until the predetermined sample size was obtained.

The annual number of diabetic patients without foot ulcer and with foot ulcer that were seen by the diabetic clinic were 8000 and 252 respectively.

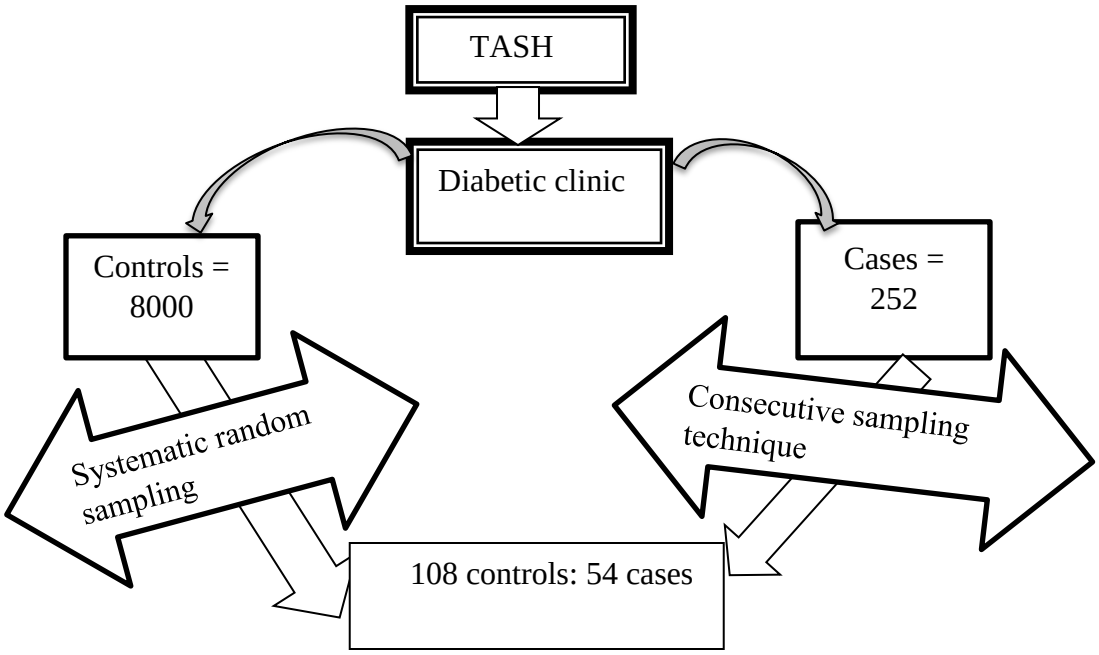

Figure 2: Schematic presentation of the sampling procedure for study participants in TASH, Addis Ababa, Ethiopia, 2019.

4.7. Data collection tools and procedures

The questionnaire was developed by the principal investigator by selecting and modifying different similar articles (4,12,13,39,40,42) and standard evaluation tools (44–47) for diabetic foot ulcers and all the variables of interest were assessed accordingly.

An interviewer-administered structured questionnaire and record review were used to collect data from the cases and controls. The questionnaire comprises four parts.

The first part is: Socio-demographic characteristics of respondents like age, sex, marital status, which has 6 items.
The second part is: Clinical factors related questions of respondents like type of DM, duration of DM, history of DFU, history of amputation, which has 15 items.
The third part is: Behavioral factors related questions like walking bare foot, inspecting and washing feet daily, which has 21 items.
The fifth part is: Biologic factors of the respondents (laboratory results) of the respondents like FBS, HgbA1C, LDL, HDL, which will be taken from patient card. It has 4 items.

Weight, height and blood pressure of the study participants was measured as follows.
Weight was measured in light closing and without shoes in kilograms (kg).

Height was measured using stadiometer in centimeter (cm) in erect position that the back of the head, shoulder blades, buttocks, and heels make contact with the backboard with shoes removed.
Blood pressure was measured using a mercury sphygmomanometer with a cuff deflation rate of 2 mmHg.

4.8. Study variables

4.8.1. Dependent variable

- Diabetic foot ulcer

4.8.2. Independent variables

Socio-demographic factors:

- Age, sex, marital status, level of education, occupation, area of residence

Clinical factors:

- Type of DM, duration with DM,
- Follow up, treatment type,
- Skin, nail problems, foot deformity,
- Comorbidity (hypertension, heart disease, peripheral neuropathy)
- BP, BMI, FBS
- Hgb A1C

Behavioral factors:

- Walking barefoot, appropriate foot wear,
- Inspecting, washing feet daily, inspecting shoes for foreign objects,
- Using moisturizer after washing,
- Attending class on diabetic foot ulcers, reading manuals on foot care and proper foot wear,
- Exercise, smoking, alcohol intake

Biological factors:

- Cholesterol, Triglyceride,
- LDL, HDL

4.9. Operational definitions

Case (Patient with diabetic foot ulcer): was a diabetic patient who was diagnosed as having foot ulcer which was identified from patient card.

Control (Patient without diabetic foot ulcer): was a diabetic patient who was not diagnosed as having foot ulcer which was identified from patient card.

Foot deformity: when the big toe of the diabetic patients was turned toward the second toe and the base of big toe was pushed to the side, and if the tip of the toe was bent.

Well fit foot wear: A footwear that was wider than the size of the foot. That was checked by measuring the size of foot on a paper with a marker and that of a shoe. Then both the size of the foot and shoe were compared, and no reddened areas on the foot on removal of the footwear.

Ill fit foot wear: when footwear was equal to the size of the foot and there were reddened areas on the foot on removal of the footwear.

Callus: diabetic patients were observed and palpated for the presence of thick areas on the bottom or sides of feet and toes.

Dry skin: diabetic patients were observed and palpated for a rough skin.

Tinea pedis: diabetic patients were observed for erythema and fissuring between the toes due to fungal infection.

Nail deformity: diabetic patients were observed for ingrown toenail or thickened nail fold skin.

Onychomycosis: nail of diabetic patients were observed for foul smelling, dark color, brittle and thickened nails.

Peripheral neuropathy: loss of sensation. The 10-g Semmes–Weinstein monofilament was used to identify peripheral sensory neuropathy. The ten-point test was used. The upper part of the foot, plantar aspect of the hallux and third digit together with the 1^{st}, 3^{rd} and 5^{th} metatarsal heads were used for testing. With the eyes closed, the patient reported to the investigator when he or she could feel the monofilament. Participants who were unable to feel the 10 gram monofilaments on greater than or equal to 4 of the 10 points were considered as neuropathic.

Body Mass Index (BMI): is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). It is classified as BMI less than 18.5 kg/m^2 = underweight, BMI ranging from 18.5–24.9 kg/m^2 = normal range, BMI ranging from 25 – 29.9 kg/m^2 = overweight and BMI $\geq$ 30 kg/m^2 = obese (48).

Family support: the support diabetic patients got from their family members in caring for their feet.

4.10. Data quality assurance

Content validation of the adapted questionnaire was done by experienced researchers. The English questionnaire was translated to the Amharic language by language expert translators then back to the English language to check for consistency. Three MSc graduate students collected the data. One MSc holder supervised the overall data collection process. Prior to the data collection, the enumerators and the supervisor received one day training about the data collection techniques. In addition, the Amharic version questionnaire was pre-tested on 5% (8 diabetic patients) of the calculated sample size two weeks before actual data collection in St. Paul's Hospital Millennium Medical College. Ambiguous words and concepts were corrected accordingly.

Throughout the course of the data collection, interviewers were supervised. Twenty percent of the collected data were checked by the supervisor daily for completeness and finally, the principal investigator monitored the overall quality of data collection. The collected data were reviewed and checked for completeness before data entry; the incomplete data were discarded.

4.11. Data analysis procedures

Data were checked, coded and entered to Epi-Data Manager version 4.4.2.2, and were exported to SPSS version 24 for analysis. Data entry was made by the principal investigator.

Cross-tabulation was done to assess the distribution of cases and controls. The binary logistic regression model was used to assess the association between the dependent and independent variables. All variables with P-value < 0.25 were included in the multivariable analysis to avoid confounders (49). The magnitude of the association was measured by using an Odds Ratio with its 95% confidence interval. Statistical significance was declared at P- value < 0.05. Finally, the data were presented with texts, tables and graphs.

4.12. Ethical consideration

Ethical clearance letter was obtained from the institutional review board of Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery research committee. An official letter was submitted to Tikur Anbessa Specialized Hospital, diabetic clinic and then, permission was obtained from the concerned bodies. Prior to data collection; Information was given to the participants and participants' voluntary participation, confidentiality, anonymity, and freedom to withdraw from the study at any time were assured. The nature and importance of the study was explained and consents were obtained from the participants.

4.13. Dissemination of the result

The results of the study will be presented and submitted to Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery.

A copy of the findings will also be disseminated to Tikur Anbessa Specialized Hospital, diabetic clinic. There is also a plan to publish the results of the research in reputable national or international scientific journals.

5. RESULTS

5.1. Socio-demographic characteristics of respondents

A total of 162 diabetic patients were approached and 161 diabetic patients agreed to participate in the study, resulting in a response rate of 99.4%.

In this study, 53 cases (diabetic patients with foot ulcer) and 108 controls (diabetic patients without foot ulcer) were interviewed to answer questions from their socio-demographic, clinical, behavioral and biological backgrounds. The mean age (SD) of the cases and controls was 50.55 ±16.34 years and 51.48 ± 16.62 years, respectively. Most of the study participants were in the age group 58-67 years. Among the respondents, 28 (33.7%) cases and 55 (66.3%) controls were males. The socio demographic characteristics of the study participants are shown in table 1 below.

Table 1: Socio demographic characteristics of the study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variables	Cases (%)	Controls (%)
Age category in years		
18-27	6(28.6)	15(71.4)
28-37	9(45.0)	11(55.0)
38-47	4(30.8)	9(69.2)
48-57	12(32.4)	25(67.6)
58-67	15(34.1)	29(65.9)
≥ 68	7(26.9)	19(73.1)
Marital status		
Married	40(35.7)	72(64.3)
Single	8(22.9)	27(77.1)
Divorced	5(35.7)	9(64.3)
Educational level		
No formal education	4(25.0)	12(75.0)
Primary	15(36.6)	26(63.4)
Secondary	7(36.8)	12(63.2)
Above secondary	27(31.8)	58(68.2)
Occupation		
Employed	30(40.0)	45(60.0)
Unemployed	23(26.7)	63(73.3)
Residence		
Urban	50(32.3)	105(67.7)
Rural	3(50.0)	3(50.0)

5.2. Clinical characteristics of respondents

The proportion of type I DM among the cases and controls was 16(34.8%) and 30(65.2%), respectively. The proportion of cases and controls having DM less than 10 years was 20 (29.0%) and 49 (71.0%) respectively. In addition, the mean ± SD year duration of DM among cases and controls was 13.04±8.44 and 12.47±9.47 respectively. Hypertension was common among controls (65.5%) compared to cases (34.5%), while foot deformity was higher among cases (53.8%) compared to controls (46.2%). The proportion of kidney disease was 8 (80.0%) among controls and 2(20.0%) among cases. The proportion of having FBS ≥ 126 mg/dl was higher in controls (71.0%) compared to cases (29.0%). The clinical characteristics of the respondents are shown in table 2 below.

Table 2: Clinical factors of the study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variables	Cases (%)	Controls (%)
Regularly visit a physician		
Yes	53(33.1)	107(66.9)
No	0(0.0)	1(100.0)
Treatment kind of DM		
Oral hypoglycemic agents	15(30.0)	35(70.0)
Insulin	35(45.5)	42(54.5)
Both	3(8.8)	31(91.2)
Heart disease		
Yes	10(34.5)	19(65.5)
No	43(32.6)	89(67.4)
Peripheral neuropathy		
Yes	25(56.8)	19(43.2)
No	28(23.9)	89(76.1)
Dyslipidemia		
Yes	0(0.0)	9(100.0)
No	53(33.9)	99(65.1)
10 g- monofilament		
Positive	24(46.2)	28(53.8)
Negative	29(26.6)	80(73.8)
Nail problems		
Nail deformity	14(53.8)	12(46.2)
No nail problems	39(28.9)	96(71.1)
BMI		
< 18.5	11(73.3)	4(26.7)
18.5-24.9	5(11.9)	37(88.1)
25-29.9	19(31.1)	42(68.9)
≥ 30	18(43.2)	25(58.1)

The proportion of callus among cases and controls was 11(42.3%) and 15(57.7%) respectively. The skin problems of the study participants are shown in figure 3 below.

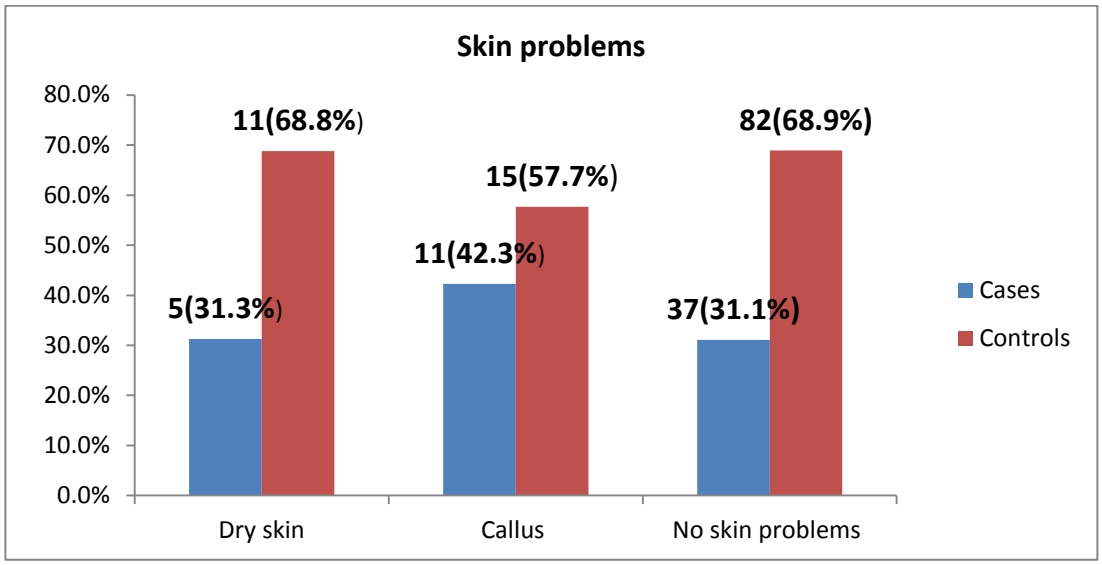

Figure 3: Skin problems of the study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

The proportion of uncontrolled blood pressure among cases and controls was 34.4% and 65.6% respectively. The proportion of BP status of the respondents is shown in figure 4 below.

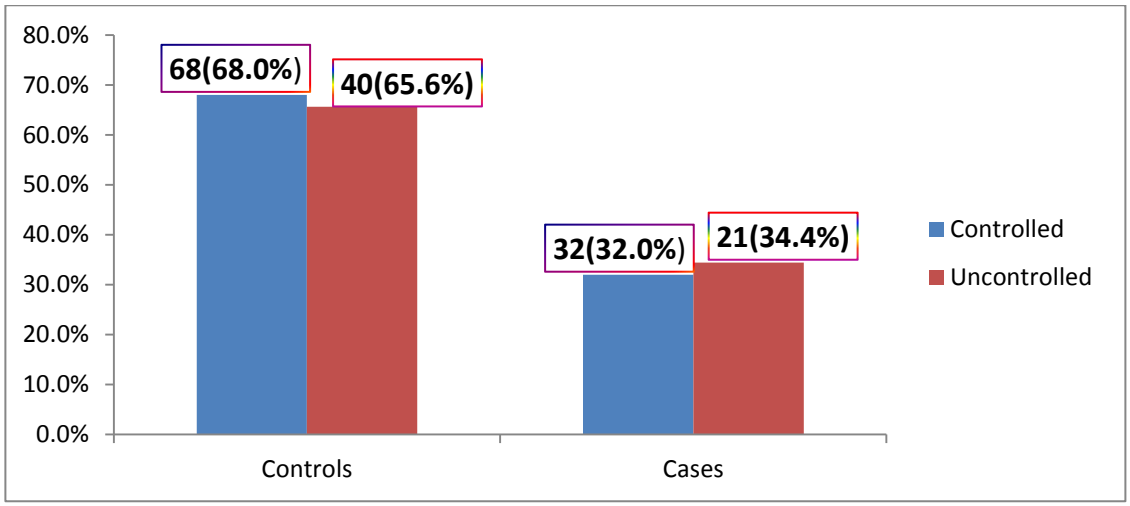

Figure 4: BP status of the study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

5.3. Behavioral factors of respondents

The proportion of washing feet on a daily basis among the controls (66.4%) was higher compared to cases (33.6%). The proportion of inspecting feet entirely was better in controls (64.8%) compared to cases (35.2%). Controls were getting more family assistance during foot inspection (64.9%) compared to cases (35.1). The proportion of reading handouts on proper foot wear was better among controls (63.3%) compared to cases (36.7%), and the proportion of attending class on foot care was higher in controls (68.8%) compared to cases (31.2%). The proportion of inspecting shoes for foreign objects or torn linings were greater in controls (64.8%) compared to cases (35.2%), and the proportion of taking alcohol was more in controls (66.7%) compared to cases (33.3%). The behavioral factors of the study respondents are shown in table 3 below.

Table 3: Behavioral factors of the study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variables	Cases (%)	Controls (%)
Ever wear shoes without socks		
Yes	20(28.6)	50(71.4)
No	33(36.3)	58(63.7)
Use moisturizer after washing		
Yes	32(35.6)	58(64.4)
No	21(29.6)	50(70.4)
Use moisturizer between toes		
Yes	29(43.3)	38(56.7)
No	24(25.5)	70(74.5)
Family assistance in washing		
Yes	16(36.4)	28(63.6)
No	37(31.6)	80(68.4)
Read handouts on foot care		
Yes	13(20.6)	50(79.4)
No	40(40.8)	58(59.2)
Annual foot examination session by physician		
Yes	25(37.3)	42(62.7)
No	28(29.8)	66(70.2)
Regular physical activity		
Yes	32(29.6)	76(70.4)
No	21(39.6)	32(60.4)
Frequency of regular physical activity		
< 3 times per week	24(38.3)	38(61.7)
≥ 3 times per week	12(24.4)	34(75.6)
Running		
Yes	4(40.00	6(60.0)
No	30(31.6)	65(68.4)
Walking		
Yes	29(32.6)	60(67.4)
No	5(31.3)	11(68.8)
Jogging		
Yes	4(40.0)	6(60.0)
No	30(31.6)	65(68.4)
Do you smoke		
Yes	2(50.0)	2(50.0)
No	51(32.5)	106(67.5)
Foot wear		
Well fit	22(34.4)	42(65.6)
Ill fit	31(32.0)	66(68.0)

5.4. Biological factors of the study participants

The mean ± SD value of cholesterol among cases and controls was 199.38 ± 47.87 and 194.61 ± 46.95 respectively. In addition, the mean ± SD value of LDL among cases and controls was 152.32 ± 24.30 and 142.12 ± 33.31 respectively. The biological factors of the respondents are shown in table 4 below.

Table 4: Biological factors of the study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variables	Cases (%)	Controls (%)
Cholesterol		
< 200	28(28.6)	70(71.4)
≥ 200	25(39.7)	38(60.3)
Triglyceride		
< 200	31(26.5)	86(73.5)
≥ 200	22(50.0)	22(50.0)
HDL		
35-60	30(27.8)	78(72.2)
< 35	7(53.8)	6(46.2)
> 60	16(40.0)	24(60.0)
LDL		
130-160	31(39.2)	48(60.8)
< 130	5(12.8)	34(87.2)
> 160	17(39.5)	26(60.5)

5.5. Factors associated with diabetic foot ulcer

5.5.1. Bivariate analysis of factors affecting diabetic foot ulcer

Binary logistic regression was done for each factors of diabetic foot ulcer among diabetic patients as shown in the following tables.

5.5.1.1. Bivariate analysis of socio-demographic characteristics

Bivariate analysis was carried out to assess the association of socio-demographic variables. Among the socio-demographic variables, occupation was a candidate variable for multivariable logistic regression model at p- value < 0.25. The bivariate analysis of socio-demographic characteristics of the respondents is shown in table 5 below.

Table 5: Bivariate analysis of the socio-demographic characteristics of study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variables	Cases (%)	Controls (%)	COR (95% CI)	P-value
Sex				
Male	28(33.7)	55(66.3)	1.08(0.56-2.08)	0.82
Female	25(32.1)	53(67.9)	1	
Age category:				
18-27	6(28.6)	15(71.4)	1	
28-37	9(45.0)	11(55.0)	2.05(0.56-7.46)	0.28
38-47	4(30.8)	9(69.2)	1.11(0.25-5.04)	0.89
48-57	12(32.4)	25(67.6)	1.20(0.37-3.87)	0.76
58-67	15(34.1)	29(65.9)	1.29(0.42-4.02)	0.66
≥ 68	7(26.9)	19(73.1)	0.92(0.26-3.32)	0.90
Marital status				
Married	40(35.7)	72(64.3)	1.88(0.78-4.51)	0.37
Single	8(22.9)	27(77.1)	1	
Divorced	5(35.5)	9(64.3)	1.88(0.49-7.22)	0.36
Educational level				
No formal education	4(25%)	12(75%)	0.72(0.21-2.43)	0.59
Primary	15(36.6%)	26(63.4%)	1.24(0.57-2.71)	0.59
Secondary	7(36.8)	12(63.2%)	1.25(0.44-3.54)	0.67
Above secondary	27(31.8)	58(68.2%)	1	
Occupation				
Employed	30(40.0)	45(60.0)	1	
Unemployed	23(26.7)	63(73.3)	0.55(0.28-1.06)	**0.08**
Area of residence				
Urban	8(32.3%)	105(67.7%)	1	
Rural	3(50.0%)	3(50.0%)	2.10(0.40-10.78)	0.37

5.5.1.2. Bivariate analysis of clinical factors

Bivariate analysis was carried out to assess the association of clinical factors. Among the clinical factors; kind of treatment of DM taking, peripheral neuropathy, nail problems and foot deformity were candidate variables for multivariable logistic regression model at p- value < 0.25. The bivariate analysis of clinical factors of the respondents is shown in table 6 below.

Table 6: Bivariate analysis of the clinical factors of study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variable	Cases (%)	Controls (%)	COR (95% CI)	P-value
Category of DM				
Type I	16(34.8%)	30(65.2%)	1	
Type II	37(32.2%)	78(67.8%)	0.89(0.43-1.83)	0.75
Duration of DM				
< 10 years	20(29.0%)	49(71.0%)	1	
≥ 10 years	33(35.9%)	59(64.1%)	1.34(0.70-2.68)	0.36
Treatment kind of DM				
Oral hypoglycemic agents	15(30.0)	35(70.0)	1	
Insulin	35(45.5)	42(54.5)	1.94(0.92-4.13)	**0.08**
Both	3(8.8)	31(91.2)	0.23(0.06-0.85)	**0.03**
Hypertension				
Yes	20(34.5)	38(65.5)	1.12(0.57-2.21)	0.75
No	33(32.0)	70(68.0)	1	
Heart disease				
Yes	10(34.5)	19(65.5)	1.09(0.47-2.54)	0.84
No	43(32.6)	89(67.4)	1	
Peripheral neuropathy				
Yes	19(45.2)	23(54.8)	4.18(2.01-8.70)	**0.00**
No	30(25.2)	89(74.8)	1	
Kidney disease				
Yes	2(20.0)	8(80.0)	0.49(0.10-2.39)	0.38
No	51(33.8)	100(66.2)	1	
Skin problems				
Dry skin	5(31.3)	11(68.8)	1.00(0.33-3.11)	0.99
Callus	11(42.3)	15(57.7)	1.63(0.68-3.88)	0.27
No skin problems	37(31.1)	82(68.9)	1	
Nail problems				
Nail deformity	14(53.8)	12(46.2)	2.87(1.22-6.76)	**0.02**
No nail problems	39(28.9)	96(71.1)	1	
Foot deformity				
Yes	7(53.8)	6(46.2)	2.59(0.82-8.13)	**0.10**
No	46(31.1)	102(68.9)	1	

5.5.1.3. Bivariate analysis of behavioral factors

Bivariate analysis was carried out to assess the association of behavioral factors. Among the behavioral factors; inspecting feet daily, using moisturizer between toes, reading handouts on foot care, and regular physical activity were candidate variables for multivariable logistic regression model at p- value < 0.25. The bivariate analysis of behavioral factors of the respondents is shown in table 7 below.

Table 7: Bivariate analysis of the behavioral factors of study participants attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variables	Controls (%)	Cases (%)	COR (95% CI)	P-value
Ever walk barefoot				
Yes	2(50.0)	2(50.0)	2.08(0.29-15.18)	0.47
No	51(32.5)	106(67.5)	1	
Ever wear shoes without socks				
Yes	20(28.6)	50(71.4)	0.70(0.36-1.38)	0.30
No	33(36.3)	58(63.7)	1	
Always inspect your shoes for foreign objects or torn linings				
Yes	37(35.2)	68(64.8)	0.74(0.36-1.49)	0.39
No	16(28.6)	40(71.4)	1	
Inspect your feet daily				
Yes	23(21.9)	82(78.1)	1	
No	30(53.6)	26(46.4)	4.11(2.04-8.28)	**0.00**
Inspect your feet entirely				
Yes	31(35.2)	57(64.8)	1	
No	22(30.1)	51(69.9)	0.79(0.41-1.54)	0.49
Family assistance during inspection				
Yes	13(35.1)	24(64.9)	1	
No	40(32.3)	84(67.7)	0.88(0.41-1.90)	0.74
Wash your feet daily				
Yes	50(33.6)	99(66.4)	1	
No	3(25.0)	9(75.0)	0.67(0.17-2.55)	0.55
Use moisturizer after washing				
Yes	32(35.6)	58(64.4)	1	
No	21(29.6)	50(70.4)	0.76(0.39-1.48)	0.42

Putting moisturizer between toes				
Yes	29(43.3)	38(56.7)	2.23(1.14-4.35)	**0.02**
No	24(25.5)	70(74.5)	1	
Family assistance during washing				
Yes	16(36.4)	28(63.6)	1	
No	37(31.6)	80(68.4)	0.81(0.39-1.68)	0.57
Attend class on foot care				
Yes	24(31.2)	53(68.8)	1	
No	29(34.5)	55(65.5)	1.16(0.60-2.25)	0.65
Read handouts on foot care				
Yes	13(20.6)	50(79.4)	1	
No	40(40.8)	58(59.2)	2.65(1.28-5.51)	**0.01**
Ever read handouts on proper foot wear				
Yes	18(36.7)	31(63.3)	1	
No	35(31.2)	77(68.8)	0.78(0.39-1.58)	0.50
Annual foot examination session by physician				
Yes	25(37.3)	42(62.7)	1	
No	28(29.8)	66(70.2)	0.71(0.37-1.38	0.32
Regular physical activity				
Yes	32(29.6)	76(70.4)	1	
No	21(39.6)	32(60.4)	1.56(0.78-3.10)	**0.21**
Do you smoke				
Yes	2(50.0)	2(50.0)	2.08(0.29-15.18)	0.47
No	51(32.5)	106(67.5)	1	
Do you take alcohol				
Yes	2(33.3)	4(66.7)	1.02(0.18-5.75)	0.98
No	51(32.9)	104(67.1)	1	
Foot wear				
Well fit	22(34.4)	42(65.6)	1	
Ill fit	31(32.0)	66(68.0)	0.90(0.46-1.75)	0.75

5.5.2. Multivariable analysis of factors affecting diabetic foot ulcer

Model was checked for fitness using Hosmer and Lemshow test and the p- value was 0.97.

The multivariable analysis displayed in the table 9 below shows that after controlling the possible confounders; occupation, kind of treatment for DM, putting moisturizing cream between toes, daily inspection of foot and peripheral neuropathy were statistically significant with diabetic foot ulcer at p-value < 0.05.

The risk of developing DFU among employed diabetic patients was 65% less likely to occur compared to diabetic patients who were unemployed [AOR: 0.35, CI: 0.14-0.87, p=0.03].
Diabetic patients taking insulin alone were 2.75 times more likely to develop DFU compared to diabetic patients taking oral hypoglycemic agents [AOR: 2.75, CI: 1.04-7.23].
Diabetic patients taking both insulin and oral hypoglycemic agents were 89% less likely to develop DFU compared to diabetic patients taking oral hypoglycemic agents [AOR: 0.11, CI: 0.02-0.57, P=0.01].
Diabetic patients who have peripheral neuropathy were 7.56 times more risk to develop DFU than diabetic patients without peripheral neuropathy [AOR = 7.56; 95% CI: 2.82-20.24, P=0.00].
Diabetic patients who did not inspect their feet daily were 5.61 times more risk to develop DFU than diabetic patients who inspect their feet daily [AOR = 5.61; 95% CI: 2.24-14.05, P=0.00].
Diabetic patients who use moisturizing cream between their toes were 3.35 times more likely to develop DFU compared to diabetic patients who did not use moisturizing cream between their toes [AOR: 3.35, CI: 1.35-8.32, P=0.01].

Table 8: Bivariate and multivariable logistic regression for determinants of diabetic foot ulcer among diabetic patients attending the diabetic clinic in TASH, Addis Ababa, Ethiopia, 2019, (n=161).

Variables	Cases (%)	Controls (%)	COR (95% CI)	P-value	AOR (95% CI)	P-value
Occupation						
Employed	30(40.0)	45(60.0)	1		1	
Unemployed	23(26.7)	63(73.3)	0.55(0.28-1.06)	0.08	0.35(0.14-0.87)**	0.03
Treatment kind of DM						
Oral hypoglycemic agents	15(30.0)	35(70.0)	1		1	
Insulin	35(45.5)	42(54.5)	1.94(0.92-4.13)	0.08	2.75(1.04-7.23)**	0.04
Both	3(8.8)	31(91.2)	0.23(0.06-0.85)*	0.03	0.11(0.02-0.57)**	0.01
Peripheral neuropathy						
Yes	23(54.8)	19(45.2)	4.18(2.01-8.70)*	0.00	7.56(2.82-20.24)**	0.00
No	30(25.2)	89(74.8)	1		1	
Inspect your feet daily						
Yes	23(21.9)	82(78.1)	1		1	
No	30(53.6)	26(46.4)	4.11(2.04-8.28)*	0.00	5.61(2.24-14.05)**	0.00
Putting moisturizer between your toes						
Yes	29(43.3)	38(56.7)	2.23(1.14-4.35)*	0.02	3.35(1.35-8.32)**	0.01
No	24(25.5)	70(74.5)	1		1	
Reading handout on foot care						
Yes	13(20.6)	50(79.4)	1		1	
No	40(40.8)	58(59.2)	2.65(1.28-5.51)*	0.01	1.36(0.53-3.52)	0.52
Regular physical activity						
Yes	32(29.6)	76(70.4)	1		1	
No	21(39.6)	32(60.4)	1.56(0.78-3.10)	0.21	1.52(0.58-4.02)	0.40
Nail problems						
Nail deformity	14(53.8)	12(46.2)	2.87(1.22-6.76)*	0.02	2.61(0.86-7.96)	0.09
No nail problem	39(28.9)	96(71.1)	1		1	
Foot deformity						
Yes	7(53.8)	6(46.2)	2.59(0.82-8.13)	0.10	2.89(0.55-15.28)	0.21
No	46(31.1)	102(68.9)	1		1	

*Note: *= variables with p value of < 0.05 in bivariate analysis and ** = variables that show significant association in multivariable logistic regression analysis at p-value < 0.05*

1 = reference

6. DISCUSSIONS

The main purpose of this study was to assess determinants of diabetic foot ulcer among diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019. The identified determinants were: occupation, kind of treatment of DM, putting moisturizing cream between toes, daily inspection of foot and peripheral neuropathy.

In this study, the risk of developing diabetic foot ulcer among employed diabetic patients was 65% less likely to occur compared to diabetic patients who were unemployed [AOR: 0.35, CI: 0.14-0.87, p=0.03]. This finding is similar to the cross-sectional study done in Arbamich Hospital, Ethiopia, that states, diabetic patients who were farmers were 6.54 times more to develop DFU than employed (AOR 6.542, 95% CI: 2.841-49.035) (4). But this finding is inconsistent with the cross-sectional study conducted in University of Gondar Referral Hospital, Ethiopia, that showed occupation was not significantly associated with DFU (12), this discrepancy could be due to difference in sample size and study design.

In this study, diabetic patients taking insulin alone were 2.75 times more likely to develop diabetic foot ulcer compared to diabetic patients taking oral hypoglycemic agents [AOR: 2.75, CI: 1.04-7.23]. This finding is consistent with research findings conducted in: Iran with a prospective cohort study that reveals, insulin usage [AOR: 5.78, CI: 2.37–14.07, P < 0.01] was having a statistically significant relationship with the incidence of DFU (38), Eastern Indonesia with a case control study that states diabetic patients taking insulin were 9.37 times more risk to develop diabetic foot ulcer compared to diabetic patients taking oral hypoglycemic agents [AOR:9.37, 95% CI: 2.240-39.182] (39). But inconsistent with the studies conducted in: Saudi Arabia with a cross-sectional study that states, taking insulin was not significant risk factor for the development of DFU (23), Malaysia with a case-control study that showed insulin treatment was not a significant determinant of DFU (35), and with a cross-sectional study conducted in University of Gondar Referral Hospital, Ethiopia, that showed taking insulin was not significantly associated with DFU (12). This discrepancy could be due to difference in sample size, study design and disease condition.

In this study, diabetic patients taking combined medication (insulin and oral hypoglycemic agents) were 89% less likely to develop diabetic foot ulcer compared to diabetic patients taking oral hypoglycemic agents [AOR: 0.11, CI: 0.02-0.57, P=0.01]. This contradicts with research findings conducted in: Iraq with a cross-sectional study that showed that using a combination of insulin and oral antidiabetic agents were significantly associated with the development of DFUs (34), Pakistan with a cross-sectional study that states, combination of both insulin and oral hypoglycemic agents were strongly associated with the development of diabetic foot ulcer (40). Malaysia with a case-control study that showed combination of both insulin and oral hypoglycemic agents were not significantly associated with DFU (35), and Eastern Indonesia with a case control study that states taking both insulin and oral hypoglycemic agents were not significantly associated with DFU [AOR: 2.38, 95% CI: 0.507 - 11.199] (39). This discrepancy might be due to the differences in sample size and study designs.

In this study, diabetic patients who have peripheral neuropathy were 7.56 times more risk to develop diabetic foot ulcer than diabetic patients without peripheral neuropathy [AOR = 7.56; 95% CI: 2.82-20.24, P=0.00]. This finding is consistent to the studies conducted in: Australia with a cross sectional study, that reveals diabetic patients with peripheral neuropathy were 1.77 times more risk to develop diabetic foot ulcer than diabetic patients without peripheral neuropathy [AOR:1.77, CI: 1.09-2.86] (33), Iran with a prospective cohort study that reveals, diabetic patients with distal neuropathy were 3.37 times more risk to develop diabetic foot ulcer than diabetic patients without neuropathy [AOR: 3.37, CI: 1.40-8.09, P= 0.007] (38), Pakistan with a cross-sectional study states, development of diabetic foot ulcer was strongly associated with neuropathy among diabetic patients with neuropathy than diabetic patients without neuropathy (40), and University of Gondar Referral Hospital, Ethiopia, with a cross sectional study that reveals diabetic patients who have neuropathy were 21.76 times more risk to develop DFU than diabetic patients who have no neuropathy [AOR:21.76, CI: 8.43-57.47)] (12). This condition is inevitable as patients with neuropathy could sustain minor trauma without being aware of the injury until it worsens. It had been suggested that this condition can be prevented by wearing proper foot wear, maintaining hygiene and performing daily physical examination.

But inconsistent to the studies conducted in: Saudi Arabia with a cross-sectional study that states, neuropathy was not significantly associated with the development of diabetic foot ulcer [AOR: 0.42, CI: 0.05–3.44, p: 0.421] (23), and Arbaminch Hospital, Ethiopia, with cross sectional study design states that neuropathy was not significantly associated with the development of diabetic foot ulcer (4). This discrepancy might be due to differences in diabetes mellitus duration, and study design.

In this study, diabetic patients who did not inspect their feet daily were 5.61 times more risk to develop diabetic foot ulcer than diabetic patients who inspect their feet daily [AOR = 5.61, 95% CI: 2.24-14.05, P=0.00]. This is consistent with the case control study conducted in Eastern Indonesia that states, diabetic patients who inspect their feet were 64% less risk to develop diabetic foot ulcer than diabetic patients who did not inspect their feet daily [AOR: 0.36, CI: 0.186-0.703] (39). These findings indicate the importance of daily feet inspection to prevent risk factors. This finding is also consistent with the International Working Group on the Diabetic Foot (IWGDF) guideline that states, risk patients with diabetes should inspect their feet daily (8). But this is inconsistent with the cross sectional study conducted in Iraq that states, daily feet inspection was not significantly associated with the development of diabetic foot ulcer [p= 0.172] (34). This discrepancy might be due to difference in study design and participants behavior in inspecting feet.

In this study, diabetic patients who use moisturizing cream between their toes were 3.35 times more likely to develop diabetic foot ulcer compared to diabetic patients who did not use moisturizing cream between their toes [AOR: 3.35, CI: 1.35-8.32, P=0.01]. Though there are no studies that show the association of putting cream between toes and diabetic foot ulcer, this finding is consistent with the guideline Diabetes Foot: Risk Assessment Education Program Participant's Package that states "do not put cream between the toes"(50).

7. STRENGTHS AND LIMITATIONS OF THE STUDY

7.1. Strength of the study

- It attempted to assess determinants of diabetic foot ulcer using a stronger study design from other studies conducted in Ethiopia. Because previous studies were cross sectionals.

7.2. Limitations of the study

- The retrospective nature of collecting information about some of the variables is prone to recall bias.
- It was difficult to get laboratory records of the biologic factors that were taken before the occurrence of the outcome of interest.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusions

This study identified risk factors for diabetic foot ulcer as: taking insulin alone, peripheral neuropathy, not inspecting feet daily, and putting moisturizing cream between toes, were positively associated with diabetic foot ulcer. Whereas employed and taking both insulin and oral hypoglycemic agents were negatively associated with diabetic foot ulcer.

8.2. Recommendations

Based on the study findings, the following recommendations are forwarded.

To TASH

- It is encouraged if TASH strengthens annual foot examination session for diabetic patients that will help to reduce the rate of diabetic foot ulcer.

To health care providers

- It will be advantageous if health care providers provide extra advice to diabetic patients to wear appropriate foot wear.

To diabetic patients

- It will be beneficial if diabetic patients inspect their feet daily.
- It will be better if diabetic patients do not put moisturizing cream between their toes.

To upcoming researchers

- A prospective cohort study is encouraged to establish the temporal relationship of biologic factors with diabetic foot ulcer.

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10.APPENDIXES

10.1. Appendix I: Information sheet (English version)

Addis Ababa University

College of Health Sciences

School of Nursing and Midwifery

Postgraduate Program

Good morning!

My name is _____. Here, I am here representing Guesh Teklu, Adult Health Nursing Student at Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery, Graduate Study Program, and he is conducting a research on a topic entitled as Determinants of diabetic foot ulcer among adult diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital, 2019.

I am inviting you to participate in this research. You may choose to take part or not and if you chose to, you are free to withdraw from the study at any time during the study. If you do not want to take part, your care in the hospital will not be affected by your decision.

The necessary information regarding the study is mentioned below.

Purpose of the study: the purpose of this study is to assess the determinants of diabetic foot ulcer among adult diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital.

Participants to be included: all consecutive diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital during the study period will be recruited until sample size is achieved.

Benefits and risks of the study:

Benefits: For your participation in the study no payment will be granted or has no special privilege to you. Your responses to the following questions are beneficial to you and other diabetic patients as input in identifying risk factors for diabetic foot ulcers and will contribute a role in improving diabetic foot care in accordance with the findings.

Risks: Your participation will not expose you to any harm. The study will be conducted through interviews and you will assist me in completing the questionnaire. I will ask you some questions and your answer will help me to fill the forms. The questions are easy and will take about 25 – 30 minutes to complete the forms. I will also use the opportunity to look at your feet to identify any problem.

Confidentiality: The questionnaire is completely anonymous, your name will not be mentioned in the questionnaire and you cannot be identified in any way. The information you will provide is confidential and will only be available to me and my supervisor. It will not also be disclosed to the third party.

If you have questions regarding this study or would like to be informed of the results after its completion, you are welcome to contact me on the number and e-mail address below. And if you are willing to take part in this study, you are required to sign the consent form attached.

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Are you willing to participate in this study?
_____Yes, I want to participate in the study (Please go to the next page).
_____ No, I do not want to participate in the study (Thank you very much).

10.2. Appendix II: Consent form (English version)

In undersigning this document, I am giving my consent to participate in the study. I have been informed that the purpose of this study is to assess the determinants of diabetic foot ulcer among diabetic patients attending the diabetic clinic in Tikur Anbessa Specialized Hospital. I have understood that participation in this study is entirely voluntary and my identity will not be disclosed to the third party. I have also been informed that my participation or my refusal to take part will not affect the care I receive from the hospital. I understood that participation in this study imposes no risk to me. I understood that Guesh Teklu is the contact person if I have questions about the study or about my rights as a study participant.

Now I am giving my consent to participate in the study voluntarily.

Signature of the participant _____ Date____/_____/____

Data collector

Name _____ Signature _____Date____/_____/____

10.3. Appendix III: Questionnaire (English version)

Part I: Socio-demographic characteristics of respondents

Code: _____

Instruction: Please circle the provided responses

Status (from patient card): 1. Control ☐ 2. Case ☐

S. No:	Question	Response
101	Sex	1. Male 2. Female
102	Age	
103	Marital status	1. Single 2. Married 3. Separated 4. Divorced 5. Widowed
104	Educational level	1. No formal education 2. Primary (1-8) 3. Secondary (9-10) 4. Above secondary
105	Occupation	1. Private 2. Governmental employee 3. Farmer 4. Housewife 5. Daily labor 7, Others (specify)------
106	Area of residence	1. Urban 2. Rural

Part II: Clinical factors related questions

S. No:	Question	Response	Remark
201	Which category of diabetes do you have? (from patient card)	1. Type I 2. Type II	
202	Duration of diabetes mellitus	_____ years	
203	Do you visit your physician regularly for evaluation and treatment of your diabetes?	1. Yes 2. No	
204	Kind of treatment of DM taking	1. Insulin 2. Oral hypoglycemic agents 3. Both 7, Other (specify)	
205	Do you have another known disease?	1. Yes 2. No	
206	If yes to 205, what type of known disease?	1. Hypertension 2. Heart disease 3. Peripheral neuropathy 7, Others (specify)	
207	Blood pressure	SBP ____ mmHg DBP _____ mmHg	
208	Weight	_____ Kg	
209	Height	_____ m	
210	Body Mass Index (BMI)	_____ Kg/m^2	
211	Fasting Blood Glucose	_____ mg/dl	
212	10 g- Monofilament	1. Positive 2. Negative	
213	Skin problems	1. Dry skin 2. Callus 3. Tinea pedis 4. No	
214	Nail problems	1. Nail Deformity 2. Onychomycosis 3. No	
215	Does the patient have foot deformity?	1. Yes 2. No	

Part III: Behavioral factors related questions

S. No:	Question	Response
301	Do you ever walk around in your bare feet?	1. Yes 2. No
302	Do you ever wear shoes without wearing any socks?	1. Yes 2. No
303	Do you always inspect your shoes for foreign objects or torn linings?	1. Yes 2. No
304	Do you inspect your feet daily?	1. Yes 2. No
305	Do you inspect your feet entirely?	1. Yes 2. No
306	Do you get family assistance during feet inspection?	1. Yes 2. No
307	Do you wash your feet daily?	1. Yes 2. No
308	Do you use moisturizer after feet washing?	1. Yes 2. No
309	Do you use moisturizing cream between your toes?	1. Yes 2. No
310	Do you get family assistance during feet washing?	1. Yes 2. No
311	Have you ever attended a class on how to care for your feet?	1. Yes 2. No
312	Have you ever read any handouts on foot care?	1. Yes 2. No
313	Have you ever read any handouts on proper footwear?	1. Yes 2. No
314	Do you have an annual foot examination session by professional?	1. Yes 2. No
315	Do you do physical activity on a regular basis?	1. Yes 2. No
316	If yes to 315, how many times per week?	_____ times per week
317	If yes to 315, what kind of exercise?	1. Running 2. Walking 3. Jogging 7, Others (specify)
318	Do you smoke?	1. Yes 2. No
319	Do you take alcohol?	1. Yes 2. No
320	If yes to question 319, could you measure it?	1. Every day 2. Once per week 3. Once per month 7, Others (specify)
321	Foot wear	1. Well fit 2. Ill fit

Part IV: Biologic factors of the respondents (laboratory results)

S. No:	Question	Response
501	Total cholesterol	mg/dl
502	Triglyceride	mg/dl
503	HDL	mg/dl
504	LDL	mg/dl

Thank you for your cooperation!!

Results:

1. Questionnaire completed _____
2. Questionnaire partially completed _____
3. Participant refused _____
4. Others (Specify) _____

Checked by Supervisor**:**

Name_____ Signature _____ Date____/____/___

10.4. Appendix IV: Information sheet (Amharic Version)

ተጨማሪ መግለጫዎች

አዲስ አበባ ዩኒቨርሲቲ

ጤና ሳይንስ ኮሌጅ

የነርሲንግ እና ሚድዋይፈሪ ትምህርት ቤት

የድህረ - ምረቃ መርሃ ግብር

አባሪ I: የመረጃ ሰነድ

ጤና ይስጥልኝ!!

ስሜ _____ እባላለሁኝ፡፡ እዚህ የተገኘሁት በአዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ በነርሲንግ እና ሚድዋይፈሪ ትምህርት ቤት የድህረ ምረቃ መርሃ ግብር ተማሪ የሆኑት ጉዕሽ ተክሉን ወክዬ ነው፡፡ እሳቸውም በጥቁር አንበሳ ስፔሻላይዝድ ሆስፒታል የስኳር ህመም ማእከል በሚከታተሉ ታካሚዎች ሁርያ የእግር ቁስለትን በሚያጋልጡ ነገሮች ላይ ጥናት እያካየዱ ይገኛሉ፡፡ በዚህ ጥናት እንዲሳተፉ እጋብዛችኋለሁኝ፡፡ ተሳታፊ ለመሆንም ላለመሆንም መምረጥ ይችላሉ፡፡ ከፈለጉ በጥናቱ ወቅት በማንኛውም ጊዜ ጥናቱን ማቋረጥ ይችላሉ፡፡ እርስዎ ለመሳተፍ ካልፈለጉ,በውሳኔዎ ምክንያት በሆስፒታሉ ውስጥ በሚያገኙት እንክብካቤ ላይ ለውጥ አያመጣም፡፡

ስለ ጥናቱ አስፈላጊ መረጃ ከዚህ በታች ተዘርዝሯል፡፡

የጥናቱ ዓላማ፣ የዚህ ጥናት ዓላማ በጥቁር አንበሳ ስፔሻላይዝድ ሆስፒታል የስኳር ህመም ማእከል በሚከታተሉ ታካሚዎች ለእግር ቁስለት የሚያጋልጡ ነገሮችን ለመገምገም ነው.፡፡

ተሳታፊዎች፣ በጥናቱ ወቅት በጥቁር አንበሳ ስፔሻላይዝድ ሆስፒታል የስኳር ህመም ማእከል የሚከታተሉ ታካሚዎች

የጥናቱ ጥቅሞች እና ጉዳቶች፣

ጥቅሞች፣ በጥናቱ ሲሳተፉ ክፍያ አይሰጥዎትም ወይም ልዩ ልዩ መብት አይኖርዎትም፡፡ ይሁን እንጂ መልስዎ ለእርስዎ እና ለሌሎች የስኳር ታካሚዎች ለእግር ቁስለት የሚያጋልጡ ነገሮች ለማወቅ ያግዛል፡፡ እንዲሁም በግኝቶቹ መሰረት የስኳር ህመም የእግር ቁስለት እንክብካቤ ለማሻሻል ከፍተኛ አስተዋጽኦ ይኖረዋል፡፡

ጉዳቶች፣ ተሳትፎዎ ወደ ማንኛውም ጉዳት አያጋልጥም፡፡ ጥናቱ የሚካሄደው በቃለ-መጠይቆች ሲሆን መጠይቁን በመመለስ ያግዙኛል፡፡ እኔ ጥያቄዎችን እጠይቅዎታለሁ እና መልሶችዎ ቅጾቹን ለመሙላት ያግዘኛል፡፡ ጥያቄዎቹ ቀላል እና ቅጾቹን ለማጠናቀቅ 25 – 30 ደቂቃዎችን ይወስዳሉ፡፡ በተጨማሪም ማንኛውንም ችግር ለማወቅ እግርዎን ለመመልከት እድሉን እጠቀማለሁ፡፡

ሚስጢራዊነት፣ መጠይቁ ሙሉ ለሙሉ ስም ኣይፃፍበትም እናም ስምዎ በመጠይቁ ውስጥ አይጠቀስም፡፡ በምንም መልኩ ሊታወቅ አይችልም፡፡ የሚሰጡት መረጃ በምስጢር የሚያዝ እና ለእራሴ እና ለአለቃዎቼ ብቻ ነው የሚነሆው፡፡ ለሶስተኛ ወገን አይገለፅም.፡፡

ይህንን ጥናት በተመለከተ ጥያቄ ካለዎት ወይም ከተጠናቀቀ በኋላ ስለ ውጤቶቹ መረጃ እንዲሰጥዎት ከፈለጉ ከዚህ በታች ባለው ቁጥር እና ኢሜል አድራሻ ሊያገኙ ይችላሉ፡፡ በዚህ ጥናት ለመሳተፍ ፈቃደኛ ከሆኑ, በስምምነት ቅፁ በመፈረም ይተባበሩን፡፡

የዋናው ተማራማሪ ስም እና አድራሻ፡

ስም፡ ጉዕሽ ተክሉ ወልደማርያም

ተንቀሳቃሽ ስልክ፡ **+251-9-33-05-26-93**› ኢሜል፡ gueshomt21@gmail.com

የዋናው አማካሪዎች ስምና አድራሻ፡

ስም፡ ንጉሰ ታደለ

ተንቀሳቃሽ ስልክ፡ **+251-9-13-16-31-30**› ኢሜል፡ niguse.tadele@aau.edu.et

ስም፡ ዶ/ር ጌታሁን ታረቀኝ›

ተንቀሳቃሽ ስልክ፡ **+251-9-11-40-55-17**› ኢሜል፡ gtarekegn@gmail.com

የተባባሪ አማካሪ ስም እና አድራሻ፡

ስም፡ ዮሴፍ ፅጌ

ተንቀሳቃሽ ስልክ: **+251-9-11-30-58-24**› ኢሜል፡ josephtsige@yahoo.com

በዚህ ጥናት ለመሳተፍ ፈቃደኛ ነዎት?

_____ ኣዎ, በጥናቱ ውስጥ መሳተፍ እፈልጋለሁ (እባክዎ ወደ ቀጣዩ ገጽ ይሂዱ)

_____ አይ, በጥናቱ ውስጥ መሳተፍ አልፈልግም (በጣም አመሰግናለሁ)

10.5. Appendix V: Consent form (Amharic Version)

አባሪ II፡ የስምምነት ቅፅ

በዚህ ሰነድ ላይ በመለያዬ ለመሳተፍ ፈቃደኛነቴን እሰጣለሁ. የዚህ ጥናት ዓላማ በጥቁር አንበሳ ስፔሻላይዝድ ሆስፒታል የስኳር ህመም ማእከል በሚከታተሉ ታካሚዎች ለእግር ቁስለት የሚያጋልጡ ነገሮችን ለመገምገም እንደሆነ ተነግሮኛል.፡፡

በዚህ ጥናት መሳተፍ ሙሉ በሙሉ በፈቃድ ውስጥ የተካተተ እንደሆነና የእኔን ማንነት ለሶስተኛ ወገን እንደማይሰጥ ተረድቻለሁ፡፡ በተጨማሪም የእኔ መሳተፍ ወይም ላለመሳተፍ በሆስፒታሉ ከሚያገኘው እንክብካቤ ጋር ምንም ችግር እንደሌለው ተነግሮኛል፡፡ በዚህ ጥናት ውስጥ መሳተፍ ለኔ ምንም ችግር እንደማይፈጥር ተረድቼያለሁ፡፡ ስለ ጥናቱ ወይም እንደ ተሳታፊ ስለ መብቶቼን አስመልክቶ ጥያቄዎች ካሉኝ ጉዕሽ ተክሉ ተጠሪ መሆኑን ተረድቻለው፡፡ .

አሁን በፈቃደኝነት በጥናቱን ለመሳተፍ ፈቃደኛነቴን ሰጥቻለሁ፡፡

የተሳታፊው ፊርማ _____ ቀን _____ / _____ / _____

መረጃ ሰብሳቢ

ስም _____ ፊርማ _____ ቀን _____ / _____ / _____

10.6. Appendix VI: Questionnaire (Amharic Version)

አባሪ III፡ መጠይቅ

ክፍል I-የተሳታፊው ማህበራዊ እና ኢኮኖሚያዊ ባህርያት

ኮድ: _____

መመሪያ: እባክዎ የተሰጡትን ምላሾች ያክብቡ

የታካሚው ሁኔታ (ከታካሚው ካርድ)፡ 1. የእግር ቁስለት የሌለው ☐ 2. የእግር ቁስለት ያለው ☐

ተራ ቁጥር	ጥያቄ	መልስ
101	ፆታ	1. ወንድ 2. ሴት
102	ዕድሜ	
103	የጋብቻ ሁኔታ	1. ያላገባ/ች 2. ያገባ/ች 3. የተለያዩ 4. የተፋታ/ች 5. የሞተችበት/ባት
104	የትምህርት ደረጃ	1. ያልተማረ 2. ኣንደኛ ደረጃ (1ኛ - 8ኛ) 3. ሁለተኛ ደረጃ (9ኛ - 10ኛ) 4. ከሁለተኛ ደረጃ በላይ
105	ስራ	1. የግል 2. የመንግሥት ሠራተኛ 3. ገበሬ 4. የቤት እመቤት 5. የቀን ሰራተኛ 7, ሌሎች (ይጥቀሱ) ------
106	የመኖሪያ አካባቢ	1. ከተማ 2. ገጠር

ክፍል II: ከክሊኒካል ምክንያቶች ጋር ተያያዥነት ያላቸው ጥያቄዎች

ተራ ቁጥር	ጥያቄ	መልስ	ማብራሪያ
201	የትኛው የስኳር ህመም ዓይነት አለዎት? (ከታካሚው ካርድ)	1. ዓይነት I 2. ዓይነት II	
202	የስኳር ህመምዎ ስንት ዓመት ሁኖታል?	_____	
203	ለስኳርዎ ምርመራ እና ሕክምና በመደበኛነት ሀኪምዎን ይጎበኛሉ?	1. አዎ 2. አይ	
204	ምን ዓይነት የሱኳር መድሃኒት ይወስዳሉ?	1. በመርፌ (ኢንሱሊን) 2. በአፍ የሚዋጥ 3. ሁለቱም 7, ሌላ (ይጥቀሱ)	
205	ሌላ የታወቀ በሽታ አለዎት?	1. አዎ 2. አይ	
206	መልስዎ አዎ ከሆነ, ምን ዓይነት በሽታ ነው?	1.የደም ግፊት 2. የልብ ህመም 3. የነርቭ ችግር 7, ሌሎች (ይጥቀሱ)	
207	የደም ግፊት	SBP _____ mmHg DBP _____ mmHg	
208	ክብደት	Kg	
209	ቁመት	m	
210	የሰውነት ብዛትን መለኪያ (BMI)	Kg/m^2	
211	የፆም የደም ግሉኮስ መጠን	mg / dl	
212	10 g- Monofilament	1. ላለ 2. የለም	
213	የቆዳ ችግሮች	1. ደረቅ ቆዳ (Dry skin) 2. የቆዳ መጅ፣ ጠጠር ያለ ነገር (Callus) 3. የእግር ፈንገስ (Tinea pedis) 4. አይ	
214	የጥፍር ችግሮች	ነ. የጥፍር መበላሸት (Nail Deformity) 2. የጥፍር ፈንገስ (Onychomycosis) 3. አይ	
215	ታካሚው የእግር መበላሸት ችግር ላለው ?	1. አዎ 2. አይ	

ክፍል III: ከተሳታፊዎች ባህሪያት ጋር ተያያዥነት ያላቸው ጥያቄዎች

ተራ ቁጥር	ጥያቄ	መልስ
301	በባዶ እግርዎ ይጓዛሉ?	1. አዎ 2. አይ
302	ያለካልሲ ጫማ ያረጋሉ?	1. አዎ 2. አይ
303	በጫማዎ ውስጥ የውጭ የሆኑ ዕቃዎች እንዳይኖሩት ወይም የተቀደዱ እንዳይሆኑ ይፈትሻሉ?	1. አዎ 2. አይ
304	በየቀኑ እግርዎን ይመረምራሉ?	1. አዎ 2. አይ
305	እግርዎን ሙሉ በሙሉ ይመረምራሉ?	1. አዎ 2. አይ
306	እግርዎን በሚመረምሩበት ወቅት የቤተሰብ ድጋፍ ያገኛሉ?	1. አዎ 2. አይ
307	እግርዎን በየቀኑ ይታጠባሉ?	1. አዎ 2. አይ
308	እግርዎ ከታጠቡ በኋላ የቆዳ ቅባት ይጠቀማሉ?	1. አዎ 2. አይ
309	በጣትዎ መሃል የቆዳ ቅባት ይጠቀማሉ?	1. አዎ 2. አይ
310	እግርዎ በሚታጠቡበት ወቅት የቤተሰብ ድጋፍ ያገኛሉ?	1. አዎ 2. አይ
311	እግርዎ እንዴት እንደሚንከባከቡ ትምህርት ተሰጥተዎት ያውቃል?	1. አዎ 2. አይ
312	ስለ እግር እንክብካቤ የተፃፈ ጽሑፍ አንብበው ያውቃሉ?	1. አዎ 2. አይ
313	ስለ ተገቢ ጫማ ላጠቃቀም የተፃፈ ጽሑፍ አንብበው ያውቃሉ?	1. አዎ 2. አይ
314	በየአመቱ እግርዎ በባለሙያ ይታያሉ?	1. አዎ 2. አይ
315	ዘወትር አካላዊ እንቅስቃሴ ያድርጋሉ?	1. አዎ 2. አይ
316	ለ 315 መልስዎ አዎ ከሆነ, በሳምንት ስንት ጊዜ?	_____ ጊዜ በሳምንት
317	ለ 315 መልስዎ አዎ ከሆነ, ምን ዓይነት እንቅስቃሴ?	1. ሩጫ 2. የእግር ጉዞ 3. ቀላል ሩጫ (Jogging) 7, ሌሎች (ይጥቀሱ)
318	ያጨሳሉ?	1. አዎ 2. አይ
319	አልኮል ይወስዳሉ?	1. አዎ 2. አይ
320	ለመጠየቅ 319 አዎ ከሆነ, መጠኑን ስንት ነው?	1. በየቀኑ 2. በሳምንት አንዴ 3. በወር አንድ ጊዜ 7, ሌሎች (ይጥቀሱ)
321	ጫማዎች	1. በሚገባ የገጠሙ 2. በሚገባ የገጠሙ ላይደሉም

ክፍል IV: የተሳታፊዎች ባዮሎጂካዊ ምክንያቶች (የላቦራቶሪ ውጤቶች)

ተራ ቁጥር	**ጥያቄ**	**መልስ**
501	ጠቅላላ ኮሌስትሮል	mg / dl
502	Triglyceride	mg / dl
503	HDL	mg / dl
504	LDL	mg / dl

ለትብብርዎ አመሰግናለሁ::

ዉጤት:

1. *መረጃው ሙሉ በሙሉ ተሰብስቧል* _____
2. *መረጃው በከፊል ተሰብስቧል* _____
3. ተሳታፊው እምቢ ብሏል _____
4. ሌሎች (ይጥቀሱ) _____

ተቆጣጣሪ፡

ስም _____ ፊርማ _____ ቀን _____ / _____ / _____