INFLUENCE OF FOOT-CARE ON FOOT ULCER DEVELOPMENT AMONG TYPE 2 DIABETES MELLITUS PATIENTS ATTENDING CLINICS IN EMBU COUNTY, KENYA

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DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been submitted before to any institution for examination.

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Recommendation

This thesis has been submitted with our approval as the University supervisors

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DEDICATION

The paper is dedicated to my husband, Robert Kinyua, for his love, understanding and support offered throughout this academic journey

Additionally, it is dedicated to our beloved sons, Benedict and Kelvin for being patient with mum, whose work ‘almost stole’ her from them.

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May the good Lord bless you more abundantly and add to your bosom according to your needs.

GOD BLESS YOU ALL

ABSTRACT

Type 2 Diabetes Mellitus (T2DM) has become a global epidemic of 21st century with disproportionately high socioeconomic burden in the developing world. The prevalence of T2DM continues to rise resulting in significant morbidity and mortality caused by complications such as cardiovascular, eye, renal diseases and foot problems. Diabetic Foot complication is among the worst and most common complications which have led to devastating health outcomes including substantial disability related to amputation, impairment of quality of social life and high treatment cost among patients. The incidence of amputation can be reduced by half if the best foot care practices are adopted. The increasing prevalence of T2DM from 6.3 percent,2017 to 11 percent 2018 raises a concern for the researcher to establish foot care practices among the patient attending diabetic clinics in Embu County, with the specific objective being establishing knowledge level, foot care practice and barriers to diabetes foot self-care practices. A descriptive survey targeting population of 1413 T2DM and 12 key informants from whom a sample size of 301 was systematically drawn and 12 key informants was conveniently sampled from the selected Diabetes Mellitus(DM) clinic respectively. Then Self-administered questionnaires, observational checklist and focused group discussion were performed to collect data. This data was analysed using SPSS version 24. Chi square was used to test the relationship between categorical variables. Statistical significant was be set at $\alpha = 0.05$. A logistic regression model was used to predict the relationship between foot care practices and diabetes foot ulcer. Qualitative data was analysed thematically using Nvivo version 11. Data was presented in summary tables. Majority of the respondents were female and aged between 40 and 70 years old. The duration that a patient had lived with diabetes, history of smoking and respondents age were significantly associated with foot ulcers at p value <0.05. on Knowledge of patients regarding foot complications; knowing what foot self-care entails, having knowledge on effects of smoking in diabetes and the source of information were significant predictors of diabetic foot ulcer prevention. Walking bare foot in and out of the house and dressing of blisters with sterile dressings was associated with prevention of foot ulcers. Based on the researchers findings; the age of the respondent, their smoking status and the duration they had lived with the diabetes disease significantly determined development of foot ulcers. Also, Knowledge on effects of smoking on diabetes was significantly associated with prevention of developing foot ulcers. However, it was evident that the diabetic patients in Embu County had knowledge deficit on details of self-foot care; however, there was good general knowledge on diabetes management among the patients who got the information from the health care providers. On practice of foot care practices, wearing shoes without socks, and walking bare foot was associated with risk of developing foot ulcers while dressing of blisters with a sterile dressing, drying feet after washing and drying in between the toes was associated with prevention of developing foot ulcers. The County government to develop policies on implementation of support groups among diabetic patients in all hospitals, to empower the patients with knowledge on diabetes management and prevention of its complications and the health care providers to champion for empowering practice of diabetic foot care practices through support group linkages and counseling as the country tries to achieve sustainable development goals.

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LIST OF ABBREVIATION AND ACRONYMS

ADA: American Diabetes Association

BMI: Body Mass Index

DFU: Diabetic Foot Ulcer

DM: Diabetes Mellitus

ETRH: Embu Teaching and Referral Hospital

IDF: International Diabetes federation

IDSA: Infectious Disease Society of America

LEA: Lower Extremity Amputation

NCD: Non Communicable Diseases

NGO: Non-Governmental Organisation

T2DM: Type 2 Diabetic Mellitus

WHO: World Health Organization

CHAPTER ONE
INTRODUCTION

1.1 Background Information

Diabetes mellitus (DM) is a shared public health problem experienced worldwide, and Diabetic Foot Ulcer (DFU) is one of the complex complications found with patients with diabetes mellitus (Mart´ınez-De Jes´us, 2013). Internationally, 8.3 percent of the patients are affected by DM (International Diabetis Federation, IDF, 2017). Epidemiological diabetes survey done by WHO (2017) indicated the figure had gone up to 422million worldwide by 2014. IDF their study done in 2015 projected the figure to reach 642 million by 2040(IDF, 2017).It is clear that this number can continue to go high, making DFU a significant public health problem. DM ranks in the top four non-communicable diseases (NCDs). Just like the other three (chronic respiratory diseases, cancers, and cardiovascular diseases), diabetes has been affecting people for a long time with gradual progression over time (WHO, 2015).

A meta-analysis study in various countries presented that the occurrence rate of Diabetes Foot Ulcer worldwide was 6.3percent. Compared to Oceania, North America had the highest rate, with 13 percent, with the former having a prevalence rate of 3.0 percent. In Europe, the prevalence rate was 5.1 percent, Australia had an occurrence rate of 1.5 percent, and Belgium was found to have a prevalence of 16.6 percent. While Canada had (14.8 percent), the USA had 13.0 percent. India reported a prevalence rate of 11.6 percent. (Pengzi, Jing, & Yali, 2017).

The number of patients suffering from diabetes in Africa has been increasing significantly, and there are expectations of doubling the number in the coming decades. In 2015, an estimate of 14.2 million persons with diabetes in Africa was made and if the current development continues the overall occurrence of DFU was expected to increase to 34.2 million people by 2040. A study by IDF (2017) indicates in Africa, 21.5 million people live with diabetes with an annual estimate of 480,900 diabetes-related deaths. The most populous countries in the continent had the highest numbers of people with diabetes; these countries include; the United Republic of Tanzania (1.7 million), South Africa (2.6 million), Nigeria (3.9 million) and Ethiopia (1.9 million). However, the prevalence of diabetic foot ulcer was reported to be high in Zimbabwe (9.7 percent), Gabon (10.7 percent), Seychelles (12.1 percent) and in the island of

Reunion (15.4 percent) in ascending prevalence (IDF, 2013). Recent meta-analysis study by Pengzi (2017), indicated that Africa had a higher prevalence than Asia with 7.2 percent and 5.5 percent on the later. Another study done by Abbas &Archibald (2015), indicated that the diabetic foot ulceration rates in Africa varied from one region to another and had been estimated to vary between 4 percent and 19 percent. In Nigeria, another Hospital-based study revealed that the occurrence of the lower limb ulceration ranged from 11 percent to 19.1 percent, in people with diabetes (Abbas et al., 2011; Abbas & Archibald, 2015).

In Kenya, the prevalence of diabetes stood at 3.3 percent in 2011 (IDF, 2017). Mcferran (2014) predicts arise to 4.5 percent by 2025. A study was done by Nyamu et al. (2013) at Kenyatta National Hospital (KNH) indicated that DFU prevalence was at 4.6 percent. Oduori & Ondari (2016) did another study in the same hospital, which indicated that the overall risk to the foot ulcer was 76.1 percent. There are many complications that affect people with diabetes; foot ulcer complications take the lead (Jain, 2014). According to Chu (2016), some patients developed foot ulcer after 1, 3, and 5 years and when their prevalence was examined they were increasing from 27.3 percent, 57.2 percent, and 76.4 percent, respectively, this also led to increase in prevalence of foot amputations at 12.5 percent, 22.3 percent, and 47.1 percent respectively (Chu & Wang, 2016). Other studies showed that the mortality rate as a result of diabetic foot amputation ranged from 13 percent to 40 percent within one year, at 3 years it was ranging from 35 percent to 65 percent, and at 5 years it was ranging from 39 percent to 80 percent, which was found to be worse than the mortality rate for most cancers (Walsh et al 2016; Wrobe, Mayfield, & G.E, 2015). 50 percent of the amputations can be prevented if the patients get taught on the recommended daily foot care practices (IDF, 2017).

Foot lesions in diabetic patients cause pain and morbidity to the patient, foot ulcers have direct and indirect economic cost to the family, other than the direct costs incurred due to complications on the foot, there are other indirect costs related to loss of health-related quality of life, individual patients' loss of quality life and family costs and the loss of productivity (IDF 2017). Diabetes mellitus foot ulcer is as a result of vascular disease of the peripheral blood vessels and neuropathy, which contributes majorly to the ulcer. Neuropathy can be prevented in many cases happening in developing

countries through appropriate diabetic foot self-care (Dikeukwu, 2013), which encompasses all areas to prevent and correct care of the ankle and foot. (Eastman, et al. 2014).

Foot ulcer has a high chance to affect patients with Type 2 diabetes, which may lead to amputation of their distal limbs. Further lower limb clinical abnormalities can affect patients if they do not have the adequate knowledge of foot care practices. The adoption of good care behavior of the feet in patients with type 2 DM consist of one of the practical approaches used to minimize progression of complications that follow type 2 diabetes patients (Kumiawan & Petpichetchian, 2013). Study reports in sub-Saharan Africa (SSA) indicate that majority of diabetic patients lack basic knowledge on diabetes management, use herbal medicine for treating diabetes, and are relatively unable to go to the hospital except when they have severe manifestations or complications (Chinyere, Bikash, & Benjamin, 2013).

Many studies have revealed that many diabetic patients do not acquire the recommended guidelines for foot care practices, which include regular foot inspection (Barshes, et al., 2013). In the United Kingdom, Basu *et al*.,(2014) found out that 33 percent of the patients with diabetes did not remember being given health information relating to good foot care practices. Another study was done by Muhimbili National Hospital (MNH) diabetic clinic, many of the patients 87 percent indicated never inspected their feet, and another 66 percent indicating that they did not have any interest in the information relating to foot care practices. The complications of type 2 diabetes mellitus include lower extremity amputation, which can be prevented (Morey-Vargas & Smith, 2015). Most of the time, amputations of the lower limb among diabetic patients are complicated by foot ulcers, whose risk factors are practicing poor foot hygiene, wearing inappropriate footwear, walking barefoot and delay to seek medical care apart from when the condition gets worse, (Abbas & archibald, 2014). These factors can be adjusted when recognized early, with patients having adequate knowledge of self-foot care. If these practices are put into practice, foot ulcers will be prevented (Abbas & archibald, 2014).

Prevention of foot ulcers and prophylactic foot care practices has been championed to reduce chances for amputations, minimize the use of costly resources, and patient

morbidity (Padma, et al, 2012). It might take effort and time to establish good foot self-care practices, as it is essential. Regular inspection of the diabetic foot by patients accompanied with recommended health tutelage for diabetic patients is known to be one of the easiest, cheapest, and valid measure for prevention of future foot ulcer complications (Rocha, Zanetti, & Santos, 2013). Despite there being many literature resources talking on the importance of self-foot care and diabetic foot care practices, published ones are incomplete especially on hindrances, knowledge, and practices of self-foot care in type 2 diabetic patients in Sub Saharan Africa, especially in Kenya

Thus, this study was done to establish the current knowledge, practices, and barriers of self-foot care on those patients who go to the diabetic clinics in Embu County. It was also established health care providers' perspective on patients' compliance with appropriate foot care. The information obtained from the study informed the county on the current level of use of self-foot care practices associated to strategies geared towards prevention of the diabetic foot, and helping to improve the quality of care given to patients with diabetes so as to minimise the problem related with diabetic foot problems. Educating the patients on recommended health strategies was probable to be effective if the patients were aware of the existing knowledge, practice level on self-foot care and even the barriers to foot care.

1.2 Statement of the Problem

Diabetes is not curable and the achievement of its long-term care treatment depends mostly on the patients' adherence with self-management practices**.** With poor management, diabetes results to multiple complications including foot complications. Foot complications secondary to diabetes mellitus constitute an increasing problem on public health and causing substantial financial, productivity, physical and emotional losses. Diabetic foot ulcer is expensive to treat and usually the first step towards a lower extremity amputation (LEA) which results to disability hence lowering one's productivity. The rate of losing a lower limb through amputation can be as fast as in every 30 seconds around the world as a consequence of type 2 diabetes, making the prevalence of amputation range from 0.24 percent to 8 percent worldwide.

In Kenya diabetes prevalence is 3.3 percent with predicted rise of 4.5 per cent by 2025, and DFU occurrence stands at 4.6 percent higher than the disease itself. In Embu

County clinic records indicates increasing diabetes prevalence trends from 6.3 percent to 11 percent in 2016 and 2017 respectively. DFU is also a concern because admission register indicates in every ten patient admitted with T2DM three had foot complication. This emphasis the need to care for the foot to reduce this trend and prevent progression to ulceration/amputation

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

1.3 Objectives of the Study

1.3.1 Broad Objective

To determine the Influence of foot care practices on diabetes foot ulcer (DFU) development among adult Type 2 Diabetes Mellitus (T2DM) patients attending diabetic clinics in Embu County.

1.3.2 Specific Objectives

i. To determine the influence of foot-care knowledge on development of DFU among T2DM patients attending diabetes clinics in Embu County
ii. To assess the impact of self-foot-care practices on development of DFU among T2DM patients attending diabetes clinics in Embu County
iii. To determine patient-related barriers to foot care among T2DM patients attending diabetes clinics in Embu County
iv. To determine health care providers' perspective on patients' compliance with appropriate foot care instructions

1.4 Hypothesis of the Study

H_0 There is no significant association between knowledge on diabetic foot self-care and development of diabetic foot ulcer (DFU)

H_o There is no significant association between diabetic foot self-care practices and development of DFU

H_o There is no significant association among the barriers to diabetic foot self-care practices and development of DFU

H_o There is no significance association among the providers perspective on patients compliance on appropriate care instructions and development of DFU

1.5 Significance of the Study

Self-care of the foot among Type 2 diabetes mellitus patients is a cost effective method to prevent diabetic foot complications. With appropriate choice of footwear and self-foot care, the risk of foot ulceration and amputations can be greatly reduced. When patients comply with proper foot care practices they decrease the chance of developing foot ulcers, especially among patients with low risk of peripheral neuropathy. Eighty-five percent of amputations of the lower limb can be prevented by timely and appropriate interventions to prevent diabetic foot ulcers and wounds by healthcare providers, and additionally optimal foot self-care practices by patients affected by diabetes.

Individuals living with chronic illnesses, such as Type 2 diabetes mellitus need to learn how to monitor their blood sugars, make appropriate decisions regarding their health, attain skills needed for self-foot care and change their daily lifestyle so as to manage and control their condition and avoid the complications. This study therefore focused on the Type 2 diabetes mellitus patients since management of diabetes depends on the individual patient. Maintaining and monitoring blood sugar level and control, taking the recommended diet, doing regular exercise as recommended, and complying with the prescribed medications as well as practising foot care are all that is needed to manage and control diabetes by the patient. Many studies worldwide have been done with major focus on foot care interventions and the importance of foot care among diabetic patients. However there is limited information on the extent to which Type 2 diabetes mellitus patients have adopted Foot self-care practices particularly in Embu County, hence the need to conduct this study.

1.6 Definition of Terms

Callus: This is a hard skin, found on the underside of the foot due to the unequal distribution of weight, mostly on the bottom of the heel of forefoot.

Diabetes: it's a metabolic disorder resulting from the deficit of insulin in the body or a dwindled capability of the body to utilize the insulin or both.

Diabetic Foot Ulcer: Refer to foot that has ulcer or lesions that are related to peripheral neuropathy and/or disease affecting peripheral arterial vasculature of the lower limb in a diabetic patient.

Foot Care: all practices aimed at preventing and taking care of the ankle and foot

Foot Ulcer: Is a skin break forming a deep wound, which has been infected. These can be from minor cuts, soft tissue trauma that take time to heal or from the rubbing of tight shoes that do not fit the patient.

Good Foot Care Practices: Includes participants with more than or equal to 50 percent of the total maximum score.

Good knowledge on Foot Care: Those participants with a score that is more than or the mean on foot care knowledge questions.

Ingrown Toenails. This is when the nail edges grow into the adjacent skin causing pain and pressure along the edges of the nail. If this continues, the nail can cut into the skin causing erythematic swelling, drainage, pain, and infection.

Poor Foot Care Practices: Includes participants with less than 50 percent of the total maximum score.

Poor knowledge on Foot Care: Those participants who scores below the mean on knowledge question

Self-care- Activity undertaken by a person to take care and maintenance of own self health and illness and prevention of disease related complications

Skin Fissure: A skin condition in which there is a linear-like cleavage of skin, sometimes defined as extending into the dermis.

CHAPTER TWO
LITERATURE REVIEW

2.1 Global Status of Diabetes and Diabetic Foot Complications

Chronic diseases like diabetes are among the leading cause of early mortality and morbidity. Diabetes is a non-communicable diseases (NCDs) which global leaders were targeting in the year 2011 when a political assertion to control, prevent and manage non-communicable diseases was declared (United Nations, 2011). Having an above normal body mass index (BMI) and a greater waist circumference have been closely linked to a higher risk to contract type 2 diabetes mellitus. However, this connection between a high BMI and waist circumference vary from population to population. In South-East Asia for example, a majority of people develop diabetes at a lower level of body mass index than people with European origin (WHO, 2017). WHO estimates that globally, there has been a substantial increase in the number of adults aged over 18 years, living with diabetes to 422 million people in 2014, from 108 million people in 1980 (, WHO, 2017). This analysis also indicated that Eastern Mediterranean Region had the highest occurrence of diabetes mellitus, which was at 13.7 percent followed by the South-East Asia Region which had a prevalence of 8.6 percent in 2014.

A study done by World Health Organization (2017) indicated that Diabetes type 2 led to 1.5 million deaths in the year 2012. Raised blood glucose levels are thought to have caused 2.2 million additional deaths among patients suffering from diabetes, by increasing the chances of developing other conditions associated with diabetes like hypertension and kidney illnesses. 43 percent of 3.7 million deaths have been recorded to occur before the patient gets to 70 years old. The percentage of deaths related to hyperglycemia occurring before the age of 70 is less among people living high-income countries than those who live in low-income countries (WHO, 2017).

According to International Diabetes Federation (2011), China has approximately 90.0 million people with diabetes which is estimated to increase to approximately 129.7 million people by 2030. In India 61.3 million are approximated to live with diabetes, in USA about 23.7 million people are thought to live with diabetes, Russian Federation reported that 12.6 million of her population had diabetes, Brazil also reported having 12.4 million of the people suffering from diabetes, Mexico had 10.3 million, with

Bangladesh having 8.4 million, and in Indonesia 7.2 million of its population had diabetes. The health of people living in Sub-Saharan Africa has predominantly been affected by numerous infectious diseases, including HIV/AIDS, and extreme levels of poverty. With high rate of urbanization, changing of lifestyle to adopt western lifestyles and changes in socio-economic activities among people, diabetes is rapidly becoming a new concern for public health in Africa (International Diabetes Federation, 2012). Diabetes mellitus type 2 has been in the rising trend in Africa over the past years with its prevalence being at 3.1 percent in 1980 and 7.1 percent in 2014 (NCD Risk Factor Collaboration, 2016).

A study was conducted in Nigeria among 3,500 respondents to determine specific prevalence of gender of respondents and age and factors associated with diabetes mellitus. These results revealed that the total diabetic prevalence was at 10.51 percent; was low in male than in females at 9.60 percent and 11.20 percent respectively. When the prevalence was associated to age and sex of the respondents; 2.74 percent were in the age 18-25, 8.50 percent in 26-35, 16.54 percent in 36-45 and 23.70 percent in 46-60 among and in women of the same age groups, the prevalence was at 3.95 percent for 18-25 years, 9.70 percent for 26-35 years, 13.01 percent for 36-45 years and 29.39 percent for 46-60 years, respectively (Ekpenyong, et al, 2013).

2.2 Status of Type 2 Diabetic Mellitus and Its Foot Complication

Progression of uncontrolled diabetes, can cause damage to the nervous system, kidneys, blood vessels, eye sight, and the cardiovascular system, which are closes linked to stroke and heart disease cases. Damage to the heart can lead to reduced flow of blood to the body, which when joined with damage the lower limb nerves, increases the risk of developing foot infection , foot ulcers, and the eventually amputation of the limb (WHO, 2017). It was estimated that roughly 15 percent of 150 million diabetic patients globally are highly likely to acquire diabetic foot ulcer. This disease contributes greatly to diabetic patient hospital admissions and leads to billions of dollars in medical expenses worldwide (Goodridge, Trepman, & Embil, 2015). Diabetic foot ulcers are therefore of great concern among patients with diabetes and health workers who help manage the condition to improve quality of life, their social and economic status (Leung, 2016).

Foot ulcers are becoming a global problem and in every area in the world it's reported that there is an increase in the development of diabetic foot ulcer which is caused by the loss of sensation and poor blood supply to the lower limbs. Globally, in 2013, among patients with diabetes mellitus, the commonness of foot ulcers ranged from 4 percent to 10 percent (Edgar, Peters, & Michael, 2013) the annual population-based incidence rates were also in the range of one percent to 4.1 percent, and lifetime frequency was high at 25 percent (International Working Group on the Diabetic Foot). Additionally, amputations are double among diabetic persons compared to people who are non-diabetic (Gregg, Sorlie, & Paulose-Ram, 2004). A study in Barbados reported that only 44 percent people survive for five year after a lower limb amputation compared to 82 percent among those who had not been amputated (Hambleton, Jonnalagadda, & Davis, 2014).

In Africa, foot ulcer complications were found to be the main source of extended hospitalization among type 2 diabetic patients and this was connected to the high mortality rates, becoming a main problem in public health (Abbas & Archibald, 2015). Other hospital-based case studies indicated the prevalence of limb ulcers to be ranging from 11.7 percent to 19.1 percent among type 2 diabetic patients in Nigeria (Unachukwu, et al, 2017) and 4.6 percent in Kenya (Nyamu, et al 2013). An Ethiopian study conducted in 2013 indicated that among patients with diabetes, foot ulcers are a major problem in the healthcare system and those ulcers associated with sepsis led to about 12 percent of deaths related to diabetes. Poor blood glucose control and low levels of compliance to follow-up were the major factors that contributed. This study concluded that the knowledge of the risk factors on foot ulcers in patients with diabetes would facilitate patients at risk to be identified early and intervention put in place to prevent them (Amogne, Reja, & Amare, 2013).

Research data suggest that poor blood supply to the peripheral vessels in the lower limbs is an increasing problem among diabetic patients in various African countries (Abbas & Archibald, 2015), in Tanzania the rates of peripheral vascular disease had increased from 2.9 percent in 1980 to 21 percent in year 2012. In Nigeria the rates had increased from 1.7 percent in 1968 to 54 percent in 1990 (Abbas & Archibald, 2015). Many reports from Sub Saharan Africa advocate that diabetic foot ulcers are highly correlated to loss of nerve sensation rather than poor blood supply. Additionally,

simultaneous infections in the foot contribute in the disease process of foot ulcer, infections can progress to cell death, systemic infection, gangrene and finally limb amputation or death of the patient (Abbas & Archibald, 2015)

A study by (SiéEssoh, Kodo, & Lambin, 2009) reported that in Ivory Coast 46.9 percent of diabetic patients had amputation below the knee and 11.2 percent had amputation below the elbow as common procedures done on patients with type 2 diabetes mellitus. However, in Zimbabwe, (Sibanda, Sibanda, & Jonsson, 2009) the prevalence of lower limb amputation was at 9 percent among 100 patients who were involved in the study. A study done to observe Infected Diabetic Foot was carried out by Amogne, Reja, and Amare (2013) among 291 Diabetic Foot Infection (DFI) patients indicated most of the patients had marginal loss of sensations, more than half of the patients had Peripheral Arterial Disease (PAD) and almost half had been diagnosed with systemic bone infections. In the year prior to hospital admission, 40 per cent of the diabetic patients had some history with foot ulcers that had been infected. Most infections were involved the forefoot or toes and were of mild to moderate severity to the patient.

Results of an Ethiopian study done by Deribe, Woldemichael, and Nemera (2014) showed that out of 216 respondents, 14.8 percent had foot ulcers related to diabetes**.** The factors related to foot ulcers were rural residence, occupation of the patient, duration of diabetes, high blood pressure, and the presence of other infections. The study concluded that in addition to diabetic follow up and regular check-ups, health care workers ought to emphasize on knowledge enhancement of the patient on regular diabetic foot examination and inspection, and the recommended specific foot self-care practices.

Several studies done in Kenya indicate that foot ulcers are major complications at the referral facilities such as Kenyatta National Hospital (KNH). (Mario & Sridevi, 2008), ascertained that the risk factors responsible for the ulcers are modifiable and manageable and includes poor control of blood sugars, poor control of hypertension, opportunistic and chronic infection, dyslipidaemia, and poor self-foot-care.

A retrospective study done at the Tenwek Mission Hospital in Bomet County showed that between the years 2009-2015, 150 patients underwent limb amputation, out of

which diabetic gangrene constituted 32 percent of the total and 87 percent of the cardiovascular cases. This study concluded that diabetic vasculopathy complicated by infection is the leading cause of amputations in elderly males in Kenya. It therefore recommended control of blood sugar within normal ranges, improve on knowledge of foot care and be vigilant on infection prevention strategies among patients with diabetes (Obimbo, Ogengo, & Njogu, 2015). Addressing the patients' health behaviors (recommended diet, cessation of tobacco use, regular physical activity, and supervised exercise) and adherence to pharmacological therapies is essential to successful prevention and management of PAD (Lyn, daniel, & Jackie, 2016).

2.3 Foot Abnormalities among Diabetic Patients

According to WHO (2017) amputation rates in diabetic patients are approximately ten to twenty times more likely to patients who are non-diabetic. In the past decade the prevalence of amputation ranged from 1.5 percent to 3.5 percent on diabetic patients. A study done on prevalence of diabetic foot ulcers among type 2 diabetes mellitus patients and the related factors of the lesions in Basrah, Iraq revealed that diabetic foot ulcers were found in 46.7 per cent of patients and many of the patients experienced multiple foot abnormalities (Mansour & Imram, 2016). The foot abnormalities observed among these patients included; prominent metatarsal head; hammertoes; claw toes; amputees; skin changes to include dryness of; callus formation; Tineapedis; foot ulcers and nail changes. This research concluded that the factors that predict foot ulceration were elderly age, male gender, low level of education, history of smoking, poverty, many years of diabetes infection, use of injectable insulin, congestive heart faillure and protein in urine (Mansour & Imram, 2016).

A study conducted to assess limb amputations performed on patients with type 2 diabetes and to find the practical extent of such patients suffering from sickness impact profile (SIP) revealed that both the total sickness impact profile scores and the physical activity scores were considerably higher among the patients who had been amputated. It was concluded therefore that the results show amputation lowers psychological and physical health conditions of patients who had their lower limb amputated (Obimbo, Ogengo, & Njogu, 2015).

2.4 Burden of Diabetes Mellitus and Foot Complications

Diabetic foot ulcer abnormalities is significant complications of type 2 diabetes mellitus and can cause substantial disability, cause high treatment cost and impairment to the quality of social life of the patients (Eastman, et al 2014). The estimates of costs incurred in management of diabetes show that the cost would vary depending on age and gender of the patient. The estimated showed that more than three-quarters of the world's expenses in 2014 were to be for persons who were aged between age 50 years and 80 years. Also, more money was likely to be spent on diabetes care for women than for men (IDF, 2017).

Risks of having lifetime diabetic foot ulcers in a patient with diabetes was estimated to be at 25 percent and studies have shown that 15 percent to 17 percent of these foot ulcers finally end up with a surgical intervention; most commonly leading to amputations (Edgar, Peters, & Michael, 2013). Patients with lower extremity amputations face many challenges and health care practitioners have acknowledged that if the suggested foot self-care practices knowledge is implemented and preventative activities taken into consideration, the amputation risks can be greatly reduced. Many reports have revealed that regular examination of the foot and recommended shoes are very crucial to prevent and control foot ulcers (Fard, Esmaeiza deh, & Larijani, 2017).

A report conducted on the economic expenses involved diabetes management in the United States in 2013 revealed that there were both direct expenses on medical and indirect expenses credited to diabetes in 2013 which were roughly 132 billion dollars. It concluded that this figure was likely to be an underestimation of the hidden costs of diabetes because it omitted unquantifiable effects such as the cost on pain suffering management the patient goes through and the care provided by family care givers. Additionally, the cost estimates excluded the burden of the patients who were undiagnosed of diabetes. On top of that the report quantified that diabetes adds another significant cost burden on to the community, especially to patients' family members who are the primary caregivers (Abbas, et al, 2011).

The average life expectancy in Kenya is 56 years due to disease burdens in the country (WHO, 2017). According to IDF, (2017) diabetes mellitus reduces life expectancy approximately by 5-10 years. The costs of treatment and loss of productivity undermine

and stunt economic growth and negatively impact on realization of vision 2030, Sustainable Development Goals (SDGs) and other national development targets (Eastman, et al 2014)

Kenya is not economically capable to set funds aside for diabetes care, control, management, and prevention. Patients with diabetes in Kenya who are capable to fund their treatment and care are limited (Wamai, 2009), the high cost of managing the condition leaves many patients with diabetes and their families at the risk of poorer health living conditions and abject poverty (WHO, 2017). According to IDF (2015), the mean healthcare expenditures due to diabetes per person with diabetes is 82.4 US dollars.

2.5 Knowledge and Self-Care Practice among Diabetic Patients

In developing countries such as Kenya, barefoot gait has been identified as a common practice among rural populations (Abbas & Archibald, 2015) alongside improper footwear and inappropriate foot care practice (Ulbrecht, Hurley,Mauger, & Cavanagh, 2014). A hospital case study done by Padma *et al*., (2013) among 117 patients with type 2 diabetes to assess the foot self-care practices, their knowledge levels and their commitment to managing the disease. Almost two thirds of the patients were conscious of the importance involved with having regular exercise, recommended dietary control in terms of proportions and prescribed drug compliance. Sixty four per cent of those who followed recommended self-care methods achieved glycaemic control. Thus it was found that patients who were aware, were knowledgeable of the disease, and constantly practiced recommended foot care practiced reached better glycaemic control.

A study done by(Ekpenyong, et al (2013) in Nigeria found out of 352 patients with diabetes, 30.1 percent of them were knowledgeable on the disease and 10.2 per cent practiced good self-foot care. Majority of the patients, about 78.4 percent, who had poor self-foot care practices lacked adequate knowledge on good foot care practices. On knowledge evaluation, 68.8 percent of the respondents were not aware of the first thing to do after finding an erythematic lesion on their feet or bleeding between their toes. Another 61.4 percent did not know of the importance of inspecting and checking the inside of their footwear for sharp bits and pieces. Results on self-foot care practice showed that 89.2 percent of type 2 diabetes mellitus patients did not receive advice

when they bought new footwear especially on breaking in and 88.6 percent failed to get comfortable size footwear as recommended. Low levels of poverty and education and significantly linked to poor foot care practices and poor knowledge. Minority of the participants (40.9 percent) inspected their feet on a regular basis, (46 percent) washed their feet with warm water regularly and (47.7 percent) inspected their shoes for objects before and after wearing (Edmund, Sussan, & Onyinye, 2016).

According to Jamil *et al* ., (2014) in a study to determine patients with diabetes practising recommended self-foot care according done by the International Guidelines and how the disease impacts the health of their foot, diabetic patients who were practicing recommended foot care was a measly 6 percent. There were 55 percent females and 55 percent males who participated in that study. Seventeen percent used to examine their feet on a daily basis, 20 percent of them washed their feet with warm water every day, while 73 percent washed their feet with warm water more than one in a single day. Twenty three percent of the patients reported to drying their feet after every foot wash especially between the toes, 27 percent applied emollients lotions on foot, 25 percent inspected their shoes before wearing them, 24 percent used to wear shoes that fit comfortably, 8 percent wore socks made from cotton and changed them every day and 36 percent used to walk bare footed.

2.6 Barriers to Self-foot Practices Among Diabetes Patients

According to a study done by Seld & Tsige (2014) in Ethiopia, on barriers for self-foot care, participants were asked to specify if they had barriers that limited them from recommended self-foot care practices; 48 percent and 52 percent indicated “no” and “yes,” respectively. As to the barriers of proper foot self-care practices, in the 162 participants who had faced barriers, 92 participants pointed out the lack of proper and poor communication between healthcare practitioners and patients; 72 participants revealed its inconvenience to work and 56 participants did not know what to do . Another report indicated poor knowledge as the major contributing factor for poor self-foot care practice levels. In the same study, the inadequacy of knowledge on self-foot care was at 33.0 percent, 5.7 percent of the participants reported poverty as a factor, and 6 percent reported poor communication of recommended health message between healthcare providers and their patients as hindrances to foot care (Amogne, Reja, & Amare, 2013). Poor knowledge on diabetes was found to be common among

individuals with low education levels; this made learning specific self-management difficult.

Practical skills ought to advance blood glucose management and control. Highest level of education was a significant factor used to determine the individuals who were likely profit from an involvement in self-foot care in patients with diabetes (Kisokanthet al., 2013). More reports have also revealed that diabetes knowledge on proper foot care should be given based on the patients' level of education in order for all patients to understand it at their own language and level of understanding (Elliott et al., 2013).

2.7 Health Care Providers' Perception on Patient Compliance with Foot Care Instructions

Health care workers should advise the patients on the recommended foot care which is essential in both the control, prevention, and management of the diabetic foot ulcer disease. The significance of self-care habits and practices being at the center of diabetic foot ulcer management should be reinforced. This was agreed in a consensus statement issued by a multi-disciplinary panel and published in the year 2011 (Mclnnes et al 2011). In order to increase the coverage of proper foot care in the diabetic patients, barriers to recommended diabetic foot care practices should be minimized and those factors that promote practice of the recommended strategies should be first identified.

In recent years, however, patients have shown a higher knowledge level and interest in proper diabetic foot self-care practices. With improved research, there is evidence based on the development of international consensus on procedures and clinical practices that outline approaches used to diagnose diabetic foot ulcer and the appropriate treatment to be given (Apelqvist et al 2014). The presence of guidelines and consensus documents on the treatment and diagnosis of diabetic foot has pushed the execution of these guidelines on an international level. Despite all this, there are many hindrances to the enforcement of these guidelines for global good healthcare. These hindrances involve: attitudes of patients with diabetes and the healthcare system; and the beliefs of doctors, and health professionals in the medical field, who works together to make sure that patients with diabetes do not get the recommended care they need.

A study conducted in Tanzania by Abbas et al (2011) showed limited health facilities providing specialized foot care, serving a big area geographically, where patients had to travel large distances to get to these facilities. These barriers impeded patient to come to come to foot clinics. IDF (2013) study showed that despite availability of the diabetic clinics, depending on the attitude of the health-care practitioners working in these facilities, they might lack the necessary knowledge or have no interest in learning about diabetic foot pathology. This was caused by the absence and delay of proper foot care. Some doctors tend to stick to old opinions that are likely to impede with their inclination solve diabetic foot ulcer problems among their patients. Patients who were found to seek other forms of medicine were omitted from care since such patients were not believed to be compliant with the health care giver instructions (Tripp-Reimer et al 2011).

2.8 Prevention and Management of Foot Complications

An analysis was done for 6 years on how effective the preventive foot care practices were and it revealed that the patients with diabetes who had high chances of developing foot ulcers and were compliant with preventive practices were 13 times less likely to have foot ulcers as to those patients who did not follow the recommended guidelines. Among the patients who complied with the recommendations, the total cumulative occurence of foot ulcer was rated at 3.1 percent compared to 31.6 percent among those who did not comply (Call-Paschal *et al*., 2013).

The following are some foot care practices put across by America Diabetes Association (2016) for diabetic patients.

i. Avoid the barefoot gait.
ii. Be more active. Active involvement between the patient and healthcare team to plan a good physical activity program.
iii. Check the feet every day. Inspecting feet for blisters, swelling, cuts and red spots every day. Making use of the mirror in case unable to see the sole of the feet.
iv. Do not smoke.
v. Keep the skin smooth and soft. Apply some lotion or petroleum jelly on bottom and top of your feet, leaving out the space between the toes.

vi. Elevate the feet when seated to keep blood flowing. Wiggling the toes and moving the ankles down and up for five minutes a couple of time in a day is recommended.

vii. Protect the feet from extremely cold and hot temperatures.

viii. Trim the toenail when needed. Nails should be trimmed straight across and filing of edges done carefully.

ix. Wash the feet every day. After washing the feet, they should be dried carefully, especially between the toes.

x. Wear shoes and socks at all times. Always wear well-fitting and comfortable shoes. Always inspect inside the shoes before and after wearing to check for objects

2.9 Theoretical Framework

The study is hinged on Dorothea Orem's self-care theory (2001). Orem's theory is made up of 3 related theories: 1) Theory of Self-Care; 2) Theory of Self-Care Deficit; 3) Theory of Nursing Systems.

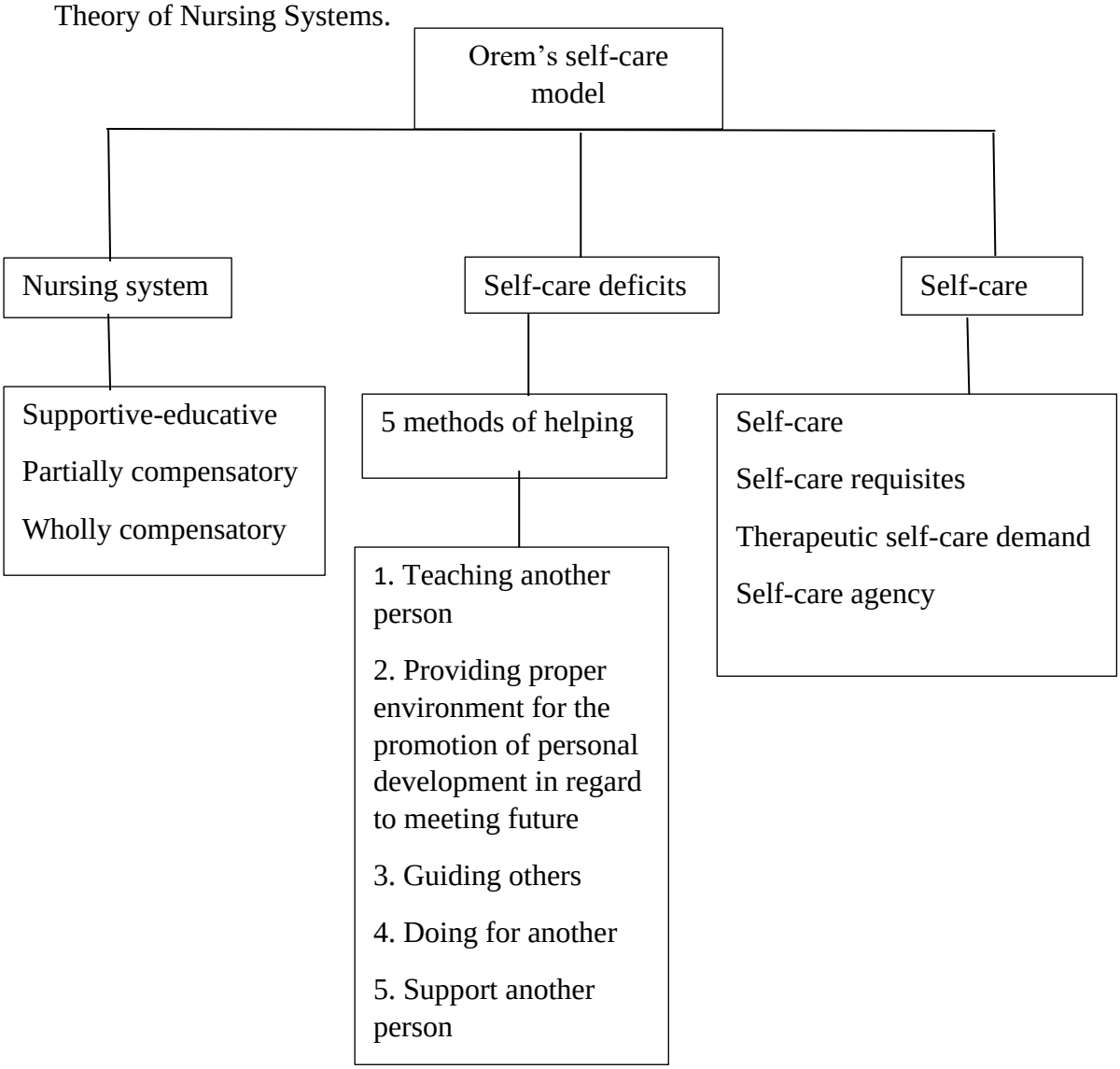

Figure 1: Orem's Self Care Theory

According to Orem (2001), the three-part theory focuses persons dealing with relations and not on the individuals themselves. Each of the three theories focuses specific dimensions of individual persons: the theory of self-care focusing on the self, i.e. self-care rudiments the needs a person needs to meet so as not to get ill and stay healthy. The theory of self-care deficit focuses on the assistance needed such as educational programs when s self-care capabilities are exceeded by the self-care requisites; and the theory of the nursing system focusing on systems that fits the patient's capability to

implement self-care such partial/wholly compensatory or supportive education. This theory gives a good guide that can be used to plan and implement clinical guidelines pertaining to proper foot care. Orem (2001) believes that people have the capability to take care of themselves and they are helped by nurses when their self-care ability is distorted. Nurses do this by providing educations and direct care support to the patient. Based on Orem's self-care theory, the role of the nurse has been introduced so as to act as a force and facilitator of change. Due to how chronic diabetes is, patients should collaborate in the steps involved in the management control and treatment of the disease.

2.10 Conceptual Framework

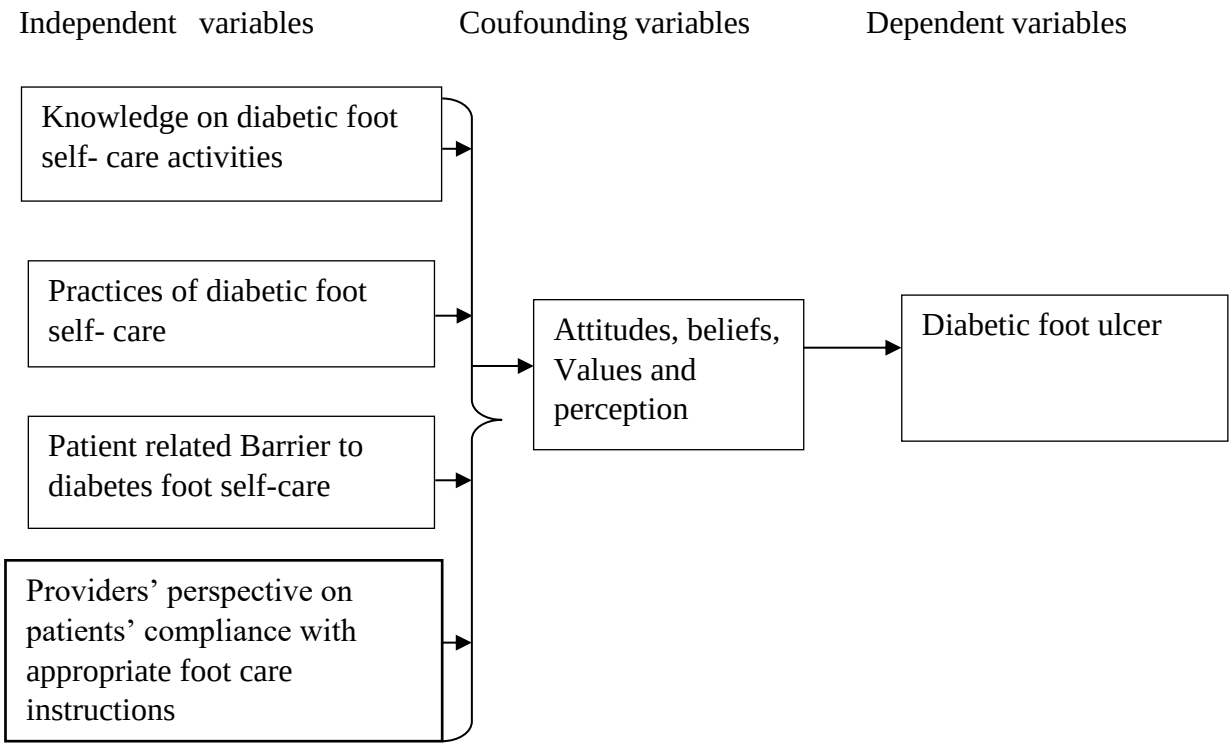

Figure 2: Conceptual Framework

2.10.1 Knowledge on Foot Self-Care Practices

This refers skills, information and facts picked up through education or experience relating to diabetes foot self-care such as characteristic of foot wear, foot wear practice, foot washing, foot wear practice, and footwear inspection which if not adequate is likely to cause diabetic foot ulceration.

2.10.2 Practices on Foot Self-Care

This refers to activities relating to care given to diabetic foot such as how to do inspection of foot and footwear, how to wash it, and how to take care of corn/blister/nails on the foot to avoid developing diabetic foot ulceration.

2.10.3 Barriers to Foot Self-Care Practices

This refers to factors related to patients that hinder them from proper foot care practices such; lack of appropriate knowledge, poor eyesight, economic factors, cultural factors and client's ignorance on self-care thus development of diabetic foot ulcer.

2.10.4 Providers' Perspective on Patients' Compliance with Appropriate Foot Care Instructions

This refers the perception of the key health care providers (nurse, dietician, paediatrician and medical officer) on patients' compliance with appropriate foot care instruction. This would include perceived barriers from the patient and healthcare system which contributes to inappropriate foot care practices in patients with diabetes thus development of diabetic foot ulcer**.**

CHAPTER THREE
METHODOLOGY

3.1 Study Area

The study was carried out at all diabetic clinics in Embu County which offers the specialized clinic. Embu County lies about 120 kilometers north east of Nairobi, on south-eastern slopes of Mount Kenya. The county borders Machakos County to the South, Tharaka Nithi Country to the North, Kitui County to the East and Kirinyaga County to the West. It occupies an area of 2,818 km2 and is divided into four constituencies namely; Mbeere South, Mbeere North, Runyenjes and Manyatta Sub-Counties which forms Sub-Counties. Each sub county has a district hospital making them to be four level four hospital plus one main teaching and referral hospital (level 5) in manyatta subcounty. Out of the five hospitals only three offers diabetic clinic, that is, Kianjokoma and Runyenjes sub county then the main referral hospital.

3.2 Research Design

A descriptive survey design was used in the study to describe the phenomena or the subjects under study as accurately as possible without manipulation of variables. It was used to assess self-foot care practices among patients with type 2 diabetes attending diabetic clinic in Embu County. It was also used to determine health care providers' perspective on patient compliance on foot care instructions.

3.3 Population of the Study

Population used to conduct the study was 1413 people, with 954 attending Embu level five hospital, 234 attending Runyenjes sub-county hospital, and 225 attending Kianjokoma sub-county hospital. The study also targeted four respondents from each facility: This was comprised of the key health care providers (nurse, dietician, paediatrician and medical offices), resulting to 12 key informant as every facility is run by one specialist at any given shift

3.4 Sampling Procedure and Sample Size Determination

3.4.1 Sample Size Determination

This study used a sample of 301 Type 2 diabetes mellitus patients. The sample size was determined using the formula by Fisher et al (1991)

$$N = \frac{Z^2 \text{ pq}}{d^2}$$

Where:

N is the population sample

Z which is1.96 is the standard normal deviate which corresponds to 95 percent confidence level

P=0.5 the proportion of type 2 diabetic patients who practice foot care it is unknown, so 0.5 was be used.

q (1- p) = 0.5

d = 0.05 (statistically tolerated error)

$$N = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2}$$

N = 384 diabetic patients

The population of Type 2 diabetes mellitus patients in the selected facilities was less than 10,000, so the sample was be adjusted as follows:

$$\text{Adjusted sample } nf = \frac{n}{1+\frac{n}{N}}$$

Where n = 384 (calculated sample size)

N=1413 (The population of diabetic patients registered to the 3 health facilities)

$$nf = \frac{384}{1+\frac{384}{1413}} = 301 \text{ Type 2 diabetic patients.}$$

3.4.2 Sampling Technique

Embu County was purposively selected due to its high incidence of diabetes foot complication, that is, clinic data indicated every ten patients seen four presented with

this complication. Thus it became necessary to establish foot self-care practices among diabetes patients, and healthcare perspectives on patient compliance of foot care instructions among these patients. There was only three public health facilities offering management of diabetic services out of the five hospitals in the county and they were all sampled for the study. Fisher et al, (1991) formula was be used to determine sample size, then proportionately identified the number of respondents used per facility as shown in table 1. Daily type 2 diabetes mellitus patient registers from the three health facilities namely; Kianjokoma Sub-County Hospital, Runyenjes sub-county hospital and Embu Teaching and Referral Hospital was used to identify the participants for the study. Systematic sampling was used to identify respondents from the daily type 2 diabetes mellitus registers at the health facilities, with sampling interval being 5 (1413/301=4.7) and blindly selecting from table of random numbers the starting point. Convenient sampling was used to pick the key health care providers from every facility. At any given clinic session there were four cadres of health care professional, though the team assigned to run the clinic are more than one in every cadre. Thus the researcher conveniently sampled the four health providers for the group discussion on that particular day as indicated in the table 2.

Table 1.
Sampling Frames for Diabetes Patients

Health facilities	Population	Sample size
Embu teaching and referral hospital	954	204
Runyenjes sub county hospital	234	50
Kianjokoma sub county hospital	225	47
Total	1,413	301

Table 2
Sampling Frame for Key Health Care Providers

Health facilities	Cadre	Population	Sample
Embu teaching and referral hospital	Medical officer	3	1
	Nurse	2	1
	dietician	4	1
	Podiatrist	2	1
Runyenjes subcounty hospital	Medical officer	2	1
	Nurse	2	1
	Dietician	2	1
	Podiatrist	2	1
Kianjokoma sub county hospital	Medical officer	2	1
	Nurse	3	1
	Dietician	2	1
	Podiatrist	2	1
	Total	28	12

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

The respondents of this study did include all T2DM patients over 18 years, who voluntarily consented to participate in the study with key healthcare providers giving their consent to provide information.

3.5.2 Exclusion Criteria

The respondent who do not qualifies to be part of the study was include; those T2DM patient below 18years and those over 18years but decline to be participants in the study and Health care providers who refused to give their consent.

3.6 Research Instruments

The instrument of the study was structured questionnaire, direct observation /examination of the patient and focussed group discussion. The questionnaire containing socio-demographic data, knowledge, practice and barrier on diabetes foot self-care was administered to all the participant (patients) and the patients' feet was physically examined for foot ulceration to provide additional information on actual foot care practices. Focus group discussion was performed in the form of key informant discussion.

The questionnaire was pre-tested in Chuka general hospital, in located in Tharaka Nithi County whose characteristics are almost identical to hospitals under study in Embu County. Questionnaires were given to a ten percent of the sample size (30 participants). This pre-test permitted changes to be made to the questionnaires by inclusion of questions and correcting mistakes found not applicable to the study.

Unnecessary questions were removed, the questionnaire was tested and issues made clear by technical persons involved so as to ensure their validity. Peer reviews and proof reading of the questions was done before the tool was presented to participants so as to assure content validity.

So as to test the reliability of the questionnaire, a pre-test was done using Cronbach's Alpha with the threshold being 0.7 which formed this study's benchmark (Gliem & Gliem 2003).

3.7 Data Collection Method

Collection of data was done using a pretested and structured questionnaire through key informant interviews, direct observation on patient foot and face to face interviews. Preparation of the questionnaire was in English and which was then translated to the local dialect (the Kiembu language) then retranslated back to English so as to ensure consistency. The interview was conducted through focused group discussion to individual identified as key informant. Two research assistant were involved in the process to collect data from participants. One-day training was done for the two research enumerators. All T2DM patients, who attended diabetic clinic and key informant who met the inclusion criteria in the selected facilities during the duration of the study, were included. The rate of response for the study was at 98.7 percent, revealing acceptable and high rates of response (Mugenda, & Mugenda, 2003).

3.8 Data Analysis

Analysis of collected data was done using the Statistical Package for the Social Science (SPSS) statistical software version 24. Descriptive figures such as mode and mean, were computed to establish characteristics of participants. Proportions was be computed and reported as percentage of totals. Chi square test was used in testing the

connection between categorical variables. Statistical significance was be set at $\alpha = 0.05$. A logistic regression model was used to predict the relationship between diabetes foot complications and foot care practices. Qualitative data was analysed thematically. Data was presented in summary tables.

3.9 Ethical Consideration

Permission was sought from the Embu Teaching and Referral Hospital (ETRH) institutional research board committee and National Council for Science, Technology and Innovation ("NACOSTI") before the execution of the research. The questionnaires were given to participants after obtaining an informed go-ahead which involved detailed explanation on the nature and purpose of the research. Participants' names and any identifications means were not used during process to collect data so as to ensure data privacy. The researcher made sure that all the data and information obtained from the questionnaire was kept in strict confidence and was used for the sole purpose to conduct this study.

CHAPTER FOUR

RESULTS PRESENTATION

4.1 Socio-Demographic Profile and Clinical Characteristics' of the Respondents

The respondents' ranged between 40 and 89 comprehensive years with the mean age of 63 years.

Table 3
Socio-Demographic Characteristic of the Respondents

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

More than half of the participants in the study (51.2 percent) were aged between the age 50 and 70 years, while the remaining (10.8 percent) were between 40 and 50 years, and 38 percent of the participants had their age above 70 years. Most of the patients were knew of the study's topic; but despite this, low and minimal awareness on diabetic foot care was closed linked to increase in age of the participants. On gender, 112 (37.7 percent) were male participants while the remaining 62.3 percent were female. More female were found to attend the diabetic clinics compared to their counterpart male patients. Expectedly many of the respondents were married (70 percent), and the remaining 25.5 percent were separated, widowed or divorced and the remaining 4.4 percent were single.

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

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

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

Table 4
Clinical Characteristics of the Respondents

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

On clinical characteristics of the patients, 35 (11.8 percent) had suffered from diabetes for less than 5 years, 25.9 percent between 6 and 10 years, 34 percent between 11-15 years and 28.3 percent above 15 years. On checking the patients' BMI, 4.4 percent between 18.5 and 24.5 which was considered to be normal, 60.9 percent their BMI being between 24.5 and 30 which was regarded as overweight and 39.1 percent had their BMI above 30 which was interpreted as being obese.

Majority of the patients 195 (65.7 percent) were on oral antidiabetics while the remaining proportion 24.2 percent were on combined therapy. It was reported that majority of those who were on insulin therapy 30 (10.1 percent) had been recently started on the therapy since oral medication had failed to control their blood sugars.
On history taking, 215 (72.4 percent) reported to have had foot complications, out of those who had foot complications 145 (67.5 percent) were found to have foot ulcer, 70 (32.5 percent) had other foot complication such edema, corns among others while others reported non-specific problems

4.1.1 Association between Social Demographic Characteristics of theRespondents and Development of Foot Ulcers

Table 5
Association between Age and Development of Foot Ulcer

Variable	Category	Has foot ulcer		df	P value
		Yes	No	3	P=0.037
Age in years	>70	68	45		χ^2=8.464
	40-50	17	15		
	50-60	27	28		
	60-70	39	58		

Among the respondents 113 patients were aged above 70 years, out of all these 68 had developed foot ulcer while 45 never had foot ulcer. Those of age bracket 40-50, 17 of them had foot ulcers while 15 were free of foot ulcers. In the age bracket of 50-60, 27 had foot ulcer with 28 without foot ulcers and those in the age bracket of 60-70 were 97, out of these, 39 had developed foot ulcers while the remaining had not suffered the complication. χ^2 (3, N=297) = 8.464, p=0.037. This meant that age was a predictor of developing foot ulcer; those with advanced age were at risk of developing the foot ulcer.

Table 6
Association between Marital Status, Gender and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		Yes	No		
Marital status	single	7	6	2	P=0.784
	Married	103	105		χ^2=0.486
	Others	41	35		
Gender	Male	62	50	1	P=0.138
	Female	89	96		χ^2=1.467

On gender, more female respondents were sampled than male. Consequently, the percentage of female respondents who had developed foot ulcer was higher than that of male. There were 112 male respondents and 185 of the female respondents. Out of the 112 male, 62 of them developed foot ulcer, while 89 out of 185 of the female had foot ulcer. However, when the total population who had developed foot ulcer was computed, relatively half of the respondents, 151 had foot ulcer. On Chi-square, there was no significant relationship between gender and development of foot ulcer χ^2 (1, N=297) = 1.467, p=0.138.

Marital status of the respondents was not related to the development of the foot ulcer. In this report, out of 13 respondents who were single, only 7 developed foot ulcers. Among the respondents who were married, 103 out of 208 developed foot ulcers and 41 out of 76 of those who were separated, divorced or widowed had developed foot ulcers.

Table 7
Association between Level of Education, Source of Income and development of Foot Ulcer

Variable	Category	Has foot ulcers		df	P value
		Yes	No		
Level of education	Informal education	33	21	3	P=0.119
	Primary education	74	68		χ^2=5.856
	Secondary education	38	44		
	Tertiary education	6	13		
Source of income	Farming	114	103	3	P=0.719
	Formal employment	8	7		χ^2=1.344
	Informal employment	27	34		
	Unemployed	2	2		

Level of education, relationship between education levels and development of foot ulcers was not statistically significant. There were 54 respondents who had informal education, out of these 33 developed foot ulcer. Of those who had primary education, 74 out of 142 had developed foot ulcers, while those with secondary level of education 38 out of 82 had developed foot ulcer. Fewer respondents had tertiary education, out of 19 only 6 developed foot ulcers χ^2 (3, N=297) = 5.856, p=0.119.

Source of income was also not significantly related with foot ulcers development. 217 of the respondents were farmers and 114 out of these developed foot ulcers, those who had formal employment were 15 and 8 of them developed foot ulcers. 61 of the respondents had informal employment, out of these 27 developed foot ulcers while half of those who were unemployed developed foot ulcers χ^2 (3, N=297) = 1.344 p=0.719.

Table 8
Association between Smoking and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Smoking status	Past smoker	27	46	2	P=0.017
	Never smoked	119	105		χ^2=5.738

Smoking is a risk factor for development of foot complications among type 2 diabetic patients. This became evident in this study. Out of 297 respondents, only 73 had reported to be past smokers. 46 of the 73 respondents, who were past smokers, had developed foot ulcers. The numbers of those who were non-smokers were averagely the same between those who developed foot ulcers and those who didn't. There was a strong association between smoking and history of smoking with development of foot ulcers χ^2 (1, N=297) = 5.738 p=0.017. Chewing or taking oral tobacco was not associated with development of foot ulcers.

Table 9
Association between Number of Years of Living with Diabetes and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		Yes	No		
Number years with diabetes	Less than 5 years	20	15	3	P=0.003
	6-10 years	44	33		χ^2=13.722
	11-15 years	55	46		
	>15 years	27	57		

The number of years a respondent had lived with diabetes was significantly associated with foot ulcers development. People living for more than 15 years with diabetes were at a greater risk of foot ulcers development. In this study, 35 respondents had lived with diabetes for a period of not more than 5 years and only 15 of them had developed foot ulcers. Those who had lived with diabetes for 6-10 years were 77 and 33 out of these had developed foot ulcers. A relatively high number of respondents 101, had lived with diabetes for 11 to 15 years, among these 46 had developed foot ulcers. Those having lived with diabetes for more than 16 years were 84 and more than half of them, 57 had developed foot ulcers χ^2 (3, N=297) = 13.722, p=0.003.

Table 10
Association between Type of Treatment and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		Yes	No		
Type of treatment	Oral antidiabetics	93	102	2	P=0.452
	Insulin injections	18	12		χ^2=1.587
	Combined therapy	35	37		

The type of treatment the patient was on was not related to foot ulcers development. The respondents in this study were on insulin, oral antidiabetic and others on combined therapy. Out of 30 respondents who were on insulin 12 of them had developed foot ulcer. Those on oral antidiabetic were 195 and 102 of them had developed foot ulcer.On average, half of those who were on combined therapy developed foot ulcer χ^2 (2, N=297) = 1.587, p=0.452.

Table 11
Association between BMI and Development of Foot ulcer

Variables	Category	Has foot ulcer		df	P value
		Yes	No		
Current BMI	18.5-24.5	6	7	2	P=0.139
	24.5-30	91	77		χ^2=3.954
	>30	49	67		

When the BMI of the respondents was associated with development of foot ulcer, the results were not significant. 13 of the respondents had a BMI between 18.5 and 24.5. Out of these 7 had developed foot ulcer. Those who had a BMI between 24.5 and 30 were 168 and 77 of them had developed foot ulcer. The portion of respondents who were considered to be obese, above a BMI of 30, were 116 and 67 of them had developed foot ulcers χ^2 (2, N=297) = 3.954, p=0.139.

Table 12
Regression Analysis between Age of the Respondents and Foot Ulcer Development

		B	S.E	Wald	df	Sig.	Exp(B)	95 percent C.I for EXP(B)	
								Lower	Upper
Step 1	Age	-.289	.092	9.861	1	.002	.749	.625	.897
	Constant	.456	.179	6.476	1	.011	1.578		

Generally the age, gender, smoking status and how long the patient had lived with diabetes were considerably linked to the development of foot ulcers. When these factors were subjected to backward forward regression analysis, only age, cigarette smoking and duration a respondent had lived with diabetes was considerably linked to foot ulcers development. Age of the respondent was a significant predictor of developing foot ulcer. Age increase increased the risk of developing foot ulcer by 74.9 percent and this was considerably high at χ^2 (1, N=297) = 9.861, p=0.002, OR= 0.749, CI [0.625-0.897].

Table 13
Regression Analysis between Smoking Status of the Respondents and Foot Ulcer Development

	B	S.E	Wald	df	Sig.	Exp(B)	95 percent C.I for EXP(B)	
							Lower	Upper
Step 1 History of smoking	.658	.277	5.644	1	.018	.518	.301	.891
Constant	1.849	.775	5.690	1	.017	6.352		

Those patients who had history of smoking were 0.518 times more likely to develop foot ulcer compared to those who have never smoked χ^2 (1, N=297) = 5.644, p=0.018, OR= 0.518, CI [0.301-0.891].

Table 14
Regression Analysis between Years of Diabetes Infections and Foot Ulcer Development

	B	S.E	Wald	df	Sig.	Exp(B)	95 percent C.I for EXP(B)	
							Lower	Upper
Step 1 Years with diabets	.370	.122	9.219	1	.002	1.447	1.140	1.838
Constant	-.997	.360	7.682	1	.006	.369		

The longer the patient had lived with diabetes, the more likely they were to develop foot ulcer

From regression analysis it was evident that those patient who had lived with diabetes longer were 1.447 times more likely to develop foot ulcers compared to those who were diagnosed a few years ago χ^2 (1, N=297) = 9.219, p=0.002, OR= 1.447, CI [1.140-1.838].

4.2 Knowledge on Diabetes Foot Self-care

The patients were given twelve multiple choice questions which were translated to the language the participant understood best. The answers chosen were rated as correct or incorrect. Each correct response earned the participant one point while an incorrect

response earned zero point. The points earned were then grouped as poor knowledge (0-3 points), fair knowledge (4-7 points), good knowledge (8 points and above).

Table 15
Knowledge on Diabetes Foot Care

Variable	Category	Frequency	Percentage
Define foot self-care	Correct response	209	70.4
	Wrong response	88	29.6
Source of information	Health care provider	209	70.4
	Community health worker	44	14.8
	School	12	4
	Own reading	32	10.8
Knows that DM patient should look after their feet for injury	Yes	167	56.2
	No	130	43.8
Knows that DM patient should maintain their blood sugar within the normal ranges	Yes	270	90.9
	No	27	9.1
Inspect inside their foot wear before wearing and when removing	Often	178	59.9
	Sometimes	113	38
	Rarely	6	2
Knows that DM patient should not smoke cigarette or chew tobacco	Yes	111	37.4
	No	186	62.6
What to do if you found redness/ bleeding between your toes	Leave it	227	76.8
	Report to health care provider	69	23.2
	Don't know	1	0.3
What temperature of water to use to wash feet	Hot	1	0.3
	Lukewarm	296	99.7
How to trim toe nails	Straight across the file the sharp corners along the nail contour	95	32
	Trim following nail contours	131	44.1
	Trim straight only	59	19.9
	Trim following contour the file	12	4
Frequency of doing exercises among diabetic patients	Often	256	86.2
	Sometimes	40	13.5
	Rarely	1	0.3

Majority of the participants 209(70.4 percent) were able to define what foot self-care meant, 88 (29.6 percent) gave a wrong meaning of the phrase self-foot care. Source of information, 70.4 percent said they were taught by health care worker, 14.8 percent knew it from community health care worker, 4 percent from school and 10.8 percent from their own reading respectively.

More than half of the respondents (99.7 percent) stated that they know they should comply with their medication prescription because they are at risk to get diabetic foot complications. Interestingly, majority of the participants (56.2 percent) did know that they need to inspect their feet for minor injuries which they may not feel due to the diabetic disease. On maintaining blood sugar within normal ranges, 90.9 percent of the respondents reported to know. The participants were asked to rate on how frequent they were expected to check or inspect inside their foot wear for sharp objects or torn lining and 59.9 percent reported to be checking often, 38 percent sometimes, and 2 percent rarely.

On using tobacco both their smoking and chewing tobacco status was assessed. A higher proportion of participants (62.6 percent) didn't know that smoking or chewing tobacco causes poor blood circulation especially to the lower extremity (foot). The respondents were also assessed on emergency action to take in-case they observed redness or bleeding between their toes during inspection; 76.4 percent reported that they will leave it for some time to see if it heals or goes away, 23.2 percent will report the observation to the health care provider and 0.3 percent didn't know what to do.

When the participants were asked on the temperature of the water appropriate for washing the feet; 0.3 percent said it should be hot, and 99.7 percent reported lukewarm respectively.

Majority of the participants 131 (44.1 percent) reported that the long nails should be trimmed following the nail contour, while 4 percent said the nails should be trimmed following the contours of the toe and filling of sharp corners to follow the contours of the toe, 19.9 percent reported to trim the long nails straight across only and the remaining 32 percent said the nails should be trimmed straight across then filed following nail contour.

Exercise is crucial to maintaining and controlling the blood sugar levels of a diabetic patient. When knowledge on exercise in management of diabetes was assessed, 256 (86.2 percent) of participants said they should exercise often, 13.5 percent sometimes, 0.3 percent rarely and percent never at all. Those participants who knew how to trim their long toe nails were 31.3 percent, while those who knew the correct frequency of

exercising were 86.2 percent. On the correct temperature for washing feet, 99.7 percent knew it while those who were knowledgeable on frequency of inspecting inside their foot wear was represented by 59.3 percent.

Table 16
Level of Knowledge on Diabetes Foot Self- Care

Variable	Category	Frequency	Percentage
Level of knowledge on foot self-care	Poor	60	20.2
	Average	122	41.1
	Good	115	38.7

In general, level of knowledge was then computed and categorized as poor, average and good from the above responses. The points earned were used to group the respondents knowledge levels as poor knowledge (0-3 points), fair knowledge (4-7 points), good knowledge (8 points and above). The results were then tabulated as shown in table above. Majority of the respondents (41.1 percent) had average level of knowledge, 38.7 percent had good knowledge with 20.2 percent having poor level of knowledge.

Table 17
Association between Knowledge on Foot Care and Development of Foot Ulcer

Variable	Category	Has foot ulcer		df	P value
		Yes	No		
Define foot self-care	Wrong response	50	38	1	P=0.019
	Correct response	97	112		χ^2=5.539
Source of information about foot self-care	Health care provider	101	108	3	P=0.030
	Community health worker	24	20		χ^2=8.975
	School	12	1		
	Own reading	15	17		
Has knowledge on taking medicine as prescribed	Yes	151	45	1	P=0.492
	No	0	1		χ^2=1.038
Has knowledge that DM patient should look after their feet for injury	Yes	81	86	1	P=0.413
	No	70	60		χ^2=0.835
Has knowledge on blood sugar maintenance among diabetic patients	Yes	18	9	1	P=0.106
	No	133	137		χ^2=2.976
Frequency of inspecting foot wear inside	Often	85	93	2	P=0.412
	Sometimes	63	50		χ^2=1.771
	Rarely	3	3		
Has knowledge on effects of smoking or chewing tobacco in diabetes	Yes	66	45	1	P=0.023
	No	85	101		χ^2=5.267
Knowledge on what to do in case there is bleeding between the toes	Leave it	121	106	2	P=0.214
	Report to health care provider	30	39		χ^2=3.082
	Don't know	0	1		

4.2.1 Association between Level of Knowledge on foot Self-care and Development of Foot Ulcer

Generally, it is expected that increase in level of knowledge increases good or best practices on foot self-care to prevent foot ulcer development. In this study, 209 (70.4 percent) respondents knew what it meant to do foot self-care. Out of these 97 of them developed foot ulcer. This meant that knowing what foot self-care was did help the respondent to translate the knowledge to foot self-care practice. Out of 88 respondents who didn't know the definition of foot self-care, 54 developed foot ulcer. Therefore, development of foot ulcer was dependent on knowledge on the definition χ^2 (, N=297) = 5.539, p=0.019.

The source of information about foot self-care had a significant association with development of foot ulcer. The patients who were knowledgeable about foot self-care were more likely to develop foot ulcer compared to those who got knowledge from community health workers and healthcare practitioners. Out of 12 respondents who got

knowledge from school, 11 developed foot ulcer. Again out of 32 respondents who had read on their own for foot care, 15 developed foot ulcer. The respondents who had gained this knowledge from the community health worker or health care provider developed foot ulcers on average rate. Therefore, information from health care provider or community health worker was key χ^2 (3, N=297) = 8.975, p=0.030.

Majority of the respondents knew that they should take their antidiabetic medication regularly but unexpectedly most of the 151 out of 296 had developed foot ulcers. Only one respondent didn't know about importance of taking the antidiabetic medication regularly but still didn't develop foot ulcer. Therefore, only knowing the importance of taking antidiabetic medication as prescribed does not prevent development of foot ulcer. There might be other factors that contribute χ^2 (1, N=297) = 1.038, p=0.492.

More than half of the respondents knew that they should look after their feet for injury, but out of 167 of the respondents who knew, 81 developed foot ulcer. Out of 130 who didn't know, 70 developed foot ulcer. These results shows that regardless of the knowledge the respondent developed foot ulcer χ^2 (1, N=297) = 0.835, p=0.413. similar findings were reported on knowledge on maintaining blood sugar within normal ranges, out of the 270 who knew the importance of maintaining the normal levels of blood sugar, 133 developed foot ulcer while out 27 who didn't know, 18 developed foot ulcer χ^2 (1, N=297) = 2.976, p=0.106.

On regular inspection of foot for injuries, especially inspecting their foot wears before wearing and when removing them, 176 respondents knew but still 83 of them developed foot ulcer. Out of 121 who were not aware of such a practice 68 developed foot ulcer. It is essential to check the footwear of a patient with diabetes especially on removing the wear to ensure no object is mounted on them. However, in this research knowledge of this practice was not considerably linked to the development or prevention of developing foot ulcer χ^2 (1, N=297) = 2.344, p=0.156.

Knowledge on effects of smoking or chewing tobacco considerably related to prevention of development of foot ulcer. Out of 297 respondents, 111 knew that a diabetic patient should not smoke or chew tobacco. However, 66 out of those who had the knowledge developed foot ulcer. Relatively half of the respondents (85 out of 186)

who were not aware of the effects of smoking on development of foot ulcers ended up with foot ulcers χ^2 (1, N=297) = 5.267, p=0.022.

The respondents were assessed on the emergency action they could take in case the observed redness or bleeding between the toes. From the responses given, the respondents do not have the correct knowledge on what to do. 227 out of the 297 respondents who were sampled reported that they will leave it to heal on its own. Out of these who reported to leave it to heal, 121 had developed foot ulcer. Out of the 69 who could have reported to the health care provider 30 developed foot ulcer. There was only one respondent who didn't know what to do and fortunately didn't develop foot ulcer χ^2 (2, N=297) = 3.082, p=0.214.

Table 18
Association between Knowledge on Exercise, Trimming of Toe Nails, Temperature of Water Used to Wash Feet and Foot Ulcer Development

Variable	Response	Has foot ulcer		df	P value
		Yes	No		
Temperature of water to be used to wash feet	Don't know	30	39	1	P=0.492
	Hot	0	1		χ^2=1.038
	Lukewarm	0	1		
	Yes	151	145		
Knew how to trim toe nails	No	44	49	1	P=0.454
					χ^2=0.675
	Often	107	97		
Frequency of exercising	Sometimes	130	126	2	P=0.583
					χ^2=1.079
	Rarely	21	19		
		0	1		

On the issue concerning the temperature of the water used to wash the feet, majority knew it should be lukewarm but this didn't deter development of foot ulcer among them. Out of the 296 who reported to have used lukewarm water, 151 developed foot ulcers χ^2 (1, N=297) = 1.038, p=0.492. The respondent didn't have the correct knowledge on how to trim their long toe nails but this was not significantly affecting development of foot ulcer. Only 93 out of 297 respondents knew how to trim their toe nails, however, out of these 44 developed foot ulcers. Among the 204 who didn't know

how to trim their toe nails, 107 developed foot ulcers. Therefore, knowing how to trim the nails was not substantial χ^2 (1, N=297) = 0.675, p=0.454. The frequency exercise was also not significantly associated with foot ulcer development.

Table 19
Association between level of Knowledge and Foot Ulcer

Variable	Category	Has foot ulcer		Df	P value
		Yes	No		
Level of knowledge	Poor	36	24	2	P=0.156
	Average	55	67		χ^2=3.715
	Good	60	55		

On analysis, the knowledge of the respondents was not considerably linked to the prevention of foot ulcer. In this study, 60 respondents had inadequate knowledge, 122 average and 115 had adequate knowledge. Out of those who had poor knowledge, 36 respondents had developed foot ulcer, those who had generally above average 237 and 115 of the developed foot ulcer. This implies that the patient's knowledge did to directly translate to use of best practices in prevention of foot ulcer χ^2 (2, N=297) = 3.715, p=0.156.

4.2.2 Respond to Null Hypothesis

The null hypothesis was, there is no association between the knowledge on diabetes foot self-care and the development of diabetes foot ulcer but from the results though general knowledge was not significantly associated with development of foot ulcer but there were specific variable which were positively related. For example knowing what it meant to do foot self-care, those who knew were less likely to develop foot ulcer compared to those had no idea, source of information was also another factor, those who got information from health workers were less likely to develop foot ulcer compared to those got from school or own reading. Also knowing the effect of smoking or chewing tobacco was associated with prevention of development of foot ulcer. Thus null hypothesis was rejected and alternative directional hypothesis accepted

4.3 Practices of Foot Self-care

On practice of foot self-care, the patient is expected to optimize their metabolic glucose levels, patients should be screened and educated on best foot self-care practices. These

practices include but not limited to routine inspection of foot for foot deformities, skin lesions, fungal infection, and hyperkeratosis. Control of foot wear, they should wear comfortable shoes not tight or torn. Keeping the toe nails short by filling the sharp edges and early diagnosis and treatment of foot injuries. In this study, the researcher was more concerned on the best practices related to foot inspection, prevention and foot wear. The participants were subjected to twenty-five multiple choice questions which were tailored to assess the actual practice of best foot self-care practices.

Table 20
Examination of Feet and Checking of Shoes before Wearing and when Removing them

Variable	Category	Frequency	Percentage
Examination of feet	Once a week or less	23	7.7
	Less than 5 times a week	52	17.5
	Once a day	220	74.1
	More than once a day	2	0.7
Do you check shoes before wearing them	Rarely	111	37.4
	Sometimes	160	53.8
	Often	26	8.8
Checks shoes when taking them off	Never	7	2.4
	Rarely	179	34
	Sometimes	101	60.3
	Often	10	2.4

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

Table 21
Washing of Feet and Use of Moisturizing Creams on Feet

Variable	Category	Frequency	Percentage
Frequency of washing feet	Most days of the week	29	9.8
	Once a day	265	89.2
	More than once a day	3	1
Ensures feet are dry after washing	Never	20	6.7
	Rarely	129	43.4
	Sometimes	145	48.8
	Often	3	1
Ensures between toes are dry	Never	84	28.3
	Sometimes	131	44.1
	Often	57	19.2
	Always	25	8.4
Use of moisturizing cream on feet	Never	19	6.4
	Once a month	39	13.1
	Once a week	51	17.2
	Daily	188	63.3
Use of moisturizing cream between toes	Daily	16	5.4
	Once a week	103	34.7
	Once a month	9	3
	Never	169	56.9

Washing of the feet of a diabetic patient is of paramount importance, 1 percent of the respondents in this study reported to wash their feet more than once daily, 89.2 percent one time in a day, and 9.8 percent most days a week. Generally, 1 percent dries their feet often after washing, 48.8 percent sometimes dry their feet, 43.4 percent rarely dry their feet and 6.7 percent never dries their feet after washing. On probing further in drying between toes, after washing, 8.4 percent ensures their feet are dry especially between the toes always, 44.1 percent sometimes check if they are dry sometimes, 19.2 percent often ensure that the space between their toes is dry and 28.3 percent never checks in between the toes to check if its dry.

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

Table 22
Type of Foot Care Practices used Among the Respondents

Variable	Category	Frequency	Percentage
Use of slipper with no fastening	Most of the time	5	1.7
	Sometimes	232	78.1
	Rarely	41	13.8
	Never	19	6.4
Frequency of trimming toe nails	Never	8	2.7
	Less than once a month	145	48.8
	Once a month	135	45.5
	Most of the time	9	3
Wearing of trainers	Never	42	14.1
	Rarely	178	59.9
	Sometimes	75	25.3
	Most of the time	2	0.7
Wearing shoes with lace-up strap fastening	Never	6	2
	Rarely	140	47.2
	Sometimes	139	46.8
	Most of the time	12	4
Wearing pointed shoes	Most of the time	10	3.4
	Sometimes	128	43.1
	Rarely	74	24.9
	Never	85	28.6
Wearing of flip –flop or mules	Most of the time	4	1.3
	Sometimes	223	75.1
	Rarely	48	16.2
	Never	22	7.4
Breaking in new shoes gradually	Never	82	27.6
	Sometimes	159	53.5
	Most of the time	55	18.5
	Always	1	0.3
Wearing artificial fiber socks	Most of the time	2	0.7
	Sometimes	169	56.9
	Rarely	73	24.6
	Never	53	17.8

The respondents reported to trim their toenails as they grew longer. 3 percent reported to trim their nails most of the time, 45.5 percent once a month, 48.8 percent less than a month and 2.7 percent never trimmed their toe nails. 1.7 percent reported to wear slippers with no fasteners most of the time, while 78.1 percent. 13.8 percent, 6.4 percent wear them sometimes, rarely and never respectively. It was reported that some patient wear trainers. On this, 0.7 percent proportion of the respondents was found to wear trainers most of the time, 25.3 percent sometimes wear trainers, 59.9 percent rarely were they found wearing trainers and 14.1 percent never wore trainers at all.On the type

of shoes worn by the participants, 4 percent wore shoes with lace-up or strap fasteners most of the time, 46.8 percent sometimes wore such shoes, 47.1 percent rarely wore shoes with fasteners or lace-ups and 2 percent never wore such shoes. It was also reported that there was use of pointed shoes among the participants, 3.4 percent reported to have worn pointed shoes most of the time, 43.1 percent some times, 24.9 percent rarely and 28.6 percent never wore pointes shoes. Use of mules or flip-flops wear was also assessed whereby 1.3 percent reported to have worn the mules most of the time, 75.1 percent some times, 16.2 percent rarely and 7.4 percent never wore mules. New shoes was considered to be tight, therefore the frequency of wearing or breaking in new shoes was assessed. Gradual breaking in of new shoes was reported to be the good practice for diabetic patients, 0.3 percent reported to gradually break in new shoes always, 18.5 percent most of the time, 53.5 percent sometimes and 27.6 percent rarely or never.

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

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

on the same. 24.6 percent sometimes use the hot water bottle, 10.8 percent, 64.6 percent rarely use and others never use the hot water bottle respectively.

Table 23
Other Practices Related to Foot Ulcer Prevention

Variable	Category	Frequency	Percentage
Wearing shoes without socks	Often	29	9.8
	Sometimes	152	51.2
	Rarely	65	21.9
	Never	51	17.2
Frequency of changing socks	Less than 4 times a week	1	0.3
	4-6 times a week	23	7.7
	Daily	271	91.2
	More than once a week	2	0.7
Walking in the house bare foot	Often	6	2
	Sometimes	210	70.7
	Rarely	66	22.2
	Never	15	5.1
Walking outside the house barefoot	Often	4	1.3
	Sometimes	153	51.5
	Rarely	108	36.4
	Never	32	10.8
Use of hot bottle in bed	Sometimes	73	24.6
	Rarely	32	10.8
	Never	192	64.6
Use of radiator to warm body	Often	1	0.3
	Sometimes	119	40.1
	Rarely	38	12.8
	Never	139	46.8
Use of remedies when one has a corn	Often	14	4.7
	Sometimes	187	63
	Rarely	53	17.8
	Never	43	14.5
Use of dry dressing on blisters	Never	27	9.1
	Rarely	153	51.5
	Sometimes	103	34.7
	Often	14	4.7
Use of dressing when one has a cut, gaze or burn	Never	34	11.4
	Rarely	139	46.8
	Sometimes	100	33.7
	Often	24	8.1

Warming oneself especially during a cold season is crucial to avoid numbness, in this study it was found that 0.3 percent of the participants often put their feet near the fire

or on a radiator; 40.1 percent sometimes put their feet near the fire or radiator while 12.8 percent rarely put their feet near the fire or on a radiator. A relatively high proportion, 46.8 percent was reported never put their feet near the fire or on a radiator.

Use of corn remedies, corn plaster or paints is common among the general population especially in treating a corn. This practice was evaluated among the diabetic patients who participated in this study. 4.7 percent were found to have often used corn remedies/ corn plaster or paints, 17.8 percent rarely used the corn remedies, 63 percent sometimes and 14.5 percent never used the corn remedies. It was also reported that 4.7 percent often use a dry dressing on a blister or burn when they get one, 34.7 percent sometimes puts a dry dressing on the blister in case they get one, 51.5 percent, 9.1 percent rarely and never uses a dry dressing to cover a blister when they get one.

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

Table 24
Level of Practice of Foot Self-care

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

Practice of foot care among the respondents was categorized into poor, moderate and good by calculating the sum of activities practiced by each respondent. Those who carried out 0-57 percent were rated to have poor practice, those who carried out between 58-71 percent were rated to have moderate practice and those who carried between 72 percent and above were classified as to have good foot self-care practice. The number of respondents with poor practice was 45.1 percent, those with moderate practice were 41.4 percent and the remaining had good foot care practice.

4.3.1 Association between Practice and Development of Foot Ulcer

In this study various practices were assessed and found that generally the respondents had averagely good practice.

Table 25
Association between Foot Examination and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Examination of feet	Once a week	12	11	3	P=0.556
	2-6 times a week	30	22		χ^2=2.082
	Once daily	103	117		
	More than once a day	1	1		

On examination of the feet, out of 23 who examined their feet once a week 11 of them developed foot ulcers; 52 respondents examined their feet 2-6 times a week and 22 of the developed foot ulcers. Among the 220 who checked their feet once daily, 117 developed foot ulcer. Two respondents reported to examine their feet more than once a day and yet one of them developed foot ulcer. Frequency of foot examination was therefore not significantly associated with development of foot ulcers χ^2 (3, N=297) = 2.082, p=0.556

Table 26
Association between Examination of Shoes before Wearing them and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Examination of shoes before wearing them	Rarely	49	62	2	P=0.228
	Sometimes	86	74		χ^2=2.955
	Often	11	15		

Checking of shoes before wearing was also assessed, out of 111 who rarely checked their shoes before wearing, 62 developed foot ulcer, 160 respondents checked their shoes before wearing sometimes and yet 74 of them developed foot ulcer. 26 respondents often checked their shoes before wearing them and 15 of the developed foot ulcers. Regarding this information, it is evident that checking of shoes before wearing was not a determining factor for developing foot ulcers χ^2 (2, N=297) = 2.955, p=0.228

Table 27
Association between Drying the Feet after Washing and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Drying of the feet after washing	Never	7	13	3	P=0.037
	Rarely	56	73		χ^2=8.510
	Sometimes	80	65		
	Often	3	0		

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

Table 28
Association between Drying the Toes, Applying Moisturizing Cream between the Toes and Development of Foot Ulcers

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Drying feet between toes	Never	26	58	2	P=0.000
	Sometimes	62	69		χ^2=27.822
	Often	38	19		
	Always	20	5		
Applying moisturizing cream between the toes	Daily	3	13	3	P=0.022
	Once a week	51	52		χ^2=9.672
	Once a month	2	7		

Drying the feet between toes was also assessed. 84 participants never dried their feet between the toes. Majority of those who didn't dry the feet between their toes (58) developed foot ulcers. Out of 131 participants who sometimes dried their feet between the toes 69 developed foot ulcers. There were those who often dried their feet between toes. Among the 57 who ensured they often dry their feet between toes, only 19

developed foot ulcers. This indicates that drying of feet between toes prevents development of foot ulcers. These results were considerably linked to the of foot ulcers development χ^2 (3, N=297) = 27.822, p=0.000. Nominal by nominal association between those participants who dry their feet between the toes and those who developed foot ulcers was significant at Phi Cramer's value of 0.306, p=0.000. Application of moisturizing cream on feet between the toes was also significantly associated with development of foot ulcers χ^2 (3, N=297) = 9.672, p=0.022.

Table 29
Association between Walking Barefoot and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Walking barefoot	Never	9	5	3	P=0.012
	Rarely	43	25		χ^2=11.024
	Sometimes	93	116		
	Often	1	5		

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

Table 30
Association between Wearing Shoes with or Without Socks and Development of Foot Ulcers

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Wearing shoes without socks	Never	31	20	3	P=0.000
	Rarely	36	29		χ^2=18.281
	Sometimes	75	77		
	Often	4	25		

Wearing of socks is important among diabetic patients. On assessment, 29 (9.8 percent) of the respondents were wearing shoes without socks often. Out of these 25 developed

feet ulcers. Out of 152 who sometimes wore shoes without socks, 77 developed foot ulcer. 65 participants rarely wore shoes without socks and only 29 developed foot ulcer. For the 51 who never wore shoes without socks, only 20 developed foot ulcers χ^2 (3, N=297) = 18.281, p=0.000.

Table 31
Dressing a Blister and Development of Foot Ulcer

Variables	Category	Has foot ulcer		df	P value
		No	Yes		
Putting a dressing on a blister	Never	7	21	3	P=0.006
	Rarely	76	77		χ^2=12.336
	Sometimes	51	50		
	Often	12	3		

The respondents were asked if they put a dressing on any blister they develop. From the responses, out of 28 who never put a dressing on the blister, 21 developed a foot ulcer from the blister. Out of 153 who rarely put a dressing, 77 developed foot ulcer. However, out of 15 who often ensure that the blister is dressed, only 3 developed foot ulcer. These findings indicate that if all the blisters are dressed, the risk of developing foot ulcer decreases. Dressing of the blister was significantly associated with prevention of foot ulcer development χ^2 (3, N=297) = 12.336, p=0.006.

Table 32
Regression Analysis for Walking Bare Foot and Dry Dressing of Blisters

	B	S.E	Wald	df	Sig.	Exp(B)	95 percent C.I for EXP(B)	
							Lower	Upper
Step 1 Barefoot	-.524	.220	5.676	1	.017	.592	.385	.911
Drydressing	-.349	.776	5.946	1	.047	.705	.500	.995
Constant	1.183	.341	12.007	1	.001	3.265		

When dressing of the blister, walking bare foot and application of moisturizing cream between toes was subjected to stepwise logistic regression, only walking bare foot and dressing the blisters was found significantly affecting development of foot ulcers at p values 0.017 and 0.047 respectively

Table 33
Association between General Practice and Development of Foot Ulcer

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

In general, when practice of foot self-care related to the development of foot ulcers, out of 134 patients who had poor practice, 81 among them developed foot ulcers. Out of 123 who moderately practiced self-foot care, 54 developed foot ulcers. Forty patients had good practice and only 16 of them developed foot ulcer. Therefore good practice of self-foot care was associated with prevention of foot ulcers χ^2 (2, N=297) = 9.198, p=0.010.

4.3.2 Risk factors for Developing Foot Ulcer

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

Table 34
Risk Factors for Development of Foot Ulcer

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

On examination of the patients using a checklist, 25.6 percent had fissure or cracks, 4 percent had infected toe nail, 41.8 percent had a callus or corns, 0.7 percent had blisters on the day of examination and other reported that their blisters had healed, 1 percent

had an abrasion, 41 percent had sores, 3.4 percent had dressed blisters and 71.4 had a foot complication. Other factors are summarized in the table 20 below.

4.3.3 Type of Foot Wear used by Respondents

Table 35
Type of Shoes used by the Respondents on the Time of Study

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

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

4.3.3Association between Level of Knowledge on Self-foot Care and Practice of Self-foot care

Table 36
Association between Level of Knowledge and Level of Practice of Self-foot Care

Variable			Level of practice			Total
			Poor	Average	Good	
Level of knowledge among the patients	Poor	Count	41	17	2	60
		Expected count	28.3	28.5	3.2	60.0
	Average	Count	61	61	0	122
		Expected count	57.5	57.9	6.6	122.0
	Good	Count	38	63	14	115
		Expected count	54.2	54.6	6.2	115.0
Total		Count	140	141	16	297
		Expected count	140.0	141.0	16.0	297.0

χ^2 (4, N=297) = 33.739, p=0.000

When the relationship between self-foot care practice and knowledge was analyzed, out of 60 respondents who had poor knowledge, none good practice, those who were averagely knowledgeable, out of 122, 61 had average practice and the remaining had poor practice. 115 respondents had good knowledge and 62 of them had above average practice of foot care and 40 had good practice of foot care. The results shows that increasing the knowledge on foot care among the respondents will positively impact on prevention of foot ulcers. On Chi-square, the results were significant χ^2 (4, N=297) = 164.505, p=0.000. These results show that the proportion that had good knowledge tried to practice self-foot care compared to those with poor knowledge.

4.3.4 Respond to Null Hypothesis

From the study it is clear that there was a strong relationship between foot care practices and development of foot ulcer. Generally good foot care practices was associated with prevention of foot ulcer development. Specifically drying of the feet after washing, drying between the toes, was associated with prevention of foot ulcer, while application of moisturizing cream between the toes, walking bare foot and wearing shoes without sock was significantly related to development of foot ulcer. On observing the risk factors behavior majority were found to have moist between the toes and the improper

nail appearance which were predisposing them to develop foot ulcer. Therefore null hypothesis was rejected and alternative direction hypothesis accepted

4.4 Patient related Barriers to Foot Self-care

After assessing the patient foot self-care knowledge and assessing their foot self-care practice, the study wanted to identify the barriers hindering proper foot self-care. A large proportion of the respondents' 219 (73.7 percent) reported to have barriers to foot self-care.

Table 37
Barriers to Foot self-care

Barriers to foot self-care among the respondents	Frequency	percentage
Poor vision among respondents	122	41.1
Inability to reach their feet	165	55.6
Cannot afford the recommended shoes	30	10.1
Don't think it is important to do foot self-care	114	38.4
Don't know how to do foot self-care	127	42.8
Poor communication between the health care provider and the patient	1	0.3
Lack of family support	19	6.4
Walking bare foot is common and seen to be normal in the society	4	1.3
Lack of motivation	3	1

The factors indicated in table 35 were found to hinder foot self-care. 122 (41.1 percent) of the participants reported that their vision was impaired, they were not able to see well, 55.6 percent were not able to reach their feet for inspection, 10.1 percent the cost of the recommended shoes was not affordable, 38.4 percent never thought it was important to do foot self-care, 42.8 percent didn't know what it entails to do foot self-care, 0.3 percent were not able to practice foot self-care due to poor communication between the health care provider and the patient, 6.4 percent lacked family support to practice foot self-care, and 1.3 percent, 1 percent reported to walk bare foot since it is a common practice in their society and lacked motivation respectively

4.4.1Respond to Null Hypothesis

On patient related barriers it was observed that majority 219(73.7%) experienced some barrier while trying to implement the recommended foot care practices and major

barriers noted were impaired vision which reduced their effectiveness on foot examination, lack of knowledge on the appropriate foot care and also inability to afford the recommended shoes. Thus null hypothesis was rejected and alternative directional hypothesis accepted.

4.5 Health Care Providers' Perspective on Patients Compliance with Appropriate Foot Care Instructions

A total of 12 key informants were selected from the three health facilities offering specialized diabetic clinic. Participants were sampled from various discipline to obtain broad range of viewpoint on their opinions on patients' compliance with appropriate foot care instruction. The breakdown of the participant were four in every facility, that is, 1 nurse, 1nutritionist, 1medical officer and 1 podiatrist. Therefore in every facility formed a group discussion of four participant where the main topic was introduced and being guided by key open question discussion were carried out.

From the discussion we observed common factors, initially we designed our interviews to elicit type of foot care education given and when do they typically provide the information and it was evident from the members that once the patient is diagnosed they were given comprehensive health message.

> "*During clinics we put all diabetic patients together, teach them on blood glucose control, diabetic diet and any other relevant information as per their questions. Sometimes we find ourselves busy and only give key information about diabetes only" (respondent 2 nurse from Embu level 5 hopsital)*

From the above comment it is evident that the patient receive health massages on diabetes but not specifically on diabetic foot care. It was also supported by nurse's response from Embu level 5 hospital

> *"I teach my patients mostly on the food portions to eat and type of food to take. This helps on maintaining glycemic blood sugars within the normal ranges. We rarely emphasize on foot care not unless a patient asks a specific question on foot car"*
>
> *(Respondent 9 podiatrist from Embu level 5 hospital)*

In another interview

> *"When a patient is diagnosed with diabetes they are connected to the nutritionist for counseling. Sometimes when there is enough time, the patients are put together and taught about diabetes. But mostly, due to work load we only teach them on basic diabetic care and answer any questions specifically asked."*
>
> *(Respondent 6 nurse in Runyenjes sub county hospital)*

When the nutritionist was interviewed, it was evident that most of the time the patients received health messages regarding diabetic food and blood glucose glycemic control. There was little evidence of teaching these patients on diabetic foot care practices.

> *"When the patients are sent to me, i teach them on diabetic nutrition food proportions and maintaining blood glucose within normal ranges.*
>
> *(Respondent 3 Nutritionist from Kianjokoma Sub county hospital)*

In another interview,

> *I teach my patients on diabetic food, and the general care for diabetic patients. Sometimes the patients report late than agreed and find us on with health messages; this means they miss some information. In other days, we offer individualised health education, and this depends on the need of the patients. Some patients don't ask about foot care practices.*
>
> *(Respondent 4 Nutritionist from Embu level 5 hospital)*

Another key question tried to elicit information on health workers perceived berries to the provision of education on foot care, and common factors such as communication barrier, staff shortages, patients' attitudes and also lack of appropriate teaching aid were emphasised through expression of the following statement.

> *"When I teach my clients I mix the languages this makes it difficult to understand some practices. I do not know the local language of the majority of the patients so am forced to use Kiswahili. Some of the patients do not even understand Kiswahili and it requires the nutritionist to translate. This poses a communication barrier."*
>
> *(Respondents 7 MO Embu level 5 hospital)*

In another interview;

> *Sometimes the attitude of the patients to foot care is negative, they don't concentrate with foot care, and they want us to teach them on diabetic food to take to control their blood sugars. I also would like to teach them on foot care practices but i don't have the charts for demonstration of these practices. We also need specific updates for the recommended practices so that we can teach the patients the right and correct procedures.*
> *(Respondent 10 Podiatrist in Runyenjes sub County hospital)*

Another respondent said;

> *In my place of work, it's recommended that the diabetic patients are given health message on diabetic food, foot care practices and general health care. However, this is not done due to understaffing. As a nurse you are expected to attend to various patients and at the same time teach the diabetic patients. When time is available we do that, but sometimes we send them to the nutritionist for counselling. Sometimes the patients request for specialised care and screening for the risk factors for development of foot ulcers. Unfortunately, the specialists visit the facility once in a while and can't reach all the diabetic patients.*
> *(Respondent 8 Nurse from Kianjokoma Sub county hospital)*

During another focus group discussion it was evident that diabetic food and foot wear was among the key messages offered to patients;

> *Most of the patients are taught on control of blood sugars and foot wear appropriate for diabetic patients. The patients are supposed to be taught on foot care practices and how to prevent foot complications but due to staff shortages it is provided once in a while.*
> *(Respondent 9 Podiatrist Embu level 5 Hospital)*

There was also another key question which tried to obtain information on health care workers perceived facilitators to the provision of education on diabetes foot care and common themes identified were; management support, occasional facilitators from external specialist, team working and support group linkage. These point were clearly expressed through the following statements.

"In our facility we really appreciate the management support, we get through their provision of continuous update through trainings, workshops etc either within the facility or outside on diabetes management, that is, we always have the current information, the limitation is too much workload such that to provide the information appropriately to the client is a challenge"

(Respondent 2, nurse Embu teaching and referral hospital)

In another interview

"We do have established support which meets once per month, during which clients share their experience both positive and negative concerning their condition thus encouraging one another. I do also come in to clarify any concern raised by the group members or offer any other health information based on identified need of the client. Even in those groups when funds are available we do invite some specialist such eye specialist, renal specialist among others who comes screen the client and share with them some health messages"

(Respondent 5 Medical Officer from Runyenjes sub county hospital)

This was echoed by a another respondent

"Our support group has been the main entry point through which we pass health messages to our clients because that is the time we can get large numbers gathered together"

(Respondent 1medical officer from Kianjokoma sub county hospital)

In another interview

"Our team work spirit has been a great boost to our success in management of our client, this is because with our staffing shortages if we don't work as team may achieve little. For example at times you may find that when am out may be for other official duty and my colleague is not available any other team member available will always provide foot care health messages required by the client."

(Respondent 11 from Runyenjes sub county hospital)

Another respondent also agreed with the above statement;

> *"If it were not for our team work, with crisis we have from manpower, material and even workload we could be having recurrent burn out but God is faithful we have never had any incidents"*
> *(Respondent 12, nutritionist from Runyenjes sub county hospital)*

From these focus group discussions, it was evident that there is deficit of knowledge specifically on ideal foot care practices and communication barrier between the health care provider and the patients. Staffing issues were the most reason given for not giving the messages as recommended and lack of visual aids for teaching. Getting current updates, involvement of external specialist in the clients care, team work and having support group linkages were cited as some of the factors which facilitates the much they are able to offer to the diabetic clients.

4.5.1 Respond to Null Hypothesis

On health care providers perception on patient compliance on appropriate care instruction it was observed that a number of perception was related to improper foot care practices which was associated with development of foot ulcer. Such factors included, health workers emphasizing less on diabetic foot care and concentrating more on diet and glycaemic control. Also they noted some barrier that prevented them from offering the timely and appropriate health instructions to the patients such as staff shortages, patients' attitudes and lack of teaching materials. Thus null hypothesis was rejected and alternative directional hypothesis was accepted

CHAPTER FIVE
DISCUSSION OF THE RESULTS.

5.1 Social Demographic Characteristics of the Respondents

In this study there more female participants 62.3 percent compared to male participants. In the three hospitals selected for this study, the number of female patients who were seeking diabetic care was higher than that of men, the key informants from the three hospitals also confirmed that the female patients seek health care services more than their counter part male patients. These results relate to those reported by Selvakumar and Shah (2016) which revealed that more female patients seek health care services more than male patients. In Nigeria, it was also reported that there are more female patients seeking diabetic care than males (Edmund, Sussan, & Onyinye, 2016).

Many of the participants were above 40 years of age. This is in line with other studies which indicate that type 2 diabetes affects mostly people above the age of 40. In this research study, the age of most of the respondents were between the ages of 40 and 70. In another study done in Tanzania, age above 55 years was a risk factor for foot ulcer development (Chiwanga & Njelekela, 2015).

On smoking, this study revealed that a few respondents 24.6 percent who were currently smoking had a greater risk of developing foot ulcers as compared to ones who didn't smoke. Those who were past smokers were also at risk. These results are congruent with those found by Goweda et al., (2017) in a study on assessment of Knowledge and Practices of Diabetic Patients Regarding Diabetic Foot Care, in Makkah, Saudi Arabia. In Nigeria, a study on patients' attitude and knowledge on diabetes mellitus among people living in a local community in Enugu State revealed that smoking cigarette increased chances of developing foot ulcer (Edmund, Sussan, & Onyinye, 2016).

The duration that a respondent had lived with diabetes was significantly associated with foot ulcers. Those patients having lived with diabetes for more than 11 years (62.3 percent) had a greater risk of foot ulcers development compared to those who had lived with diabetes for a period of less than 5 years. This had a positive correlation with increase in age. In a study conducted in Egypt also showed that the more years a patient

had lived with diabetes the greater the risk they had in foot ulcers development (El-Khawaga & Abdel-Wahab, 2015).

5.2 Knowledge on diabetic foot self-care

5.2.1 Association between Level of Knowledge on Foot Care and Development of Foot Ulcer

In this study, knowing what self-foot care meant, source of information about foot care and knowledge on effects of smoking were significantly associated with foot ulcers. The 70.4 percent respondents who knew what is self-foot care, were seen to practice good self-foot care and this led to a few of them developing foot ulcers compared to those were not knowledgeable on foot care. Many of the respondents who had inadequate knowledge on proper foot self-care developed foot ulcers. These results agree with those conveyed in a study done in South India (George, et al., 2013). In Ethiopia good knowledge was linked to good foot self-care practices. This was revealed in a study on attitudes and knowledge about diabetic mellitus and its associated factors among people in Debre Tabor, North west Ethiopia (Asmamaw et al., 2015).

The patients who got the information about foot care from the health care providers 70.4 percent had high chances of practicing the correct and recommended foot care compared to those who read in books on their own or taught in school. This implied that information from health care providers in the health facilities was clear and recommended, compared to the information that the respondents obtained from friends, school and own reading. During focus group discussion, it was evident from the members that once a patient is diagnose they are given comprehensive health messages,

> *During clinics we put all diabetic patients together, teach them on blood glucose control, diabetic diet and any other relevant information as per their questions. Sometimes we find ourselves busy and only give key information about diabetes only.*
>
> *(Respondent 2 Nurse from Embu level 5 hospital)*

From the above comment it is evident that the patients receive health messages on diabetes but not specifically on diabetic foot care. These results echo what (George, et al., 2013) found on knowledge of self-foot care. In Iraq inadequate knowledge on foot care was closely linked to peripheral neuropathy (Saber & Daoud, 2018). In

Tanzania, many patients with type 2 diabetes got information about foot self-care from nurses (Chiwanga & Njelekela, 2015).

Information on smoking was crucial in relation to smoking status of the respondents. Those respondents who had good knowledge on effects of smoking in diabetes 62.6 percent were not smoking at the time of study. Either they were past smokers or never smoked. Majority of the respondents who were smoking had poor knowledge on effects of smoking in a patient with diabetes. In this study smoking contributed significantly to development of foot ulcers. These results are in agreement with those revealed by (Dikeukwu, 2013) in a study on performance and awareness on recommended foot self-care practices among patients with diabetes which also reported smoking as a predictor to development of foot ulcers in South Africa. Smoking was also reported in a study in India of foot care practices, that those patients who were smoking during the time of study had higher risk of foot ulcers (Chellan, et al., 2012).

5.3 Practices on Diabetic Foot Self-Care

5.3.1 Association Between Practice of Self-Foot Care and Development of Foot Ulcers

In this study, walking bare foot and dressing of blisters with sterile dressing was associated with foot ulcers. Those patients, who reported to be walking bare foot in and out of the house, were prone to develop foot ulcers compared to those who wore shoes. Walking bare foot was linked to risk of foot injury which can develop into foot ulcer. 2 percent of the respondents often bare footed while 70.7 sometimes walked bare foot. These results concur with those reported by (Taksande, Thote, & Jajoo, 2017) in a study on attitude, practice, and knowledge on foot care among patients with diabetes at central rural India which showed that bare foot walking increases chance of developing foot ulcer.

Those patients who reported presence of a blister to a health care worker and had it dressed, rarely developed foot ulcers compared to those patients who ignored the blister to heal on its own. 4.7 percent often applied a dressing while 34.7 percent sometimes dressed a blister with sterile dressing. Foot blisters which were not dressed were prone to infection that led to foot ulcers. These results are similar to those found by in a study on diabetic foot diseases in Ethiopia (Amogne, Reja, & Amare, 2013).

Few patients reported to check inside their shoes before wearing them. However this was not linked with foot ulcers development. In a study done in a rural area by (Selvakumar & Shah, 2016) revealed that none of the patients checked inside their shoes before wearing them.

On the practices of foot care, in this study, using Lukewarm water for washing feet, daily changing of socks, skin care of the feet, and not to apply cream between toes was associated with good foot care practice. In Malaysia, similar results were reported however in that study checking of temperature of water used to wash the feet was poorly done (Muhammad-Lutfi, Zaraihah, & Anuar-Ramdhan, 2014).

Wearing of shoes with socks often, ensuring the feet and between the toes are dry were connected to increased foot ulcer prevention. In this study, few patients were practising these ideal practices. This was linked with deficit of knowledge on ideal practices on foot care. This was supported in a focus group discussion when it became evident that most of the information given was related to diet.

> *I teach my patients mostly on the food portions to eat and type of food to take. This helps on maintaining glycemic blood sugars within the normal ranges. We rarely emphasize on foot care not unless a patient asks a specific question on foot care.*
>
> *(Respondent 9 from Embu level 5 hospital)*

5.4 Patients' Related Barriers to Foot Care Practices.

In this study, impaired vision, 41.1 percent(122), inability to reach their feet, 55.6 percent (165),knowledge deficit on diabetic foot care,42.8 percent (127), Failure to realize the importance of the practice,38.4 percent (114) and those could not afford the recommended shoes, 10.1 percent (30) were the main barriers associated with foot ulcer development. These results were based on 219(73.7 percent) respondents who reported to have barriers to foot self-care out of 297 participants of the study

From this study it is clear that majority 219(73.7 percent) of the participant encounter several barriers while trying to self-manage their foot care. This was consistent with a study done by Seid and Tsige (2015) Ethiopia on barriers to foot care practices which

indicated that out of 313 participants, 162 (54 percent) experienced some hindrance to the effective foot care. Impaired vision and inability to reach the feet for inspection among the participant in this study were among the major barriers identified but this was contrary to the same study by (Seid and Tsige 2015) which indicated that it was among the least barriers bothered the participant,9 (5.5 percent) and 6(3.7 percent) respectively. Both studies being done in developing countries, it is suggestive that each country has its own unique barriers which cannot be generalized,

On the knowledge deficit was supported by a study done by Bago, (2017) in Ethiopia which indicated poor knowledge as the major contributing factors to poor practice level of self-foot care. It was also in line with Seid and Tsige (2015) findings which showed 82 (50.6 percent) did not know what to regarding foot care practices and that suggest poor knowledge. Amogne, et al, (2013) also indicated that poor knowlegde on diabetes foot care as a main barriers to effective foot self-care practice.

5.5 Health Care Providers Perspective on Patients Compliance with Appropriate Foot Care Instruction

The results analysis identified three broad themes: Kind of health messages given to the client which came out clearly as blood glucose control, diabetic food diet and very little emphases on diabetic foot care; barriers encountered when delivering the intended health messages which was also indicated as communication barriers, staff shortages, patients attitude and lack of appropriate teaching materials and lastly facilitators to dissemination of these health messages to the clients (N, 2015).

Despite the fact that foot ulcer is one of the most devastating and common complications associated with diabetes mellitus, its evident that foot self-care health messages is not a priority among health workers. This was clearly indicated from this study: *"I teach my patients mostly on the food portions to eat and type of food to take. This helps on maintaining glycemic blood sugars within the normal ranges. We rarely emphasize on foot care not unless a patient asks a specific question on foot care" (R9).* This was also supported in a study done by Guell and Unwin (2015) that health provider's and workers dealing clinical diabetes management, control and prevention is to attain diabetes (glycaemic) control in their patients. Foot care comes as additional treatment and care following tight glycaemic controls and measures. It is also indicated

from Guell and Unwin (2015) that staff shortage is also a factor hindering the delivery of the appropriate health messages to the diabetes client which is consistent with the finding from this study that; *"In my place of work, it's recommended that the diabetic patients are given health message on diabetic food, foot care practices and general health care. However, this is not done due to understaffing. As a nurse you are expected to attend to various patients and at the same time teach the diabetic patients. When time is available we do that, but sometimes we send them to the nutritionist for counselling. Sometimes the patients request for specialised care and screening for the risk factors for development of foot ulcers. Unfortunately, the specialists visit the facility once in a while and can't reach all the diabetic patients."(R8)*

CHAPTER SIX
SUMMARY, CONCLUSSION AND RECOMMENDATION

6.1 Summary of the Research Findings

The research found out that most of the patients seeking diabetic health care services in Embu County have their ages ranging from 40 to 89 complete years with a mean age of 63 years. Majority of the respondents were married, Christians and never smoked in the past. An average number of participants had a primary level of education with some having tertiary education and others non-formal education.

In this study, the patients who went to the diabetic clinic during the duration of study were above 40 years of age, increasing in age was closely linked risk of developing diabetes type 2. Patients having diagnosed with diabetes for less than 5 years by the time of study, other between 6-10 years and others more than 11 years. Those having lived with diabetes for more five years had a greater risk of developing foot ulcer compared to the once who were diagnosed recently.

Some patients reported to have been smoking in the past and a few were currently smoking. A minimal number reported to chew or take oral tobacco in the past. None of the respondent was found or reported to chew or take oral tobacco currently. Smoking or past history of smoking was closesly linked to the risk of developing foot ulcers. The number of cigarette smoked was not significant in the study.

Source of income and level of education were varied and neither of the two was associated with foot ulcers. However, the level of education was associated with understanding of what diabetes is and its management. Most of them were farmers, with some having formal employment and others self-employment.

Among the individual characteristics; smoking currently or in the past was linked to foot ulcers development. Increase in age was also a factor increasing the chances of developing foot ulcers. The older patients were found to be prone to minor injuries which were untreated and these developed to foot ulcer, sometimes they reported forgetting to take their medication and this led to diabetic foot complications.

Many of the patients living with diabetes were aware of what appropriate diabetic foot care meant. The ones who knew what the practice entailed indicated to have gotten the information from the health care workers. Some got the information from community health worker and others from school or their own reading. It was evident that those who got the knowledge from school or own reading did not have exact details on self-foot care practices. Other aspects of knowledge on diabetes were assessed to include how frequent to inspect their feet, frequency of washing their feet, trimming of toe nails, exercises, and effects of smoking in diabetes. Out of all these knowledge on effects of smoking on diabetes was considerably linked with foot ulcers development. Those who had this knowledge were not smokers or ceased smoking. Smoking was identified as a risk factor to development of foot ulcers.

Various aspects of practice of diabetic foot care were assessed in a set of questions. They were ranging from examination of feet; feet care practices, walking bare foot, changing of socks, foot wear and application of oils to feet and in between the toes. It was found that the patients who reported to be walking bare foot in or out of the house were at a greater risk of developing foot ulcers. This was associated with minor injuries sustained in case of bare foot walking. The type of foot wear was assessed but was not considerably linked to the development of foot ulcers. There were those patients who reported to have developed foot blisters, those whose blisters were dressed and kept clean healed while those, whose blisters were not dressed, developed foot ulcers. There it was indicated that dressing or not dressing of the blisters can lead to development of foot ulcer or prevention. Wearing of socks often, always ensuring the feet are dry after washing them and drying in between the toes were considerably linked to foot ulcers prevention. However in this study it was evident that few patients practiced these ideal practices due to knowledge deficit on ideal foot care practices.

The study identified presence of callus, sores, and blisters were most common risk factors. These risk factors were identified on examination during the time of study. Other minor risk factors included having infected toe nail, having an ingrown, moist skin and rough untrimmed toe nails. The patients were found to have limited knowledge relating foot ulcers development and its risk factors.

When the respondents were probed for barriers to self-foot care, impaired vision, inability to reach their feet, lack of family support in managing diabetes, knowledge deficit on ideal foot care practices and affordability of the ideal diabetic foot wear were cited as the barriers to effective foot care practices. This was supported by information obtained during focus group discussion which revealed a gap in giving specific health message on foot care due to lack of adequate time, staff shortages, patients attitude, lack of visual aids for teaching and communication barrier between the patients and the heathcare provider. Though there were some barriers in disseminating foot self-care health messages but there were also some facilitating factors which enabled health care providers to achieve the much they were able to, which included regular training and workshops to equip them with current updates, team work spirit among them, formation of support groups among the clients and getting facilitation from specialist such as ophthalmologist, renal specialist, from other organization. This was also obtained during focused group discussion.

6.2 Conclusion

Based on the researchers' findings; religion, source of income, level of education and gender did not affect significantly the practice of the ideal self-foot care practice. The age of the respondent, their smoking status and the duration they had lived with the diabetes disease significantly determined development of foot ulcers.

It was evident that the diabetic patients in Embu County have knowledge deficit on details of self-foot care; however, there was good knowledge among the patients who got the information from the health care providers. The patients who had obtained knowledge on foot care from other sources did not get the ideal practices. Knowledge on effects of smoking on diabetes was closely linked to foot ulcers prevention.

On practice of foot care practices, wearing shoes without socks, walking bare foot was connected to the risk of foot ulcers development while dressing of blisters with a sterile dressing, drying feet after washing and drying in between the toes was associated with prevention of developing foot ulcers.

On patient related barriers, impaired vision, inability to reach the feet for inspection, knowledge deficit, and inability to afford recommended shoes were cited as the major barriers to effective foot care practices.

When the health care providers were probed on their perception on patient's compliance with appropriate foot care instructions, three themes were identified; health messages given concentrating on blood glucose control, diabetes diet and very little on foot care practices; barrier to effective delivery of health messages which included communication barriers, staff shortages, patients attitudes and lack of appropriate teaching materials and finally facilitating factors to their delivery of health messages such regular training for updates, team work spirit support group linkage among the diabetes patient and occasional facilitation by external experts

6.3Recommendations

6.3.1Recommendations for Policy Makers

i. The Government of Kenya to make policies and guidelines on implementation of support groups among diabetic patients in all hospitals, to endow the patients with knowledge on diabetes prevention and management of its complications.
ii. The Ministry of Health under the Kenyan Government should involve the county government so to carry out rigorous campaigns on practice of the recommended diabetic foot care practices in management of diabetes to reduce the burden on drug procurement and promote good health of her citizens.

6.3.2 Recommendation for Practice

i. The health care workers and providers to champion for empowering practice of diabetic foot care practices through support group linkages and counseling as the country tries to attain sustainable development goals.
ii. The health care provider to ensure availability of the charts used to demonstrate ideal foot care practices.

6.3.3 Recommendation for Further Research

i. A qualitative research should be done on attitude and perception of health care workers towards diabetic foot care practices among patients with diabetes in

Embu County Kenya. The study revealed that, most health care providers were giving health messages related to diet most than foot care practices.

ii. A qualitative study should be conducted on determinants of knowledge levels on diabetic foot care practices among diabetic patients in Embu County Kenya. The study identified a knowledge gap in delivery of knowledge on ideal self-foot care practices to diabetic patients.

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APPENDICES

APPENDIX I

PARTICIPANT QUESTIONNAIRE

Code……..

Section A: Socio-Demographic data

1. Age (Yrs) ……
2. Sex
    a) Male
    b) Female
3. Marital status
    a) Single
    b) Married
    c) Separated
    d) Divorced
    e) Widowed
4. Level of education
    a) Tertiary
    b) Secondary
    c) Primary
    d) No formal education
5. Religion
    a) Christian
    b) Muslim
    c) Others(specify)
6. Source of income
    a) Farming
    b) Formal employment
    c) Informal employment
    d) Unemployment
7. Do you smoke cigarettes?
    a) Currently smoking
    b) Past smoker
    c) Never smoked
8. If ever smoked or smoking how many sticks per day…….

9. Do you take oral tobacco
    i. Currently oral tobacco
    ii. Past took oral tobacco
    iii. Never took oral tobacco

Section B: Clinical Characteristics

10. For how long have you had diabetes mellitus?

a) Less than 5 years
b) 6 to 10 years
c) 11 to 15years
d) 16 to 20 years

11. What kind of diabetes treatment are you on?

a) Insulin
b) Oral antidiabetics
c) Combined

12. What is your BMI value

a) Less than 18.5kg/m^2
b) 18.5 – 24.5kg/m^2
c) 24.5 – 30kg/m^2
d) Above 30kg/m^2

13. Have you ever had/have foot complication

a) Yes (proceed from question 14)
b) No (proceed from section C)

14. Have you ever had any of following foot problem

a) Corns
b) Ingrown nails
c) fissures
d) Athletes foot
e) Deformity
f) Charcot's athropathy
g) Oedema
h) foot ulcer

15. How long after being diagnosed with diabetes did you get foot problems?
    a) Less than 5 years
    b) 6 to 10 years
    c) 11 to 15 years
    d) Over 16 years

Section C: knowledge of foot self-care (tick the appropriate answer)

16. Do you know what foot self-care is
    a) Yes (proceed from question 2)
    b) No (proceed from question 4)

17. If yes how would you define it?
    a) All preventive and corrective practices carried out on the foot and ankle by individual in order to prevent occurrence of foot complication or manage them if they have already occurred
    b) Ensuring the feet are dry after washing it
    c) Wearing appropriate shoes
    d) Inspection of foot regularly

18. From where did you hear/learn of foot care?
    a) Healthcare provider
    b) Community health worker
    c) School
    d) Own reading

19. DM patients should take medication regularly because they are liable to get DM complication
    a) I do know
    b) I don't know

20. DM patient should look after their feet because they may not feel a minor injury to their feet
    a) I do know
    b) I don't know

21. DM patients should maintain blood sugars within normal range to reduce risk of diabetic foot complication
    a) I do know
    b) I don't know

22. DM patients should inspect their feet regularly because they get foot ulcer unknowingly
    a) I do know
    b) I don’t know
23. How often are you expected to inspect inside your footwear for object or torn lining
    a) Often
    b) Sometimes
    c) Rarely
    d) Never
24. DM patient should not smoke or chew tobacco because smoking causes poor blood circulation affecting the feet
    a) I do know
    b) I don’t know
25. If you found redness/bleeding between your toes what is the first thing you do
    a) Leave it for some days and see if it goes away
    b) Wash it
    c) Report to the health care provider
    d) Don’t know
26. What temperature of water do you think you should wash your feet in
    a) Hot
    b) Cold
    c) Lukewarm
27. How do you trim your long nails on the foot
    a) Trim nails straight across and filling sharp corners to follow the contours of the toe
    b) Trim nails following the contours of the toe
    c) Trim nails straight across only
    d) Trim nails following the contour then filing sharp edge
28. How often are you expected to do exercise
    a) Often
    b) Sometimes
    c) Rarely
    d) Never

Section D: Practices of foot self-care (Please tick the category which best reflects what you actually do)

29. Do you examine your feet?
    a) More than once a day
    b) Once a day
    c) 2-6 times a week
    d) Once a week or less
30. Do you check your shoes before you put them on?
    a) Often
    b) Sometimes
    c) Rarely
    d) Never
31. Do you check your shoes when you take them off?
    a) Often
    b) Sometimes
    c) Rarely
    d) Never

32.. Do you wash your feet?
    a) More than once a day
    b) Once a day
    c) Most days a week
    d) A few days a week
33. Do you check your feet are dry after washing?
    a) Often
    b) Sometimes
    c) Rarely
    d) Never
34. Do you dry between your toes?
    a) Always
    b) Often
    c) Sometimes
    d) Rarely/Never

35. Do you use moisturizing cream on your feet?

a) Daily
b) Once a week
c) About once a month
d) Never

35. Do you put moisturizing cream between your toes?

a) Daily
b) About once a week
c) About once a month
d) Never

36. How often are your toenails cut?

a) About once a week
b) About once a month
c) Less than once a month
d) Never

37. Do you wear slippers with no fastening?

a) Most of the time
b) Sometimes
c) Rarely
d) Never

38. Do you wear trainers?

a) Most of the time
b) Sometimes
c) Rarely
d) Never

39. Do you wear shoes with lace-up, Velcro or strap fastenings?

a) Most of the time
b) Sometimes
c) Rarely
d) Never

40. Do you wear pointed-toed shoes?
    a) Most of the time
    b) Sometimes
    c) Rarely
    d) Never
41. Do you wear flip-flops or mules?
    a) Most of the time
    b) Sometimes
    c) Rarely
    d) Never
42. Do you break in new shoes gradually?
    a) Always
    b) Most of the time
    c) Sometimes
    d) Rarely /Never
43. Do you wear artificial fiber (e.g. nylon) socks?
    a) Most of the time
    b) Sometimes
    c) Rarely
    d) Never
44. Do you wear shoes without socks/stockings/tights?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often
45. Do you change your socks/stockings/tights?
    a) More than once a day
    b) Daily
    c) 4-6 times a week
    d) Less than 4 times a week
46. Do you walk around the house in bare feet?
    a) Often
    b) Sometimes
    c) Rarely

d) Never

47. Do you walk outside in bare feet?
    a) Often
    b) Sometimes
    c) Rarely
    d) Never
48. Do you use a hot water bottle in bed?
    a) Often
    b) Sometimes
    c) Rarely
    d) Never
49. Do you put your feet near the fire or on a radiator?
    a) Often
    b) Sometimes
    c) Rarely
    d) Never
50. Do you use corn remedies/corn plasters/ paints when you get a corn?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often
51. Do you put a dry dressing on a blister when you get one?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often
52. Do you put a dry dressing on a blister, cut, or burn when you get one?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often

Section E: Barriers of Foot Care. (Patient related barriers)

53. Do you encounter barriers that limit you from proper foot care?

a) Yes

b) No

54. What kind of barriers do you encounter in relation to self-foot care? (Tick the appropriate choices for you or add any other choices)

	Correct	Incorrect
I could not see well enough		
I could not reach my foot		
I could not afford buying shoes		
I did not think it was important		
I did not know what to do		
Poor communication between nurse and patient		
Lack of family support		
Bare foot walking is common in our society		
Lack of motivation/intelligent		

APPENDIX II

OBSERVATION CHECKLIST

Code ……..

Foot appearance	Yes	No
Presence of ulceration		
Presence of skin fissures, cracks		
Presence of infected toe nail		
Presence of callus, corns		
Presence of blisters		
Presence of abrasion		
Presence of sores		
Presence of foot deformity		
If ulcer present, was sterile dressing applied on the affected part		
Skin		
Dry		
Moist between toes		
Toe nail appearance		
Trimmed		
Not cut to the shape of the toe		
Presence of rough edges or corners		
Presence of ingrown		
Presence of infected ingrown		
Nature of footwear		
Soft upper		
Soft/cushioned insoles		

Footwear during evaluation	Yes	No	Presence of foreign object/s
Lace-up, closed, leather shoes			
Boots			
Sneakers/Rubber shoes			
High heels			
Sandals			
Rubber slippers/Flip-flops			
Custom-made shoes			
Plastic shoes			
Barefoot			

APPENDIX III

FOCUS GROUP DISCUSSION AMONGST THE KEY INFORMANTS

Code ……

In your own opinion:

i. What type of foot care education/information do you give?
ii. When do you typically provide this information?
iii. How patient foot care education/information is provided (mode of delivery)?
iv. What is your perceived barriers to the provision of education on foot care?
v. What is your perceived facilitators to the provision of education on foot care?

APPENDIX IV

RESEARCH AUTHORISATION

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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Date: **17th January, 2019**

Annastacia Munzi Mbisi
Chuka University,
P. O. Box 109-60400
CHUKA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Foot care practices among adult patients with Type II Diabetics Mellitus attending Diabetes Clinics in Embu County"*** I am pleased to inform you that you have been authorized to undertake research in **Embu County** for the period ending **17th January, 2020.**

You are advised to report to **the County Commissioner, the County Director of Education and the County Director of Health Services, Embu County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Embu County.

The County Director of Education
Embu County.