RISK FACTORS ASSOCIATED WITH DIABETIC FOOT ULCER AMONG PEOPLE LIVING WITH DIABETES ATTENDING GOVERNMENT OWNED HOSPITALS IN OWERRI, IMO STATE

BY

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A THESIS SUBMITTED TO THE POST GRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI, IMO STATE, NIGERIA.

JULY, 2023

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IN PARTIAL FUFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PUBLIC HEALTH (MPH) DEGREE

JULY, 2023

CERTIFICATION

This is to certify that this work "**RISK FACTORS ASSOCIATED WITH DIABETIC FOOT ULCER AMONG PEOPLE LIVING WITH DIABETES ATTENDING GOVERNMENT OWNED HOSPITALS IN OWERRI, IMO STATE**" was carried out by **NWOKELEME OGECHI CHIKAODI (20184139408)**, in partial fulfillment for the award of the degree of Master of Public Health (MPH in Epidemiology and Biostatistics) in the Department of Public Health, Federal University of Technology, Owerri.

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i.

DEDICATION

This thesis work is dedicated to people living with diabetes especially those battling with diabetic foot ulcer.

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TABLE OF CONTENTS

DEDICATION iii

ACKNOWLEDGEMENTS iv

ABSTRACT v

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background to the study 1

1.2 Statement of problem 3

1.3 Objectives of the study 4

1.3.1 General objective 4

1.3.2 Specific objectives 4

1.4 Research hypotheses 4

1.5 Significance of the study 5

1.6 Scope of the study 5

CHAPTER TWO 7

LITERATURE REVIEW 7

2.1.1 Concept of diabetes mellitus 7

2.1.2 Concept of diabetic foot ulcer 8

2.1.3 Path Physiology of diabetic foot ulcer 9

2.1.4 Epidemiology of Diabetic Foot Ulcers 13

2.1.5 Symptoms of diabetic foot ulcer 15

2.1.6 Prevention of DFU 15

2.1.7 Diagnosis of DFU 15

2.1.8 Treatment of DFU 17

2.1.9 Complications of DFU 18

2.1.10 Risk factors of DFU 18

2.2 Theoretical Framework 19

2.2.1 The health belief model 19

2.3 Empirical Studies 23

2.3.1. Summary of relevant literature reviewed 39

CHAPTER THREE 40

MATERIALS AND METHODS 40

3.1 Study design 40
3.2 Area of study 40
3.3 Study population 42
3.4 Sample size and sampling technique... 42
3.4.1 Sample size... 42
3.4.2 Sampling method... 43
3.5 Instrument for data collection 44
3.6 Validity of instrument 44
3.7 Reliability of Instrument 45
3.8 Method of data collection... 45
3.9 Method of data analysis... 45
3.10 Ethical considerations/ informed consent 46
CHAPTER 4 47
RESULTS AND DISCUSSION 47
4.1.1 Socio-demographic Characteristics of the Respondents. 47
4.1.2 Associating Socio-demographic Factors of Foot Ulcer among people living with Diabetes Studied... 48
4.2 Influence of foot care knowledge on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state 51
4.3 Patterns of diabetes management on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state 54
4.4 Association between duration of diabetes and diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State 56
4.5 Discussion 57
CHAPTER FIVE 60
CONCLUSION AND RECOMMENDATIONS 60
5.1 Conclusion... 60
5.2 Recommendations 60
REFERENCES 61
APENDIX A 69
QUESTIONNAIRE 69
APPENDIX B 72

APPENDIX C 73
APPENDIX D 74
APPENDIX E.. 75
OPERATIONAL.. 75
DEFINITION OF TERMS 76

LIST OF TABLES

Table 4.1: Socio-demographic Factors of Foot Ulcer among people living with Diabetes Studied 50

Table 4.2: Influence of foot care knowledge on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state. 53

Table 4.3: Pattern of diabetes management on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State. 55

Table 4.4: Association between duration of diabetes and diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state 56

LIST OF FIGURES

Figure 2.1: Health belief model 20

Figure 3.1: Geological map of Owerri 41

LIST OF APPENDIXES

Appendix A Questionnaire 69

Appendix B: Reliability Statistics 72

Appendix C Letter of introduction 73

Appendix D Ethical clearance from Imo state ministry of health 74

Appendix E: Ethical clearance from F.M.C Owerri 75

ABSTRACT

Diabetic foot ulcer is the most common life threatening complication associated with diabetes, a metabolic disorder characterized by elevated blood glucose. It results in medical and socioeconomic burden for the patients, families, society and also countries. In Imo State Nigeria, there is not much of literature on epidemiological studies on diabetic foot ulcer among persons living with diabetes. Therefore, the aim of this study was to determine the risk factors associated with diabetic foot ulcer (DFU) among persons living with diabetes in government owned hospitals in Owerri, Imo State.

A hospital based case control study design was adopted for this study. Simple random sampling technique was used to select the 400 study participants from people living with diabetes attending government owned hospitals who fulfilled the criteria, of which 200 were cases and 200 controls. Well-structured questionnaire alongside patient folder was used to collect information on demographic factors, foot care knowledge, diabetes management pattern and diabetes duration. All data were entered and analyzed using the International Business Machine (IBM) Statistical Package for the Social Sciences (SPSs) version 22.

Results clearly indicated that 260 (65%) were males. For the case group, the males were 140 (70%) while they were 120 (60%) females in the control group. more than half of the total subjects (205: 51.2%) were of age 51 – 70 years (case group: 70%, control group: 32.5%). The 31 – 50 years comprised of 17.5% of the case group and 59.5% in the control group. only 8 (2%) subjects in all were up to or below 30 years and they all fall within the control group (4%). There were approximately 54% of foot ulcer cases in males against 43% in females, consequently the risk for foot ulcer was found to be 36% significantly lower among females than in males (p= 0.036, X2= 4.40, OR= 0.64). Diabetes foot ulcer increased significantly with age (p< 0.0001, X2= 96.78), with 76% cases recorded for the above 70 compared to 68% and 23% respectively on the 51-70 years and 31- 50 years. Using the above 70s as the reference age group, the odds for foot ulcer were found to lower by 39% among the 51-70 years (p= 0.388 X2= 0.74, OR= 0.69) and 91% significantly lower among the 31- 50 years (p< 0.0001, X2= 35.1, OR= 0.09). The foot ulcer cases were estimated to be 69.9% among those that responded they have not heard of it in the past. The risk for the disease was close to 6 times higher among the group that did not hear of the foot care (p < 0.0001, X2= 69.03, OR= 5.88). Similarly, the odds were also significantly higher among those that do not perform regular foot examination (p < 0.0001, X2= 44.90, OR= 7.17), or only do so sometimes (p < 0.0001, X2= 17.50, OR= 3.37), compared to those that conduct regular examination of foot. Not following diabetes diet plan (p < 0.0001, X2= 52.17) as well as not taking diabetes medication (p < 0.0001, X2= 52.17) are significant risk factors of foot ulcer in this study (p< 0.0001.

In conclusion, this study found that a significant number of risk factors exist among people living with diabetes attending government owned hospitals in Owerri, Imo state. Considering sociodemographic factors, the study result showed that level of education, occupation, male gender and age were significant risk factors. Furthermore, lack of foot care knowledge and practice, poor diabetes management pattern and long term diabetes duration all contribute to risk of developing DFU. The researcher recommended that surveillance of DFU should be carried out in the state, risk targeted public health interventions in communities, monitoring and evaluation of treatment uptake, education on foot care practices and further studies on suicidal ideation among people living with diabetes.

Keywords: Diabetic foot ulcers, Risk factors, Diabetes

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Diabetes mellitus, a metabolic disorder is a serious issue of public health concern and diabetic foot ulcer is the most common life threatening complication associated with diabetes. It results in medical and socioeconomic burden for the patients, families, society and also countries. Such burdens include long healing period, high disability rate and great medical expenses (Brem *et al.*, 2008The negative impact on the patient's quality of life and the associated economic burden on the patient, their family and health care systems make the prevention of diabetic foot ulcer very important (Khumar et al., 2014) The number of adults with diabetes in the world increased from 151 million in 1980 to 425 million in 2017 with a trend tilting towards further increase in times to come (IDF,2017). Global incidence of diabetic foot ulcers has been estimated to be 6.3% that is to say that from 10% to 34% of diabetics are likely to develop diabetic foot ulcers in their lifetime (Armstrong., 2017).

In developed countries, diabetic foot ulcers are the most feared complication of diabetes and a major cause of disability, mortality and morbidity. The rate of lower limb amputation in patients with diabetes mellitus is 15 times higher than patients without diabetes, it estimates that approximately 50% to 70% of all lower limb amputations are due to diabetic foot ulcer (Leone *et al.,* 2012). Although there is a rise in diabetes mellitus globally, sub Saharan Africa appears to be the worst hit (International Diabetes Federation, 2017). Nigeria in the last two decades has witnessed more than 100% increase in the prevalence of the disease from 2.2% in 1997 to 6% in 2015 (Adeloye et al., 2017). The burden of diabetic foot ulcer in Nigeria has been reportedly high with the prevalence rates ranging from 11% - 32% among hospitalized patient (Arumah et

al., 2017). With the rapid increase in prevalence of diabetes in Africa, the burden of DFU is expected to increase in the region. Studies have shown that severity of diabetic foot ulcer is the strongest significant risk factor of amputation for diabetic patients (Visvianathan *et al.*, 2011). One in every 6 diabetic patients are likely to suffer diabetic foot ulcer. It is reported that every 30 seconds a leg is amputated due to diabetic foot ulcer worldwide (Richard et al.,2008 and IDF, 2017). The life time risk of developing DFU is between 19% and 34% and recurrence is common after healing. (Edmond et al., 2021). Poor glycemic control and previous ulcer have been found to be additional associated risk factors for diabetic foot ulcer (Denan, 2017). Also explorations into temporal associations of diabetic foot ulcer reveals that it is significantly associated with peripheral sensory neuropathy, peripheral vascular disease and walking barefoot (Akaninyere *et al*., 2013)

Certain risk factors such as retinopathy, elevated waist circumference, hyperkeratosis have been associated with DFU (Zantour *et al*., 2020). The largest identified risks for developing diabetic foot ulcer include neuropathy, peripheral vascular disease, hypertension, charcot joint. The risk increases further when there is a current or past history foot ulcer, gangrene or amputation (Al-Rhubeann *etal*., 2015). DFU is complex and difficult to treat, more than half of DFU become infected and risk of death within 5 years for diabetic patients with ulceration is higher than in diabetic patients with no foot ulcer. With the constant increase in the prevalence of diabetes in Africa, Nigeria in particular, the burden of diabetic foot ulcer is expesscted to also be on the increase, so understanding the risk factors will be of utmost importance.

Therefore, the following research questions where thus formulated to guide the study:

1) To what extent is socio demographic factors associated with diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state?

2) What is the influence of foot care knowledge on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

3) What is the influence of pattern of diabetes management on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

4) What is the influence of duration of diabetes on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

1.2 Statement of problem

The prevalence rate of diabetes was said to be 10.7% among patients attending Imo state owned hospitals (Adogu et al.,2015) and DFU accounts for the majority of non-traumatic amputations in Nigeria. Diabetic foot ulcer was one of the most common complication of diabetes among adult diabetic patients who presented at the government owned hospital in Imo State (Ezeama, 2019). It is noteworthy that recent reports show that there is a high prevalence rate of DFU in Nigeria. The burden of DFU in Nigeria has prevalence rate ranging from 11% - 32% among hospitalized patients (Arumal *et al.,* 2017). The above showed that Diabetic foot ulcer was a major concern in Imo state, Nigeria.

Furthermore, the belief system of people with leg ulcers as having stepped on poison, he increased trend in amputation as a result of diabetes and limited studies on diabetic foot ulcer in Imo State, Nigeria, has prompted this study.

Finally, in order to carry out an effective prevention and control of diabetic foot ulcer among people living with diabetes in Imo State, the pattern of occurrence of the condition as regards risk factors among persons in the state must be studied.

1.3 Objectives of the study

1.3.1 General objective

To determine risk factors associated with diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

1.3.2 Specific objectives

1) To identify socio demographic factors associated with diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

2) To determine the influence of foot care knowledge on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

3) To determine the influence of pattern of diabetes management on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

4) To determine the influence of duration of diabetes on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

1.4 Research hypotheses

Ho: Socio demographic factors do not pose significant risk for diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State.

Ho: Foot care knowledge has no significant influence on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State.

Ho: Pattern of diabetes management has no influence on diabetic foot ulcer among g people living with diabetes attending government owned hospitals in Owerri, Imo State.

Ho: Duration of diabetes do not significantly influence diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State

1.5 Significance of the study

The rising prevalence of diabetes mellitus in sub-Saharan Africa with Nigeria being the worst hit and several risk factors has led to a rise in diabetic foot ulcer in the population. Risk factors are variables associated with increased risk of a disease.

Basically, this study is aimed determining risk factors associated with diabetic foot ulcer peculiar to people living with diabetes attending government owned hospitals in owerri in Imo State. Knowledge of causal inference of exposure factors can help in the creation of prevention programs targeted at disrupting the natural history of diabetic foot ulcer among diabetes.

This study will help researchers to understand from a case control approach the risk factors associated with diabetic foot ulcer in this particular population. Thus, it will not only be beneficial to researchers but also to people living with diabetes in the state, medical practitioners, NGOs and the common man.

In long term, as a nation, there will be increased work productivity as most of the work force which belong to the group being affected by the condition will have reduced morbidity. Also the monies used for management of this ailment can to other profitable ventures.

1.6 Scope of the study

This study was limited to the risk factors associated with diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State. Owerri being the capital of Imo state was used as the study area. Also this study encompasses diabetics who have resided for at least 6 months and above in owerri, Imo State. The population for the study were

persons aged 18yrs and above. The independent variable is the risk factors while the dependent variable is the diabetic foot ulcer. The research design is case control.

CHAPTER TWO

LITERATURE REVIEW

2.1.1 Concept of diabetes mellitus

Diabetes mellitus is a metabolic disease characterized by high blood sugar that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Sugars are one of the three types of carbohydrates along with starch and fiber. Once the body absorbs simple sugar, it usually converts them all into glucose which is an important source of fuel for the body. Glucose is the sugar that is transported throughout the blood stream and taken up by cells. Insulin is a hormone, released from the pancreas that regulates the amount of glucose in the blood. Glucose in the blood stream stimulates the pancreas to produce insulin. This insulin in turn helps the glucose to move from the blood to the cells. Once inside the cells, glucose is converted to energy which is used immediately or is stored as fat or glycogen until it is needed.

Types of diabetes mellitus;

1) Type 1 diabetes mellitus: This is also known as insulin dependent diabetes mellitus. This is as a result of failure of the body to produce enough insulin. It is of immune mediated nature in which a T-cell mediated autoimmune attack leads to loss of beta cells which produces insulin, this in turn leads to insulin deficiency.

2) Type 2 diabetes mellitus: This is also known as non-insulin dependent diabetes mellitus. It begins with insulin resistance, a condition in which cells fail to respond to insulin properly. As the disease progresses, a lack of insulin may develop. This occurs primarily due to lifestyle factors and genetics example obesity, lack of physical activity, poor diet, stress and urbanization

3) Gestational diabetes: This occurs when pregnant women without previous history of diabetes develop high glucose level.

Symptoms of diabetes mellitus include; increased thirst, increased hunger, increased urination, blurred vision, drowsiness, nausea, decreased endurance during exercise, weakness, unexplained weight loss etc. Prevention and control of DM involves management, lifestyle modification and medications

Diabetes mellitus is associated with several complications classified as

i) Microvascular Complications: This is the result of damage to small blood vessels. These includes retinopathy (eye damage leading to blindness), nephropathy (kidney damage leading to renal failure), and neuropathy (nerve damage leading to impotence and diabetic foot disease)

ii) Macro vascular Complications: These are injuries to large blood vessels. These include cardiovascular diseases such as heart attack, stroke.

2.1.2 Concept of diabetic foot ulcer

Diabetic foot ulcer (DFU): Diabetic foot ulcer is a major complication of diabetes mellitus, and is defined as foot affected by ulceration that is associated with neuropathy and/or peripheral arterial disease of the lower limb in a patient with diabetes.

According to the World Health Organization and to the International Working Group on the Diabetic Foot; diabetic foot is defined as the foot of diabetic patients with ulceration, infection and/or destruction of the deep tissues, associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb.

Diabetic foot ulcers can be said to be an injury to all layers of skin, necrosis or gangrene that usually occur on the soles of the feet, as a result of peripheral neuropathy or peripheral arterial disease in diabetes mellitus (DM) patients (Alavi et al., 2014).

In simple terms it is described as an open wound on the lower extremity limb of a diabetic patient.

2.1.3 Path Physiology of diabetic foot ulcer

The pathophysiology of diabetic foot ulcers is complicated but the root etiology is said to be hyperglycemia which impairs host defenses at cellular level thus affecting the macrophages, leucocytes and other cell types. Several components cause added together create a sufficient impact for ulceration. DFU pathophysiology has vascular, neuropathic, and immune system components and they all have a close relationship with the hyperglycemic state of diabetic patient (Clayton et al., 2009 and Wolf et al., 2004)

Vascular System Components: Vascular changes leading to diabetic foot ulcers correlate with hyperglycemia-induced changes in peripheral arteries of the foot and are usually associated with cellular Start with a level (Clayton et al., 2009).

Prolonged hyperglycemia results in endothelial cell dysfunction and angiosclerosis of both large and small vessels, which leads to a decrease in vasodilators. Additionally, plasma thromboxane A2 levels are increased (Paraskevas *et al*., 2008). This results in peripheral arterial vasoconstriction and plasma hypercoagulability, leading to ischemia and increased risk of ulcers, impaired wound healing and the ability to fight infection. Peripheral arterial disease (PAD), which does not directly cause ulcers and is commonly seen with neuropathy, may increase the risk for people with diabetic neuropathy.

Neuropathic system components: Hyperglycemia causes oxidative stress in nerve cells and causes neuropathy. Further neuronal dysfunction follows glycosylation of neuronal proteins, leading to further ischemia. These cellular alterations manifest themselves in the motor, autonomic, and sensory components of neuropathic foot ulcers. Damage to the motor neurons of the leg muscles can lead to flexor and extensor muscle imbalances, anatomical deformities, and eventual skin ulcers. It reduces the ability of the skin on your feet to hydrate, which can lead to cracked epidermis and skin damage. Finally, due to decreased peripheral sensation, patients may be unaware of foot pain, which increases the rate of skin damage and neuropathic fractures. The blood supply required to heal diabetic foot ulcers is greater than that required to maintain intact skin, which can lead to chronic ulcers (Sumpio., 2012).

Immune System Component: Immune alterations include decreased healing response in diabetic foot ulcers. Increased T lymphocyte apoptosis that inhibits healing has been observed in patients with diabetic foot ulcers (Arya et al., 2013) The immune system of diabetics is much weaker than that of healthy individuals. It leads to impairment of polymorphonuclear cell function, such as action, intracellular killing. The immune system is compromised by decreased leukocyte activity, inappropriate inflammatory response and disruption of cell-mediated immunity,9 inhibition of fibroblast proliferation, keratinocyte basal layer impairment, and decreased epidermal cell migration. Leukocyte phagocytosis was significantly reduced, and improved bactericidal rates were directly correlated with improved hyperglycemia. Decreased chemotaxis of growth factors and cytokines and excess metalloproteinases lead to a long-lasting inflammatory state that interferes with normal wound healing. Studies have shown that serum glucose levels above 150 ml/dl compromise the immune system. Diabetics have a poor tolerance for infections, which

compromise diabetes control. This repeated cycle leads to uncontrolled hyperglycemia, further influencing the host's response to infection. (Clayton et al., 2009)

In brief, the effects of diabetes on key structures of the foot-ankle complex can be summarized as follows.

1)**Effects on skin**: The skin suffers greater than normal compressive and shear stresses, explaining the initiation of tissue damage that correlates very closely with the traumatic ulcer process. cracking, resulting in reduced hydration, reduced elasticity and susceptibility to mechanical stress.

2) **Effects on tendons and ligaments:** Glycosylation of the protein and consequent collagen abnormalities increase cross-sectional area. H. Thickening - tendons and ligaments and greater modulus of elasticity. The plantar fascia and Achilles tendon are particularly affected by this process. Both causes increase the stiffness of these structures.

3) **Effects on cartilage**: Similar to tendons and ligaments, cartilage changes in composition primarily due to changes in collagen fibers. This increases stiffness and reduces range of motion in all joints of the foot and ankle.

4) **Effects on muscles:** Diabetes mellitus causes severe damage to nerve conduction and impairs management of associated muscle fibers. As a result, both the intrinsic and extrinsic muscles of the ankle-foot complex are damaged structurally (reduced muscle mass) and functionally (reduced muscle strength).

5) **Impact on Peripheral Sensory system**: Conduction defects have a dramatic impact on peripheral sensors as they lead to loss of protection under the sole of the foot. This exposes the diabetic foot to thermal or mechanical trauma, delaying the detection of infectious processes or tissue degradation.

6) **Effect on foot morphology (deformation**) : Most of the above changes cause significant imbalances in the peripheral muscles and soft tissues of the foot, significantly altering morphology and determining the development of foot deformity. The most common foot deformities in diabetic patients are high longitudinal arches (stiff concave feet), hammer toes, and hallux valgus. A completely different morphological degeneration is neuropathic arthropathy, the analysis of which is not the subject of this discussion.

Types of diabetic foot ulcers

According to Edmonds 2006, diabetic foot ulcers are divided into two groups. marked as such. 1)**Neuropathic ulcer:** This occurs when peripheral diabetic neuropathy is present. It is marked as such: Your feet are warm, your circulation is good, you sweat less, and your skin is dry and cracked.

2)**Neuroischaemic ulcers:** This occurs when there is peripheral artery disease. It is marked as such: Your feet are colder, non-palpable pulsation, skin is thin, smooth and without hair, subcutaneous tissue atrophy, intermittent claudication.

Classification of diabetic foot ulcers

Although there are many classifications of DFU, the most commonly used classification system is the Wagner-Ulcer classification system. The purpose of the Wagner grade is to enable specialists to better monitor and treat diabetic foot ulcers. The above stated group of diabetic foot ulcer can further be classified using the Wagner grade. This grading system uses a number from 0 to 5 to classify diabetic foot ulcers.

Wagner grades are as follows:

i. Grade 0. Although diabetic foot ulcers do not exist, the risk of developing them is high.
ii. Grade 1. Early superficial ulcers. A superficial ulcer covers all layers of the skin but not the underlying tissue.
iii. Grade 2. Deep ulcers protrude beyond the surface into ligaments and muscles. There is no abscess or cellulitis and no bone has been exposed yet.
iv. Grade 3. Deeper ulcers develop due to inflammation or abscesses in the subcutaneous connective tissue. This includes infections of muscles, tendons, joints, and/or bones.
v. Grade 4. The tissue around the ulcer (toes and front feet only) is starting to disintegrate. This condition is called gangrene.
vi. Grade 5; Gangrene spreads from the local area of the ulcer and is widespread. This affects the entire foot (Oyibo et al., 2001)

2.1.4 Epidemiology of Diabetic Foot Ulcers

Diabetic foot ulcers (DFU) are one of the most disabling chronic complications of diabetes mellitus (DM), with prevalence exponentially increasing worldwide. The number of people with diabetes is currently estimated at 425 million worldwide, and this number is expected to rise to 629 million by 2045 (International Diabetes Federation, 2017). Also, with an adult diabetes prevalence of about 6%, equivalent to about 5 to 7 million adults, Nigeria currently hosts the largest number of persons living with diabetes than any sub-region in West Africa (International Diabetes Federation 2017).

Burden of DFU in Nigeria has been reportedly high with the prevalence of hospitalized patients ranged from 11% to 32% (Anumah et al., 2017)

About five years ago, the DFU amputation rate in Nigeria was as high as 52%(Edo et al., 2013)

DFU mortality was reported to be 14% in Africa and 40.5% in a Nigerian cohort (Rigato et al., 2018).

As the incidence of DM is rising dramatically worldwide, so is the incidence of diabetic foot disease The lifetime risk of a person with diabetes developing diabetes mellitus foot ulcers (DMFU) is reported to be as high as 25 %. In Nigeria, around 10% of people with diabetes suffer lower limb complications and the incidence is rising (Ogbera, 2006).

In the last two decades, Nigeria, for instance has witnessed more than a 100% increase in the prevalence of the disease, from 2.2% in 1997 to nearly 6% in 2015 (Adeloye, 2017).

Prevalence rates of DFU in Nigeria from several single center studies vary widely from 11.7%-32%. Similar wide variations have also been reported for DFU outcomes with amputation rates ranging from 12.6%-52% and mortality rates ranging from as low as 8.7% to above 40%

(Anumah et al., 2017).

Global prevalence of diabetic foot is 6.3% (95%CI:5.4–7.3%), and the prevalence in North America, Asia, Europe, Africa and Oceania was 13.0% (95%CI:10.0–15.9%), 5.5% (95%CI:

4.6–6.4%), 5.1% (95%CI:4.1–6.0%), 7.2% (95%CI:5.1–9.3%), and 3.0% (95% CI:0.9–5.0%). Diabetic foot was more prevalent in males than in females, and more prevalent in type 2 diabetic foot patients than in type 1 diabetic foot patients (Penzi et al., 2016)

According to a systemic review done by Penzi et al in 2017, that global diabetic foot ulcer prevalence was 6.3% (95%CI:5.4-7.3%), which was higher in males (4.5%, 95%CI:3.7-5.2%) than in females (3.5%, 95%CI:2.8-4.2%), and higher in type 2 diabetic patients (6.4%, 95%CI:

4.6-8.1%) than in type 1 diabetics (5.5%, 95%CI:3.2-7.7%).

2.1.5 Symptoms of diabetic foot ulcer

Symptoms of diabetic foot ulcer include;

I) Numbness and tingling sensation; This is loss of sensation or feeling on the feet,

II) Painless blisters, calluses or wounds; a blister or callused region of the pores and skin, that does not heal is very often linked to diabetic foot ulcer.

III) Purulent discharge; Purulent discharge is from wound alongside odor from the feet .

IV) Unusual swelling, redness and irritation; In the initial stages of DFU, bulging of the skin may be noticed. Overtime the area becomes swollen and visibly red..

V) Fever and chills; Usually fever higher than 101.5^{o}c together with chills is a sign of serious infection.

VI) Black tissue formation on wound site (this black tissue is called Eschar and it's as a result of lack of healthy blood supply to the ulcerated region.

2.1.6 Prevention of DFU

To save you the improvement of diabetic foot ulcer sure steps are observed

i. Frequent overview through a foot specialist.

ii. Good foot hygiene: this includes use of suitable shoes to lessen stress point, in addition to fending off injury.

iii. Careful glycemic control.

iv. Foot care education

2.1.7 Diagnosis of DFU

The cause of DFU may be decided through figuring out danger elements which includes diabetic peripheral neuropathy, noting that 50 percentage of human beings are asymptomatic, and ruling

out different reasons of peripheral neuropathy which includes alcohol abuse and spinal injury (Turns, 2012). This may be decided exactly via deep anamnesis and bodily exam.

1)History: The patient records is vital to be considering that maximum human beings with atherosclerotic disorder within side the decrease extremity are asymptomatic, patients who display signs and symptoms are located claudication, ischemic ache at rest, non-cured wounds and apparent leg ache. Cramps, weak point and leg discomfort are regularly felt by diabetics due to their tendency to be afflicted by occlusion of tibioperoneal atherosclerosis

2)**Physical exam:** According to Stillman (2008), bodily exam in patients with diabetic ulcers is split into three parts, namely:

i) Examination of ulcers and general circumstance of the extremities.

ii) Assessment of viable vascular insufficiency

iii) Assessment of viable peripheral neuropathy

3) Laboratory exam

i) Blood tests: leukocytosis may also suggest an abscess or different contamination of the foot.
Wound restoration is inhibited through the presence of anemia. The presence of arterial insufficiency that already exists, the country of anemia reasons ache at rest

ii) Metabolic profile: size of blood glucose, glychemhemlobin and serum creatinine facilitates to decide the adequacy of glucose law and renal function

iii) Noninvasive vascular laboratory exam: pulse volume recording (PVR) or plethysmography.

4) Radiological exam

i) A simple exam of the diabetic foot may also display demineralization and the charcot joint and the presence of osteomyelitis

ii) Computed tomographic (CT)scan and magnetic resonance Imaging (MRI): even though a skilled examiner can diagnose an abscess with a bodily exam, a CT test or MRI can be used to assist diagnose an abscess if the bodily exam is unclear

iii) Bone scanning remains questionable for its usefulness due to the massive fake high-quality and fake bad results. Recent studies cite 99mTc-categorised ciprofolxacin as a marker for osteomyelitis

iv) Conventional arteriography: While vascular or endovascular surgical procedure is planned, arteriography is essential to expose the volume and importance of atherosclerotic disorder.

2.1.8 Treatment of DFU

The main goal in the treatment of diabetic ulcers is wound closure (Alayi et al., 2014). The treatment of her DFU wound in DM patient is continuous with the type of action depending on the severity of the ulcer and the presence or absence of ischemia. The basics of DFU therapy are:

i. Necrosis/Debridement.
ii. Relieving Stress/Pressure on injury sight (Offloading)
iii. Diagnosing Bacterial Types and Treating Infections, Providing Appropriate Antibiotics and Ulcer Treatment using wound dressing that are clean and moist.
iv. Vascular grafting or bypass may be indicated in patients with peripheral arterial disease.
v. Wound dressings
vi. Relief by use of Total Contact Casting

vii. Hyperbaric Oxygen

2.1.9 Complications of DFU

The major complication of diabetic foot ulcers is leg amputation, further reducing quality of life and increasing mortality.

2.1.10 Risk factors of DFU

Risk factors are things or exposures that increase the chance of developing a disease. When it comes to risk factors in health and disease, it could be behavioral, physiological, demographic, environmental, or genetic.

According to Edo, Edo and Ezeani, (2013) Spontaneous blisters, peripheral vascular disease, peripheral neuropathy and visual impairment were common risk factors of diabetic foot ulcer.

According to lack of foot care education, diagnosis of visual impairment, hypertension and poor dietary habit were linked to presence of DFU.

Other factors such as previous extremity amputation, anatomic foot deformity, peripheral vascular disorder, visual impairment, diabetic nephropathy, terrible glycemic control and smoking have been identified (Lipsky et al., 2012).

2.2 Theoretical Framework

2.2.1 The health belief model

This is a social psychological health behavior change model which was developed to explain and predict health related behaviors, particularly in regard to the uptake of health services (Siddiqui *et al* 2016, Janz *et al* 1984). It was developed in the 1950s by social psychologists Hochbaum, Rosenstock and others who were working in the U.S. public health service in order to understand people's failure to adopt disease prevention strategies and screening in order to aid early detection of disease

The HBM suggests that a person's belief in a personal threat of an illness or disease together with a person's belief in the effectiveness of the recommended health behavior or action will predict the likelihood that the person will adopt the behavior.

This study used its construct as a framework to understand risk factors associated with diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

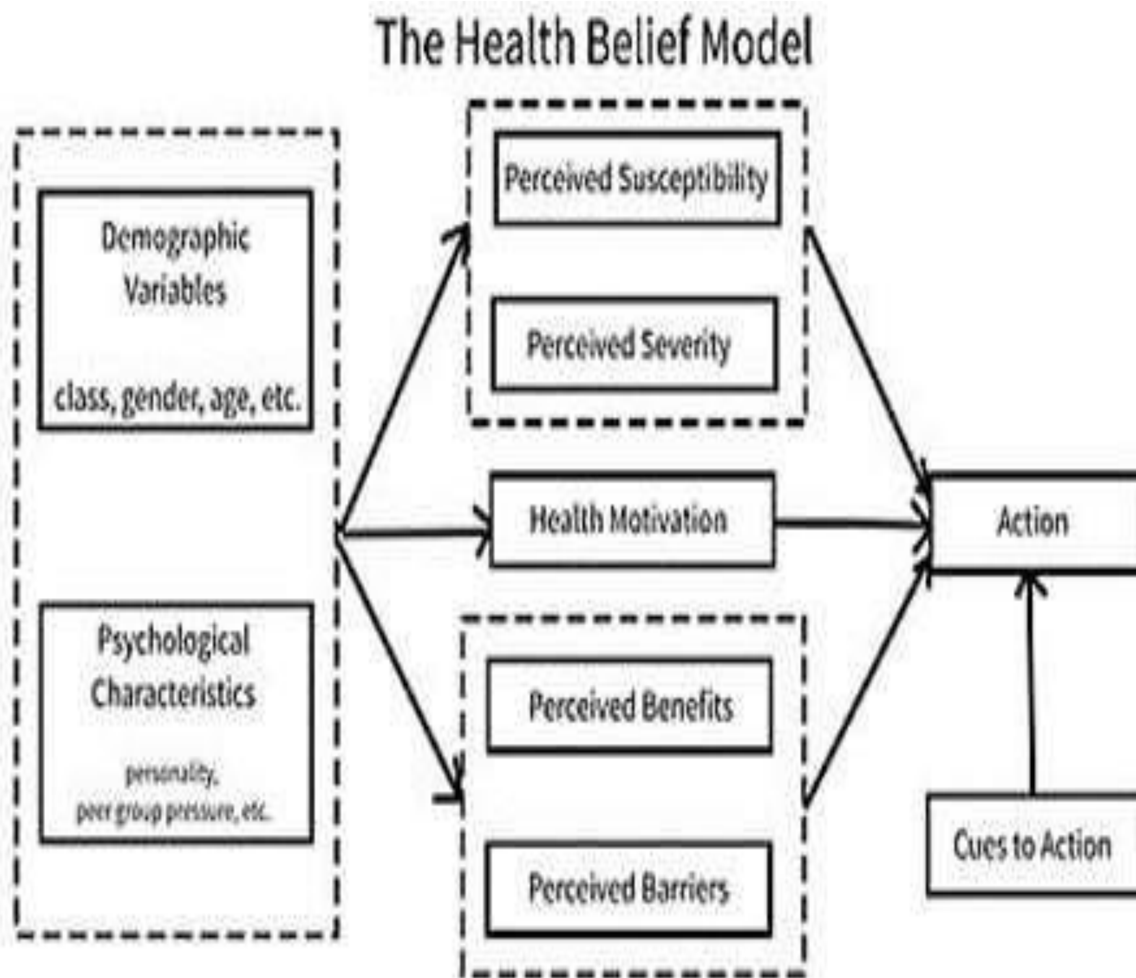

FIG 2.1: HEALTH BELIEF MODEL

(Adopted from Becker and Rosenstock, 1984 and Stoebe, 2000)

There are six constructs of the HBM. The first four constructs were developed as original tenets of HBM while the last two were added as research evolved about HBM. They include

1. Perceived susceptibility: This refers to a person's subjective perception of the risk of acquiring an illness or disease. There is a wide variation about how a person feels as regards personal vulnerability to an illness or disease.
2. Perceived severity- This refers to a person's feelings on the seriousness of contracting an illness or disease. There is wide variation in a person's feelings of severity, and often a person considers the medical consequences (e.g. death, disability) and social consequences (e.g. family life, social relationships) when evaluating the severity.
3. Perceived benefits- This refers to a person's perception of the effectiveness of various actions available to reduce the threat of illness or disease or to cure illness or disease. The course of action a person takes in preventing or curing illness or disease relies on consideration and evaluation of both perceived susceptibilities and perceived benefits, such that the person would accept the recommended health action if it was perceived as beneficial.
4. Perceived barrier- This refers to a person's feelings on the obstacles to performing a recommended health action. There is a wide variation in a person's feelings of barriers, or impediments which lead to a cost – benefit analysis. The person weighs the effectiveness of the actions against the perception that it may be expensive, dangerous, unpleasant, time consuming or inconvenient.
5. Cue to action- This the stimulus needed to trigger the decision-making process to accept a recommended health action. These cues may be internal (e.g. headaches, chest pain, leg

pain) or external (e.g. illness of family member, advice from others, newspaper article, e.t.c.)

6. Self- efficacy- This refers to the level of a person's confidence in his or her ability to successfully perform a behavior. This is a construct in many behavioral theories as it directly relates to whether a person performs the desired behavior.

In HBM, perceived susceptibility, perceived severity, perceived benefit and perceived barriers assist in decision making. In relation to this study, the perceived susceptibility in the Owerri is their likelihood of being exposed to diabetic foot ulcer based on the prevalence of diabetes in the area, the perceived severity is how serious the condition will be if exposed to it, perceived benefit will be improved quality of health and absence or non-occurrence of diabetic foot ulcer while perceived barriers are giving up some lifestyles that encouraged the disease. The decision to change the behavior which include poor adherence to diabetes management outline (dieting, diabetes medications etc.), sedentary lifestyle, poor foot care practices will be determined by the benefits verses the barriers.

2.3 Empirical Studies

In Nigeria, research on diabetic foot ulcer are limited, although there are evidences that shows that diabetic foot ulcer is a problem in the area.

A study by Alrub et al. (2019) aimed to identify factors associated with quality of life in Jordanian diabetic patients with foot ulcers. A total of 144 consecutive patients with diabetic foot ulcers aged 18 years or older attending a diabetic foot clinic at a center specializing in diabetes were included in the study. Health-related quality of life was assessed using two self-administered questionnaires. Results showed that DFU patients had lower mean DFS-SF scores and lower mean scores on physical and mental component summary scales (PCS8 and MCS8). Men had significantly higher her DFS-SF scores, indicating a better health-related quality of life than women (P-value 0.038). Her one patient who experienced a stressful life event had a significantly lower health-related quality of life using the DFS-SF scale and her SF-8 summary scale. Patients with peripheral vascular disease (PVD) and obese patients had lower QOL on DFS-SF and PCS8. Conclusion. Patients with diabetic foot ulcers had a poor quality of life. Female sex, obesity, presence of peripheral vascular disease, and stressful life events were the most important factors associated with poor quality of life in patients with diabetic foot ulcers.

Tindong et al., (2018) in another study identified the prevalence of diabetic foot ulcers and high risk of ulceration in rural hospitals in southwestern Cameroon, and sought to explain the clinical manifestations and identify factors associated with diabetic foot ulcers. A cross-sectional study design was used. Data were collected using a structured questionnaire administered to consecutive diabetic patients. Detailed foot examination findings were recorded. Diabetic foot ulcers were diagnosed according to the International Working Group on Diabetic Foot (IWGDF) definitions. Data were analyzed with Stata IC version 12. Of the 203 participants, 63.1% were female. Ages

range from 26 to 96. Her median duration of diabetes was 4.0 years (interquartile range 1.0–8.0 years). Diabetes epidemic Foot ulcers were 11.8% (24), of which 29.2% (7) were high grade (grades 2 to 4) and most ulcers (58.3% (14)) were in the plantar area. The prevalence of high-risk ulcers was 21.8% (39). Loss of protection (OR = 3.73, 95% CI = 1.43-9.71; P = 0.007) and peripheral arterial disease (OR = 3.48, 95% CI = 1.14-10.56; P = 0.028) were independently associated with diabetes in the foot. was related. Diabetic foot ulcers have been found to be a common complication of diabetics attending hospitals in these areas. Loss of protection and peripheral arterial disease have been found to increase the likelihood of developing diabetic foot ulcers and have been proposed as prime targets for prevention.

In another study by Freitas et al. (2020) In a study conducted in Brazil, the aim of the study was to assess risk factors associated with recurrence of his DFU in a Brazilian prospective cohort. A prospective cohort of cured DFU patients was followed from January 2014 to June 2017 in Curitiba, Brazil. During the study period, regular home visits were made by a DFU specialist nurse to assess ulcer recurrence. The presence of risk factors in the group of patients who developed ulcers during follow-up was compared with the presence of these factors in the group of patients without recurrence. At admission, 35 subjects had a previous distal ulcer, which healed completely at follow-up. Of the 35 patients, 15 were male (43%) with a mean age of 65.8 ± 10.9 years (48-85 years). Most patients were married and had low income (< US$250/month). Mean BMI was 26.5 ± 5.6 kg/cm2. 74% (26/35) had another comorbidity. The mean duration from DM to ulcer was 14.6±5.2 years. Overall mortality during the study period (3 years) was 14%. DFU recurred in 23 of his patients (65.7%). Results were similar for both groups, except that the relapsed DFU group had lower income (less than $250 per month). A Brazilian pilot study concluded that DFU recurrence is common and associated with low family income.

In a study to determine annual incidence and clinically relevant risk factors for foot ulcers in a large cohort study of diabetic foot ulcer (DFU) and diabetes mellitus (DM) patients in China, Jing et al., 2015. A cohort of a total of 1,333 patients, consisting of 452 DFU patients and 881 DM patients, underwent foot screening, physical examination, and clinical examination at eight hospitals, demographic information, medical and social history, peripheral Neuropathy (PND) Screening was screened at baseline for peripheral neuropathy. Screening for arterial disease (PAD), assessing nutritional status, and managing diabetes. A total of 687 (51.5%) of 1,333 patients were followed for a median of 12 months. There were 458 DM patients and 229 her DFU patients. A total of 46 patients died during follow-up. 13 were DM patients and 33 were his DFU patients. Of the 641 patients, 445 (69.4%) patients were DM patients and 196 (30.6%) patients were his DFU patients. At follow-up, 36 of 445 DM patients (8.1%) and 62 of his 196 DFU patients (31.6%) developed new ulcers. 10 of his 196 DFU patients were amputated. The annual incidence of ulceration in DM patients and amputation in DFU patients was 8.1% and 5.1%, respectively. The annual mortality rates for DM and DMF patients were 2.8% and 14.4%, respectively. A binomial logistic regression model was used to determine which risk factors were independent risk factors for foot ulcers during the follow-up period. ratios 3.136, 2.629) and decreased.

A binary logistic regression model was used to examine which risk factors were independent risk factors for foot ulceration during the follow-up period, and the final results showed that nephropathy (odds ratio 2.32), insulin level (odds ratio 3.136, 2.629), and decreased HDL (odds ratio 0.427) were associated with increased risks for foot ulceration.

A cross sectional study by Buzaid & Nagem, (2018) was aimed to determine the risk of diabetic foot ulcer and amputation among patients with type 2 diabetes at Benghazi Medical Center diabetic clinic. Out of the studied population, 87 (84.5%) patients wear inappropriate shoes, 37 (35.9%)

had Tinea pedis, 26 (25.2%) had foot deformity, 13 (12.6%) patients had bilateral hallux valgus deformity, 8 (7.8%) patients had clawing of feet, 2 (1.9%) patients had Charcot joint, and one patient (0.97%) had amputated toes. Dorsalis pedis and posterior tibial arteries pulsations were not palpable in six (5.8%) patients, there was a loss of protective sensation among 20 (19.4%) patients, vibration sense was absent in 15 (14.6%) patients, and joint position sense was lost in five (4.9%) patients. According to Scottish Intercollegiate Guideline Network system, 59 (57.3%) patients were in the low-risk category, 18 (17.5%) were in the moderate-risk, 22 (21.4%) were in the high-risk, and 4 (3.9%) were in the active disease categories. The prevalence of DFU was high in the study group.

Wash et al., (2016) conducted a study to determine whether the presence of diabetic foot ulcers was strongly associated with an increased risk of death. Data from her 414,523 diabetic patients enrolled in the UK Health Improvement Network practice were analyzed. The impact of covariates on diabetic foot ulcers and mortality was assessed and the results showed that 20,737 of the patients developed diabetic foot ulcers. 5.0% of those with new-onset ulcers died within 12 months of their first foot ulcer visit, and 42.2% of those with new-onset foot ulcers died within 5 years of her . Even after accounting for important known complications of diabetes that can affect mortality, the correlation between DFU and mortality remains strong, with a fully adjusted hazard ratio of 2.48 (95% confidence interval:

2.43, 2.54). Geographical differences existed, but they were not spatially related. It was concluded that DFU was associated with an increased risk of death.

In a study by Saleem et al. (2017) conducted a prospective study aimed at evaluating risk factors associated with poor outcomes in diabetic foot ulcers. Of the total 112 patients tested, the majority

were male (60.7%) and over the age of 50 (62.5%). Regarding outcome, 68% were completely cured, 27.7% were amputated, and 4.5% died.

during this time. Patient age greater than her 50 years, longer duration of diabetes (>10 years), rural origin, and heel ulcers were significantly associated with poorer outcome ($P < 0.05$).

A cross-sectional descriptive study by Yazdanpanah et al., (2018) aimed to assess the prevalence of diabetic foot ulcers and associated risk factors. The prevalence of diabetic foot ulcers was 6.4% (95% CI:4.64-8.73). 17 of them were female (4.9%). On univariate analysis, the following variables had statistically significant associations with DFU prevalence:

diabetes duration, education level, 10 g monofilament sensation, ankle-arm index (ABI), and body mass index (BMI). Patient age, glycemic control, and smoking did not show a significant association with DFU. After logistic regression analysis, patients with 10 g monofilament hypo sensory had more her DFU than patients with normal sensation (OR = 8.84, 95% CI:3.5–22.3). Abnormal ABI increased the likelihood of DFU (OR=5.6, 95% CI:1.3-24.18). Her DFU prevalence was higher in patients with diabetes duration of 11–20 years than in patients with 5 years or less (OR = 3.8, 95% CI:1.33–10.8). Her odds of developing DFU were 0.27 (95% CI:0.12-0.57) in educated versus illiterate patients. BMI was significantly associated with the prevalence of DFU. The odds were 0.259 (95% CI:0.108-0.623) in overweight patients and 0.263 (95% CI:0.1-0.687) in obese patients.

In a study by Bakri et al. (2012) he aimed to assess the prevalence of diabetic foot ulcer and its risk factors in patients visiting the National Center for Diabetes, Endocrinology, and Genetics (Amman, Jordan). A systematic random HIS sample of 1,000 diabetics from the study area was selected. In the sample, 49% were male. The average age of the sample was 52 years and the

average duration of diabetes was 9.7 years. The prevalence of diabetic foot ulcers he had was 4.6%, sensory neuropathy 14.9%, leg ischemia 7.5%, and amputation 1.7%. Ulcers are mainly associated with men, neuropathy and prolonged diabetes. The researchers showed that community-based studies are also needed to determine the true prevalence of foot complications from diabetes.

Parisi et al., (2018) We collected clinical and epidemiological data on a large cohort of diabetic patients from 19 centers and conducted a cross-sectional study aimed at highlighting factors associated with potentially relevant ulceration and amputation risk. Of the 1455 patients included in the study, those with ulcers had longer disease duration (17.2 ± 9.9 vs 13.2 ± 9.4 years; $p<0.001$) and poor glycemic control (HbA1c 9.23 ± 2.03 vs 8.35 ± 1.99). ; $p < 0.001$). Independent risk factors for ulcers were male (OR 1.71; 95% CI 1.2-3.7), smoking (OR 1.78; 95% CI 1.09-2.89), and neuroischemic foot (OR 20, 34; 95% CI 9.31-44.38) was the region. Origin (people in developed regions at higher risk, OR 2.39; 95% CI 1.47-3.87), presence of retinopathy (OR 1.68; 95% CI 1.08-2.62), lack of vibratory sensation (OR 7.95; 95% CI 4.65) -) 13.59). The risk factors for amputation were male (OR 2.12; 95% CI 1.2-3.73), type 2 diabetes mellitus (OR 3.33; high, OR 19.63; 95% CI). 3.43-112.5), hypertension (low risk, OR 0.3; 95% CI 0.14-0.63), region of origin (south/southeast, OR 2.2; 95% CI 1.1-4.42), history of ulcer (OR 9.66; 95% CI) 4.67-19.98), and changes in vibration sensitivity (OR 3.46; 95% CI 1.64-7.33). There was no association between outcome and ethnicity.

A prospective observational study by Nazish et al., (2019) aimed to identify factors associated with the increased prevalence of diabetic foot ulcers and their poor outcomes. The study was conducted from December 2015 to February 2016 at Bahawalpur Victoria Hospital, Bahawalpur. A total of 101 participants aged 18 years and older who presented with DFU were enrolled in the study. Ulcer duration, location, pain, and wound depth were assessed. Results showed that the

majority of patients were male (69.3%), type 2 diabetes (95%), and uneducated (82.17%). The mean age was 59 ± 10.43 years and mean duration of diabetes was 10.38 ± 7.9 years. 32.6% of patients had hypertension, 23.7% had IHD, and 24.7% were smokers. 85.1% had sensory neuropathy and 41.58% had retinopathy. PAD (18.8%) and nephropathy (7.9%) were relatively rare. Patients were divided into three groups based on outcome: cured (2.97%), non-cured (63.36%), and amputation group (33.66%). The mean duration of presentation was 24 ± 10.39 days in the healing group, 72.61 ± 179.49 days in the non-healing group, and 49.82 ± 41.75 days in the amputation group. The Wagner classification showed that 0% of ulcers in the amputation group were healed, 70.31% were unhealed, and 94.11% of ulcers were grade 3 or higher. Sensory neuropathy (94.11%) and smoking (29.41%) were more common, and mean HbA1c (8.05 ± 1.55) was highest among amputees. It was concluded that DFU is common in older illiterate men with longstanding diabetes. Hypertension, IHD, neuropathy, retinopathy, and smoking were common in patients with DFU. PAD and nephropathy were rare. High amputation rates and low healing rates were observed. Sensory neuropathy, Wagner grade (p value <0>.05), was associated with poor prognosis.

Shafi et al., (2018) conducted a study using a descriptive cross-sectional study design aimed at identifying risk factors associated with developing diabetic foot ulcers. This study was conducted from January 1, 2017 to July 31, 2017 at the Department of Internal Medicine, Service Hospital, Lahore. 150 diabetic patients from her 20 years to her 75 years of age undergoing surgical outpatient/emergent care with diabetic foot ulcers were enrolled. Patients with comorbidities such as congestive heart failure, chronic renal failure, and chronic liver disease were excluded from the study. A complete medical history was taken regarding the duration of diabetes and its treatment. A detailed general physical examination was performed in each case, in addition to his ABI

examination using sensory testing and Doppler ultrasound. A blood sample for HbA1c has been sent to Check blood sugar control. Ulcer debris was sent for culture and susceptibility. As a result, there were 90 males and 60 females. His 53.3% of patients had peripheral neuropathy, 64% had absent or decreased peripheral pulses, and 46.7% had poor glycemic control. Latent infections have been observed in up to 90% of patients. Shoe trauma was seen in 40% of cases. Her 30 (30%) of patients eventually required amputation, but bed rest was managed conservatively. It was concluded that persistent diabetes, the presence of underlying infections, peripheral vascular disease, and peripheral neuropathy were the major risk factors involved in the development of diabetic foot ulcers. described an urgent need to educate people with diabetes about glycemic control and careful foot care.

Systematic review by Tolossa et al. (2020) determine the prevalence of his DFU in Ethiopia. Tolossa et al., 2020. Articles were identified through electronic databases such as Medline, Hinari, Pub Med, Cochrane Library, Web of Science, and Google Scholar. Finally, 11 studies that met the eligibility criteria were included in the final systematic review and meta-analysis. Data extraction was performed using a standardized data extraction checklist and analysis was performed using STATA version 14. Heterogeneity was assessed using the Cochrane Q test statistic and the I2 test. RESULTS: The overall incidence of foot ulcers in

Ethiopian diabetic patients was 12.98% (95% CI:7.81-18.15). Subgroup analysis revealed the highest prevalence in Addis Ababa (19.31% (95% CI:2.7, 41.37)). Foot ulcers were associated with local location (OR=2.72, 95%, CI:1.84–4.01)), presence of calluses on the feet ((OR=12.67, 95%, CI:6.47–24.79)), and body mass index >24.5 ((OR = 2.68, 95%, CI:1.58–4.56)), poor self-care ((OR = 1.47, 95% CI:1.25-1.73)), type I diabetes ((OR = 0.42, 95% CI:0.22-0.79), staying in the DM for >1 hour. Ages 10 years ((OR = 0.23, 95%, CI:0.11-0.50)), ages <45 OR = 0.44, >20

years were recruited. Patient records of sensory neuropathy, vibratory neuropathy, painful neuropathy, vascular insufficiency, retinopathy, and dermatologic changes were recorded. A total of 53 (5.3%) patients had foot ulcers, 17 (1.7%) had amputations, and 172 (17.2%) had compromised feet. A total of 62 patients in risk category 1, 82 in risk category 2, and 28 in risk category 3 were identified. Loss of protective sensation in 174 patients (17.4%), loss of vibration sensation in 162 patients (16.2%), loss of posterior tibial pulse in 115 patients (11.5%), loss of dorsalis pedis in 97 patients. cases (9.7%). Patients and lameness in 72 (7.2%) patients. Loss of protective sensation ($p<0.000$), loss of vibratory sensation ($p<0.039$), and vascular insufficiency ($p=0.02$) were significantly greater in diabetic patients with foot ulcers than in those without. :

The prevalence of foot ulcers in Jordan was 5.3%, and at-risk feet predominated in 17.2% of patients. Patients with loss of protective sensation, loss of vibratory sensation, and vascular insufficiency in the lower extremities have been found to be at increased risk of developing foot ulcers.

Kantya Kumar (2019) conducted a hospital-based cross-sectional study of patients diagnosed with diabetic foot ulcers receiving appropriate treatment, follow-up care, and health education. Study patients did not undergo any invasive procedures for study purposes.

As a result, 64.0% of patients suffered from peripheral neuropathy, 73% had diabetes for more than 10 years, 49% had peripheral arterial disease, 34% had diabetic Charcot joints, and 26% had uncontrolled hyperglycemia. was shown.

They concluded that diabetes mellitus is a lifelong disease and foot complications from diabetes can be life-threatening, disabling, costly to treat, and result in significant morbidity.

In an analytical cross-sectional study by cardino et al. (2011) aimed to compare the clinical and biochemical characteristics of patients with diabetic foot ulcers who underwent major amputation with those who underwent mild and no amputation. Identify risk factors associated with major limb amputations. A retrospective review of the history of diagnosis of diabetic foot ulcers was performed from 2004 to 2007. 501 charts were reviewed, but 9 were excluded due to missing pages. The University of Texas was used to classify diabetic foot ulcers. Differences in means were tested using the t-test and differences in proportions were tested using the chi-square test. A heavy logistic regression analysis was performed to determine which variables were associated with the major truncations. The results stated that major amputations were performed in 48.6% of patients. This was significantly lower than the pre-DECT 70% ($p<0.001$), but exceeded the ADA recommendation of 1/2. 40% 42.7% had below-knee amputation, 4.7% had above-knee amputation, and 1.2% had hip dislocation. Presence of neuropathy (OR:± 1.66, p0.04), peripheral vascular disease (OR:± 1.27, p0.05), and ulcer severity according to the University of Texas Classification (OR:± 2.16, p0.01)) was associated with major amputations in diabetic foot ulcers. According to multiple logistic regression, University of Texas 3D (OR:2.2, $p<0.01$) and neuropathy (OR:1.63, p0.02) were predictors of severe diabetic limb amputation. In conclusion, a significant proportion of diabetic foot ulcer patients in Philippine General Hospitals underwent major amputations. Diabetics should emphasize proper foot care, as this study showed that patients with neuropathy and the University of Texas 3D classification were more likely to undergo major amputation.

Ugwu et al., (2019) carried out an observational study on the Multi-Center Evaluation of Diabetic Foot Ulcer in Nigeria between March 2016 and April 2017 in six tertiary healthcare institutions.

336 diabetic patients hospitalized for DFU were prospectively followed and managed by a multidisciplinary team until discharge or death. Demographic and diabetes-related information and ulcer characteristics were recorded. Patients were evaluated for neuropathy, peripheral arterial disease (PAD) and medical co-morbidities while relevant laboratory and imaging tests were performed. The study end-points were ulcer healing, Lower extremity amputation (LEA), duration of hospitalization and mortality. Here we present data on amputation. The results showed that 119 of her subjects (35.4%) underwent her LEA during the follow-up period. A univariate predictor of LEA was his ulcer duration >1 month before admission (P<0> duration he 6 months). A total of 108 patients with her DFU of ≥6 months were enrolled and their results documented. DFU descriptions included size, depth, protection, perfusion, and presence of infection. Complications evaluated included ophthalmopathy, renal disease, and heart disease. All patients received the necessary local wound care with sharp debridement of associated necrotic and infected tissue and unloading with appropriate footwear and therapeutic devices. As a result, the average age of The patients studied were 56+SD 9 years old and the male to female ratio was 3:3.3. The mean duration of DFU was 18+/-SD 17 months (range 6 to 84 months). Ulcer healing was significantly associated with offloading, primarily through the use of total contact cast (TCC) (p=0.013). Non-healing ulcers were significant, with duration of chronic DFU >12 months (p=0.002), smoking (p=0.000), elevated HbA1c (>7%), large size (mean Poor glycemic control evidenced by SD 8+ 4 cm), increasing depth (p<0, p=0.001), p=0.002), p=0.002), p=0.017). A period of ≥6 months included cutaneous calluses and symptoms of ulcers of increased size and depth associated with nerve ischemia in a diabetic patient who had a history of smoking and whose HbA1c was greater than 7%. I was. Discharging primarily with TCC is an effective way to manage long-standing DFU.

In a study by Banick et al. (2020) aimed to assess the risk of diabetic foot ulcers (DFU) and find associated factors in his type 2 diabetes (T2D) patients in Bangladesh. This cross-sectional study recruited 1200 subjects with T2D who participated in 16 centers of the Diabetes Association of Bangladesh Health Care Development Project. Primary and secondary endpoints DFU risk were assessed using a modified version of the International Working Group on Diabetic Foot (IWGDF) risk classification system. The modified system was based on five parameters: peripheral neuropathy (PN), peripheral arterial disease (PAD), malformation, ulcer history, and amputation. Risks were group 0 (no PN, no PAD), group 1 (with PN, no PAD, no deformity), group 2A (with PN, deformity, no PAD), group 2B (PAD), group 3A (history of ulcers), Yes). .and group 3B (cut). Associated factors for DFU risk were determined separately for each risk category using multinomial logistic regression. Results Overall, 44.5% of subjects were classified as "at risk" for DFU. This risk was higher in men than in women (45.6%) and in those living in rural areas compared to urban populations (45.5%). According to the IWGDF categories, the risks were distributed to 55.5%, 4.2%, 11.6%, 0.3%, 20.6%, and 7.9% of group 0, group 1, group 2A, group 2B, group 3A, or group 3B. Factors associated with DFU (OR > 1) were age >50 years, rural area, low economic status, insulin use, history of trauma, diabetic retinopathy, and diabetic nephropathy. In conclusion, a significant number of her T2D patients studied put her at risk for DFU and there is a need for effective screening programs to reduce DFU-related morbidity and mortality. I understand.

To define risk factors for foot ulcers associated with the main factors (peripheral sensorimotor neuropathy, peripheral vascular disease, altered foot biomechanics, history of foot ulcers or leg amputations), Leymare et al., (2005) did the following: Multivariate analysis of her 446 patients without foot ulcers. Her four significant risk factors for foot ulcers were identified. There was a

correlation between the likelihood of belonging to a risk group and the number of associated factors. This study points to the importance of screening, especially in long-standing diabetes, microvascular complications, and socially disadvantaged populations. The goal of Shahi et al. (2012) was a prospective determination of risk factors for foot ulcers in North Indian diabetic patients. 678 diabetic patients were studied, 97 of whom reported diabetic foot ulcers (DFU). Patients were interviewed with a pre-tested structured questionnaire to document their medical history. Statistical analysis was performed using SPSS 16.0 software. Results showed that her prevalence of DFU in diabetic patients was her 14.30% (95% CI = 11.67–16.94). Of the 581 diabetes-only patients, 42.16% (95% CI 68.17-77.67) belonged to rural areas, whereas 70.10 of DFU patients (n 97) aspired to rural areas. In a multivariate logistic regression model, significant risk factors for DFU were age >50 years (OR -6.97, P = 0.00), duration of diabetes 4 to 8 years (OR = 2.47, P = 0.00), and >8 years. (OR = 3.03, P = 0.00), rural (OR = 0.44, P = 0.00), oral hypoglycemic drug therapy (OR = 2.90, P = 0.00), insulin therapy (OR = 9.58, P = 0.00), smoking (OR = 0.57, P = 0.00). In conclusion, a high prevalence of foot ulcers has been identified among diabetic patients in rural North India. Age, duration of diabetes, tobacco consumption, oral antidiabetic/insulin consumption, and local location were identified as important risk factors.

A cross-sectional study was performed by Mariam et al. (2017) investigated the incidence of foot ulcers in diabetic patients at Gondar University Hospital, Ethiopia. 279 study participants were selected using systematic random sampling. Bivariate and multivariate logistic regression models were fitted to identify factors associated with diabetic foot ulcers. Odds ratios with 95% confidence intervals were calculated to determine significance levels. Diabetic foot ulcers were identified in 13.6%. Country residence [AOR = 2.57; 95% CI:1.42; 5.93], type II diabetes [AOR = 2.58; 95% CI:1.22, 6.45], overweight [AOR = 2.12; 95% CI:1.15] , 3.10], obesity [AOR = 2.65; 95% CI:

1.25; 5.83], poor foot self-care practices [AOR = 2.52; 95% CI:1.21; 6.53] and neuropathy [AOR = 21.76; 95% CI:8.43, 57.47] were factors associated with diabetic foot ulcers. It has been established that diabetic foot ulcers are high. Emphasizing rural living, limiting excessive weight gain, treating neuropathy, and promoting foot self-care can reduce diabetic foot ulcers.

Sai et al., (2018) A cross-sectional study aimed to examine the quality of life (QOL) of patients with diabetic foot ulcers by domain and to examine the factors associated with this condition. 55 patients were recruited. Quality of life data were collected using a questionnaire using the Diabetic Foot Ulcer Scale. Statistical analysis was performed using the Mann-Whitney U test and the Kruskal-Wallis test. The results stated that QOL was higher in the domains of emotions, positive compliance, family life, and friends, and his QOL was higher in the domains of daily activities, physical health, leisure, money, positive attitudes, and treatment. Low to average. Significant differences in patient quality of life were found between income (p = 0.004), degree of injury (p = 0.047), number of injuries (p = 0.029), and blood glucose level (p = 0.013). Although no other variables were significantly associated with her QOL, marital status was significantly correlated with the leisure domain (p = 0.004) and ulcer duration was significantly correlated with the affective domain (p = 0.001). The study concluded that there was a correlation between income, wound severity, number of wounds, blood glucose levels and quality of life in patients with diabetic foot ulcers. This study recommends considering economic status, wound grade and number, and blood glucose levels to improve patient quality of life for effective patient care.

In a case control study by Fawzy et al (2019), the objective was to determine risk factors associated with DFU among T2DM. Results from 100 cases and 100 control recruited showed that older age, long duration of diabetes and poor glycemic control reflected in high levels of HbAIC were

signiicnt factors associated with DF(OR=4.1,95%CI 2.3-7.4, $P<0.0001$; OR=6.5,95% CI4.9-9.3, $P<0.00001$, and OR=1.1, 95% CI(1.05-1.3), $P<0.002$, respectively.

In a cross-sectional study by Deribe (2014), the primary objective was to assess the prevalence and influencing factors of diabetic foot ulcers in diabetic patients attending Arbaminch hospital. Her 216 diabetic patients attending Arbaminch Hospital from 10 February 2013 to 10 April 2013 were recruited. Subjects were identified using a simple random sample, and data were collected using interviewer-administered questionnaires, record review checklists, and observational checklists. Data were encoded and input into Epidata version 3.1 and exported to SPSS version 16.0 for analysis. Descriptive analyzes were conducted on sociodemographic variables, diabetes knowledge, diabetes self-care practices and attitudes, and clinical factors. To identify independent factors associated with diabetic foot ulcers, a binomial logistic regression analysis was also performed and significant factors were scored with p<. 0.05 with 95% confidence interval. Finally, the data were presented with explanatory descriptions, tables and graphs. Results: All study participants were interviewed, with a response rate of 100% and a mean age ± SD of 50.72 ± 13.39 years. Of the 216 study participants, approximately 32 (14.8%) had diabetic foot ulcers, 129 (59.7%) were male, 61 (28.2%) were from rural areas, 132 (61.11%) were overweight, 97 (44.5%) were obese. Diabetic foot self-care practices are inadequate, with 80 (37%) of them having secondary education. Rural residents (AOR=4.074, 95% CI 1.262-13.151), no complications (AOR=0.611, 95% CI 0.131-0.955), mean arterial pressure >90 (AOR=5.113, 95% CI 1.285-20.347), duration of diabetes >10 years (AOR = 8.452, 95% CI 2.365-30.994) is an independent factor associated with DFU. The conclusions and recommendations of this study indicate that a significant proportion of people with diabetes developed diabetic foot ulcers. Region, duration of

diabetes, mean arterial blood pressure, presence of comorbidities, and occupation are factors associated with diabetic foot ulcers.

Chavan (2018) conducted a study aimed at investigating the prevalence and risk factors for diabetic foot ulcers in people with diabetes. This study was a hospital-based, cross-sectional study conducted in an outpatient department of general medicine in 200 diabetic patients from January 2018 to June 2018. Diabetic foot ulcers were diagnosed based on physician insight, according to standard criteria. Attempts have been made to identify risk factors such as smoking. Diagnosed patients were treated appropriately. The results showed that there were more males than females. The majority of patients he was in the 51-60-year-old group (35.5%). Most of the diabetic patients came from rural areas. H. 84.5%. The majority were illiterate. H. 69% 21.5% were smokers. 40% regularly consume alcohol. 36.5% were overweight and 14% were obese. The prevalence of diabetic foot ulcers in diabetic patients was 16%. No significant associations were found between age, place of residence, literacy, duration of diabetes, and obesity and her DFU. Diabetic foot ulcers were found to be significantly associated with men, smokers, smokers + smokers, alcoholics, smokers + alcoholics, family history of diabetes, and insulin users. The study concluded that the prevalence of diabetic foot ulcers is very high among diabetics. Tobacco use, alcohol use, mixed tobacco and alcohol use, and a family history of diabetes were significant risk factors for diabetic foot ulcers.

A prospective study by Musa et al 92018). This study was conducted between January 2015 and December 2016. (2018) identified risk factors associated with amputation in his DFU patient with diabetic foot ulcers at a military hospital in Dhahran, Saudi Arabia. As a result, of the total 82 patients enrolled in the study, 55 patients were male (67.07%), the mean (SD) age of the participants was 60 (± 11.4) years, and the mean diabetic The duration was 8.5 years (± 3.7) years

and the mean hemoglobin A1c was 4.8 (± 2.8) %. In univariate analysis, aging and increased white blood cell count were factors associated with amputation (OR=1.1, 95% CI=1-1.1, P=0.012; OR=383, 95% CI=7.9-18,665, P = 0.003). On the other hand, the odds of ischemic ulcers leading to amputation were half that of neuropathic ulcers (OR = 0.5, 95% CI = 0.3-0.9, P = 0.036), and higher Wagnerian degrees protected against amputation. OR=14.5, 95% CI=4.3-49.4, P<0>1) age >50 years, rural area, low economic status and insulin use. This study concluded that a significant number of T2D patients studied are at risk of DFU and that effective screening programs are needed to reduce DFU-related morbidity and mortality.

2.3.1. Summary of relevant literature reviewed

The majority of the literature reviewed were cross-sectional studies primarily aimed at prevalence studies of diabetic foot ulcers. Several studies have found that the prevalence of diabetic foot ulcers is higher in men than in women. Certain factors such as socio-demographic factors were associated with DFU.

In a study by Wash et al. (2016) concluded that DFU is associated with an increased risk of death in people with diabetes. In a cohort study by Jing et al., 2015, the annual incidence of ulceration in DM patients and amputation in DFU patients was 8.1% and 5.1%, respectively. The annual mortality rates for DM and DMF patients were 2.8% and 14.4%, respectively.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study design

A hospital based retrospective case control study design (Analytical epidemiology) was adopted for this study. It is hospital based because the study population were a group of people living with diabetes attending government owned hospitals in Owerri, Imo state. This study compared patients who have the highlighted outcome (cases) with patients who do not have the outcome (control), and looked back with the aid of a questionnaire to compare relationship between a range of factors and the risk of diabetic foot ulcer occurrence among people living with diabetes attending government owned hospitals in Owerri, Imo state. The study being a case control study is designed to estimate odds ratio which is a measure of association that quantifies the relationship between an exposure and health outcome.

3.2 Area of study

This research was carried out in government hospitals in Owerri, Imo state. Owerri is the capital of Imo State in Nigeria. It is the largest city in Imo state. Owerri consists of three local government areas: Owerri Municipal, Owerri North and Owerri West. It has an area of approximately $100km^2$ and a population of 1,401,873 as of 2016. The postal code of the area is 460. Owerri city sits at the intersection of roads from Port harcourt, Onitsha, Aba, Orlu, Okigwe and Umuahia. Oweri is bordered by the Otamiri River to the east and the Nworie River to the south. Some major roads that run through the city are; Onitcha Rd, Aba Rd, Okigwe Rd, Portharourt Rd. Roads within the city are Weatheral Rd, Douglas Rd, Works Rd and Tetlow Rd. Relief market is the main market in Owerri after the demolition of Eke Ukwu Owerri. Owerri produces many agricultural products such as cassava, yam, corn and palm products. Owerri also

has huge crude oil and natural gas reserves. Christianity is the dominant religion in Owerri with catholics and Anglicans having the largest following. The city's population is redominatly Igbos and the major language spoken is igbo. Owerri city is served by two government hospitals which are Imo specialist hospital Umuguma and Federal University Teaching Hospital Owerri formerly known as Federal Medical Centre Owerri. These hospitals which are both tertiary health facilities will serve as the study area. These hospitals have qualified medical practitioners across all specialties and serve as a training center for both paramedical and medical heath personnel They also serve as referral centers for other hospitals and health centers within the catchment area.

Figure 3.1: Geological map of owerri (Source: Google map)

3.3 Study population

The population of people living with diabetes attending government owned hospitals in Owerri aged ≥ 18 years constitutes the study population.. To get the participants, I selected people living with diabetes from the out-patient department of the two government hospitals that are in owerri. Individuals who suit the case definition for the study were classified as cases while the controls were recruited from the non-cases (Diabetics without foot ulcer). Matching was done on the various cofounding variables such as age, gender. Detailed history demographical data and other relevant information were recorded from all participants.

3.4 Sample size and sampling technique

3.4.1 Sample size

The sample size was obtained using the sample size formula for case control study:

$$n = \left(\frac{r+1}{r}\right) \frac{(p)(1-p)(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

Where

For 80% power, $Z_{\beta} = .84$

For 0.05 significance level, $Z_{\alpha} = 1.96$

r = 1(equal number of cases and controls)

The proportion of the control group is 20%

To get the proportion of cases exposed:

$$P_{\text{cases exp}} = \frac{OR\ p_{\text{controls exp}}}{p_{\text{controls exp}}(OR - 1) + 1}$$

$$P_{\text{cases exp}} = \frac{2.0\ (0.2)}{(0.2)(2.0 - 1) + 1}$$

$$= \frac{0.4}{1.20} = 0.33$$

Average proportion exposed = (0.33 + 0.20) / 2 = 0.265

$$n = \left(\frac{r + 1}{r}\right) \frac{(p)(1-p)(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

$$n = 2\ \frac{(0.265)(1 - 0.265)(0.84 + 1.92)^2}{(0.33 - 0.20)^2} = 181$$

Therefore, n = 362 (181 cases, 181 controls)

To accommodate sampling error, it was upgraded to 400.

(Source: Fawzy et al., 2019)

3.4.2 Sampling method

Simple random sampling technique was used to select participants.

In Owerri there are two government hospitals and they were used for this study. Based on patient size in the hospitals, three quarter of the participants were selected from federal teaching hospital. Owerri while one quarter was selected from Imo specialist hospital, Umuguma Owerri. For the respondents from Federal Teaching hospital, the patient folders were sorted based on patients who were active. In selecting study participants' diabetics who met the case definition

were put in a sample frame and 150 participants were selected using simple random sampling. Those who did not meet the case definition were put in a sample frame and 150 participants were also selected balloting. For the respondents from Imo Specialist hospital Umuguma, the researcher/ research assistant went to the clinic on daily bases and all patients who met the criteria for case and control was included until the required number of 50 cases and 50 control was gotten.

	CASES	**CONTROL**
FUTHO	150	150
IMO SPECIALIST	50	50
TOTAL	200	200

3.5 Instrument for data collection

Hospital records (patient's folder) was used to identify diabetic foot ulcer cases.

Also a well-structured questionnaire was used to collect information of participants related to exposure such as social demographic factors, foot care knowledge, pattern of diabetes management and duration of diabetes. These instruments for data collection were administered after explaining purpose of the study to the participants.

3.6 Validity of instrument

The study questionnaire was carefully prepared by the researcher and sent to the researcher's supervisor for vetting after corrections were made to ascertain face and content validity. Also public health specialists and medical doctors were consulted for the questionnaire construction to improve content validity. After that a final draft was made.

3.7 Reliability of Instrument

Test – retest reliability method was used. The copies of questionnaire were given to 20 subjects with similar characteristics to those in the target population, the same questionnaire was re-administered after two weeks to the same respondents and the reliability was tested to get a correlation coefficient. The Cronbach's Alpha Reliability Correlation Coefficient was 0.77 thus, the instrument was reliable to use.

3.8 Method of data collection

For the purpose of this study, the respondents were people living with diabetes attending follow up visits (outpatients) in government owned hospitals in Owerri from Dec 2021 to May 2022. From the hospital records, the researcher was able to identify patients already diagnosed of diabetic foot ulcer, this helped in identifying the cases. The researcher trained research assistants who aided in the distribution of the questionnaire in aspect of translation in case of people who don't understand English without altering the questionnaire content and also in communication skills. A written informed consent was obtained from each respondent before data was collected.

The copies of questionnaire were distributed by the researcher and research assistant. Each questionnaire was communicated in English language to the literate respondents as they answer while the questions were translated to local language for the non-literates and their responses noted. Each questionnaire took about 10-15 minutes to be completed. The researcher and research assistant visited the selected hospitals on their clinic days within a period of six months till the required sample size was achieved.

3.9 Method of data analysis

Data was analyzed using the International Business Machine (IBM) Statistical Package for the Social Sciences (SPSs) version 25. Frequency distribution tables were computed for all variables

and expressed as percentage of distribution. Chi-Square test was used for associating factors of diabetic foot ulcer. Logistic regression technique was used to establish the influencing factors. Odds ratio(OR) was computed and used to assess size measures for the risk factors. All statistical tests were performed at 5% level of significance. Probability value (P) was used to establish significant factors.

3.10 Ethical considerations/ informed consent

An introduction letter was obtained from the Department of Public Health, School of Health Technology, Federal University of Technology, Owerri. Ethical clearance was obtained from the ethical review committee of Federal Medical Centre, Owerri and also from Ministry of Health, Imo state. Also a written informed consent from all the participants was obtained before being allowed to participate in the study.

CHAPTER 4

RESULTS AND DISCUSSION

4.1.1 Socio-demographic Characteristics of the Respondents.

In this section, the variables of interest include; Gender, Age range, Educational level, Residence and Occupation.

A total of 400 diabetic subjects were studied comprising of 200 cases of foot ulcer and 200 controls. The result in Table 4.1presents the characteristics of the subjects, which clearly indicates that 260 (65%) were males. For the case group, the males were 140 (70%) while they were 120 (60%) females in the control group. more than half of the total subjects (205: 51.2%) were of age 51 – 70 years (case group: 70%, control group: 32.5%). The 31 – 50 years comprised of 17.5% of the case group and 59.5% in the control group. only 8 (2%) subjects in all were up to or below 30 years and they all fall within the control group (4%).

Large numbers of the participants have education up to secondary level (44.5%) and tertiary level (46%). A total of 90 (45%) have secondary education level in the case group while 109 (54.5%) studied up to tertiary level of education in the control group. None of the subjects in the control group do not have the formal sort of education. Majority of the participants in the control group (70%) are resident in the urban areas but 55% in the case group resides in the rural area.

In terms of occupation, over one quarter of the case group (25.5%) are civil servants against 56% in the control. Those who engage in trading were 59 (29.5%) in the case group and 46 (23%) in the control group. Twenty percent of the control group are entrepreneurs against just four and half percent in the case group.

4.1.2 Associating Socio-demographic Factors of Foot Ulcer among people living with Diabetes Studied.

The association between socio demographic factors with diabetic foot ulcer among diabetic subjects studied is contained on Table 4.1. The table clearly shows the significant effect of the socio demographic factors. There were approximately 54% of foot ulcer cases in males against 43% in females, consequently the risk for foot ulcer was found to be 36% significantly lower among females than in males ($p = 0.036$, $\chi^2 = 4.40$, OR= 0.64). Diabetes foot ulcer increased significantly with age ($p < 0.0001$, $\chi^2 = 96.78$), with 76% cases recorded for the above 70 compared to 68% and 23% respectively on the 51-70 years and 31- 50 years. Using the above 70s as the reference age group, the odds for foot ulcer were found to lower by 39% among the 51-70 years ($p = 0.388$ $\chi^2 = 0.74$, OR= 0.69) and 91% significantly lower among the 31- 50 years ($p < 0.0001$, $\chi^2 = 35.1$, OR= 0.09).

Education is also another significant socio demographic risk factor of foot ulcer in this study ($p < 0.0001$, $\chi^2 = 35.6$), with more cases found in the lower levels of education. Clearly the odds for foot ulcer were found to be approximately one and half times higher among secondary education level participants (OR = 1.49) and over 12 folds higher among primary education level subjects (OR = 12.11).

Foot ulcer cases were up to 65% among rural resident subjects against 39% for the urban with significant higher odds of approximately 3 times more for those living in the rural areas ($p < 0.0001$, $\chi^2 = 25.6$, OR= 2.85). Occupation is also a significant socio demographic risk factor ($p < 0.0001$, $\chi^2 = 119.45$), with many cases recorded among farmers (100%) and artisans (95%). The risk among traders were about 2.8 times significantly higher than that of the civil servants (p <

0.0001, χ^2= 16.37, OR= 2.82), while it was by far close to 42 times higher among the artisans compared to the civil servants ($p < 0.0001$, OR= 41.7).

Table 4.1: Socio-demographic Factors of Foot Ulcer among people living withDiabetes Studied

Socio-demographics	Case	%	Control	%	Total	OR	Chi-sq	P
Gender								
Male (reference)	140	53.8	120	46.2	260	.-.	-	-
Female	60	42.9	80	57.1	140	0.64	4.40	0.036
Total	200	50.0	200	50.0	400			
Age (years)								
18 – 30	0	0.0	8	100	8	0	15.53	0.0001
31 – 50	35	22.7	119	77.3	154	0.09	35.10	0.0001
51 – 70	140	68.3	65	31.7	205	0.69	0.74	0.388
Above 70 (reference)	25	75.8	8	24.2	33	-	-	-
Total	200	50.0	200	50.0	400		96.78*	0.0001
Education level								
No formal education	10	100	0	0.0	10	-	exact	0.0002
Primary	25	89.3	3	10.7	28	12.11	22.96	0.0001
Secondary	90	50.6	88	49.4	178	1.49	3.50	0.061
Tertiary (Reference)	75	40.8	109	59.2	184	-	-	-
Total	200	50.0	200	50.0	400		33.59	0.0001
Residence								
Urban (reference)	90	39.1	140	60.9	230			
Rural	110	64.7	60	35.3	170	2.85	25.58	0.0001
Total	200	50.0	200	50.0	400			
Occupation								
Civil service	51	31.3	112	68.7	163			
Trader	59	56.2	46	43.8	105	2.82	16.37	0.0001
Artisan	38	95.0	2	5.0	40	41.7	Exact	0.0001
Farmer	43	100.0	0	0.0	43	-	Exact	0.0001
Entrepreneur	9	18.4	40	81.6	49	0.49	3.10	0.078
Total	200	50.0	200	50.0	400		119.45	0.0001

4.2 Influence of foot care knowledge on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state.

Those who indicated that they have heard about foot care to prevent and care for diabetic foot ulcer were 191 (47.8%) in all, of which only 28.3% were foot ulcer cases (Table 4.3). The foot ulcer cases were estimated to be 69.9% among those that responded they've not heard of it in the past. The risk for the disease was close to 6 times higher among the group that did not hear of the foot care ($p < 0.0001$, $\chi^2 = 69.03$, OR= 5.88). Similarly, the odds were also significantly higher among those that do not perform regular foot examination ($p < 0.0001$, $\chi^2 = 44.90$, OR= 7.17), or only do so sometimes ($p < 0.0001$, $\chi^2 = 17.50$, OR= 3.37), compared to those that conduct regular examination of foot. Their respective cases were 22.5% for the regular foot examination group, 67.6% for non-regular feet examination group and 49.4% for rare feet examination group ("sometimes"). The use of lukewarm water for feet washing is found advantageous for foot ulcer care in this study ($p < 0.0001$, $\chi^2 = 60.44$). with only 6.3% of the group having foot ulcer cases against 64.8% on "Never" group and 55.9% on "sometimes" group, there were higher odds of foot ulcer to the tune of 53 and 50 folds respectively among for the "Never" and "sometimes" group compared to those of the "always' group. Similarly, both drying of feet after washing and cutting of toe nails straight across showed some protective likelihood against foot ulcer in this study. Lower cases were recorded for subjects that do dry their feet after washing ('always' vs 'never': 37.4% vs 78.3%) and for those that cut their toe nails straight across 37.4% vs 78.3%), The accompanying odds were respectively 5.4 times ($p < 0.0001$, $\chi^2 = 52.75$) and 4.6 times ($p < 0.0001$, $\chi^2 = 20.9$) significantly higher in the 'never' group compared to the 'always' group in each situation. $p < 0.0001$, $\chi^2 = 52.75$, OR= 5.41),

Other significant factors of foot ulcer in this study include wearing tight fitted shoes, ($p < 0.0001$, $\chi^2 = 42.33$), walking around on barefoot ($p < 0.0001$, $\chi^2 = 53.98$) and non-use of moisturizing lotion

on feet ($p < 0.0001$, $\chi^2 = 45.14$). All the studied subjects that do wear tight fitted shoes have foot ulcer against 33.6% for those that do not. There were 83% cases among those that walk around with bare foot compare to 33.6% on those that do not go on barefoot. Consequently, the odds for foot ulcer were estimated to be 90% and 84% respectively lower in not walking around on barefoot (OR=0.10) and on walking on barefoot sometimes (OR=0.16) compared to always going about on bare foot. The odds in nonuse of moisturizing lotion on feet and its use only for sometimes were estimated to be almost 6 times and 1.6 times respectively higher compared to the use moisturizing lotion on feet.

Table 4.2: Influence of foot care knowledge on diabetic foot ulcer among d people living with diabetes attending government owned hospitals in Owerri, Imo state.

foot care knowledge	Case	%	control	%	Total	OR	Chi-sq	p
Heard about foot care to prevent and care for diabetic foot ulcer								
Yes (Reference)	54	28.3	137	71.7	191			
No	146	69.9	63	30.1	209	5.88	69.03	0.0001
Total	200	50.0	200	50.0	400		69.03	0.0001
Regular feet examination								
Always (Reference)	20	22.5	69	77.5	89			
Never	98	67.6	47	32.4	145	7.19	44.90	0.0001
1Sometimes	82	49.4	84	50.6	166	3.37	17.50	0.0001
Total	200	50.0	200	50.0	400		44.94	0.0001
Washing of feet daily with lukewarm water								
Always (Reference)	4	6.3	60	93.8	64			
Never	59	64.8	32	35.2	91	27.55	53.46	0.0001
Sometimes	137	55.9	108	44.1	245	19.03	50.46	0.0001
Total	200	50.0	200	50.0	400		60.44	0.0001
Drying your feet after washing								
Always (Reference)	96	37.4	161	62.6	257			
Never	100	76.3	31	23.7	131	5.41	52,75	0.0001
Sometime	0	0.0	8	100	8	-0	Exact	0.030
Total	196	49.5	200	50.5	396		65.91	0.0001
Cutting of toe nails straight across								
Yes (reference)	11	20.8	42	79.2	53			
No	189	54.5	158	45.5	347	4.57	20.9	0.001
Total	200	50.0	200	50.0	400	0.22	20.90	0.0001
Wearing tight fitted shoes								
Always	11	100	0	0.0	11	-	Exact	0.0001
Never (Reference)	101	38.7	160	61.3	261			
Sometimes	88	68.8	40	31.3	128	3.40	31.05	0.0001
Total	200	50.0	200	50.0	400		42.33	0.0001
walking around on barefoot								
Always (reference)	74	83.1	15	16.9	89			
Never	40	33.6	79	66.4	119	0.10	50.44	0.0001
Sometimes	86	44.8	106	55.2	192	0.16	36.49	0.0001
Total	200	50.0	200	50.0	400		53.98	0.0001
Use of moisturizing lotion on feet								
Always (reference)	14	25.9	40	74.1	54			
Never	135	66.2	69	33.8	204	5.59	28.35	0.0001
Sometimes	51	35.9	91	64.1	142	1.60	1.76	0.185
Total	200	50.0	200	50.0	400		45.14	0.0001

OR: Odds ratio, p: probability value at 5%, Exact: Fishers exact test applied, Reference comparison variables indicated,

4.3 Patterns of diabetes management on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state

The patterns of diabetes management on diabetic foot ulcer in association with the occurrence of foot ulcer disease among diabetes subjects studied is presented on table 4.4. Foot ulcer cases were more on those that do not follow diabetes diet plan (100%) or follow the plan sometimes (83.2%) compared to the rate for those that follow plan (14.7%). It was also more for the subjects that do not engage on regular exercise (77.1% against 64.9%). Not taking diabetes medication also recorded high foot ulcer rate than taking it (75.8% vs 17.3%), as well as non-intake of insulin (41% vs 18%). All the studied subjects who responded that they do not monitor their blood sugar level regularly have foot ulcer compared to only 7.1% that have it among the ones that regularly monitor their blood sugar level. Those who indicated that they use herbs to control sugar level showed more cases of foot ulcer (77.8%) than those that do not (40.5%).

Not following diabetes diet plan ($p < 0.0001$, χ^2= 52.17) as well as not taking diabetes medication ($p < 0.0001$, χ^2= 52.17) are significant risk factors of foot ulcer in this study ($p< 0.0001$, Among the diabetes patients who do not take medication, there exist odds of 15 folds in foot ulcer development compared those that do take medication (OR =14.9). The patients on noninsulin intake recorded greater odds of 3.2 folds more ($p < 0.0001$, χ^2= 11.19).

Other risk factors based of patterns of diabetes management include lack of regular monitoring of blood sugar level ($p < 0.0001$, χ^2= 79.97), and use of herbs to control sugar level. ($p < 0.0001$, χ^2= 16.56). for those who do not use herbs to control their sugar level the odds showed 79% lower compared to those that use herbs (OR=0.19).

Table 4.3: Pattern of diabetes management on diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo state

Patterns of diabetes management	Case	%	control	%	Total	OR	Chi-sq	p
Do you follow the diabetes diet plan?								
Always ref	29	14.7	168	85.3	197	-		
Never	12	100.0	0	0.0	12	0	52.17	0.0001
Sometimes	159	83.2	32	16.8	191	28.8	182.32	0.0001
Total	200	50.0	200	50.0	400		194.54	0.0001
Exercise regularly								
Always	63	64.9	34	35.1	97			
Never	81	77.1	24	22.9	105	1.82	3.66	0.056
Sometimes	56	28.3	142	71.7	198	0.21	38,4	0.0001
Total	200	50.0	200	50.0	400		76.97	0.0001
Intake diabetics medications								
Always	35	17.3	167	82.7	202			
Never	25	75.8	8	24.2	33	14.9	50.94	0.0001
Sometimes	140	84.8	25	15.2	165	26.7	165.98	0.0001
Total	200	50.0	200	50.0	400		175.17	0.0001
Do you take insulin shot?								
Always	11	18.0	50	82.0	61			
Never	94	41.2	134	58.8	228	3.20	11.19	0.0008
Sometimes	95	85.6	16	14.4	111	27.0	75.97	0.0001
Total	200	50.0	200	50.0	400		88.18	0.0001
Do you monitor your blood sugar regularly?								
Always	12	7.1	157	92.9	169			
Never	11	100.0	0	0.0	11	-	79.97	0.0001
Sometimes	177	83.5	35	16.5	212	66.16	219.5	0.0001
Total	200	51.0	192	49.0	392		230.45	0.0001
Do you use herbs to control your sugar level?								
Always	28	77.8	8	22.2	36			
Never	68	40.5	100	59.5	168	0.19	16.56	0.0001
Sometimes	104	53.1	92	46.9	196	0.32	7,58	0.006
Total	200	50.0	200	50.0	400		17.94	0.0001

4.4 Association between duration of diabetes and diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State

In Table 4.5, foot ulcer cases seem to be rising significantly with the increase in the number of years after diagnosis of diabetes ($p < 0.0001$, $\chi^2 = 96.68$). The cases were approximately 12% at less than 5 years of diabetes but showed increase to 44.4% and 100% respectively for the 5 -9 years and the over 9 years of diabetes. The 5-9 years of diabetes duration significantly contained about 6 time more odds for foot ulcer cases compared to the less than 5 years ($p < 0.0001$, OR= 5.91, $\chi^2 = 36.42$).

Table 4.4: Association between duration of diabetes and diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State

Diabetes Duration	Case		Control		OR	χ^2	P	Total
	Number	%	Number	%				
< 5 years	17	11.9	126	88.1				143
5 to 9 years	59	44.4	74	55.6	5.909	36.42	0.0001	133
10 to 14 years	97	100.0	0	0.0	-	Exact	0.995	97
> 14 years	21	100.0	0	0.0	-	Exact	0.998	21
Total	194	49.2	200	50.8		202.73	0.0001	394

4.5 Discussion

In this chapter, discussion, conclusion and recommendations on the risk factors associated with diabetic foot ulcer among diabetics in government hospitals in owerri were duly outlined.

Major findings in this study from a total population of 400 persons were that the males had the largest population 260 (65%). For the case group, the males were 140 (70%) while they were 120 (60%) in the control group. A higher population of respondents were of age 51 – 70 years (case group: 70%, control group: 32. 5%).

When socio-demographic characteristics were considered in this study, results showed that the male gender was significantly associated with diabetic foot ulcer. There were approximately 54% of foot ulcer cases in males against 43% in females, consequently the risk for foot ulcer was found to be 36% significantly lower among females than in males ($p= 0.036$, $\chi^2= 4.40$, OR= 0.64). Previous studies by (Paris et al 2018) which stated that male gender was a risk factor of DFU (OR1.71;95%CI 1,2-3.7) supported this finding. The reason may be because the male gender tends to have poor health seeking behavior as compared to the female gender. Another reason may be the exposure of the male gender as regards strenuous or difficult tasks which could lead to foot injuries.

Also place of residence was associated to DFU in this study. Foot ulcer cases were higher among rural resident subjects (65%) with significant higher odds of approximately 3 times more for those living in the rural areas ($p < 0.0001$, $\chi^2= 25.6$, OR= 2.85). This is in agreement with a systematic review done by Tolossa et al., (2020) which stated that foot ulcer was significantly associated with rural residence (OR=2.72, 95%, CI: 2.7. 41.37). A cross-sectional study by Deribe (2014) also agreed with this study with a result stating rural residents (AOR=4.074, 95% CI 1.262-13.151) This may be as a result of lack of access to standard health care facilities in rural areas.

When foot care knowledge was considered in this study, result showed that risk of DFU was close to 6 times higher among the group that did not hear of the foot care ($p < 0.0001$, $\chi 2 = 69.03$, OR= 5.88). Similarly, the odds were also significantly higher among those that do not perform regular foot examination ($p < 0.0001$, $\chi 2 = 44.90$, OR= 7.17), or only do so sometimes ($p < 0.0001$, $\chi 2 = 17.50$, OR= 3.37), compared to those that conduct regular examination of foot.

Furthermore, the result showed that drying of feet after washing, cutting the toenails straight across and use of lukewarm water for feet washing was advantageous and reduces the risk of developing DFU. Use of tight fitted shoes and non-use of moisturizing lotion on the feet also posed as risk factors. A cross-sectional study was performed by Mariam et al. (2017) was in agreement with this study as its result stated poor foot self-care practices [AOR = 2.52; 95% CI:1.21; 6.53].

When considering pattern of diabetes management, results from this study showed that diabetic foot ulcer cases were more on those that do not follow diabetes diet plan (100%), compared to those who do sometimes and those who follow their diet plan. It was also more for those who do not engage on regular exercise. Also not taking diabetes medication, not regularly monitoring blood sugar were directly associated DFU

With regards to diabetes duration, this study noted that foot ulcer cases seem to be rising significantly with the increase in the number of years after diagnosis of diabetes ($p < 0.0001$, $\chi^2 = 96.68$). The 5-9 years of diabetes duration significantly contained about 6 time more odds for foot ulcer cases compared to the less than 5 years ($p < 0.0001$, OR= 5.91, $\chi^2 = 36.42$). Previous studies by Yazdanpanah et al., (2018) which stated that DFU prevalence in patients with 11-20 years, was more than in patients with less than 5years (OR=3.8,95% CI:1.33-10.8) supported this finding. Paris et al., (2018) also stated that Patients with ulcer had longer disease duration (17.2+_9.9 vs13.2+_9.4years; p<0.001). It therefore means that prolonged diabetes is a risk

factor to developing DFU and the reason may be that the long term condition could have caused some nerve damage leading to diabetic foot ulcer.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, this study found that a significant number of risk factors exist among people living with diabetes attending government owned hospitals in Owerri, Imo state. When socio demographic characteristics were considered the study result showed that level of education, occupation, male gender and age were significant risk factors. Furthermore, lack of foot care knowledge, poor diabetes management pattern and long term diabetes duration all contribute to risk of developing DFU.

5.2 Recommendations

After the conclusion of this study, the researcher made the following recommendations:

1. There is need to carry out surveillance of DFU among diabetics in the state.
2. Monitoring and evaluation of treatment uptake among diabetics so as to reduce the risk of developing DFU.
3. There is dire need to constantly educate diabetics on meticulous foot care practices and self-care.
4. Risk targeted public health interventions should be carried out in communities to improve knowledge, awareness on lifestyle modifications and prevention of DFU via mitigation of its risk factors.
5. Further studies can be carried out as regards persistent hyperglycemia despite use of medication, how to reduce suicidal ideation among people with diabetes in order to reduce death rate from diabetes and its complications.

REFERENCES

Adeloye, D., Ig,J.O., Aderemi.A.V., Adeleye.N., Amoo,E.O., Oni.G.(2017). Estimating the Prevalence, hospitalization and mortality from type 2 diabetes mellitus in Nigeria: a systematic review and meta analysis. *British Medical Journal* (7), e015424.

Adogu, P.O.U., Chineke, H.N., Ewuzie, M.U., Enwerem, O.O., Egenti, N.B.(2015). The prevalence and presentation pattern of Diabetes Mellitus in Patients at Imo State University Teaching Hospital (IMSUTH) Orlu and Imo State Specialist Hosital (IMSSH) Umuguma Owerri (A 10- Year Retrospective Study: 1st November 2004 to 31st October 2013). *Journal of Diabetes Mellitus* (5),2.

Akaninyene,A.O., Umoh,A.V., Essien,E.O., Enang,E.O., Okpa,O.H., Mbu,N.P.(2013). Profile, Baacteriology and Risk Factors for Foot Ulcers among Diabetics in a Tertiary Hospital in Calabar, Nigeria.

Anumah,F.O., Mshelia-Reng,R., Abubakar.A.,Sough.T., Asudo.F., Jamda.M.N., Omonua.O., Oumodu.K.C., Shuaib.R. (2017). Management outcome of diabetic foot ulcers in a teaching hospital in Abuja, Nigeria. *Journal of Diabetes Complication,* (9), 15-20

Armstrong. (2017). Diabetic foot ulcers and their reoccurrence. *New England Journal of Medicine,*376:2367-2375

Alavi A., Sibbald,RG., Mayer, D., Goodman, L., Botros,M., Armstrong,D.G.(2014). Diabetic foot ulcers: Part II. Management. *Journal of American Academy of Dermatology*, 70(21),:e1-24.

Alavi,A., Sibbald,R.G., Mayer,D., Goodman,L., Botros,M., Armstrong,D.G.(2014). Diabetic foot ulcers:Part I. Pathophysiology and prevention. *Journal of American Academy of Dermatology*,70(1),1-18.

Alayed, M., Younes, N., Al-Smady, M., Khader, Y., Robert, A., & Ajlouni, K. (2017). Prevalence of Foot Ulcers, Foot at Risk and Associated Risk Factors Among Jordanian Diabetics. *Current Diabetes Reviews*, *13*(2),182-191 . https://doi.org/10.2174/1573399812666151210143140

Alrub, A. A., Hyassat, D., Khader, Y. S., Bani-Mustafa, R., Younes, N., & Ajlouni, K. (2019). Factors associated with health-related quality of life among Jordanian patients with diabetic foot ulcer. *Journal of Diabetes Research*.(2019),8. https://doi.org/10.1155/2019/4706720

Al-Rubeaan,K., Derwish,M.A., Ouisi,S. (2015). Diabetic foot complications and their risk factors from a large retrospective cohort study. *Public journal of Science.*10(5),e0124446

Anumah FO, Mshelia-Reng R, Abubakar A, Sough T, Asudo F, Jamda MA, Omonua O, Odumodu KC, Shaibu R. (2017). Management outcome of diabetic foot ulcers in a teaching hospital in Abuja, Nigeria. *Journal of Diabetes Complication,* (9):15–20.

Bakri,F.G., Allan,A H., Khader,Y.S., Younes,N.A., Ajlouni K.M. (2012). Prevalence of diabetic foot ulcer and its associated risk factors among diabetic patients in Jordan. *Jordan Medical Journal*, *46*(2),118-125

Banik,P.C., Barua,L., Moniruzzaman,M., Mondal,R., Zaman,F., Ali,L. (2020). Risk of diabetic foot ulcer and its associated factors among Bangladeshi subjects: A multicentric cross-sectional study. *British Medical Journal,* (10)2,e034058.

Brem.H., Sheehan.P., Rosenberg.H.J., Schneider.J.S.(2008). Evidence based protocol for diabetic foot ulcers. *Journal of Plastic, Reonstructive Aesthetic Surgery*, (117),193-209.

Bus,S.A., Valk,G.D., Van Deursen,RW., Armstrong,D.G., Caravaggi,C., Hlavácek,P.(2008). "Specific guidelines on footwear and offloading". *Diabetes/Metabolism Research and Reviews*. **24** (1), S192-3. *PMID 18442186*

Buzaid,N., Nagem,F. (2018). Characteristics of diabetic foot disease and risk factors in Benghazi, Libya. *Ibnosina Journal of Medicine and Biomedical Sciences*, 10(5). 178-5

Chavan,M.S.(2018). Prevalence and risk factors of diabetic foot ulcer at a tertiary care hospital among diabetic patients. *International Journal of Advances in Medicine*, *5*(5). 322-9

Clayton,W.J., Elasy,T.A.(2009) A review of the pathophysiology, classification and treatment of foot ulcers in diabetic patients. *Clinical Diabetes*,27(2):52–58.

Denan.P.A., Ahachi,N.C., Kortor,N.J., Mue,D.D., Elachi,C.I.I., Ogiator,M., Utoo,M.P., Osuji,J.I. (2017). Diabetic foot ulcers: EpidemiologY, Management Modalities and Outcome at Benue State University Teaching Hospital Makurdi. *Journal of Advances in Medicine and Medical research,* 22(10):1-12.

Deribe,B. (2014). Prevalence and Factors Influencing Diabetic Foot Ulcer among Diabetic Patients Attending Arbaminch Hospital, South Ethiopia. *Journal of Diabetes & Metabolism*, *05*(01).

Dong.Y., Xing.S., Wang.Y., Wang.F., Wang.Y., Xu.X., Wang.G., You.W. (2017_. Non surgical treatment or foot deformities and lesions in patients with diabetes mellitus. *The Journal of Diabetic Foot Complication*, (9):8-14.

Edmonds,M.E.(2006). ABC of wound healing. *British Medical Journal*, (18)407-10.

Edmonds,M., Manu,C., Vas,P. (2021). The current burden of diabetic foot disease. *Journal of Clinical Orthopaedic Trauma.*8(17)88-93.

Edo.A.E., Edo.G.O., Ezeani.I.U.(2013). Risk factors, ulcer grade and management outcome of diabetic foot ulcers in a Tropical Tertiary Care Hospital. *Nigerian Medical Journal,* (54),59–63.

Ehusani,F.E., Giwa,S.O., Ohwovoriole,A.E.(1999) A retrospective study of diabetic foot lesions in Lagos. *Nigerian Journal of Internal Medicine*, (2):10-2.

Ekpebegh,C.O., Iwuala,S.O., Fasanmade,O.A., Ogbera,A.O., Igumbor,E., Ohwovoriole,A.E. (2009) Diabetes foot ulceration in a Nigerian hospital: in-hospital mortality in relation to the presenting demographic, clinical and laboratory features. *International Wound Journal*. ;6(5):381–5.

Ezeama.M.C., Enwereji.E.E. (2019). Prevalence of diabetes mellitus among adults treatd in Imo State University teaching hospital Orlu local government area, Imo State, Owerri, Nigeria. *IJAM* **6**;6

Fawzy, M.S., Alshammari.M.A., Alruwaili.A. A., Alanazi.R.T.R., Alharbi.J.A.M ., Almasoud. A.M.R., Alshamiri.R.A., Toraih.E.A. (2019). Factors associated with diabetic foot among type 2 diabetes in Northern area of Saudi Arabia: a descriptive study. *BMC,*12:51.

Freitas,F., Winter,M., Cieslinski,J., Tasca Ribeiro,V.S., Tuon,F.F. (2020). Risk factors for plantar foot ulcer recurrence in patients with diabetes – A prospective pilot study. *Journal of Tissue Viability*, *29*(2),132-137.

Gubara Musa,H., Ahmed,E.M. (2012). Associated risk factors and management of chronic diabetic foot ulcers exceeding 6 months' duration. *Diabetic Foot & Ankle*, *3*(1).

Google map.(2021)s

International Diabetes Federation (2011), *Diabetes Atlas*, International Diabetes Federation,

Brussels, Belgium, 5th edition. http://www.idf.org/diabetesatlas/5e/the-global-burden.

InternationalDiabetesFederation (2012), *DiabetesAtlas*. http://www.idf.org/diabetesatlas/africa

IDF. 2015 International diabetes federation 7th edition.

International Diabetes Federation. (2017). Diabetes atlas 8th Edition. International Diabetes Federation. Available from: http://www.diabetesatlas.org. http//www.diabetesatlas.org

International Working Group on the Diabetic Foot (1999) In: International consensus on the diabetic foot. International Working Group on the Diabetic Foot, The Netherlands, pp 20–96

Jans,N.K., Marshal,H.B. (1984). The health belief model: A decade later. *Health Education and behavior.* **11**(1):1-47.

Jeffcoate,W.J., Lipsky,B.A., Berendt,A.R., Cavanagh,P.R., Bus,S.A., Peters,E.J. (2008). "Unresolved issues in the management of ulcers of the foot in diabetes". *Diabetic Medicine*. **25** (12): 1380–9. *PMID 19046235*

Ji,X., Jin P., Chu,Y., Feng,S., Wang,P. (2014). Clinical characteristics and risk factors of diabetic foot ulcer with multidrug-resistant organism infection. *International Journal of Lower Extremity Wounds*, *13*(1),64-71.

Jiang,Y., Wang,X., Xia,L., Fu,X., Xu,Z., Ran,X., Yan,L., Li,Q., Mo,Z., Yan,Z., Ji,Q., Li, Q. (2015). A cohort study of diabetic patients and diabetic foot ulceration patients in China. *Wound Repair and Regeneration*, *23*(2),222-230.

Kantva,D.S.M., Kumar,D.M. (2019). Risk factors of diabetic foot ulcer at a tertiary care hospital among diabetic patients. *International Journal of Medical and Biomedical Studies*, *3*(8),152-154.

Khumar. A., Sandireddy. R., Yerra. V.G., Areti. A., Komirishetty. P. (2014). Neuroinflammation and oxidative stress in Diabetic Neuropathy: Futuristic StrategiesBased on these Targets. International Journal of Endocrinology.2014 (10)

Leone.S., Pascale.R., Vitale.M., Esposito.S.(2012). Epidemiology of diabetic foot. *Infez Med.* (20)1:8-13

Leymarie,F., Richard,J.L., Malgrange,D. (2005). Factors associated with diabetic patients at high risk for foot ulceration. In *Diabetes and Metabolism* (Vol. 31, Issue 6).

Lipsky,B.A., Berendt, A.R., Cornia, P.B.(2012). Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. *Clinical Infectious Diseases*,54(12):e132–e173.

Litzelman,D.K.,, Slemenda,C.W., Langefeld,C.D., Hays,L.M., Welch,M.A., Bild,D.E.(1993)

"Reduction of lower extremity clinical abnormalities in patients with non-insulin-dependent diabetes mellitus. A randomized, controlled trial". *Annals of Internal Medicine,* **119** (1): 36–41 *PMID 8498761*. *S2CID 35492751*

Mbanya.J.C., Motala.A.A., Sobngwi.E., Assah.F.K., Enoru.S.T. (2010). Diabetes in sub Saharan

Africa*. Lancet*. 2010;375:2254-2266.

Mariam,T.G., Alemayehu,A., Tesfaye,E., Mequannt,W., Temesgen,K., Yetwale,F., Limenih,M.

A. (2017). Prevalence of Diabetic Foot Ulcer and Associated Factors among Adult Diabetic Patients Who Attend the Diabetic Follow-Up Clinic at the University of Gondar Referral Hospital, North West Ethiopia, 2016: Institutional-Based Cross-Sectional Study. *Journal of Diabetes Research*, *2017*. https://doi.org/10.1155/2017/2879249

Mc Intosh,C., Kelly,L.(2009). Importance of wound debridement in management of diabetic foot ulcers: case report. Wound Essentials. 2009;4:122-5.

Misliza,A., Ayu S, M. (2009). Sociodemographic and lifestyle factors as the risk of diabetic foot

ulcer in the university of malaya medical centre. *Journal of Health and Translational Medicine*, *12*(1),15-21.

Musa,I.R., Ahmed, M.O.N., Sabir,E.I., Alsheneber,I.F., Ibrahim,E.M.E., Mohamed,G.B.,

Awadallah,R.E., Abbas,T., Gasim,G.I. (2018). Factors associated with amputation among patients with diabetic foot ulcers in a Saudi population. *BMC Research Notes*, *11*(1). https://doi.org/10.1186/s13104-018-3372-z

Nazish,Z., Khan,M.Y., Zahara,F.T. (2019). Factors associated with increased prevalence of

diabetic foot ulcer and its poor outcome. *Medical Forum Monthly*, *30*(10).

Odunsade, O., Amoran, O.E., Salami, O. (2018). Diabetic foot ulcer: risk factors amomg patients

of a secondary healthcare facility in south west Nigeria. *Ghana Medical Journal,* 52(4):222-227.

Ogbera.A.O., Fasanmade.O., Ohwovoriole.A.E., Adediran.O. (2006). An assessment of the

disease burden of foot ulcers in patients with with diabetes mellitus attending a teaching hospitalin Lagos, Nigeria*. Int J Low Extrem Wounds.* 5:244-249.

Ogbera.A., Fasanmade.O., Ohwovoriole.A.(2006) "High costs, low awareness and a lack of

care—the diabetic foot in Nigeria," *Diabetes Voice*, (3),30–33.

Ogbera.A.O., Chinenye.S., Onyekwere.A., Fasanmade.O. Prognostic indices of diabetes mortality. *Ethnicity and Disease*,17(4),721–5.

Oyibo,S.O., Jude.E.B., Tarawneh.I.,Nguyen.H.C., Harkless.L.B., Boulton.A.J.M.(2001). A comparism of two diabetic foot ulcer classification system the wagner and the university of texas wound classification system. *Diabetes*;24(1),84-8.

Paraskevas,K.I., Baker,D.M., Pompella,A., Mikhailidis,D.P.(2008). Does diabetes mellitus play a role in restenosis and patency rates following lower extremity peripheral arterial revascularization? A critical overview. *Annals of Vascular Surgery*;22(3),481–491.

Parisi,M.C.R., Neto,A.M., Menezes,F.H., Gomes,M.B., Teixeira,R.M., De Oliveira,J.E.P., Pereira,J.R.D., Fonseca,R.M.C., Guedes,L.B.A., E Forti,A.C., De Oliveira,A.M.A., De Medeiros Nóbrega,M.B., Colares,V.N.Q., Schmid,H., Nienov,O.H., Nery,M., Fernandes,T.D., Pedrosa,H. C., Schreiber,C., Saad,M.J.A. (2016). Baseline characteristics and risk factors for ulcer, amputation and severe neuropathy in diabetic foot at risk: The BRAZUPA study. *Diabetology and Metabolic Syndrome*, *8*(1),25.

Pengzi.Z ., Jing.L.,Yali.J., Sunyinyan.T., Dalong.Z., Yan Bi.(2017) Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis *PMID*:27585063 https://doi.org/10.1080/07853890.2016.1231932

Prompers.L., Huljberts.M., Schaper.N. (2008). Resource utilization and cost associated with the treatment of diabetic foot ulcers. Prospective data from Eurodiale study .
Dabetogia, (51),1826-1834.

Rebolledo,F.A., Soto,J.T., de la Pena,J.E.(2011). The pathogenesis of the diabetic foot ulcer: prevention and management. In Global Perspective on Diabetic Foot Ulcerations 2011. *In Tech.*155-182.

Richard.J.L., Sotto.A., Jourdan. N., Combescure. C., Vannereau. D., Rodier. M., Lavigne.J.P. (2008). Risk factors and healing impact of multi-drug resistant bacteria in diabetic foot ulcers. Diabetes and Metabolism. 34(2008) 363-369.

Rigato,M., Pizzol,D., Tiago,A., Putoto, G., Avogaro,A., Fadini,G.P.(2018). Characteristics,

analysis. *Diabetes Research Clinical Practise*, (142),63–73.

Rosenstock, I. 9(1974). Historical origins of the health belief model. *Health Education and Behavior*, **2**(4):328-335.

Saleem,S., Hayat,N., Ahmed,I., Ahmed,T., Rehan,A.G. (2017). Risk factors associated with poor outcome in diabetic foot ulcer patients. *Turkish Journal of Medical Sciences*, *47*(3),826-831.

Sari,Y., Purnawan, I., Taufik,A., Sumeru,A. (2018). Quality of Life and Associated Factors in Indonesian Diabetic Patients with Foot Ulcers. *Nurse M edia Journal of Nursing*, *8*(1,13-24).

Shafi,A., Maaz-Ul-Hassan., Tufail,S. (2018). A study of risk factors of diabetic foot ulcers. *Medical Forum Monthly*, *29*(4),63-63.

Shahi,S.K., Kumar, A., Kumar,S., Singh., Gupta, S.K., Singh,T. (2012). Prevalence of Diabetic Foot Ulcer and Associated Risk Factors in Diabetic Patients From North India. *The Journal of Diabetic Foot Complications*, *4*(4),83-91.

Shokry Abd-Allah, E. (2016). Diabetic Foot Among Elderly at Zagazig City: Risk Factors and Foot Care Practices. *American Journal of Nursing Science*, *5*(1),22-29.

Steed,D.L.(2004). Debridement. *Journal of American College of Surgeons*;187 (1):71S-4.

Stillman,R.M.(2008) Diabetic ulcer. Available on http://emedicine.com. Retrieved on June 2008.

Siddiqui, T.R., Ghazal, S., Bibi,S., Ahmed,W., Sajjad,S.F. (2016) Use of health belief model for the assessment of public knowledge and household preventive practices in Karachi, Pakistan, a dengue-endemic city. *PLOS Neglected tropical diseases.* 10(11): 1935-2735.

Sumpio,B.E.(2012). Contemporary evaluation and management of the diabetic foot. *Scientifica*, 435487.

Tindong,M., Palle,J. N., Nebongo,D., Aminde,L.N., Mboue-Djieka,Y., Mbarga,N.T.F., Dehayem, M.Y., Choukem,S.P. (2018). Prevalence, Clinical Presentation, and Factors Associated With Diabetic Foot Ulcer in Two Regional Hospitals in Cameroon. *International Journal of Lower Extremity Wounds*, *17*(1),42-47.

Tolossa,T., Mengist,B., Mulisa,D., Fetensa,G., Turi,E., Abajobir, A. (2020). Prevalence and associated factors of foot ulcer among diabetic patients in Ethiopia: A systematic review and meta-analysis. *BMC Public Health*, *20*(1)41.

Turns,M.(2012). "The diabetic foot: an overview for community nurses". *British Journal of CommunityNursing*. **17** (9):422,424–27,430. *PMID* 23123487.

Ugwu,E., Adeleye, O., Gezawa,I., Okpe,I., Enamino,M., Ezeani, I. (2019). Predictors of lower extremity amputation in patients with diabetic foot ulcer: Findings from MEDFUN, a multi-center observational study. *Journal of Foot and Ankle Research*, *12*(1),34.

Vileikyte,L., Rubin,R.R., Peyrot,M., Gonzalez,J.S., Boulton,A.J., Ulbrecht,J.S., Cavanagh,P.R. (2009). "Diabetic feet". *The British Journal of General Practice : the Journal of the Royal College of General Practitioners.* **59** (561): 290.

Viswanathan. V., Kumpatla.S. (2011). Patterns and cause of amputation in Diabetic patients- A multi centric study from India. The Journal of the Association of Physicians of India.59(3):148-51

Walsh,J.W., Hoffstad,O,J., Sullivan,M.O., Margolis,D.J. (2016). Association of diabetic foot ulcer and death in a population-based cohort from the United Kingdom. *Diabetic Medicine*, *33*(11),1493-1498.

Wang,A.H., Xu,Z.R., Ji,L.N.(2012). Clinical characteristics and medical costs of diabetics with amputation at central urban hospitals in China. Zhonghua Yi Xue Za Zhi;(92):224-7.

WHO(2020). About diabetes. Retrieved on the 29th june 2020 from https://webcache.googleusercontent.com/search?q=cache:m6ifdHAc8IAJ:https://www.w ho.int/diabetes/action_online/basics/en/index3.html+&cd=9&hl=en&ct=clnk&gl=ng

Wolf,G.(2004).New insights into the pathophysiology of diabetic nephropathy: from haemodynamics to molecular pathology. *European Journal of Clinical Invest*igation; 34(12):785–796.

Yazdanpanah,L., Shahbazian,H., Nazari,I., Arti,H.R., Ahmadi,F., Mohammadianinejad,S.E., Cheraghian,B., Latifi,S.M. (2018). Prevalence and related risk factors of diabetic foot ulcer in Ahvaz, south west of Iran. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, *12*(4).

Yazdanpanah,L., Shahbazian,H., Nazari,I., Hesam,S., Ahmadi,F., Cheraghian,B., Arti,H.R., Mohammadianinejad,S.E. (2018). Risk factors associated with diabetic foot ulcer-free survival in patients with diabetes. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, *12*(6),519-524.

Zantour,B., Bouchareb,S., El Ati,Z., Boubaker,F., Alaya,W., Kossomtini,W., Sfar,M.H. (2020) Risk assesment for oot ulcers among Tunisian subjects with diabetes; a cross sectional out patient study. *BioMedical Central Endocrine disorder.*20(1):128.

APENDIX A

QUESTIONNAIRE

OUESTIONAIRRE ON THE RISK FACTORS ASSOCIATED WITH DIABETIC FOOT ULCER AMONG PEOPLE LIVING WITH DIABETES ATTENDING GOVERNMENT OWNED HOSPITALS IN OWERRI, IMO STATE.

Hospital ______________ **Code** __________

Informed Consent Form

My name is Nwokeleme Ogechi C, I humbly solicit for your participation in this study where we aim to learn more about the factors associated with diabetic foot ulcer among people living with diabetes attending government owned hospitals in Owerri, Imo State, Nigeria.

The information obtained in this study is only for scientific research without any commercial interests.

Your personal information will be kept confidential as your name will not be required but rather represented with a code.

The questionnaire will not cost you anything other than 10 minutes of your time.

Whether or not to participate in the research is entirely up to you. If you have any questions about the research, you can ask he researcher. You can also refuse to participate in this study or withdraw from the study at any time.

If you agree to participate in the study, please sign your Signature below

Signature __________________

Date __________________

SECTION A: SOCIO DEMOGRAPHIC DATA

1) Gender: Male ☐ Female ☐
2) Age range: 18- 30 ☐ 31 – 50 ☐ 51 – 70 ☐ Above 70 ☐
3) Educational level: No formal Education ☐ Primary ☐ Secondary ☐ Tertiary ☐
4) Residence: Urban ☐ Rural ☐
5) Occupation: Civil service ☐ Trader ☐ Artisan ☐ Farmer ☐ Entrepreneur ☐

SECTION B: FOOT CARE KNOWLEDGE

6) Have you heard about foot care to prevent and care for diabetic foot ulcer? Yes ☐ No ☐
7) Do you examine your feet regularly? Always ☐ Never ☐ Sometimes ☐
8) Do you wash your feet daily with lukewarm water? Always ☐ Never ☐ Sometimes ☐ ☐
9) Do you dry your feet after washing? Yes ☐ No
10) Do you cut your toe nails straight across? Yes ☐ No ☐
11) Do you wear tight fitted shoes? Always ☐ Never ☐ Sometimes ☐
12) Do you walk around on barefoot? Always ☐ Never ☐ Sometimes ☐
13) Do you use moisturizing lotion on your feet? Always ☐ Never ☐ Sometimes ☐

SECTION C: PATTERN OF DIABETES MANAGEMENT

14) Do you follow the diabetes diet plan? Always ☐ Never ☐ Sometimes ☐

15) Do you exercise regularly? Always ☐ Never ☐ Sometimes ☐

16) Do you take diabetics medications? Always ☐ Never ☐ Sometimes ☐

17) Do you take insulin shot? Always ☐ No ☐ Sometimes ☐

18) Do you monitor your blood sugar regularly? Always ☐ Never ☐ Sometimes ☐

19) Do you use herbs to control your sugar level? Always ☐ Never ☐ Sometimes ☐

APPENDIX B

RELIABILITY STATISTICS

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
..711	.798	35

APPENDIX C

FEDERAL UNIVERSITY OF TECHNOLOGY
SCHOOL OF HEALTH TECHNOLOGY
DEPARTMENT OF PUBLIC HEALTH
E-mail: publichealth@futo.edu.ng

P.M.B. 1526
Owerri, Nigeria
Telegrams.
FEDUNITECH, OWERRI

VICE-CHANCELLOR: PROF. Nnenna Nnannaya Oti
B.Sc, M.Sc. (Nig), PGD. (Belgium), PhD (FUTO), FSSN, RSS & JP

Dean: Prof. P. U. Agbasi. B.Sc, M.Sc, Ph.D
Head of Department: DR.U.M Chukwuocha
B.Sc, MPH, Ph.D.

Our Ref: FUT/SOHT/PUH/CS.006/VOL. 1 October 22, 2021
Your Ref:

Dear Sir/Ma,

LETTER OF INTRODUCTION

The bearer **Nwokeleme Ogechi Chikaodi** with Reg. No. **20184139408** is a bona-fide student of the Department of Public Health, Federal University of Technology, Owerri. As part of requirement for graduating MPH student, every student is required to carry out a well-articulated research.

Accordingly, **Nwokeleme Ogechi Chikaodi** is seeking to carry out her research in your Hospital on **RISK FACTORS ASSOCIATED WITH DIABETIC FOOT ULCER AMONG DIABETICS IN GOVERNMENT HOSPITALS IN OWERRI, IMO STATE, NIGERIA.** We would appreciate your kind assistance towards the realization of this compulsory requirement for her graduation.

Please give her the necessary assistance she requires for a successful programme.

Dr U.M Chukwuocha
HOD Public Health

APPENDIX D

GOVERNMENT OF IMO STATE OF NIGERIA

Telegrams:
Telephone:
Your Ref: ....
Our Ref: ....

MINISTRY OF HEALTH
PUBLIC HEALTH DEPT
OWERRI
25/11 — **2021**

NWOKELEME OGECHICHIKAODI
DEPT OF PUBLIC HEALTH
SCHOOL OF POST GRADUATE STUDIES
FUT, OWERRI.

RE: APPLICATION FOR ETHICAL CLEARANCE CONVEYANCE OF APPROVAL.

I am directed to convey approval to your application for Ethical Clearance on your research work entitled; RISK FACTORS ASSOCIATED WITH DIABETIC FOOT ULCER AMONG DIABETICS IN GOVERNMENT HOSPITALS IN OWERRI, IMO STATE

With this approval you can carry on with your proposed research while ensuring the observance of consent, confidentiality and other ethical considerations.

You are to submit a copy of your work to the office of the Honourable Commissioner at the end.

Good luck!

DIRECTOR
PUBLIC HEALTH/PRIMARY HEALTH CARE
MINISTRY OF HEALTH
OWERRI

Dr. Okeji A.C.
PDH

APPENDIX E

FEDERAL MEDICAL CENTRE

P. M. B. 1010, Orlu Road Owerri, Imo State, Nigeria

Medical Director
DR. K. I. ACHIGBU
MBBS, FWACP
Chief Consultant Paediatrician

Ag. Head of Clinical Services
DR. CHUKWUMAM D.O.C
M.B.B.S, FWACS, FICS
Chief Consultant Orthopaedic/ Trauma Surgeon.

Chairman of Board
SENATOR (DR) IS'HAQ SALMAN

Head of Administration
KELECHI O. OTUNEME
B.TECH, MILR, MSC, MNIM, AHAN, ANIPR

21305

e-mail: hospitalfmc162@yahoo.com,
Phone: 08033269325 (MD), 08035508779 Ag. (HCS), 08034546666 (HAS)

FMC/OW/HREC/VOL.II/027

November 25, 2021.

Nwokeleme Ogechi Chikaodi,
Department of Public Health,
Federal University of Technology,
Owerri.
Imo State.

Dear Nwokeleme Ogechi Chikaodi,

ETHICAL APPROVAL

RE: RISK FACTORS ASSOCIATED WITH DIABETIC FOOT ULCER AMONG DIABETICS IN GOVERNMENT HOSPITALS IN OWERRI. IMO STATE.

The Health Research Ethics Committee has reviewed your proposal on the above study.

I am pleased to inform you that ethical approval has been granted for the conduct of your research.

You are advised to adhere to your methodology as stated in the proposal and submit a copy of your dissertation to this Committee on completion of your study.

This approval is valid for one year.

Yours faithfully,

Ikeifeanyi

DR. I. I. IKE (MBBS, FMCPAED)
CHAIRMAN, HEALTH RESEARCH ETHICS COMMITTEE.

DEFINITION OF TERMS

Diabetes mellitus: is a metabolic disease associated with high blood sugar.

Diabetic foot ulcer (DFU): This is an open sore or wound that occurs in approximately 15% of diabetic patients and is commonly located at the bottom of the foot.

Lower extremities amputation: is the surgical removal of the lower limb i.e. the thigh, leg, ankle or foot.

Duration of diabetes: The period of time in which a person has been confirmed of being diabetic.

Body mass index (BMI): A person's weight in kilograms divided by the square of height in meters.

Case definition: Cases is defined as any diabetic in government hospitals in Owerri who have been diagnosed of diabetic foot ulcer.

Control: Control is defined as any diabetic in government hospitals in Owerri who has no active symptoms of diabetic foot ulcer. Matching of cases to controls were based on the following cofounding; age, socio economic status.

Inclusion criteria: Any diabetic aged 18yrs and above, in government hospitals in Owerri, Imo state. It must be an individual who has given informed consent.

Exclusion criteria: Individuals who were not visiting government hospitals in Owerri, diabetics who had traumatic ulcer due to car accident and individuals who do not give their informed consent will be excluded from this study.