KNOWLEDGE AND PRACTICE OF FOOT SELF-CARE AND ASSESSMENT OF FOOT-AT-RISK AMONG ADULT DIABETIC PATIENTS ATTENDING TWO TEACHING HOSPITALS IN ENUGU STATE

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ENUGU CAMPUS

OCTOBER, 2015

TITLE PAGE

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M.SC DISSERTATION

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CERTIFICATION PAGE

I, Ogbogu Chinenye J. PG/MSC/12/61491 certify that this original work is mine except as specified in the acknowledgement and references. Neither the dissertation nor the original work contained therein has been submitted to this University or any other institutions for the award of M.Sc in Nursing.

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Student

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Dr. Mrs. Anarado A.N Date

Supervisor

DEDICATION

I dedicate this work to all the nurses and other health care providers who work tirelessly in managing the diabetic patients and to the diabetic patients who make efforts to care for their foot.

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The researcher is grateful to God Almighty for his mercy, grace and loving kindness throughout the course of this course. I sincerely thank my project supervisor, DR (Mrs.) Anarado A.N. for her unalloyed support, motherly kindness, direction and scrutiny of this project. Indeed, you are the best. This work would be incomplete without mentioning my parents Chief and Mrs. Anthony Ogbogu (Chinyelugo) for their unalloyed support, and my siblings especially Chibuzor (Lastborn) who encouraged me all the way. I couldnôt have done this without your support. Many thanks also to the faculty of International Interdisciplinary Wound Care Course (Prof. Gary Sibbald, Prof. Elizabeth Ayello and Hiske Smart) for exposing me to the programme that changed my life entirely. Thanks to Dr. Nwaneri A. (Head of Department), for believing in me, Dr (Mrs.) Chinweuba for standing with me and understanding my inadequacies, Dr (Mrs.) Ogbonnaya N.P and Dr (Mrs.) Ehiemere I. O. for your wonderful motherly encouragement, Dr (Mrs.) Okpala, Mrs Iheanacho P., Mr Ingu Justine, and the entire staff of this noble department. My unreserved gratitude goes to my dear friend Dr. Anetekhai Ikpemhi Wilson whose encouragement and love was my pillar of support throughout the course of this programme, Dr. Odo Nnaemeka, Dr. Akah Chineme and Mr. Ohaegulam Chike for the encouragement all the way. I also appreciate Dr. Ekenze Sebastian, Dr (Rev.) Okafor C. (UNTH) and late Prof. Ofoegbu (ESUTH) (Consultant Endocrinology Physicians) for their unalloyed support. My profound gratitude goes to my research assistants Miss Princess Orazulume and Mr. Chibuike. This work was possible because you were part of it. May God richly bless you, amen.

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Abstract

Diabetic foot ulcer which occurs as a result of poorly managed diabetes mellitus constitutes an increasing public health problem especially to those living in Sub-Saharan Africa. This study assessed the knowledge, practice of foot self-care and foot-at-risk of ulceration, among adult diabetics being managed at two teaching hospitals in Enugu State, Nigeria. The study adopted a descriptive cross sectional survey design. 202 and 112 patients respectively were proportionately and purposively recruited for the study from the two teaching hospitals. Data collection was done using three instruments: a 47 item researcher developed questionnaire used to solicit information on respondents characteristics, knowledge and self-reported practice of foot self-care, a Standardized tool ñ60 seconds screening toolò used to assess foot-at-risk of ulceration as well as the common foot abnormalities observed in the respondents and an observation checklist used to validate the self-reported foot self-care practices. The instruments were face and content validated while reliability of the instrument was carried out using test re-test method and Pearsonôs Moment Correlation Statistics. Data collected for the study were analyzed with the help of percentages and mean for descriptive statistics IBM SPSS version 20 and Pearsonôs Moment Correlation for inferential statistics at 0.05 level of significance. Results of this study showed that 16.9% had good knowledge, 68.5% had average, while 14.6% of the respondents had poor knowledge of foot self-care. Reported foot self-care practices was poor 9.9%, while on observation, 28.7% respondents had appropriate foot wears. The respondents at risk of diabetic foot ulceration were 42.7%. The common foot problems identified were foot deformity (36.6%), linear cracks (19.1%) and active ulcer or blisters (15.6%). Smoking and eye complication were associated with higher risk of developing foot ulceration ($P < 0.05$). The younger the patients, the better the knowledge and practice of foot self-care while being gainfully employed and prior diabetic foot education were found to increase diabetic foot self-care practice ($P < 0.05$). Respondents who had good knowledge had also good practice of foot self-care ($P = 0.000 \underline{\sim} 0.001$). Conclusion and recommendation: instituting supportive-educative system of intervention could improve patientsôknowledge and foot care practices.

CHAPTER ONE

INTRODUCTION

Background to the study

Diabetes mellitus and its complications have become a pandemic affecting 346 million people worldwide (World Health Organization [WHO], 2011). Wild, Roglic, Green, Sicree and King. (2004) projected that prevalence will increase to 366 million by 2030 due to population growth, aging, unhealthy diet, obesity and sedentary life styles (WHO, 2011). This increase in prevalence is expected to be more in the Middle Eastern crescent, Sub-Saharan Africa and India. WHO (2011), reports that ñmore than 80% of people with diabetes live in low and middle ï income countriesò (Sub Saharan Africa inclusive). In Africa, the estimated prevalence of diabetes is 1% in rural areas, up to 7% in urban sub-Saharan Africa, and between 8-13% in more developed areas such as South Africa and in those of Indian origin (Mortala, 2004). The prevalence in Nigeria varies from 0.65% in rural Mangu (North) to 11% in urban Lagos (South) (Akinkingbe, 1997; Sunny andEkere, 2011). WHO suggests that Nigeria has the greatest number of people living with diabetes in Africa (Sunny et al, 2011).This population of Nigerians with diabetes are at a 25% increased risk of diabetic foot ulceration and this will in turn increase the risk of lower limb amputation if not managed appropriately (Singh, Armstrong and Lipsky, 2005).

Diabetic foot ulcer according to the National Institute for Health and Clinical Excellence (NICE, 2011) is a complication of poorly managed diabetes disease. It is also a complex, chronic wound which has a major long-term impact on the morbidity, mortality and quality of patientôs lives. Lavery et al (2008) and the International Working Group on the Diabetic Foot (IWGDF) identified the yearly incidence rate of ulceration. If a person has diabetes and no other complication, he/she has a 2% risk of developing a foot ulcer. Annually, this incidence increases to 4.5% with neuropathy and to 13.8%

with peripheral vascular disease. In the presence of previous ulcer, previous amputation, peripheral vascular disease, and neuropathy, the incidence of developing a foot ulcer increases to 32.2% (Lavery et al., 2008). The life time risk of a person with diabetes mellitus developing a foot ulcer is as high as 25% (Singh et al, 2005; Brem, Sheehan, Rosenberg, Schneider and Boulton, 2006) and a 50% to 70% recurrence rate within 5 years (Brem, et al, 2006). Diabetic foot ulcer constitutes an increasing public health problem especially to those living in sub-Sahara Africa, and the foot ulcers are leading cause of admissions, amputations and mortality in diabetic patients. This can be prevented since neuropathy is the major cause.

Diabetic foot ulcer precedes lower limb amputation in 85% of cases (Brem et al, 2006; Borton et al, 2008). The annual incidence of lower-limb amputations in persons with diabetes has been documented to be 181 for 100,000 population in Brazil and as high as 936 per 100,000 population in Barbados, 478 per 100,000 population in Guyana, 590 per 100,000 population in United States of America (USA) and 285 per 100,000 in United Kingdom (UK) (Sibbald, Ayello, Alavi, Woo, Hiske et al., 2012). It does not end with an amputation, it has been documented that mortality following amputation increases with the level of amputation (Berthel and Ehrler, 2010) and ranges from 50-68% at five years, which is comparable or more than for most malignancies (Abbas, & Archibald, 2007). According to Ngim, Ndifon, Udosen, Ikpeme andIsiwele (2012), diabetic foot ulcers accounted for 58% of all major amputations in South-South Nigeria.

Around 10% of people with diabetes in Nigeria suffer lower-limb complications, and the incidence is rising. The diabetic foot ulcer is the second leading cause of diabetes related deaths in Nigeria, accounting for 24% of all diabetes mortalities. In 2005, people with diabetes-related foot ulceration made up almost 12% of the total hospital admissions and about a quarter of people in Nigeria with newly diagnosed diabetes already suffer foot ulceration (Ogbera, Fasanmade & Ohwovoriole 2006).

Nerve damage and vascular disease are compounded by walking barefoot. Barefoot is a particularly strong risk factor in Nigeria (especially in southern part of the country), where many people are encouraged by their religious beliefs not to use footwear and foot care (Ogbera et al, 2006).

Two thirds of people with diabetes foot complications require some form of amputation, after which, their care options are minimal. In many cases, people do not have the means to travel to a hospital, let alone pay for the necessary treatment, preventive health education is lacking (Ogbera, et al. 2006). Facilities for prostheses are not accessible ï or affordable. There is no provision for home visits or follow-up counseling. Often, a ócureô is first sought from traditional healers. Thus, it is common for people with diabetes foot ulceration to seek medical attention late, when bone damage has already set in. As a result, they often require long periods of hospital care. Sadly, amputation and premature death are not uncommon outcomes (Ogbera et al, 2006).

Foot ulcer is a cause of terrible suffering for those with the condition and their loved ones; the costs are high in economic, as well as human terms (Ogbera et al, 2006).He further reports that the direct economic costs of the diabetic foot in Nigeria are substantial. The average cost of successfully treating foot ulceration has been calculated at about 1000 EUR; in Nigeria, the average monthly wage is about 46 EUR (N 13,800). Given that those who suffer most diabetes complications are at the lower end of the socio-economic spectrum, the economic consequences for people with diabetes and their families are devastating. This motivates people with foot problems to seek help from traditional healers, thereby contributing to the high rates of death among people with diabetes foot ulceration (Ogbera et al, 2006).

The psychosocial costs of amputations are high. People suffer the societal stigma of losing a limb and face important problems seeking or maintaining employment. These psychosocial trauma in some cases lead to severe depression and suicide (Ogbera, 2006). Diabetes related lower extremity

amputation (LEA) have a detrimental impact on quality of life. International Best Practice Guidelines (2013), found that both the physical dimension scores and the total sickness impact profile scores were significantly higher for patients with amputation and concluded that the findings exemplify the detrimental physical and psychosocial health status of patients with diabetic-related lower extremity amputation. The major part of the burden of people of diabetic population is the impaired quantity and quality of life which are due to diabetes complications (diabetic foot ulcers inclusive) (Ogbera, Fasanmale, 2008). The problem emanating from diabetic foot ulcer does not affect the patient alone, but also the family (where funds for other things are used for treatment, time taken for admission in hospitals), the care givers and the society (where the patient who is supposed to be working is on admission or is not working due to loss of a limb, hence not contributing to the growth of the nationôs economy).

In view of the increasing rate of diabetes, the suggestions that Nigerians are the most affected, the complications of foot ulcer and risk of amputation, there is indeed an urgent need for the health care providers to aggressively address this rising incidence. This can be done by screening to identify the patients at risk of foot ulcer, educate and work with them in order to prevent foot ulcer formation by devising methods of preventing future ulcer occurrence. Assessment of foot-at-risk and knowledge and practice of foot self-care are prelude to planning any intervention to increase risk perception, and early diagnosis of foot lesions. Abbas et al., (2007) believe that identifying those at risk of foot ulceration and proper education are essential to making a difference to these depressing statistics. This should therefore be a concern to all professional health care givers and all factors associated with it should be considered while caring for the diabetic population.

In practice, poor knowledge and practice of foot self-care has been widely reported in studies (Hasaina et al (2009); Gondal et al (2007); Dikeukwu et al (2013); Desalu et al (2011)) and it has

been documented that diabetic patients are at risk of foot ulceration (Adejumo, 2013; Ekore, 2010). Reports from the developing and developed countries have shown that most of the patients have poor knowledge of foot-self-care (Batista andPinzur, 2005; Murtaza, Uzma, Shaheen and Ziauddin, 2007). Studies in other parts of the world have demonstrated lack of adequate foot care knowledge among participants (Chandalia et al, 2008; Olson et al, 2009; Viswanatham; 2010). Ogbera, Adedokun, Fasanmade, Ohwovoriole andAjani (2005), reported in a study conducted in Lagos University Teaching Hospital that more than 50% of patients with diabetes had never had their feet examined, more than 28% have never had a diabetic foot education and 41.5% of the patients with diabetes were at risk of diabetic foot ulcer. Another study in South Africa by Dikeukwu (2011) reported that more than 75% of the patients had no knowledge of foot care.

In Enugu, there is paucity of information on foot-at-risk, knowledge and practice of foot-self-care among diabetic patients including the extent of the problem and the factors associated with it. This emphasizes the need to ascertain the knowledge and practice of foot self-care and the diabetic foot at risk of ulceration among adult diabetic patients attending diabetic clinics at two teaching hospitals in Enugu. If the magnitude of this growing public health problem is ascertained, appropriate and timely intervention can be initiated to save the limbs of the diabetic population in Enugu and also Nigeria.

Statement of the problem

One of the major complications of diabetes is foot ulceration which can lead to limb amputation if adequate measures are not taken to manage it. The presence of diabetes increases the risk of a non-traumatic lower limb amputation by 20- fold. It has been estimated that every 20 seconds a lower limb in the world is amputated due to complication of diabetes (International Best Practice Guidelines, 2013). Diabetic foot ulcer is largely a self-care disease and a good self-care practice will

prevent or delay its occurrence (Abbas, 2007). This is because the patient is the first person that notices a change in self.

Clinically, the researcher has however observed that a lot of patients present to the hospital with foot ulcers that are at advanced stages and they end up with amputation. The question is, to what extent do diabetic patients practice foot-self-care, what do they know and to what extent?To answer these questions, the researcher sought to examine the foot-at-risk, knowledge and practice of foot self-care among adult diabetic patients attending teaching hospitals in Enugu.

Purpose of study

This study assessed the knowledge and practice of foot self-care and foot- at risk of ulceration among adult diabetics being managed at twoteaching hospitals in Enugu State.

The specific objectives of this study were to:

1. determine the knowledge of foot self-care among respondents.
2. identify the respondentsô self-reported foot self-care practices
3. identify the foot at risk of diabetic foot ulceration.
4. elicit other common foot problems and abnormalities observed in the respondents.

Hypotheses

The hypotheses tested were:

1- There would be no statistically significant association betweenrespondentsôcharacteristics and increased risk of diabetic foot ulcer.

2- There would be no statistically significant association between respondentsô characteristics and knowledge of diabetic foot self-care.

3- There would be no statistically significant association between respondentsô characteristics and practice of diabetic foot self-care.

4- There would be statistically significant association between respondentsôco-morbidities and increased risk of diabetic foot ulcer.

5- Diabetics with good knowledge and practice of foot self-care will have less risk of developing foot ulceration.

Significance of the study

Ostrow, Sibbald, Woo and Ayello (2010), believe that risk factor recognition is vital in helping clinicians predict, and hopefully prevent, the occurrence of diabetic foot ulcers. Studies with the diabetic population have identified neuropathy (loss of protective sensation), peripheral vascular disease, prior to foot ulcer, or previous amputation as risk factors for developing a foot ulcer (Sibbald et al. 2012). Estimating the risk factors for diabetes complications and its rate is therefore important for planning health care effectively, improve understanding of disease natural history, and target individualized therapeutic interventions for patients with diabetes (Adejuwon et al., 2013).

This study will give an insight on the need of the patients with respect to their knowledge and practice of foot self-care as well as their level of risk of foot ulceration.The result of this study will directly be of benefit to the patient because it will identify those at risk of foot ulceration and show what the patients know and how they practice foot self-care. This will therefore be a step towards risk identification, prevention and improved self-care. The respondents will also benefit from this study indirectly because the outcome will inform the diabetes health education given to the patients in the clinic that soothes the population of people in this environment.

It is hoped that the outcome of this study when communicated to the hospital and policy makers, can serve as a veritable evidence towards developing health education programme to be used in the hospitals, which can serve as an intervention to improve knowledge and foot self-care practices to reduce the level of risk of diabetic foot ulcer formation. Policies that will improve diabetes care in Nigeria may be made as a result of the outcome of this study.

In addition, result of this study will add to the existing body of knowledge in Nigeria and worldwide about diabetic foot at risk from Enugu State, knowledge and practice of foot self-care which future researchers can also rely on for reference and to define the magnitude of the problem.

Scope of study

The study is delimited to all diabetic patients attending the two teaching hospitals in Enugu state [University of Nigeria Teaching Hospital, Ituku-Ozalla (UNTH) and Enugu State University of Science and Technology Teaching Hospital, Parklane (ESUTH)] on their knowledge, practice of foot self-care and foot-at-risk.

Operational definition of terms

Knowledge of foot self-care- In this study, any participant that can identify at least 70% of what to do to take care of their feet is said to have a good knowledge, 50-69% has an average knowledge while less than 50% has a poor knowledge. These care requisites are in the researcher designed self-report instrument for the study.

Practice of foot self-care in this study will be the ability of the patient to inspect and wash foot daily, check foot wear for sharp objects before wearing them at all times and not walk bare foot. Also foot wears will be assessed to see if it is appropriate. Participants that perform at least 70% of foot care

practices in the foot assessment tool is said to have a good practice, 50-69% has an average practice while less than 50% has a poor practice.

Assessment of knowledge and practice of foot self-care in this study is a judgment made regarding how much knowledge participants have about foot self-care and the extent of their practices of foot self-care will be measured.

Assessment of foot-at-risk in this study is a judgment made after examination of the foot of a diabetic patient using a standardized tool (ó60 Seconds Screening toolô) about how many participants are at risk of developing a diabetic foot ulcer.

"Foot at risk" in people with diabetes mellitus (DM): In this study refers to the foot with neuropathy, deformity, absent pedal pulses (peripheral vascular diseases), active ulcer or history of ulcer and an amputation are at risk of diabetic foot ulcer, while foot without any of these are said to be not at risk.

Adult diabetic patients in this study are those patients 18 years and above who have been diagnosed and confirmed as having either type 1, 2 or gestational diabetes and being managed by medical officers in the selected teaching hospitals.

Teaching Hospitals refer to tertiary health institutions where health care givers (doctors, nurses, physiotherapists etc.) are trained and offer expert care in various medical specialties like the management of diabetes mellitus. The Teaching Hospitals of study in Enugu State are the University of Nigeria Teaching Hospital, Ituku-Ozalla and Enugu State University Teaching Hospital, Parklane, Enugu.

CHAPTER TWO

LITERATURE REVIEW

This chapter discusses related literature materials reviewed from text books and journals, published and unpublished articles from libraries and internet materials. The review will be organized thus: conceptual, theoretical and empirical review.

Conceptual Review

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Long-term complications of diabetes include retinopathy with potential loss of vision, nephropathy leading to renal failure, peripheral neuropathy with risk of foot ulcers, amputations and charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction (American Diabetes Association, 2013). A diabetic foot ulcer (DFU) is any full thickness wound below the ankle in a diabetic patient irrespective of its duration (Mendes and Neves, 2012). It is a complex, chronic wound, which has a major long-term impact on the morbidity, mortality and quality of patientôs lives (NICE, 2011; International Best Practice Guidelines [IBPG], 2013).Diabetic foot is defined by WHO as foot in diabetics with neurologic disorders, some degree of vascular involvement with or without metabolic complications of diabetes in lower extremity and prone to infection, scarring, with or without deep tissue damage (IBPG, 2013). Diabetic foot ulcer is the most general cause of hospitalization in diabetic patients (IBPG, 2013). On the other hand, these ulcers can lead to infection, gangrene, amputation and even death if the necessary care is not provided (Snyder, 2009). Such lower extremity amputation is associated with prolonged hospitalization and rehabilitation (Bakker, 2006). The life time risk of a person with diabetes developing a foot ulcer could be as high

as 25% (Sign, 2005; Brem et al, 2006) and a 50% to 70% recurrence rate over the next five years (Brem et al, 2006).

Pathophysiology of DFU

Numerous observationalstudies have indicated that DFUs have amultifactorial nature. It is well established that insulin deficiency (absolute or relative) is the basis of the biochemical abnormalitiesthat lead to the organic complicationsof diabetes mellitus (Hoogwerf, Sferra and Donle, 2006) and the biological deficits of tissue healing and regeneration. It has also been established that perfect and persistent glycemic control, with insulin or oral agents, stop and probably regress these complications (Mendes et al, 2012). Diabetic foot ulcers are the result of the combined effects of diabetes-related vascular disease andneuropathy. Patients with diabetes have a higher incidence of atherosclerosis, thickening of capillary basement membranes, arteriolar hyalinosis, and endothelial proliferation. They may develop artherosclerosis of large and medium-sized arteries, such as aortoiliac and femoropopliteal vessels, but atherosclerosis of the infrapopliteal segments is particularly common. Combined with digital artery disease, ulcers can develop andquickly progress to gangrene in the absence of adequate blood flow.

Peripheral neuropathy is present in 60% of patients with diabetes and 80% of patients with diabetes whohave foot ulcers. Neuropathy in these patients is a multifactorial process and is thought to result from acombination of vascular disease occluding the vasa nervorum, endothelial dysfunction, deficiency of myoinositol-altering myelin synthesis and diminish sodium-potassium adenine triphosphatase activity, chronic hyperosmolarity, and effects of increased sorbitol and fructose. Decreased sensation in the footpredisposes the patient with diabetes to unnoticed injuries and fractures that overload the skin and lead toulceration.

Risk Factors to Diabetic Foot Ulcer (DFU)

Neuropathy

There are multiple types of peripheral neuropathy associated with diabetes, the most common of which is a distal sensory motor polyneuropathy. Both limbs are equally affected with symptoms being most marked in the toes and feet. Diabetic neuropathy may be further subdivided into sensory, motor or autonomic neuropathy depending on the specific nerve fibers affected.

Sensory neuropathy: When the small diameter fibers of the nerve are affected, patients may experience severe pain and dysesthesia (abnormal response to stimuli which are not usually painful). Such symptoms may occur in isolation or withconcurrent involvement of other parts of the nerve. These patients may complain ofsevere burning or lancinating pain in the feet with few other symptoms being present. More often, the large sensory fibers of the nerve are affected resulting in loss ofprotective sensation to the foot. The onset of this type of neuropathy can be quite insidious such that the patient may not be aware of any abnormality in spite of significant findings on examination. This loss of protective sensation can result in repeated episodes of trauma to the foot going unnoticed.

Motor neuropathy: When the motor fibers of a nerve are affected, the muscles supplied by the nerve will weaken and atrophy over time. In the case of diabetic polyneuropathy, the small muscles of the feet are primarily affected. In particular, the muscles that straighten the toes are weakened, resulting in a claw toe deformity in which the toes are curled and the balls of the feet become more prominent.

Autonomic neuropathy: Involvement of the autonomic nervous system can result inreduced sweating on the feet. The result is dry thin skin which is prone to cracking. In addition to the skin being less pressure tolerant, cracks in the skin can serve as portals for bacteria to enter the foot and cause more

significant infections. As the disease progresses, the foot become clinically insensitive and possibly deformed (claw toes, hammer toes, prominent metatarsal heads, etc.). Loss of protective sensation is a major component of nearly all DFUs (International Best Practice Guidelines, 2013). It is associated with a sevenï fold increase in risk of ulceration (Sigh et al, 2005). Patients with a loss of sensation will have decreased awareness of pain and other symptoms of ulceration and infection (Boulton, 2010).

Peripheral Arterial Disease (PAD)

Diabetes is a known risk factor for the development of PAD. People with diabetes are twice as likely to have PAD as those without diabetes, (IBPG, 2013) and also a key risk factor for lower extremity amputation (International Best Practice Guidelines, 2013). The proportion of patients with an ischaemic component to their DFU is increasing and it is reported to be a contributory factor in the development of DFUsin up to 50% of patients (Boulton et al., 2008; IBPG, 2013). The major vessels in the legs (large vessel disease) and/or the distal arterioles and capillaries (small vessel disease) may be affected in patients with diabetes. Large vessel disease results in stenosis or narrowing of the arteries and is often amenable to bypass surgery and/or angioplasty. Small vessel disease on the other hand usually involves occlusion or blockage of the arterioles and capillaries and is more difficult to treat, as it is not amenable to surgical interventions.

Restricted range of joint movement

Limited joint mobility most commonly affects the small joint of the hands in patients with diabetes, but can also affect movement of the toes. This is most significant for the big toe. Hallux rigidus results in the toe having reduced flexibility when pushingoff, resulting in added pressure being applied to the first metatarsophalangeal joint (ball of the foot by the big toe) when walking. Thus a stiff big toe makes the foot more prone to skin breakdown and ulceration.

Ulceration

Ulceration of the diabetic foot, either neuropathic or ischemic, does not occur spontaneously. It usually follows some form of extrinsic or intrinsic trauma. While extrinsic trauma may include any kind of thermal (e.g., scalding from hot water), chemical (e.g., abrasion from callus treatment solutions), or localized mechanical (e.g., puncture wounds from foreign objects) injuries, the most common injury leading to ulceration is continuous low-pressure trauma, typically from ill-fitting shoes, and injuries due to chronic repetitive trauma from walking or day-to-day activity. Intrinsic traumas are also easily understood as they result from foot deformities (foot drop, equinus, hammertoes, and prominent plantar metatarsal heads) and consequent altered foot biomechanics. These foot deformities result from the atrophy induced bymotor neuropathy of the footôs intrinsic muscles.

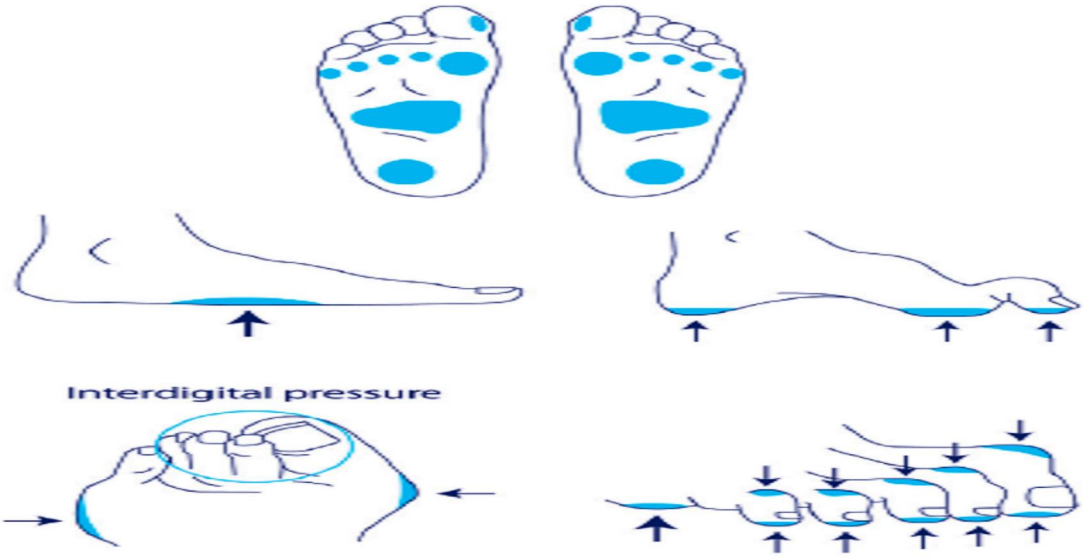

Figure 1: Areas of the foot at risk of DFU

Smoking

Cigarette smoking causes a decrease in cutaneous blood flow, as much as 40% to produce ischemia and impair wound healing. Smoking a single cigarette creates a vasoconstriction effect for as much as 90 minutes, while a packet can result in hypoxia that can last an entire day (Krasner et al, 2012). Delayed wound healing for individuals who use tobacco is said to be as a result of the tissue hypoxia effect of the cigarette. It contains carbon monoxide, nicotine, cyanide derivatives and other substances which account for more than 4000 substances, and each can negatively affect wound healing (Krasner et al, 2012).

Cigarette smoking has been significantly associated with increased risk of footulceration. Vijay Viswanathan in a study in India reported that smoking increases risk of foot ulceration by reducing blood circulation in the legs and reducing sensation in the feet (Viswanathani, 2009). Hence, a preventive strategy which could be behavioral to discourage smoking and enhance tissue oxygenation may improve healing.

Several factors have been identified to greatly increase the risk of ulceration and amputation as well as the traditional risk factors of neuropathy and peripheral vascular diseases. These factors which are common in developing countries (Abbas et al, 2007), include: (i) poverty and bare foot walking, (ii) inappropriate foot wear, (iii) poor foot hygiene and (iv) delay in seeking attention

The most important factors related to the development of foot ulcers are peripheral neuropathy, foot deformities and minor foot trauma. Trauma to the lower limb in a diabetic with ischemic diseases can often initiate a cascade of ulceration and amputation. The most common cause of initial injury to the foot is inappropriate foot wear.

Classification of DFU

Classification systems grade ulcers according to the presence and extent of various physical characteristics, such as size, depth, appearance and location. They can help in the planning and monitoring of treatment, in predicting outcome and also for research and audit:

Wagner- Meggitt's Classification (Amit, 2012)

This classification, which was developed in the 1970s, has been the most widely accepted and universally used grading system for lesions of the diabetic foot. The original system has six grades of lesions. The first four grades (grade 0, 1, 2, and 3) are based on the physical depth of the lesion in and through the soft tissues of the foot. The last two grades (grade 4 and5) are completely distinct because they are based on the extent of gangrene and lost perfusion in the foot. Grade 4 refers to partial foot gangrene and Grade 5 refers to a completely gangrenous foot.

The problem with Wagnerôs classification is that this classification does not adequately address all diabetic foot ulcerations and infections. Only one of the six grades (Grade 3) infers infection. Further, the system is limited in its ability to identify and describe vascular disease as an independent risk factor. In addition, superficial wounds that are infected or dysvascular are not able to be classified by this system (Amit, 2012).

University of Texas Classification of Diabetic Foot (Amit, 2012)

The University of Texas classification represents advancement in the treatment of the diabetic foot ulcers. This system uses four grades, each of which is modified by the presence of infection (Stage B), ischaemia (Stage C), or both (Stage D). This system has been validated and is generally predictive of outcome, since increasing grade and stage of wounds are less likely to heal without

revascularization or amputation. It is now widely used in many clinical trials and diabetic foot centers.

The most substantial point is no matter the grade; the overall outcome depends upon the stage of the disease. Increasing the stage leads to decreased healing which in turn enhances the possibility of amputations. Early detection of any of the developing sore and prompt treatment to restore the foot in perfect, healthy condition can save lots of time, money and undue stress.

Management of Diabetic Foot Ulcer

This is based on identifying and addressing the salient factors in the development of diabetic foot ulcers. Peripheral neuropathy, peripheral vascular disease and infection are three major factors in diabetic foot ulcer that can lead to gangrene and amputation. However, peripheral neuropathy is solely responsible for more than 80% of foot ulcers in diabetic patients. The primary goal of screening is early detection of diabetic foot problems, identifying those at risk and planning to reduce the risk of ulcers (Fletcher, 2006) by education on foot self-care, the use of pressure redistribution devices and offloading devices to reduce the risk of amputation at the end.

Diabetic foot examination should be part of all visits. Nurses or other trained health care providers should ask patients to remove their shoes and socks (Williams, 2012), and then examine their feet in order to screen patients at high risk and report to other members of the multidisciplinary diabetic foot team.

Management of Diabetic foot Ulcer using WAGNER grade

GRADE 0 LESIONS- Counseling regarding preventive foot care should be given to any patient whose feet are at risk of ulcer development, particularly patients with existing neuropathy. There are

several measures that can markedly diminish ulcer formation, such as avoiding poorly fitting shoes, walking barefoot, and smoking.

GRADE 1 AND 2 LESIONSð Extensive debridement, good local wound care, relief of pressure on the ulcer, and control of infection (when present) are believed to be important components of therapy for grade 1 and 2 foot ulcers (Khanolkar, 2008; Cardinal; 2009).

In clinical practice, measurements of a patientôs ulcer size should be taken at every office visit so that comparisons can be made and progress documented. The surface area of a healthy diabetic foot ulcer should decrease in size at a rate of approximately one percent a day. Ulcers that do not improve should be evaluated for ongoing soft tissue infection or osteomyelitis requiring antibiotics, insufficient vascular flow, or most commonly, the need for more effective off-loading.

Method of debridementð Debridement of necrotic tissue is important for ulcer healing (Lebrun et al; 2010), using different methods of debridement such as: sharp, enzymatic, autolytic, mechanical, and biological.

Infection control ð signs of wound infection includes purulent material or redness, swelling or warmth around the ulcer (Joseph et al; 2010). Cultures of the ulcer base are taken after debridement and prior to initiation of empiric antibiotic therapy. The most common infecting organisms are aerobic gram-positive cocci. Other frequent pathogens are aerobic gram-negative bacilli and anaerobes, usually as a second organism.

Local wound careð after debridement ulcers should be kept clean and moist but free of excess fluids. Moisture accelerates tissue healing. Dressings should be selected based upon wound characteristics, such as the extent of exudate, desiccation, or necrotic tissue. Some dressings simply provide protection, whereas others promote wound hydration or prevent excessive moisture. Wet-to-

dry saline dressings are frequently used, but some ulcers may require a moister environment. In addition, wet-to-dry dressings will remove both nonviable and viable tissues. Thus, caution is required to avoid damaging healthy tissue.

Mechanical off-loadingð Off-loading devices, including total contact casts, cast walkers, shoe modifications and other devices to assist in ambulation are available to reduce or eliminate pressure in the region of the ulcer, which is important for healing. The evidence supports the use of total contact casts and nonremovable cast walkers for relief of pressure associated with diabetic ulcer healing (Cavanagh et al; 2010).

Total contact castð A total contact cast is a padded fiberglass shell designed to take pressure off the heel or elsewhere on the foot by averaging the pressure across the sole of the foot (i.e.eliminates high and low pressure regions by providing contact at all points) or to generally un-weight the entire foot through a total contact fit at the calf. The most aggressive unloading is achieved by making the patient non-weight-bearing. Disadvantages of total contact casting include expertise needed in applying the cast, inability to inspect the wound frequently, inconvenience in activities of daily living (e.g., bathing), and the risk of developing a secondary ulcer in an ill-fitting cast (particularly in patients with neuropathy) (Khanolkar et al; 2008). Frequent cast changes may be needed to avoid complications.

Based upon randomized trials, total contact casting enhances diabetic ulcer healing and is the standard for relieving pressure from the forefoot (Lewis et al; 2013, Katz et al; 2005, Armstrong et al; 2001). Total contact casts should not be used in patients with infected wounds, osteomyelitis, peripheral ischemia, bilateral ulceration, lower extremity amputation or heel ulceration.

Cast walkers- An alternative to total contact casting is a prefabricated brace called a cast walker that is designed to maintain a total contact fit. Cast walkers provide capability to off-load the foot similar to contact casts. Cast walkers also appear to facilitate wound healing, but a significant disadvantage is poor patient compliance if the cast walker is removed (Armstrong et al; 2003),

Therapeutic shoes- After healing of the ulcer is achieved, extra-depth and -width shoes with orthoticinserts are often prescribed to prevent recurrent ulceration (Lewis et al; 2013). Wedge shoes also called half shoes, are available as a forefoot wedge and heel wedge shoes to off-load the forefoot and heel, respectively. These shoes may be useful under certain circumstances. For example, plantar heel ulcers are particularly difficult to heel because of an inability to adequately off-load this region; the heel wedge shoe can be useful to achieve this goal.

The disadvantage of wedge shoes is that most patients, especially elderly patients or those with proprioception abnormalities may not be able to maintain their balance, and some patients find walking in them difficult, if not impossible.

Knee walkers ð Knee walkers are ambulatory assist devices that may be indicated for anyone with a lower extremity issue where weight bearing needs to be avoided. These devices are becoming more popular in the treatment of diabetic ulcer as a means to off-load the foot. There are no trials evaluating the effectiveness of these devices in healing diabetic foot ulcers.

GRADE 3 LESIONS ð Before deciding upon appropriate management of deep ulcers, it is important to evaluate for substantial peripheral vascular disease or bony involvement.

Assessment for peripheral artery diseaseð Assessment of the adequacy of the circulation is an important component of the evaluation of all wounds, and particularly wounds found in patients with

diabetes. Noninvasive vascular studies including ankle-brachial index, pulse volume recordings and duplex ultrasonography should be obtained to confirm the diagnosis.

The ankle-brachial index is a measurement of the ratio of blood pressure at the ankle to that in the brachial artery that correlates with the presence and severity of arterial occlusive disease (Fowkes, 1988).

Assess for osteomyelitisð Osteomyelitis is likely to be present if bone can be, seen at the floor of a deep ulcer, or if it can be easily detected by probing the ulcer with a sterile, blunt stainless steel probe. Other signs that suggest osteomyelitis are an ulcer size larger than 2 x 2 cm and an otherwise unexplained elevation in the erythrocyte sedimentation rate,

Radiologic tests ð Radiologic tests may be useful if the diagnosis of osteomyelitis remains uncertain. The diagnosis is clear if osteomyelitis is visible on plain radiographs. However, radiologic changes occur late in the course of osteomyelitis and negative radiographs do not exclude it. Other imaging techniques that may be useful in selective cases include radionuclide bone imaging, magnetic resonance imaging and imaging with indium-labeled leukocytes.

Treatmentð The treatment of grade 3 lesions includes debridement, infection control, local wound care, and relief of pressure. The presence of osteomyelitis or peripheral artery disease warrants additional therapy (Pecoraro et al; 1990), Coordination of care among providers is important for keeping rates of amputation as low as possible. This was illustrated in a study of 10 department of Veterans Affairs (VA) medical centers in which increased rates of amputation were seen in programs with the lowest scores for availability of clinical protocols, educational seminars, discharge planning and quality of care meetings (Wrobel et al; 2003).

Antimicrobial therapyð Surgical removal of infected bone may be necessary if the ulcer is not healing. A short period of hospitalization, with surgical debridement, including culture of material obtained from deep in the ulcer and bone biopsy, is often helpful in choosing antibiotic therapy (Mushin et al; 1994). Parenteral antibiotic therapy based upon the culture results has traditionally been given for four to six weeks in patients with osteomyelitis.

Mechanics off-loadingð Mechanical off-loading relieves pressure on the ulcer and enhances healing. Total contact casting and cast walkers are alternatives to prolonged bed rest for the relief of pressure and allow for continued ambulation.

Revascularizationð Revascularization plays an important role in the management of diabetic foot ulcers in patients with documented peripheral artery disease (to avoid the need for amputation) (Khanolkar et al, 2008). In patients with diabetes, foot ulcers, and critical limb ischemia, revascularization, when possible, is associated with a lower incidence of amputation.

GRADE 4 AND 5 LESIONSð Patients with these more advanced lesions require urgent hospital admission and surgical consultation, and amputation may sometimes be required.

ADVANCED THERAPIES ð Several approaches have been reported that may improve ulcer healing, such as vacuum-assisted wound closure, the use of custom-fit semi permeable polymeric membrane dressings, cultured human dermis, and application of products such as platelet-derived growth factors and platelet releasate (Marston et al, 2003; Margolis et al; 2001).

Negative pressure wound therapy ð Negative pressure wound therapy (NPWT), also called vacuum-assisted closure (VAC), involves the application of controlled sub atmospheric pressure to the surface of the wound. NPWT enhances wound healing by increasing wound perfusion, reducing edema, reducing the local bacterial burden and increasing the formation of granulation tissue.

Randomized trials have found that NPWT reduces time to closure of diabetic foot ulcers, and wounds following diabetic foot surgery (Blume et al; 2008, Etoz et al; 2004; Armsstrong et al; 2005). In this patient population, NPWT also decreases length of hospitalization, complication rates, and cost (Andros et al, 2006).

ÅOne multicenter trial randomized 342 patients with diabetic foot ulcers (stage 2 or 3 Wagner ulcers, and adequate vascular perfusion) to negative pressure wound therapy or moist wound therapy (ie, hydrogel, alginate) (Blume et al, 2008). All ulcers were debrided (as needed) within two days of randomization, and the majority of the patients also received off-loading therapy, the primary endpoint was wound closure. A significantly greater percentage of patients treated with negative pressure wound therapy achieved wound closure within the 16 week timeframe of the study compared with alternative medical therapy (43 versus 29 percent). The negative pressure wound therapy group also demonstrated significantly fewer amputations compared with the alternate medical therapy group (4 versus 10 percent),

Å Another multicenter trial followed 162 diabetic patients for 16 weeks following partial footamputation (Armstrong et al; 2005). The percentage of patients with healed wounds (56 versus 39 percent) and time to complete closure (42 versus 84 days) were significantly improved in patients randomized to vacuum-assisted wound closure group compared with the control group.

Skin substitutesð Human skin equivalents have been studied in diabetic patients with non-infected, non-ischemic chronic plantar ulcers (Marston et al, 2001; Kirsner et al; 2010). In one study of 208 patients, weekly application of the cultured skin equivalent (Graftskin) for four weeks improved the healing rate compared with usual care (complete wound healing in 56 and 38 percent of patients, respectively) (Veves et al; 2001).

Growth factors ð A platelet-derived growth factor gel preparation (becaplermin) promotes cellular proliferation and angiogenesis and thereby improves wound healing. However, its use has been limited by high cost and by post-marketing reports of an increased rate of mortality secondary to malignancy in patients treated with three or more tubes of becaplermin (3.9 versus 0.9 in controls per 1000 person years).

Hyperbaric Oxygen Therapy ð Hyperbaric oxygen therapy, as a component of diabetic ulcer management, may be associated with improved healing but the indications for hyperbaric oxygen in the treatment of non-healing diabetic foot ulcers remain uncertain. Several metaanalyses of these trials have concluded that hyperbaric oxygen therapy in the treatment of diabetic foot ulcers may offer a benefit.

A pooled analysis found significantly improved wound healing (OR 9.99, 95% Cl 3.97-25.1), and decreased risk of amputation (OR 0.24, 95% Cl 0.14-0.43) (Liu et al, 2013). As an example of these effects, in one of the larger trials that included 70 patients with severely ischemic foot ulcers (Wagner grades 3 and 4), the amputation rate was 9 percent in the treatment group and 33 percent in the control (Faglia et al; 1996). In another trial that included 94 patients, a significantly increased incidence of complete healing (Wagner 2 through 4 ulcers) was achieved in the hyperbaric oxygen therapy group (52 versus 29 percent) compared with a placebo group (Londahi et al; 2010). Therapies that combine hyperbaric oxygen therapy with known mediators of wound healing may augment the effects of hyperbaric oxygen.

Theoretical Review

Two theories adopted for study include:

i- OREMôs self-care deficit theory of nursing,

ii- Health Belief Model

A theory is a set of concepts, definitions, relationships, assumptions, or propositions derived from models or from other disciples and project a purposive, systematic view of phenomena by designing specific interrelationship among concepts for the purpose of describing, explaining, predicting, and prescribing (Tomey & Alligood, 2002).

Orem's Self-Care Deficit Theory

As adapted from Taylor, Lillis, LeMone and Lynn, 2011 (Fundamentals of Nursing), the major assumptions were that people should be self- reliant and responsible for their own care and others in their family needing care. People are distinct individuals and nursing is a form of action interaction between two or more person, successfully meeting universal and development self- care requisites is an important component of primary care prevention and ill health prevention. A personôs knowledge of potential health problem is necessary for promoting self-care behaviours.

Oremôs self-care theory is composed of 3-inter related theory parts: theory of self-care, theory of self-care deficit and theory of nursing system (Orem, 2001).

i- Theory of Self care

This theory is based on four (4) concepts, which are self-care; self-care agency, self-care requisites and therapeutic self-care demand (Kozier et al., 2010). Orem defined self-care as the practice of activities that individual initiates and performs on their own behalf to maintain life, health and

wellbeing (Orem, 2001). When self-care is done effectively and consistently, the individual maintains structural integrity and functioning, hence contributing to the development of the individual.

Orem defined self-care agency as the human required ability or power to engage in self-care activities. It consists of two agents; self-care agent which is the individual who perform self-care activities independently and dependent care agent are individuals who care for dependents who depend on them for the provision of their care. The ability (required) of an individual to provide care independently or dependently is conditioned by age, developmental state, gender, life experience, health states, socio-cultural orientation and resource adequacy and availability (Berman et al, 2008).

Self-care requisites (needs) are actions directed towards provision of self-care (the reason for which self-care is undertaken or the desired result). The 3 categories of this self-care needs include: Universal self-care requisites, Developmental self-care requisites and Health deviation self-care requisites.

a- Universal self-care requisites are associated with life processes and maintenance of the integrity of human structure and functioning. Common to all human activities of daily living, Orem identifies these requisites as: Maintaining intake and elimination of air, water, food, excretion, balancing activity and rest, social interaction and solitude, preventing hazards to human life, wellbeing and promoting normal human functioning. The ability to carry these activities out independently will depend on age, developmental state, life experiences and socio cultural orientation.

b- Developmental requisites are associated with developmental processes derived from a condition or associated with an event that took place in an individual life e.g. adjusting to body

changes after an amputation (e.g. diabetic foot amputation), mastectomy or loss of a spouse or adjusting to a new job.

c- Health deviation self-care requisites are associated with genetic, human and functional deviations and their effects along with the medical diagnosis (e.g. diabetes mellitus) and treatment interventions and their effect on an individual. In a diabetic patient, meeting health deviation requisites may help in preventing the risk of diabetic foot ulceration and non-traumatic lower limb amputation. The presence of diabetes mellitus may result in changes in the body structure, physical functioning, behavior or individual activities of daily living. With this alteration, there is more demand on the individual for self-care (Berman et al, 2008) to prevent complications like diabetic foot ulceration. The needed demand may be in the area of recognizing that there is already a deviation (which may put the individual at risk of foot ulceration), the need to take care of the foot, recognizing a change in his/her foot and need to adhere to prescribed treatment (foot wears and medication). This can only be done when the individual has adequate/good knowledge of how to take care of his/her feet and what to look out for in assessing the feet daily. Until the individual understands that there is a deviation, he/she may not be able to manage the feet well. Deficient knowledge on diabetes foot self-care, devices to use when there is already a deviation (at risk) to prevent diabetic foot ulceration, appropriate foot wears, management of diabetic foot ulceration and blisters and physical activities should be addressed with the aim of improving knowledge which will at the long run improve practice of foot self-care and prevent risk of developing a diabetic foot ulceration.

ii- **Theory of Self–care deficit**: This nursing theory states that every individual has within them, the ability for performing self-care. Therefore, they are responsible for taking care of their own health as well as the health of their dependents. Self-care is a set of practice activities, used by individuals to

initiate, as well as perform, specific tasks pertaining to health, well-being, and maintaining life, and to do it on their own behalf. Nurses work at the front lines in providing education, support, and care, that will enable individuals experiencing health care deviation like diabetes to properly identify their health status changes (like foot deformities or abnormalities), and to locate the appropriate assistance. It is the nurses who will take on the primary role for empowering self-care, and to make their patients aware of such deleterious effects as their condition may have on them in regard to their self-care requisites, and in the carrying out of the necessary treatment modalities for stabilizing their conditions via self-care measures.

Nurses have routinely been positioned to support people in modifying their dreams or lifestyles to adjust to the demands of self-care. Learning to live with a chronic illness like diabetes has become even more prevalent among today's population and Orem provides nurses with a blueprint for governing nursing action that deals on self-care deficit. Dorothea Oremôs self-care deficit theory also assists nurses in determining levels and approaches to patientôs care.

Theory of nursing system: Orem describes how the patient self-care needs will be met by the nurse, the patient or both. Orem (1995) divided the professional nursing practice model into three systems: compensatory system, partially-compensatory system, and supportive-educative development system. It identified 3 classification of nursing system to meet the self-care needs: Wholly compensatory, where the individuals is unable to control and monitor their environment and process information e.g. in unconscious patient, Partly compensating where individual can perform some but not all self-care activities and Supportive-educative system: persons who need to learn how to perform self-care measures and need assistance to do so. Nursing is required when an adult (or in the case of a dependent, the parent) is incapable or lack the knowledge and skill to limitation in the provision of continuous effective self-care. Nurses can help them meet this need through the methods of helping,

acting for or doing for others, guiding others, supporting others, providing an environment that promotes personal development in relation to meeting current and future demands, and teaching others (George, 2010)

In relation to this study, patients/clients with diabetes mellitus need to take care of their feet themselves at home or assisted by a significant other for those that have visual impairment and cannot do so themselves. Thus, Oremôs theory serves as a good framework for directing, assessing knowledge and practice of foot self-care and also in identifying patients at-risk- of diabetic foot ulcer for prevention. Based on identified deficits, the nurse makes recommendation based on these nursing systems of Orem.

Health Belief Model (HBM)

This model was developed in the 1950s by a group of U.S. Public Health Service social psychologists who wanted to explain why so few people were participating in programs to prevent and detect disease. It was designed to predict a personôs health behavior/practices including the use of services and to justify intervention to alter maladaptive health behavior (ADA, 2009). It is a popular model applied in nursing, especiallyin issues focusing on patient compliance and preventive health care practices. The model postulates that health seeking behavior is influenced by a personôs perception of a threat posed by a health problem and the value associated with actions aimed at reducing the threats. HBM also addresses the relationship between a personôs belief and behaviors. HBM proposed that a personôshealth related behavior depends on the personôs perception of four (4) critical areas: the severity of a potential illness, personôs susceptibility to that illness, and benefits of taking a preventive action and the barriers to taking the action.

Perceived susceptibility: focuses on which level the individual feels at risk of developing a diabetic foot ulcer or complication of acondition. If an individual perceives himself to be at risk, he/she will make deliberate effort to engage in activities that prevent complications like engaging in care of the feet or consistent in daily inspection of the feet to prevent foot ulcers, identify it early or proper management of the foot ulcers to prevent complications.

Perceived severity and benefit of taking preventive actions:When an individual perceives the condition may lead to a serious complication(e.g. amputation) if not properly managed, there will be likelihood of taking recommended preventive health actions like daily foot self-care and inspection and having a health care provider examine his/her feet atevery at least once yearly. If the same individual views an intervention as unimportant, then he/ she will not carry out those preventive intervention.

Perception of risk is the root of determining whether the individual will engage in appropriate health behavior or not. One may perceive an illness to be serious and will determine to adhere to prescribed measures to prevent complications but may be hindered by some barriers to taking actions.

Factors that may influence a person perception (barriers to action) include age, gender, race and other demographic variables, psychosocial variables like social pressure, peer pressure, supportive family members, and structural variable e.g. knowledge about the diseases conditions, past experience and patient-provider experience (Berman et al, 2008). An individual will do something when he/she feels it will be beneficial in preventing foot ulcer.

In relation to this study, patients with a chronic condition like diabetes mellitus need to understand their susceptibility, severity and benefit of taking preventive measures recommended in preventing

complications of diabetes mellitus. Hence health belief model serves as a good framework in assessing knowledge of foot self-care.

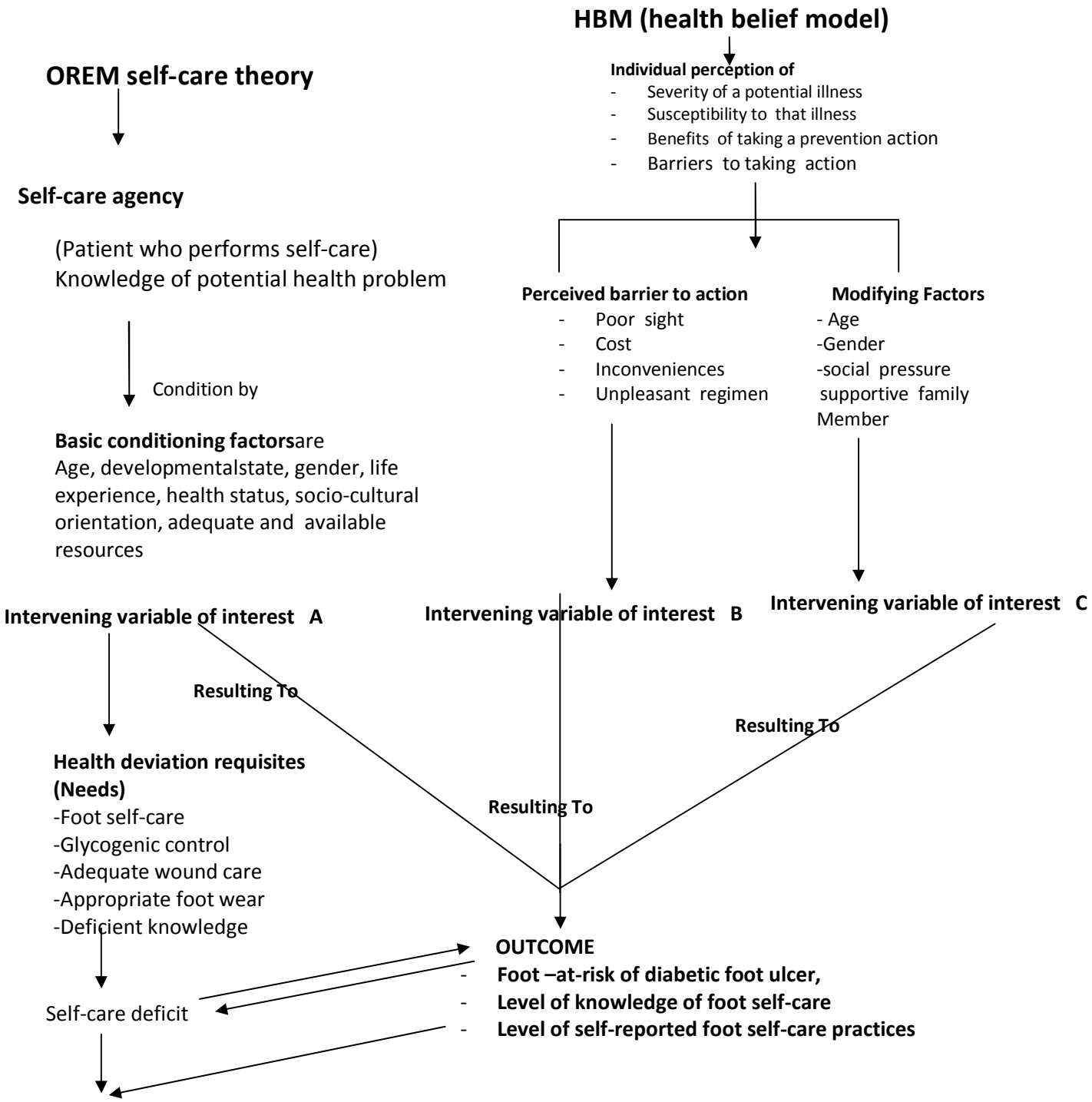

Figure 3: MODEL OF THE STUDY OF AWARENESS OF FOOT-AT-RISK, KNOWLEDGE OF AND PRACTICE OF FOOT SELF CARE AMONG ADULT DIABETIC PATIENT ATTENDING THE TWO TEACHING HOSPITALS IN ENUGU STATE.

Adapted from Taylor, Lillis, LeMone and Lynn, 2011 (Fundamentals of Nursing)

Empirical Review for the study

Many studies have been carried out on knowledge of foot self-care and also foots at risk using the 60 seconds screening tools among diabetic patients.

George et al. (2013) in a cross sectional study conducted in 212 consecutive diabetes patients attending the out-patient department of a rural secondary care hospital. They reported that 74.5%of the participants said that the feet should be inspected daily and 49% said that they should inspect the foot wear every time they wore it. Concerning the practice of foot self-care, 71.7% said they inspected their feet once or more a day and 44.3% said they inspected their foot wear each time they wore it. 87.3% used to walk barefoot inside the house, while only 10.4% said they did the same outside the house. Among the participants, 75% had score of Ó50%. Male gender (OR 2.36, 95% CI 1.16-4.79), poor education status (OR 2.40, 95% CI 1.19-4.28) and lesser duration of diabetes (OR 2.24, 95% CI 1.15-4.41) were significantly associated with poor knowledge on foot care. Poor knowledge was associated with poor foot care practices (OR 3.43, 95% CI 1.75-6.72) and the prevalence of neuropathy was 47% (95% CI 40.14-53.85) among the study subjects.

Hasnain et al., (2009) in a descriptive cross sectional study of 150 diabetic patients assessed the knowledge and practices related to foot care among diabeticpatients visiting diabetic clinic in Jinnah Hospital Lahore, Pakistan. The knowledge and practices regarding foot care were classified as good, satisfactory and poor depending upon the score. Fifteen questions each were asked regarding knowledge and practices of foot care. Each question was assigned one mark. A score of more than 70% (11-15), was regarded as good, a score of 50-70% (8-10) was regarded as satisfactory and a score of less than 50% (<8) was regarded as poor both for knowledge and practice for foot care. The researchers documented that about 29.3% had good knowledge, while 40% had satisfactory knowledge and 30.7% had poor knowledge about foot care. Whereas 14% of respondents had good

practices for foot care, 54% had satisfactory practices and 32% had poor practices. The researchers also noted that whereas education of respondents had significant statistical association with knowledge and practices regarding foot care, sex and income per capita had shown no significant statistical association with knowledge. The researchers therefore concluded that about one third of diabetic patients had poor knowledge about foot care and only very few patients had good foot care practices and that literacy have significant association with the knowledge and practices related to foot care in diabetic patients.

In a descriptive study carried out in Pakistan involving 100 patients (36 males and 64 females), 34% patients inspected their feet daily and 78% of the respondents knew about care of callosities, minor injuries and cuts, 52% of patients didn't know about correct technique of cutting nails. Eight (22.2%) male and 28 (43.8%) female patients were using open shoes while 24 (66.7%) male and 38 (59.4%) female patients had shoes with narrow forepart. Twenty two (34.4%) of the female diabetic patients in this study were using shoes with high heel and only 68% of the patients were on regular follow up (Gondal et al., 2007).

In a descriptive analytical study, by Shahbazian, Yazdanpanah and Latifi (2013) carried out at the diabetic clinic of Golestan Hospital, Ahvaz Jundishapur University of Medical Science, to assess the risk of diabetic patients for foot ulcers in Iran, 430 diabetic patients were examined of which 269(62.6%) were females and 161 (37.4%) were males. Mean age was 53.8 ± 10.7 years. The mean duration of diabetes in the studied patients was 8.1 ± 6.6 years. Two hundred and sixty four (61%) of them complained of neuropathy symptoms and 7(2%) complained of vascular symptoms. Thirty one participants (7%) had prior history of foot ulcers and 131 (31%) had received previous training for foot care. Eighty one (20%) of patients had foot deformity. On physical examination dry foot skin (19%) had the highest and callus (3%) had the lowest frequency. The researchers recorded the

presence of retinopathy in 102 (24%) patients and nephropathy in 87 (23%). Mean HbA1C was 8±1.8%. The overall prevalence of distal sensory neuropathy was 35% and vascular disease was 6%. Toe pressure was abnormal in 3% of patients. Patients were classified into four risk groups based on the presence of risk factors according to the consensus of the International Working Group on the Diabetic Foot (IWGDF): Group 0: 277cases (65%), Group 1: 75cases (17%), Group 2: 47cases (11%) and Group 3: 31 cases (7%). Foot ulcer correlated factors such as age, sex, diabetes duration, presence of previous training regarding foot care, smoking, retinopathy, nephropathy were reported. The researchers reported that age of patient and diabetes duration increases the risk of foot ulceration significantly (p=0.0001, 0.001 respectively). Previous training/ education on foot care was significantly lower on high risk group (P=0.021), Retinopathy was present more in high- risk groups significantly (P=0.005).The patientôs sex, BMI, history of smoking and nephropathy did not have significant correlation with higher risk groups (p=0.08, 0.2, 0.5, 0.05 respectively).

A study conducted to gain insight in the prevalence of peripheral neuropathy (PN), foot at risk and foot ulcers in patients with diabetes mellitus at a tertiary center reported that correct foot care practices were followed by 20.5% of study population. The remaining 79.5% did not follow the correct foot self-care practices. The researchers based on the result concluded that poor adherence to foot care practices predispose to foot problems in people with diabetes (Jayaprakash, 2009).

Francieli and Mariana (2014) carried out an exploratory descriptive cross-sectional study on Self-care into the risk factors in diabetic foot ulceration among DM patients registered in all 38 Basic Health Units (BHU) in the urban area of the city of Londrina (Brazil). Of 1,515 involved in the study, 63% were female while 37% were male. The average age was 66.1 years (standard deviation = 10.2 years) and a median of 66 years. The researchers documented the level of education to be, functional illiterate individuals (41.1%) and ones with primary education (39.8%) were predominant, while only

8.3% had higher education. They also identified a foot at risk of ulceration in 12.3% of the population, predominantly level 2 changes (7.1%), followed by level 1 (3.5%) and level 3 (1.7%). The habit of daily drying between toes was reported to be 62.2%; 20.7% reported never doing it and 17.2% carried out this care sometimes. The researchers also documented that, 16.9% of the participants self-analyze their feet daily, 46.2% sometimes and 36.9% never. They reported occasional practice of foot baths in 22.2% of individuals and 9.0% as a daily practice. Also the daily or occasional habit of walking barefoot had, respectively, 6.9% and 20.9% of respondents. 39.4% of the individuals examine presented inappropriate footwear during the interview and when asked about the kind of daily use footwear, 59.6% reported they were using inappropriate shoes. The researchers on examination reported that most individuals had improperly cut nails (59.9%), and 89.4% had their feet in good hygienic conditions. Callus was identified in 33.3% of subjects, with 21.2% located in the rearfoot, 17.6% in the forefoot and 0.9% in the midfoot. Decrease in pedal pulses was identified in 13.0% of the diabetic patients and absent in 5.5%. The researchers also identified bony disorders/ abnormalities among their participants Hallux valgus was identified in (25.6%), claw toes (9.4%), bony prominences (5.9%) and hammer toes (5.3%). The loss of protective sensation in the feet was found in 12.3% of diabetics, and for the left foot it was 0.1% higher than for the right foot. They however concluded that the three main factors that most influenced to risk of ulceration in the feet were the loss of protective sensation, claw toes and bony prominences.

Dikeukwu et al. (2013) carried out a descriptive cross sectional study on awareness and practices of foot self-care in patients with diabetes at Dr Yusuf Dadoo district hospital, Johannesburg South Africa. One hundred and twenty participants were recruited and completed the questionnaires. Women accounted for 60% (72) and men 40% (48). The mean age was 56.3 years. Out of 100 patients (36 males and 64 females), 34% patients inspected their feet daily and 78% of the

respondents knew about care of callosities, minor injuries and cuts, 52% of patients didn't know about correct technique of cutting nails. The result of the research shows that the majority of participants (63.3%) had at least one foot problem. Athleteôs foot was the most common, found in 16.2% of participants, while foot ulcers and amputation of any part of the foot were found in 5% (6) and 0.9% (1) respectively. 54.2% of the respondents inspected their shoes and 25% walked barefoot. The researchers believe that smoking was the only variable that was significantly associated with finding a foot ulcer.

Ogbera et al. (2005) carried out a cross- sectional study on Foot at Risk in Nigerians with Diabetes Mellitus-The Nigerian Scenario at the Diabetic Clinic of Lagos University Teaching Hospital, 41.5% of the DM patients were at risk of foot ulcer, and this was high. The researchers believe the high prevalence may have been due to the fact that over 50% of them had poor glycaemic control and medium/long duration of diabetes mellitus. The majority of the subjects with the foot at risk were of a low socio-educational status, overweight or obese, elderly and often walked unshod. There was a slight male preponderance in this study. Generally, there was a predominance of patients with Type 2 DM (>85%). For those with the foot at risk, the commonly used form of treatment was that intake of oral hypoglycaemic agents while the least used treatment modality was the combination of oral hypoglycaemic agents and insulin. Common potential risk factors for foot ulceration identified in this study were DM neuropathy, poor glycaemic control, structural foot deformity and peripheral vascular disease. These lend support for a multi factorial etiology for diabetic foot ulceration. Subjects with the foot at risk had a significantly higher duration of DM than those with a shorter duration. In this study, foot deformity was however, present in 26% of the subjects with the foot at risk. The mechanical abnormalities found in this study included prominent metatarsals-which was the commonest (12.6%), callus formation, claw toes, hallux valgus, hammer toes, high arching of the feet

and bunions. Among patients who have lost protective sensation, the most common mechanism of injury appears to be unperceived, excessive, and repetitive pressure on sites of foot deformities. Twenty percent of the subjects with the foot at risk for ulceration, had limited joint mobility of the hands-an indicator of microvascular complications of DM. Neuropathy was documented in 76% of the subjects with the foot at risk in this study. Previous ulceration was noted in 6.3% while previous amputation was noted in 2.5% of the patients with the foot at risk.

Adejumoet al (2013) in a one day screening for patients with diabetes using the 60 second screening tool conducted in Ibadan found out that out of the seventy-five patients, 31 (41.3%) were males and 44 (58.7%) were females. The mean age of the patients was 60.0 ± 12.6 years (range 27 ï 89) while the mean years with diabetes diagnosis was 8.95 ± 6.9 years (range 0 ï 50). More than half (54%) of the patients were within the age range of Ó61 years. Only 13% of the patients have had diabetes for Ó 20 years. None of the patients presented with any amputation, fixed toe or ankle joint, active ulcer, ingrown toe nail and blisters in the research. However, maceration between toes though not included as part of the 60 Second Foot Screen was found in 12 (16%) of the patients. On further examination of the patientsô feet using the SWM, 20.0% and 21.3% of the patients had a positive result for high risk of diabetic foot on the right and left feet respectively scoring Ó4/10 negatives. One person (1.3%) presented with a history of previous ulcer.

Desalu et al. (2011) in a cross-sectional study carried out in 3 selected tertiary hospitals in Nigeria (Federal Medical Centre in Ido-Ekiti, south western Nigeria, Sir Yahaya Memorial Hospital, Birnin-Kebbi in the north western Nigeria and Federal Medical Centre Yola, north eastern Nigeria from November 2009 to April 2010). Assessed knowledge and practice regarding foot self care among diabetic patients and classified the scores as good if score Ó70%, satisfactory if score was 50ï 69% and poor if score was < 50%. Of 352 diabetes patients, 30.1% had good knowledge and 10.2 % had

good practice of DM foot care. Two hundred and sixty four (75%) of the DM patients were unaware that smoking causes poor circulation of the feet, 242 (68.8%) were unaware of the first thing to do when they found redness/bleeding between their toes and likewise 227 (62.2%) if they found a corn/ hard skin lesion. Less than half of the respondents (40.9%) regularly inspect their feet, (46%) regularly wash their feet with warm water and (47.7%) inspect the inside of their footwear, 49.4% had a poor practice of diabetic foot care. Majority of the respondents (61.4%) were unaware of the importance of inspecting the inside of the footwear for objects or torn lining. According to the researchers, Illiteracy and low socioeconomic status were significantly associated with poor knowledge and practice of foot care.

Ekore et al. (2010) in adescriptive cross-sectional, clinic-based study was carried out at the University of Ibadan Health Centre (Jaja Clinic). The study population consisted of consenting adult diabetic patients. A total of 137 patients participated in the study and ranged in age from 37 to 75 years, with the mean SD age being 58.2 9.2 years. Of the participants, 98 (71.5%) were men and 39 (28.5%) were women; all of the participants were married. The duration of illness ranged from 1 to 20 years, with the median duration of illness being 3 1.7 years. Seventy patients (51.1%) were being managed on oral hypoglycaemic agents alone, while 55 (40.1%) were receiving a combination of diet and oral hypoglycaemic agents and 8 (5.8%) were being managed on diet alone. One hundred and twenty-six (92%) patients mentioned they had never received any education on foot care from their health care providers, while 11 (8%) had received some form of foot care education. Among those who had never received any foot care education, 92 (73%) had been diabetic for 1-5 years, while the remaining 34 (27%) had been diabetic for 6-20 years. Of the foot care measures that were known, 35 (25.5%) patients knew to wash their feet daily and dry in between the toes thoroughly, 31 (22.6%) knew not to go outdoors barefooted, 27 (19.7%) checked their feet daily, 27 (19.7%) checked inside their shoes

daily, 8 (5.8%) consciously made an effort to avoid injuries to their feet and 4 (2.9%) clipped their toenails with care. The results of this study showed that awareness of foot care measures is very poor among known diabetic patients and the researchers believe the result is largely due to a lack of education of the patients by their health care providers.

Summary of Literature Review

The literature suggests that the prevalence of diabetes is increasing to anepidemic proportion and the burden of the disease including foot ulceration will be felt more in developing countries. Education ofpatients about foot care plays an important role in foot self-care practices. People withdiabetes mellitus have for the most part poor foot self-care practices, a generally lowknowledge and awareness of foot care practices. Very few studies have been conducted intoassessment of foot-at-risk, knowledge and practice of foot self-care among adult diabetic population and no study was found to have been conducted in this field in South East, Nigeria. It is hoped that the currentstudy will bridge this knowledge gap in the literature.

CHAPTER THREE

RESEARCH METHODS

This chapter discusses the research design, area of study, study population, sample size, sampling procedure, instrument for data collection, ethical consideration, procedure for data collection and method of data analysis.

Research design

A descriptive cross sectional survey design was used for this study. This design has been used successfully in many researches on knowledge and practice studies, including one to determine the awareness and practice of foot self-care among diabetic patients attending the out-patient unit of a hospital in South Africa (Dikeukwu et al., 2013).

Area of Study

Enugu is located in latitude 60 28^{o}N and longitude 70 29ôE. It is the capital of Enugu State and it is located in the south-east geopolitical zone of Nigeria. It shares boundaries with Anambra State on the west, Abia State, the south, Kogi State on the North and Benue and Ebonyi States on the East.

There are four tertiary hospitals in Enugu state among which are the teaching hospitals used for this study. Selected hospitals include: University of Nigeria Teaching Hospital (UNTH), which operates at its permanent site in Ituku-Ozalla, along Enuguï Port Harcourt express road. This is the biggest referral and teaching hospital in the South Eastern part of the country with about 500 bed spaces. It has an out-patient diabetic clinic that holds once in a week (on Wednesdays). The second selected hospital is the Enugu State University Teaching Hospital located along Park Lane road, G.R.A. It is also a referral center and runs an out ï patient diabetic clinic once in a week. These two out-patient

clinics were the setting used for this study because of the high volume of diabetic patients managed there and the presence of expert professional diabetic caregivers.

Population of the study

Adult diabetic patient that attended the out-patient clinics in the two teaching hospitals selected were the target population. It is recorded that approximately 110 adult diabetic patients visit the clinic monthly (ESUTH Medical Records, 2014) and about 260 visit the diabetic clinic in UNTH Ituku-Ozalla monthly (UNTH Medical Records, 2014) giving a total of 370 patients per month. More than half of the patients came on either a weekly or two weekly check-ups or some were referred to the clinic for the first time. Excluding those on multiple visits, the number of diabetic patients that attended the clinic in UNTH only once in any month is approximately 65 making up to 780 diabetic patients that attended the clinic in a year, while the number of patients that attended the clinic in ESUTH only once in any month is approximately 30 making up to 360 patients in a year. The total number of patients that visit the two hospitals in a year is 1140. This is the target population.

Sample and Sampling Technique

Using Taro Yameneôs formula for finite population, the sample size required for statistical analysis was calculated (Uzoagulu, 2008).

The formular is given as:

$$n = \frac{N}{1 + N(e)^2}.$$

Where n = Sample size

N = Finite population

e = level of significance limit of tolerable error, for this study 0.05 will be acceptable 1= constant

The calculated sample size was **326.** Respondents were recruited, proportionately shared between the two study sites. Calculation is on the Appendix 3.

The inclusion criteria were that participants:

- Should be an adult (not less than 18 years)
- Must be attending the diabetic out-patient clinics at either of the two teaching hospitals during the study period.
- Must be coherent, alert and willing to participate in the study.

Purposive sampling technique was used for this study to recruit any eligible and consenting respondents at each clinic visit until the expected sample size was attained at each study site.

Instrument for Data Collection

There were three instruments used

1- Sibbald et al., (2012) 60-Second screening tool which is a modification of Inlowôs 60-Second diabetic screening tool was adopted. This is a standard tool for assessing foot-at-risk of diabetic foot ulceration and other foot problems/abnormalities. The instrument has been used for several studies which have proven the efficacy of the tool for diagnosing patient at risk of diabetic foot ulcer and foot abnormalities. Permission was also sought from the authors of the 60-Seconds screening tool. The psychometric properties of the tool; in a prospective observational study done to determine the intrarater reliability, interrater reliability and predictive validity of the 60-Second diabetic foot screen tool in two health care settings by Murphy, Laforek, Tabamo, Da Rosa and Woodbury (2012) showed that intrarater reliability was 0.96 (right foot) and 0.97 (left foot), an interrater reliability of 0.92 (on right foot), 0.93 (left foot). For the predictive validity, two subjects that had high scores in the

screening scores had an amputation and a foot ulcer. Overall, the study demonstrated excellent interrater, intrarater reliability and provides information about predictive validity.

2- Observation checklist- designed by researcher to validate foot care practices of respondents.

3- A researcher designed closed ended structured questionnaire (Appendix 1) was also used to obtain information from the respondents, it contains 47 items. The questionnaire has 2 sections:

The questionnaire was used to collect data on:

1. Participantsô demographic characteristics.

2. Knowledge and Practice of foot self-care

Validity of the instruments

Face and content validation of instrument was done by the project supervisor and experts (Diabetes Nurse Educator, two Consultant endocrinologist.). Theirinputs were utilized in modifying the tool before using the instrument for field testing.

Reliability of the instrument

The reliability test was done in Niger Foundation Hospital Iwolo, Ezeagu Local Government Area in Enugu State using a test re-test method and Pearsonôs Moment Correlation Statistics. The hospital is overseen by consultant endocrinologists. The questionnaire was administered to 32 diabetic patients who came to the clinic on an interval of two (2) weeks. The test yielded a Cronbachôs alpha coefficient of 0.77 for the researcher developed questionnaire, 0.81 for the standardized ñ60 Seconds Screening Toolò and 0.80 for the observation checklist. This correlation coefficient is high enough to show that the questionnaire is reliable.

Ethical Consideration

Ethical review and clearance for the study was obtained from the Research and Ethics Committee of Enugu State University of Science and Technology Teaching Hospital, Parklane, and that was used for the two teaching hospitals.

Consent (signed or thumb print) was obtained from the respondents and assurance was also given to them that the information gotten from the study would be purely for research purpose and handled confidentially.

Procedure for data collection

The researcher used the introduction from Head of department Nursing Sciences UNEC and approval from Research and Ethics Committee to obtain administrative permit and collect data from the respondents during the clinic days. The researcher used two trained research assistants (registered nurses) who were able to communicate well in English and Igbo languages to administer the questionnaire. The questionnaire was interviewer administered to accommodate literate and illiterate respondents. The research assistants were trained to understand the objectives of the study, the ethical considerations involved in the study, questionnaire items and confidentiality.

Data collection was done concurrently in the two study sites because they do not have the same clinic days. Data was collected on the clinic days from the two teaching hospitals, and the "60 seconds screening toolò was administered by the researcher (to reduce inter-rater reliability problem). The researcher was trained by the authors on how to use this instrument, which is part of the modules for the International Interdisciplinary Wound Care Course (Toronto/ South Africa, 2013-2014 class) which the researcher completed. The tool was used on any patient that has completed the questionnaire. Data collection continued until full sample size was attained, it lasted for 6 weeks.

Method of data analysis

Data was collated sorted out and analyzed with the aid of a statistical analytical software IBM SPSS version 20. Descriptive Statistics of percentages and means for descriptive statistics and Pearsonôs Product Moment Correlation Statistics for inferential statistics at 0.5 probability level and 95% confidence interval. Correlation coefficient values that are less than 0.05 were considered statistically significant while correlation coefficient values that are more than 0.05 were considered not statistically significant. Results were presented in frequency tables.

Respondents that can identify at least 70% of what to do to take care of their feet had good knowledge, respondents that identified 50-69% had an average knowledge while those that identified less than 50% had poor knowledge. On the practice of foot self-care, respondents that performed at least 70% of foot care practices had good practice, respondents that performed 50-69% had average practice while those that performed less than 50% had poor practice.

Using the observation guide for foot self-care practices, respondents with a score of 0.5 and above ($\geq$ 0.5) were said to be appropriate with 0.5 as the acceptable mean (decision rule). However, respondents with a mean of < 0.5 were said to be inappropriate.

CHAPTER FOUR

PRESENTATION OF RESULTS

This chapter discusses the results of the data collected. Results are presented in accordance with the objectives of the study and the research hypotheses.

The questionnaires were administered to 326 patients that presented to the clinics and who gave their consents between April and May, 2015 using interviewer method and thereafter the researcher assessed the feet of the respondents. After data collection, the questionnaires were sorted, perused and 12 (3.7%) of them had an error. Hence the study analysis was done based on 314 (96.3%) respondents that their questionnaires were correctly filled and without error.

Table 4:1: Demographic characteristics of respondents n=314

Demographic Characteristics	Groups	Frequency	Percentage (%)
Hospital	UNTH	202	64.3
	ESUTH	112	35.7
Age	18- 25yrs	01	0.30
	26 - 35yrs	11	3.50
	36 - 45yrs	28	8.90
	46 - 55yrs	81	25.8
	56 - 65yrs	95	30.3
	66yrs and above	98	31.2
	Mean ±SD (std. dev.)	59.00 ± 11.71	
Sex	Male	119	37.9
	Female	195	62.1
Tribe	Igbo	313	99.7
	Hausa	01	0.40
Religion	Roman Catholics	167	53.2
	Anglicans	67	21.3
	Methodist/Presbyterians	36	11.5
	African Traditional Religion	02	0.60
	Pentecostal (others)	42	13.4
Highest Educational Level	No formal education	50	15.9
	Primary	127	40.4
	Secondary	69	22.0
	Tertiary education	68	21.7
Occupation 55.1% are employed (self or a paid job)	Unemployed	18	5.70
	Retired	123	39.2
	Self-employed	134	42.7
	Employed (private or govt.)	39	12.4

As presented in table 4:1, the mean age of the respondents was 59.00 ± 11.71 years. Majority of the respondents were employed (55.1%), of Roman Catholic denomination (53.5%) and females (62.1%), predominantly Igbos (99.7%) and only 15.9 had no formal education.

Table 4:2: Respondentsô Life style and clinical information n=314

Life style and clinical information	Group	Frequency	Percent (%)
Do you smoke?	Yes	12	3.80
	No	302	96.2
Does any of your family member assist you in caring for your feet?	Yes	85	27.1
	No	229	72.9
Have you had a diabetic foot education before?	Yes	119	37.9
	No	195	62.1
Have you had your feet examined by a doctor or nurse?	Yes	124	39.5
	No	190	60.5
Do you have any other medical condition?	Yes	234	74.5
	No	80	25.5
If Yes, which one? (n = 234)	Hypertension	161	68.8
	Arthritis	30	12.8
	Peptic ulcer	3	1.30
	Eye complication	40	17.1
Type of Diabetes	Type I	10	3.20
	Type II	299	95.2
	Gestational	05	1.60
Duration of Diabetes since diagnosis	< 1 yr	21	6.70
	1 ï 10yrs	203	64.6
	11 ï 20yrs	69	21.9
	21 ï 30yrs	15	4.80
	> 30yrs	06	002
	Mean ± SD (months)		10.323± 87.490
Are you on medication?	Yes	302	96.2
	No	12	3.80
If Yes, which type of medication? (n=302)	Oral tablet	231	73.6
	Insulin	17	5.40
	Both	54	17.2

In table 4:2, majority of the respondents (96.2%) do not smoke, 62.1% have not had any diabetic foot education before and 60.5% have not had their feet examined by a medical doctor or nurse before. Majority of the respondents (74.5%) have other medical conditions with hypertension as the most common (68.8%), respondents were predominantly (95.2%) type 2 diabetic, and (64.6%) have had diabetes mellitus for a period of 1-10 years. 96.2% of the respondents were on medication and most of them (73.6%) take oral hypoglycaemic agents.

Objective One

To determine the level of knowledge of foot self-care among respondents

Items 17-31 addressed this objective. Results are presented on table 4:3

Table 4:3: Respondentsô knowledge of foot Self-Care n=314

Assertions: Someone with diabetes should?	Yes f(%)	No f(%)
Inspect the feet daily for any change especially in-between toes	139 (44.3)	175 (55.7)
Inspect the foot wears each time before wearing them for foreign objects	148 (47.1)	166 (52.9)
Wash feet daily with soap and water	303 (96.5)	11 (3.50)
Dry feet well after washing especially in between the toes	136 (43.3)	178 (56.7)
Use petroleum jelly or moisture cream on dry skin	199 (63.4)	115 (36.6)
Soak feet in warm water for about 5 minutes before cutting nail	38 (12.1)	276 (87.9)
Cut nails straight with a cutter and not a razor	149 (47.5)	165 (52.5)
Not walk bare foot inside or outside the house	200 (63.7)	114 (36.3)
Check the temperature of water with hand before bath	230 (73.2)	84 (26.8)
Avoid direct heat on feet	280 (89.2)	34 (10.8)
Not smoke	243 (77.4)	71 (22.6)
Wear shoes that are not tight	227 (72.3)	87 (27.7)
Not wear shoes that have pointed toes	111 (35.4)	203 (64.6)
Engage in daily exercise such as brisk walk to promote circulation	229 (72.9)	85 (27.1)
Seek professional help (Doctor or Nurse) as soon as one notices a change in feet	253 (80.6)	61 (19.4)

In table 4:3 the respondents do not know that someone with diabetes should inspect the feet daily for any change especially in-between toes, inspect the foot wears each time before wearing them for foreign objects, dry feet well after washing especially in-between the toes, soak feet in warm for about 5 minutes before cutting nail, and cut nails straight with a cutter and not a razor. The respondents however, agree that someone with diabetes should wash feet daily with soap and water, use petroleum jelly or moisture cream on dry skin, not walk bare footed inside or outside the house, check the temperature of water with hand before bath, avoid direct heat on feet, not smoke, wear shoes that are not tight, not to wear shoes that have pointed toe, engage in daily exercise such as brisk walk to promote circulation and seek professional help (Dr or Nurse) as soon as one notices a change in feet.

Based on the operational definition of levels of knowledge, the respondentsô expressed knowledge of foot self-care were re-grouped into levels as follows: 46 (14.6%) of the respondents had poor knowledge (scored <50%), 215 (68.5%) of the respondents had average knowledge of foot self-care (scored from 50-69%) while only 53 (16.9%) had good knowledge of foot self-care (scored 70 and above).

Objective Two

To identify the respondents' self-reported foot self-care practices

Items 32- 47 addressed this objective. Results are presented on table 4:5

Table 4:4: Respondents self-reported foot self-carepractices n=314

Which of these do you do/practice?	Yes f (%)	No f (%)
Inspect the feet daily for any change especially in-between toes	134 (42.7)	180 (57.3)
Inspect the foot wears each time before wearing them for foreign objects	140 (44.6)	174 (55.4)
Wash feet daily with soap and water	304 (96.8)	10 (3.20)
Dry feet well after washing especially in between the toes	133 (42.4)	181 (57.6)
Use petroleum jelly or moisture cream on dry skin	184 (58.6)	130 (41.4)
Soak feet in warm water for about 5 minutes before cutting nail	21 (6.7)	293 (93.3)
Cut nails straight with a cutter and not a razor	122 (38.9)	192 (61.1)
Not walk bare foot inside or outside the house	175 (55.7)	139 (44.3)
Check the temperature of water with hand before bath	246 (78.3)	68 (21.7)
Avoid direct heat on feet	273 (86.9)	41 (13.1)
Wear shoes that are not tight	256 (81.5)	58 (18.5)
Not wear shoes that has pointed toe	104 (33.1)	210 (66.9)

Table 4:4, shows that the respondents do not engage in daily inspection of the feet for any change especially in-between toes, do not inspect the foot wears each time before wearing them for foreign objects, do not dry feet well after washing especially in-between toes, do not soak feet in warm water for about 5 minutes before cutting nail to make the nails soft and easy to cut, do not cut nails straight with a cutter and not a razor and do not avoid wearing shoes that has pointed toes. The respondents however do engage in washing feet daily with soap and water, using petroleum jelly or moisture cream on dry skin, not walking bare footed inside or outside the house, checking the temperature of water with hand before bath, avoiding direct heat on feet and wearing shoes that are not tight.

Based on the operational definition of levels of practice as presented on table 4:4, the respondentsô self-reported foot self-care practices were re-grouped into levels as follows: 31 (9.9%) of the respondents reported poor foot self-care practices (scored <50%), 242 (77.1%) of the respondents reported average foot self-care practices (scored from 50-69%) while only 41 (13.1%) reported good foot self-care practices (scored 70 and above).

Table 4:5: Researcher observed foot self-care practice n=314

Item	Appropriate f (%)	Not appropriate f (%)
Appropriate foot wear	76(24.2)	238(75.8)
Style of footwear	104(33.1)	210(66.9)
Material of foot wear	90(28.7)	224(71.3)
Cover of foot wear	90(28.7)	224(71.3)

In table 4:5, 24.2% of the respondents showed appropriate foot wear as part of the foot-care practices observed (this was seen when respondentsô foot wears were checked for foreign body in foot wear, proper cushioning of foot wear, torn lining of shoes, improper or poorly fitted shoes and properly fitted shoes) while 75.8% of the prespondents did not have appropriate foot wear as part of the foot-care practices.

33.1% of the respondents were observed to have appropriate style of footwear. This was seen when respondents style of footwear were assessed to see if it has a pointed toe, open toe, high heel, sandals, slippers or a balanced shoes that does not compress the digits. 66.9% of the respondents were found to have an inappropriate style of footwear.

On observation, 28.7% of the respondentshad appropriate footwear material (as either inelastic material, leather or canvas or breathable material) while 71.3% of the respondentshad inappropriate footwear materials. 28.7% of the respondents showed appropriate footwear cover (all round) while 71.3% did not have appropriate footwear cover.

Objective three

To identify the foot-at-risk for diabetic foot ulceration.

Items 1-5 and 10 of the ñ60 second screening toolò addressed this objective

Table 4:6: Levels of foot-at-risk of diabetic foot ulceration. n=314

Assessment findings	Level of risk	Frequency (f)	Percentage (%)
No neuropathy	0	180	57.3%
Neuropathy	1	09	2.9%
Deformity	2a	53	16.9%
Peripheral vascular diseases (absent pedal pulses)	2b	24	7.6%
History of ulcer or active ulcer	3a	47	14.98%
History of amputation	3b	1	0.32%
Total		314	100

NB. The responses are not exclusive.

In table 4:6, 57.3% of the respondents were not at risk while 42.7% were at risk of developing a diabetic foot ulceration. This means that 42.7% of the respondents had either a previous or active foot ulcer, absent pedal pulses, neuropathy, foot deformity and/or an amputation. Respondents that are at risk are now graded in different levels according to the recommendation of International Best Practice Guidelines (2013). 2.9% of the respondents are at the least level, level 1 risk with neuropathy, 16.9% and 7.6% of the respondents are at level 2 risk with deformity for level 2a and peripheral vascular diseases (absent pedal pulses) for level 2b respectively, while 14.98% and 0.32% of the respondents are at level 3 risk with history of ulcer or active ulcer for level 3a and history of amputation for the highest level of risk as 3b respectively. Respondents with foot-at-risk were predominantly of level two (2) risk with 24.5% followed by level three (3) with 15.3% and then level one (1) with 2.9%.

Objective Four

To identify other common foot problems and abnormalities observed in therespondents

Items 1-9 in the ñ60 second screening toolò addressed this objective, with emphasis from 6-9

Table 4:7: Common foot problems and abnormalities observed n=314

Variable	Yes f (%)	No f (%)
Deformity	115 (36.6)	199 (63.4)
Fissures(Linear crack)	60 (19.1)	254 (80.9)
Active Ulcer	49 (15.6)	265 (84.4)
Previous ulcer	30 (09.6)	284 (90.4)
Previous amputation	01 (0.30)	313 (99.7)
Absent Pedal pulses	23 (07.3)	291 (92.7)
Ingrown toenail	38 (12.1)	276 (87.9)
Calluses (thick plantar skin)	32 (10.2)	282 (89.8)
Blisters	08 (02.5)	306 (97.5)
Neuropathy	22 (07.0)	292 (93.0)

As regards the common foot problems identified, table 4:7 indicates that about 9.6% of the respondents have had previous ulcer, 0.3% had previous amputation, 36.6% have had a deformity, and 7.3% had absent pedal pulses. Again on the whole, 15.6% had active ulcer, 12.1% had ingrown toenail, 10.2% had calluses, 2.5% had blisters, 19.1% had fissures and 7% of the respondentshad neuropathy.

Hypothesis One

H_0- There would be no statistically significant association between respondentôs characteristics and increased risk of diabetic foot ulceration.

Table 4:8: Correlation between respondentôs characteristics and foot-at-risk n=314

Pearson Correlation(2-tailed) coefficient	Foot-at-risk	Age	Sex	Level of education	Do you smoke	Diabetic foot education before	Occupation
Foot-at-risk	1						
P-value							
Age	-.046	1					
P-value	.417						
Sex	-.043	-.187*	1				
P-value	.450	.001					
Level of edu	-.010	-.009	.109	1			
P-value	.863	.873	.053				
Do you smoke	**.206***	.087	-.152**	.066	1		
P-value	**.000**	.126	.007	.243			
Diabetic foot education before	.094	.056	.055	-.015	-.121*	1	
P-value	.096	.318	.327	.792	.031		
Occupation	-.058	-.259**	.081	.128*	-.052	-.064	1
P-value	.306	.000	.153	.023	.360	.260	

*, **. Correlation is significant P $\geq$ 0.05 level (2-tailed).

Table 4:8 showed a weak positive statistically significant association (0.206) between smoking and risk of diabetic foot ulceration (P-value of 0.000 $\simeq$ 0.001). This means that smoking increases the risk of developing diabetic foot ulceration. The more the patient smokes, the higher the risk of developing a diabetic foot ulceration.

Other findings shows that smoking has a weak inverse (negative) significant relationship with sex (-0.152) with P-value of 0.007 and having a diabetic foot self-care education before (-0.121) with p-value of 0.031. This means that diabetic patients that smoke are more likely to be men and those that have not had diabetic foot self-care education in their life. Occupation on the other hand also has a weak inverse (negative) statistical relationship (-0.259) with age (P-value 0.000 $\underline{\sim}$ 0.001) and a positive relationship (0.128) with the highest level of education (P= 0.023). This means that patients that are gainfully employed are the younger patients who are also educated. Age also has a weak inverse significant relationship (-0.187) with sex of the participants (P= 0.000 $\underline{\sim}$ 0.001). This may also mean that diabetic patients that are elderly are more of females in this study.

Based on this, the null hypothesis (H_0) is hereby rejected (H_a- There would be a statistically significant association between respondentôsthat smoke and increased risk of diabetic foot ulcer).

Hypothesis Two

H_0- There would be no statistically significant association between respondentôs characteristics and knowledge of diabetic foot self-care.

Table 4:9: Correlations of respondentôs characteristics and knowledge of foot self-care n=314

Pearson Correlation(2-tailed) coefficient	Knowledgescore	Age	Sex	Highest edu level	Do you smoke	Diabetic foot edubefore	Occupation
Knowledge score	1						
P-value							
Age	**-.119***	1					
P-value	**.036**						
Sex	.047	**-.187****	1				
P-value	.403	**.001**					
Highest edu level	-.012	-.009	.109	1			
P-value	.835	.873	.053				
Do you smoke	-.045	.087	**-.152****	.066	1		
P-value	.422	.126	**.007**	.243			
Diabetic foot edu before	-.044	.056	.055	-.015	-.121*	1	
P-value	.435	.318	.327	.792	.031		
Occupation	.068	**-.259****	.081	.128*	-.052	-.064	1
P-value	.232	**.000**	.153	.023	.360	.260	

*,**. Correlation is significant P $\geq$ 0.05 level (2-tailed).

Table 4:9 shows that age has aweak negative (inverse) statistically significant association (-0.119) with knowledge of foot self-care (P =0.036). This shows that age influences the level of knowledge of

diabetic foot self-care. In other words, as diabetic patients grow older, their level of knowledge about diabetic foot self-caretends to decrease as well while the younger patients are more knowledgeable. Other findings shows that smoking has a weak inverse (negative) significant relationship with sex (-0.152) with P-value of 0.007 and having a diabetic foot self-care education before (-0.121) with p-value of 0.031. This means that diabetic patients that smoke are more likely to be men and those that have not had diabetic foot self-care education in their life. Occupation on the other hand also has a weak inverse (negative) statistical relationship (-0.259) with age (P-value 0.000 $\underline{\sim}$ 0.001) and a positive relationship (0.128) with the highest level of education (P= 0.023). This means that patients that are gainfully employed are the younger patients who are also educated. Age also has a weak inverse significant relationship (-0.187) with sex of the participants (P= 0.000 $\underline{\sim}$ 0.001). This may also mean that diabetic patients that are elderly are more of females in this study.

Based on this, the null hypothesis (H_0) is hereby rejected while the alternative hypothesis is accepted (H_a- There would be a statistically significant association between respondentôs characteristics (age) and knowledge of diabetic foot self-care).

Hypothesis Three

H_0- There would be no statistically significant association between respondentôs characteristics and practice of diabetic foot ulcer.

Table 4:10 : Correlations of respondentôs characteristics and practice of foot self-care n=314

Pearson Correlation(2-tailed) coefficient	Practice score	Age	Sex	Highest edu. level	Do you smoke	Diabetic foot edu before	Occupation
Practice score	1						
P-value							
Age	**-.144***	1					
P-value	**.010**						
Sex	.077	**-.187****	1				
P-value	.176	**.001**					
Highest edu. level	-.020	-.009	.109	1			
P-value	.718	.873	.053				
Do you smoke	-.019	.087	**-.152****	.066	1		
P-value	.737	.126	**.007**	.243			
Diabetic foot edu before	**.174****	.056	.055	-.015	**-.121***	1	
P-value	**.002**	.318	.327	.792	**.031**		
Occupation	**.125***	**-.259****	.081	**.128***	-.052	-.064	1
P-value	**.027**	**.000**	.153	**.023**	.360	.260	

*, **. Correlation is significant at the 0.05 level (2-tailed).

Table 4:10revealed that there were statistically significant relationships (positive correlation) between having a diabetic foot education before (0.174) with P-value of 0.002, occupation (0.125) with P-value of 0.025 and practice of foot self-care as well as an inverse statistical relationship (negative correlation) between age of the participants (P= -0.144) and practice of foot self-care with P-value of

0.010. This shows that prior knowledge of foot self-care education and being gainfully employed influences the practice of foot self-care. In other words diabetic patients who had prior diabetic foot education and those that were gainfully employed were more likely to practice correct foot self-care while the younger patients were more likely to have good self-care practices. The older the patient, the lower the practices of foot self-care while the younger the patient, the better he/she will engage in foot self-care.

Other findings show that smoking has a weak inverse (negative) significant relationship with sex (r-0.152) with a P-value of 0.007 and having a diabetic foot self-care education before (-0.121) with P-value of 0.031. This means that diabetic patients that smoke are more likely to be men and those that have not had diabetic foot self-care education in their life. Occupation on the other hand also has a weak inverse (negative) statistical relationship (-0.259) with age (P-value 0.000 $\underline{\sim}$ 0.001) and a positive relationship (0.128) with the highest level of education (P= 0.023). This means that patients that are gainfully employed were the younger patients who were also educated. Age also has a weak inverse significant relationship (-0.187) with sex of the participants (P= 0.000 $\underline{\sim}$ 0.001). This may also mean that diabetic patients that were elderly were more of females in this study.

Based on this, the null hypothesis (H_0) is hereby rejected while the alternative hypothesis (H_a- There would be a statistically significant association between respondentôs characteristics (age of patient, prior diabetic foot education and occupation) and practice of diabetic foot self-care) is accepted (not rejected).

Hypothesis Four

There would be statistically significant association between respondents' co-morbidities and increased risk of diabetic foot ulcer

Table 4:11: Correlation between respondents' co-morbidities and risk of diabetic foot ulcer

n=314

Pearson Correlation(2-tailed) coefficient	Foot-at-risk	Hypertension	Arthritis	PepticUlcer	Eye complication
Foot-at-risk	1				
P-value					
Hypertension	-.107	1			
P-value	.059				
Arthritis	-.004	-.333**	1		
P-value	.939	.000			
PepticUlcer	.101	-.101	-.032	1	
P-value	.073	.075	.573		
Eye complication	**.120***	-.392**	-.124*	-.038	1
P-value	**.034**	.000	.028	.508	

*, **.. Correlation is significant at the 0.05 level (2-tailed).

In table 4:11, eye complications (r = 0.120) with a P-value of 0.034 were identified to have a positive correlation but a weak relationship with the risk of developing a diabetic foot ulcer. This shows that patients with eye complications were more likely to develop diabetic foot ulceration than those who do not have an eye complication. In other words, as diabetic patients develop eye complication, their risk of developing a foot ulcer tends to increase as well.

Based on this finding the alternative hypothesis (H_a) is hereby accepted (not rejected) whilethe null hypothesis (H_0) is rejected (there would be no statistically significant association between the respondents' co-morbidities and risk of diabetic foot ulcer).

Hypothesis Five

Respondents with good knowledge and practice will have less risk

Table 4:12 : Correlation between Knowledge, Practice and Risk of Foot Ulcer n=314

Pearson Correlation(2-tailed) coefficient	Foot-at-risk	Knowledgescore	Practicescore
Foot-at-risk	1		
P-value			
Knowledgescore	-.039	1	
P-value	.492		
Practicescore	-.004	**.563****	1
P-value	.941	**.000**	

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4:12, revealed that there is no significant correlation between respondentôs knowledge, practice of foot self-care and risk of developing diabetic foot ulceration.

However, a moderate positive correlation (r = 0.563) was identified between knowledge and practice of foot self-care (P-value = 0.000 ≃ 0.001). This shows that the knowledge of foot self-care influences the practice of foot self-care. As knowledge of foot self-care increased, practice of foot self-care also increased as well. Respondentsthat have better knowledge of foot self-care have better practice of foot self-care.

Based on this finding, the alternative hypothesis (H_a) is hereby accepted (not rejected) while the null hypothesis (H_0-diabetics with good knowledge and practice of foot self-care will not have less risk of developing foot ulceration) is rejected.

Summary of major findings

From the analysis of data, the major findings of the study can be summarized as follows:

1- 57.3% of the respondents were not at risk while 42.7% were at risk of developing a diabetic foot ulceration.

2- The foot problems identified were foot deformity (36.6%), neuropathy (7%), peripheral vascular diseases (7.3%), ingrown toe nails (12.1%), active ulcer or blisters (15.6%), calluses/ shoe corn (10.2%), linear cracks (19.1%) and amputation (0.3%).

3- 46 (14.6%) respondents had poor knowledge of foot care, 215 (68.5%) had average knowledge while 53 (16.9%) respondents had good knowledge of foot-care.

4- 31 (9.9%) had poor practice of foot self-care, 242 (77.1%) were on the average while 41 (13.1%) respondentss had good foot self-care practice.

5- Smoking (r = 0.206, P= 0.001) and eye complications (r = 0.120, P= 0.034) were found to be associated with the risk of diabetic foot ulceration,

6- Younger patients had better knowledge (r = -0.119, P= 0.036) and practice of foot self-care (r = -0.144, P= 0.001) while being gainfully employed (r = 0.125, P= 0.025) and prior diabetic foot education (r = 0.174, P= 0.002) were found to increase diabetic foot self-care practice.

7- Knowledge of foot self-care positively influenced the practice of foot self-care.

CHAPTER FIVE

DISCUSSION OF FINDINGS

This chapter discusses the major findings in relation to previous studies. It also includes the summary, conclusion, recommendations, and the limitations of the study.

Respondent'scharacteristics

This study showed a preponderance of diabetic female patients. This was also reported by Dikeukwu et al (2013), George et al, (2013), Hasnani et al, (2009), Gondal (2007) and Adejuwon et al, (2013). This could be because women report to the hospital to seek for medical care more than men. It may also be as a result of men being bread winners of the family and are less likely to spend time on hospital visits as it means reduced or loss of wages. Majority (74.5%) of the respondents reported having a co-morbidities. Hypertension was the most common (68.8%) condition reported. Similar results were reported by Dikeukwu et al (2013) he reported that majority (70%) of participants have a co-existing medical condition. Hypertension was the most common medical condition reported by 85.7% of those with co-morbidities.Othermedical conditions they reported were eye complication (retinopathy) and arthritis. This medical conditions (eye complication) correlated with foot-at-risk of diabetic foot ulceration. Hence, may impede the practice of foot self-care among the diabetic population putting them at a greater risk. Majority of therespondents 62.1% have not received any diabetic foot education before and their feet have never been examined by a doctor or nurse before. This is also similar to other studies by Dikeukwu et al, (2013) who reported that only 32.5% of the participants had had their feet examined by a doctor or nurse, and 5.8% (7) by a podiatrist before, while Ekore et al, (2011) reported that 92% of the diabetic patients receiving care at University of Ibadan Health Centre (Jaja Clinic) had never received any form of education about foot care from their health care providers. The mean duration of diabetes since diagnosis fromrespondents in this

study was 10.32 ± SD 87.490 (months), this is similar to the findings of Adejuwon et al 2013. Alsomost of the respondents 95.2% had type 2 diabetes mellitus increased from age 35 and above, this may be because type 2 diabetes is the most common form of diabetes mellitus as age advanced. It often occurs in adulthood usually from the ages of 30-40 years recently, an increasing number of patients developing type 2 diabetes mellitus have been reported at less than 30 years (Wood, 2014). This was also documented by Ogberaet al., (2005) as well as Desalu et al., (2011).

Knowledge of foot self-care among adult diabetic patients

From this study, most (83.1%) of the respondents do not have a good knowledge of foot-self-care practices. This is higher than the findings of Hasnain et al, (2009) who found only 29% of respondents had good knowledge of foot self-care. Hasnain et al (2009) believed that formal education plays a role in better knowledge about foot self-care. Gondal et al, (2007) also documented poor knowledge of foot self-care while Desalu et al, (2011) reported that a greater portion of diabetic patient had a poor knowledge of diabetic foot self-care (68.8% were unaware of the first thing to do when they found redness/bleeding between their toes and 61.4% were unaware of the importance of inspecting the inside of the footwear for objects). Also Dikeukwu et al, (2013) documented that the participants' general knowledge of foot self-care as poor only 24.2% were aware of the need to conduct foot self-care. The lack of knowledge of foot self-care in these studies is consistent with findings by other investigators worldwide (Ekore et al, 2011, Khamseh et al, 2007).

These results are not in agreement with finding of George et al, (2013) who documented that majority (about 75%) of their participates had good knowledge of foot self-care. The possible reasons for the greater level of knowledge reported by George et al (2013), could be the fact that these diabetic patients have been exposed to a community health intervention programme and followed up on how to take care of their feet. This high level of awareness indicates that the health education sessions,

motivational counseling services, and good quality care provided to them as part of the programme have influenced their knowledge of foot self-care.

The level of knowledge of foot self-care reported in this study is very frightening considering the complications and socioeconomic consequences of diabetic foot ulcers (when it develops). Since they are registered patients attending specialist diabetic clinics at the teaching hospitals, it therefore raises a question of what they have been taught. The patient who is supposed to be the first person to notice a change in the self(foot) and seekfor medical attention early, when they donôt identify the changes early, prevention and early management to prevent complication are not instituted.

Practices of foot self-care among adult diabetic patients

From this study, the practice of foot self-care among respondentsis shown to be poor (13.1%). This result is in keeping with other studies that showed that only 14% of participants have good level of foot self-care practices (Hasnaine, 2009). The identified inadequacies of foot care practices were; non-inspection of foot daily and foot wears each time before wearing them, non-drying of the feet after washing especially in between the toes, non-cutting of toe nails straight with cutter and inappropriate foot wear.

Desaluet al, (2011) also reported similar poor level of foot self-care practice among study participants. They identified some of the inadequacies of foot self-care practices among their subjects as non-inspection of inside of foot wear, non-inspection of feet daily and failure to get appropriate size foot wear. Ekore et al, (2010) and Dikeukwu et al, (2013) also documented poor foot self -care practices among their study participants. Gondal et al, (2013) also reported poor level of practice stating that most of their participants were ignorant about simple foot self-care practices like inspecting the feet daily and cutting nails straights.

However, the finding of George et al (2013) in an intervention study, is in contrast with the findings of this present study. They reported high level of diabetic foot-care practices among diabetic patients attending a secondary care rural hospital in Southern India with a majority of them inspecting their feet one or more times a day. The possible reasons for the highlevel of practice of foot self-care could be the fact that these diabetic patients have been exposed to a community health program and followed up on how to take care of the feet. This indicates that the health education sessions, motivational counseling services, and good quality care provided to them as part of the program have influenced their practice of foot self-care and health behaviors generally.

It is not surprising that the practice of foot self-care in this presentstudy is poor because the result on knowledge of foot self-care is poor too. This poor level of knowledge and practice is disturbing knowing that knowledge and practices of good foot self-care are the simplecost-effective way of preventing and detecting diabetic foot ulcers early. This poor level of practice of foot self-care can also be as a result of poor knowledge of foot self-care. This was seen in the result of hypothesis 3, where it showed that respondents that are more knowledgeable about foot self-care showed better practice of foot self-care.

Foot-at-risk for diabetic foot ulceration

Overall, based on the outcome of the 60 Second Foot Screen, it was discovered that close to one out of two patients (42.7%) with diabetes presented with a risk of foot ulcer. Respondents with foot-at-risk were predominantly of level two (2) disorder with 24.5% followed by level three (3) with 15.30% and then level one (1) with 2.9%. This is based on the fact that these individuals had presented with at least one positive sign of disorder assessed on the 60 Second Foot Screen. The disorders that qualified them for this categorization include presentations of history of foot ulcer or active foot ulcer, peripheral neuropathy, deformity, peripheral vascular disease and previous history

of amputation. An amputation, active ulcer, history of previous ulcers, absent pedal pulses, foot deformities and neuropathies were the risk factors identified among the studyrespondents. This calls for aggressive patient foot-management knowing that the most common injury leading to ulceration is continuous low-pressure trauma, typically from ill-fitting shoes, injuries due to chronic repetitive trauma from walking or day-to-day activity which often the patient is not aware of and foot deformities (foot drop, equinus, hammer toes, and prominent plantar metatarsal heads) which result from the atrophy induced bymotor neuropathy of the footôs intrinsic muscles (International Best Practice Guidelines, 2013).

The classification of risk of diabetic foot ulceration into levels allows the managing team to determine the approaches to be taken and the frequency with which the feet of the diabetic patients should be examined, so that there is a systematic and periodic monitoring of this population to prevent diabetic foot ulceration and amputation (as recommended by the International Working Group on the Diabetic Foot). These approaches as well as frequent examination of the feet minimizes the risk of ulceration, enable analysis of the behaviours of the individual patient and advice proposed, as to the adequacy of treatment according to the progression of the disease.

The result of this present study is far below the findings of Adejuwon et al, (2013) who reported that almost one out of three (29.2%) participants are at risk of diabetic foot ulceration. It is nearthe report of Ogbera et al (2005), who reported a high risk of 41.5% of their study participants. Also Francieli and Mariana (2014) reported a higher level of risk among their participants (diabetic patients) to be 12.3% of the population and predominantly level 2 changes (7.1%), followed by level 1 (3.5%) and level 3 (1.7%) both studies have shown a predominantly level 2 risks.

The disparity in findings may be as a result of differences in age and characteristics of the respondents of the various study groups. Adejuwon et al (2013), reported that 54% of their

participants were ≥ 61 years of age while this present study showed that 46.2% of the participants were 61 years and above. This agrees with the correlation (r) that increasing age increases risk of diabetic foot ulcer.

Foot problems/ abnormalities identified amongrespondents

The common foot problems/abnormalities identified among the participants are foot deformity (hammers toe, Charcot foot, hallux valgus and high arching of the feet) as the highest, neuropathy, peripheral vascular diseases (absent pedal pulses), ingrown toe nails, active ulcer, blisters, calluses/ shoe corn, linear cracks and an amputation.

This result is comparable to the report of Dikeukwu et al, (2013), who identified only one patient with an amputation and similar foot problems/abnormalities. However, foot deformity is the most common abnormality observed in this study while they observed athleteôs foot, corns and thickened toe nails as the most common deformity. Ogbera et al (2005), observed foot deformity among their study participants. The forms of foot deformity they identified include prominent metatarsals, claw toes, hallux valgus, harmmer toes, bunions and high arching of the feet. This study result is also in line with Adejuwon et al, (2013), who identified planter calluses and foot deformities among the patients they observed in Ibadan, Nigeria.

The result of this study could have been due to individual lifelong behaviours and practices in form of long duration of repetitive pressure on the sole of the foot as a result of inappropriate foot wear which could accompany foot deformities. These findings buttress the need for strategies that ensure that foot care education with regards to the type and make of shoe, and foot examinations are carried out at each visit because mechanical factors play an important role in the initiation of foot ulcers with injury typically occurring in the setting of a foot deformity (Ogbera et al, 2013).

Respondent's characteristics and increased risk of diabetic foot ulceration

This study shows that some of the respondentsô characteristics do predict the diabetic foot-at-risk, knowledge and practice of foot-self-care among the respondents in this study. Result from present study showed that smoking increases the risk of a patient developing diabetic foot ulcer. A patient that smokes is at a higher risk of developing diabetic foot ulceration than those that do not smoke. This is not surprising because it has been documented that cigarette smoking causes a decrease in cutaneous blood flow, as much as 40% to produce ischemia and impair wound healing. Smoking a single cigarette creates a vasoconstriction effect for as much as 90 minutes, while a packet can result in hypoxia that can last an entire day (Krasner et al, 2012). Viswanathan (2009) in a study in India reported that smoking increases risk of foot ulceration by reducing blood circulation in the legs and reducing sensation in the feet.

This study also showed that younger patients are more knowledgeable and had better practice of foot self-care than the older ones. Those with prior diabetic foot education, and those that are gainfully employed also had better practice of foot self-care. This could be because the younger patients may be more exposed to educational material and hence more aware of foot self-care practices. This awareness/knowledge drives them to practice good foot self-care because one can only practice what he/she knows. This calls for more emphasis on diabetic foot education at the clinic levels and beyond in order to increase practice of foot self-care and prevent complications of diabetic foot ulcer.

This is in line with Shahbazian et al (2013) who documented a significant correlation between previous foot care education and risk of diabetic foot ulcer, noting that lack of previous foot care education increases risk of diabetic foot ulcer. This is also in line with Desalu et al, (2011) who reported that participants who had poor education had lower knowledge of foot self-care and also similar in that age and gender were not significantly associated with the knowledge of foot self-care.

Dikeukwu et al (2013) also documented that smoking was significantly associated with developing diabetic foot ulceration. Hasnain et al, (2009) also documented educational status was significantly associated with knowledge and practice of foot self-care while sex and income showed no association with knowledge and practice of foot self-care.

Respondent's characteristic and knowledge of foot self-care

This study shows that some of the respondentsô characteristic (age) do predict the knowledge of foot-self-care among the respondents in this study. Result from present study showed that age of respondents influences the level of knowledge of diabetic foot self-care. This is not in line with the report of George et al (2013) who documented that sex, poor education status had a positive correlation with knowledge of foot self-care. Ekore et al, (2010),Desalu et al, (2011) and Hasnain et al, (2009) also documented that education had a positive relationship with knowledge of foot self-care while sex does not have a relationship with knowledge of foot self-care.

Respondent's characteristics and self-reported foot self-care practices

This study shows that some of the respondentsô characteristic (age, prior foot education and highest educational level) do predict the foot-self-care practices as reported by the respondents in this study. Result from present study showed that age, prior diabetic foot education and highest educational level of respondents influences the self-reported foot self-care practices among respondents in this study. This is in line with the findings of Hasnain et al, (2009) and Ekore et al, (2010) who documented that education and illiteracy affect the practice of foot self-care practices of participants in their study. Desalu et al, (2011) also documented that illiteracy was significantly associated with poor practice of foot care among study participants.

Respondent's co-morbidities associated with increased risk of diabetic foot ulcer.

Results from present studies show that there is a significant correlation between the respondentsô medical characteristics and increased risk of diabetic foot ulcer. It shows that diabetic patients who have eye complications are more likely to develop a foot ulcer than those without eye complications. Damage to the eye is a common complication of diabetes mellitus. Uncontrolled diabetes mellitus is known to be the leading cause of blindness in adults age 20 to 74 (Abdish & Ronesh, 2014). Diabetes mellitus causes increased pressure inside the eye (glaucoma) and swelling of the lens and blurring of vision (cataract) and damages the network of blood vessels that supply the retina (diabetic retinopathy). This in turn may lead to impaired vision or loss of vision. When there is loss of vision, the patient may not have a good view of the foot, examine their feet daily and may not notice any change in their feet especially those who do not have anyone to help them assess their feet. This is similar to the findings of Shahbazian et al, (2013) who reported a significant correlation between the patientsô medical characteristics (eye complication) and risk of diabetic foot ulceration. They documented that retinopathy increases the risk of diabetic foot ulcer.

Respondent'sknowledge, practice of foot self-care and risk of foot ulceration

This study shows that there is no significant association between the participantsô with good knowledge and practice of foot self-care and increased risk of diabetic foot ulcer. This means that participants' knowledge and practice of foot self-care does not affect their risk of developing a diabetic foot ulcer. There is however paucity of data for comparison of this result.

Summary

This study was done to determine the knowledge, practice of foot self-care and foot-at-risk among adult diabetic patients and to identify the demographic characteristics, that are associated with

knowledge, practice and foot-at-risk of diabetic foot ulcers as well as to identify the medical conditions and knowledge and practice of foot self-care that are associated with foot-at-risk of diabetic foot ulcers.

Descriptive cross sectional design was used for the study and the outpatient diabetic clinics of the two teaching hospitals in Enugu state (UNTH and ESUTH) were the setting for the study. The population of the study was the adult diabetic patients, who attended the clinic within the months of April and May, 2015. Data analysis used the 314 respondents.

The data collected were sorted and analyzed using the IBM SPSS version 20. From the analysis, it was discovered that 42.7% of the respondents were at risk of diabetic foot ulceration at different levels. 22 (7%) of the participants were at level 1 risk, 115 (36.6%) and 23 (7.3%) of the respondents were at level 2 risk, 70 (23.3%) and 1 (0.003%) of the respondents were at level 3 risk, while 292 (93%) of the respondents had no risk of diabetic foot ulceration. On the level of risk, the knowledge of foot self-care among respondents, 14.6% had poor knowledge of foot care, 68.5% had average knowledge while 16.9% respondents had good knowledge of foot-care. On the practice of foot self-care, 9.9% respondents had poor practice of foot self-care, 77.1% were on the average while only 13.1% respondents had a good foot self-care practice and 28.7% respondents used appropriate foot wears while 71.3% did not use appropriate foot wears. The common foot problems identified were foot deformity, neuropathy, peripheral vascular diseases (absent pedal pulses), ingrown toe nails, active ulcer, blisters, calluses/ shoe corn, linear cracks and an amputation. Smoking was found to be associated with the risk of diabetic foot ulceration while having diabetic foot education before and being gainfully employed and being young were found to increase the practice of diabetic foot self-care. This showed that smoking increases the risk of diabetic foot ulcers and patients that were young,

gainfully employed and those with diabetic foot education had better foot self-care practices. Diabetic patients with good knowledge showed good practice of foot self-care.

Conclusion

Poor knowledge and practice of foot self-care was identified in this study among the respondents and a good number of them are at risk of developing foot ulceration as they presented with one or more risks. Health promotion and education are central to nursing and nurses all over the world are leading on this. So, Nigerian nurses must rise up to this responsibility. Instituting this supportive-educative system of intervention could improve patientsô knowledge and foot care practices as well as reduce the risk of developing foot ulceration among the diabetic population.

Implication for nursing practice

It has been estimated that every 20 seconds a lower limb in the world is lost due to complication of diabetes (International Best Practice Guidelines, 2013) and diabetic foot ulcer is largely a self-care disease and a good self-care practice will prevent or delay its occurrence (Abbas, 2007). Hence, full participation of the patients and/or caregivers as an integral member of the care team is very necessary to prevent and/or manage these complications. Integrating the patients and/or caregivers in the care team requires good knowledge of the disease, the treatment regimen and how to care for their feet.

Diabetic foot ulcer is costly, wastes medical and human resources and may have serious consequences on the quality and quantity of lives of the patients and the family. Nurses must understand their pivotal role in identifying the diabetic patients at risk of foot ulceration as well as empowering them with the needed information and skills that they need to build knowledge and enhance practice of foot self-care through series of educational activities. Although the foot

examination is the responsibility of health professionals, nurses must assist the patient to develop skills necessary for self-evaluation so that the diabetic patients can recognize potential problems and have knowledge of precautions to be taken to avert serious complications.

This study also revealed that majority of the patients had never had their feet examined by their care providers (nurses or doctors). Nurses must understand that risk factor recognition is vital in predicting, and hopefully preventing the occurrence of diabetic foot ulcers, the simple and less time consuming way of identifying those at risk of diabetic foot ulcers is by examining and attending to their feet. Deficient knowledge, ineffective self-health management and ñrisk forò being a North America Nursing Diagnosis Association (NANDA) actual and potential diagnoses places the responsibility on nurses to assess for them in clients with diabetes while planning care. The plan of care should focus on nursing outcomes classification (NOC) like improved knowledge and practice of foot self-care, improved self-health management, improved client participation to identify the factors that put the clients at risk of diabetic foot ulceration (like foot deformity or changes, foot wears) as well as what to do once they notice a change in foot. The nurses dealing with the diabetic population should organize an individualized educational plan based on these factors identified in each client that will enhance early identification of those at risk of diabetic foot ulceration. It is the responsibility of the nurse to educate the patient on appropriate foot wears to reduce plantar pressure knowing that improperly used shoes is a leading cause of foot injuries among the diabetic population.

The feet of the diabetic patients /clients have their own characteristics, capable of turning a simple cut/injury into the amputation of a limb or a threat to patientôs life itself. The education of the patient, caregivers and his family, addressing themes as foot hygiene, nail care, and use of proper footwear, are all crucial to reduce the risk of injury and the formation of ulcers. The education sessions must consider the reality of the subject, and aim to provide knowledge to promote independent individuals

who can be active in the care process. Any intervention to change health habits and lifestyles of patients with chronic diseases involves changing the individual, cultural, social and community behaviours and, for this to occur, that learning is essential (Francieli et al, 2014).

The nurse plays an important role in health education and is responsible for articulating the scientific knowledge and the individual or collective common practice, and for showing alternatives applicable to the realities presented, favouring the change in lifestyle and the development of autonomy in self-care (Francieli et al, 2014).

Limitations of the study

- The researcher encountered difficulties in search of literature on foot-at-risk of diabetic foot ulcers. Most of the studies concentrated on knowledge and practice of foot self-care among the diabetic patients.
- The study was done in the diabetic clinic days at the two teaching hospitals and hence, the researcher encountered some challenges as the patients attention were divided between coming for foot examination, running some investigations and seeing their doctors. Hence the researcher resorted to getting to the hospital before 7:00am during clinic days to see the patients before the clinics began at 9:00am.
- Lack of examination room with a couch was also encountered by the researcher. She resorted to using the consulting rooms from 7:00am to 9:00am before the doctors would start their clinic as the only option to progress.
- The sampling method used in this study was purposive sampling- characterized by deliberate effort to obtain representative sample until sample size is completed is a weak sampling method because it only recruited those who were available at that time and did not give equal

chance of being included or excluded to all eligible participants and the sample population used may not necessarily be entirely the population that the researcher is trying to reach; However, it was adequate for achieving the aim and objectives of this study. Other sampling methods such as randomizing could not be used because of logistics and may be difficult in the out-patient setting.

- Also hospital based patients were used, a greater problem will be dictated among community based patients with limited access to tertiary health facility. Future study should do this.

Recommendations

- Health care providers (nurses and doctors) should assess the feet of their clients to identify those at risk of diabetic foot ulcer. Clients with a negative screen and diabetes should be reassessed in a year or sooner if a foot problem develops. Those on risk level 1(loss of protective sensation/ neuropathy) can be assigned to more frequent (every 6 months) foot checks, including education, review of the appropriateness of their footwear, and detailed foot care education. Those with foot deformity or peripheral vascular disease (level 2) would need a 3-4 monthly follow up. They may also need an adaptive footwear and regular professional foot care. Patients with peripheral vascular disease will need scrupulous attention to cardiovascular risk management, including lipid management advice about appropriate exercise, and smoking cessation. Those with previous ulcer or amputation (level 3), should be seen every 1-2 months in line with the recommendations of the International Best Practice Guidelines (2013).
- Foot care education should be given to diabetic patients by health care providers to increase foot self-care knowledge and awareness and motivate them to engage in appropriate

performance of foot care.

- Teaching the diabetic patients about foot care is not all that is needed, they must be encouraged to actively carry out appropriate foot self-care practices through interactive teaching and demonstrations as a way of preventing foot ulceration and decreasing the rate of lower extremity amputation.
- Reminders and prompts that will ensure that health care practitioners examine the feet of diabetic patients at least once a year should be developed and put on the wall to encourage compliance.
- Podiatric services should be made available and affordable to diabetic patients to protect their feet especially those with deformities.
- Given that a significant proportion of participants reported bad practices, health care providers should use the opportunities provided by clinic visits to correct misconceptions and bad habits by providing clear and practical advice on self-care skills.
- Training of health care providers on how to care for the feet of the diabetic clients.
- While other categories of health care providers could be trained to regularly examine the feet of patients with diabetes and to provide self-care advice, the need to manage diabetic foot complications in the face of an increased prevalence of diabetes in Nigeria necessitates the urgent training recruitment of podiatrists into the public health system.
- Establishment of diabetic foot clinics that will take care of the feet of the diabetic patients only.
- Communication and care giver-patient relationship should be improved to enhance learning, knowledge and practice of foot self-care.
- This patient education and care of the feet should be done at the diabetic foot clinics where attention is paid to the foot, less volume of patients at a time and diabetic nurse educators

have time to teach and assess the feet of the patients. The role of health care providers in improving the knowledge regarding foot self-care is very important because knowledge is power; it is only when the patients know how to care for their feet that they will care for the feet. If the patient is knowledgeable he is equipped to identify changes for prevention and early intervention.

Suggestion for further studies

Further studies should be carried out on foot-at-risk, knowledge and practice of foot self-care among diabetic patients in private hospitals and health centers (rural areas) and in communities.

A research should be done to assess the impact of planned diabetic education programme on foot-at-risk, knowledge and practice of foot self-care among diabetic patients in our tertiary hospitals.

Also a research could be carried out to assess the relationship between knowledge and practice of foot self-care and risk of developing diabetic foot ulcers.

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APPENDIX 1: INSTRUMENT FOR THE STUDY

Assessment of Foot-At-Risk, Knowledge and Practice of Foot Self-Care among Adult Diabetic Patients Attending Two Teaching Hospitals in Enugu.

Information Sheet

Dear Sir/Ma,

I wish to interview you regarding knowledge of, and practice of foot self-care and also we would assess your feet using the monofilament tool to identify if you are at risk of developing a diabetic foot ulcer for prevention. There is no risk associated with the study. I would like to assure you that your identity will be kept confidential during the research and beyond. Your participation is voluntary and you do not have to answer any question you do not want to.

Thank you for the anticipated positive response in this regard.

Yours Faithfully,

OGBOGU CHINENYE JULIET
MSc. Student (UNEC)
UNIVERSITY OF NIGERIA, ENUGU CAMPUS

APPENDIX 2: QUESTIONNAIRE

ASSESSMENT OF FOOT-AT-RISK, KNOWLEDGE AND PRACTICE OF FOOT SELF-CARE AMONG ADULT DIABETIC PATIENTS ATTENDING TWO TEACHING HOSPITALS IN ENUGU.

Date : é é é é é é é é é é é é é . Patients Hospital Number é é é é é é é é é .

Name of hospital é é é é é é é é é é é é é é .

Section A- Background information

1- What is your age? é é é é é é é é é (years)

2- Sex. i- Male ☐ ii- Female ☐

3 What is your tribe?

i- Igbo ☐ ii- Yoruba ☐ iii-Hausa ☐ iv- Othersé é é é é é

4- Religion

i- Catholic ☐ ii- Anglican ☐ iii- Meth/Presby ☐ iv-Islam ☐

v- African traditional religion ☐ vi- Others (Pentecostals)é é é é é é é

5- Highest level of education?

i- Primary ☐ ii- Secondary ☐ iii- Tertiary Education ☐

iv- No formal education ☐

6- What is your occupation?

i- Unemployed ☐ ii- Employed (govt or private) ☐ iii- Self employed ☐

iv- Retired ☐ v- Student ☐

7- Do you smoke? i- Yes ☐ ii- No ☐

8- Does any of your family member assist you in caring for your feet?
i- Yes ☐ ii- No ☐

9- Have you had a diabetic foot education before? i- Yes ☐ ii- No ☐

10- Have you had your feet examined by a doctor of nurse? i- Yes ☐ ii- No ☐

11- Do you have any other medical condition? i- Yes ☐ ii- No ☐

12- If yes, which one of these?
i- Hypertension ☐ ii- Arthritis ☐ iii- Others é é é é é é é é é é é

13- What type of diabetes do you have?

i- Type 1 ☐ i- Type 11 ☐ Gestational ☐

14- Duration of diabetes mellitus since diagnosis é é é é é é é é é years/months/weeks

15- Are you on any medication? i- Yes ☐ ii- No ☐

16- If yes which type of medication?

i- Oral tablet ☐ ii- Insulin ☐ iii- Both ☐

Section B: Knowledge of foot-care

Please tick the one that you think is correct.

Which of the following do you know someone with diabetes should do	YES	NO
17- Inspect the feet daily for any change especially in-between toes		
18- Inspect the foot wears each time before wearing them for foreign objects		
19- Wash feet daily with soap and water		
20- Dry feet well after washing especially in between the toes		
21- Use petroleum jelly or moisture cream on dry skin		
22- Soak feet in warm water for about 5 minutes before cutting nail to soften nails for easy cutting		
23- Cut nails straight with a cutter and not a razor		
24- Not walk bare foot inside or outside the house		
25- Check the temperature of water with hand before bath		
26- Avoid direct heat on feet		
27- Not smoke		
28- Wear shoes that are not tight		
29- No wear shoes that has pointed toe		
30- Engage in daily exercise such as brisk walk to promote circulation		

31- Seek professional help (Dr or Nurse) as soon as one notices a change in feet		

PRACTICE OF FOOT SELF-CARE. Please tick the one that applies to you.

Which of these did you do everyday?	YES	NO
32- I inspect the feet daily for any change especially in-between toes		
33- I inspect the foot wears each time before wearing them for foreign objects		
34- I wash feet daily with soap and water		
35- I dry feet well after washing especially in between the toes		
36- I use petroleum jelly or moisture cream on dry skin		
37- I soak feet in warm water for about 5 minutes before cutting nail to soften nails for easy cutting		
38- I cut nails straight with a cutter and not a razor		
39- I do not walk bare foot inside or outside the house		
40- I check the temperature of water with hand before bath		
41- I avoid direct heat on feet		
42- I wear shoes that are not tight		
43- I do not wear shoes that has pointed toe		

Section C: Observation guide for assessing practice of foot self-care

Item	**Appropriate**	**Not appropriate**
44: Appropriate foot wear		

• Check for foreign body • Proper cushioning • Torn lining of shoes • Improper or poorly fitted shoe • Properly fitted shoes		
45: Style Of Foot Wear • Pointed Toe • Open-Toe Shoe • High Heel • Sandals Or Slippers • Well balanced shoes		
46: Material of foot wear • Unbreathable • Inelastic material (such as plastic) • Leather • Canvas		
47: Cover of foot wear • Covered all round • Not covered all round		

The practice of foot self-care will be rated as follows

1 = Appropriate. 0 = Not appropriate.

Comment by researcheré .

APPENDIX 3: Sample Size Calculation

$$n = \frac{N}{1 + N (e)^2}$$

Where n = Sample size

N = Finite population

e = level of significance limit of tolerable error, for this proposal study 0.05 will be acceptable 1= constant

Thus the sample size = 780 +360= **1140**

$$n = \frac{1140}{1+1140(0.05)^2}$$

$$n = \frac{1140}{3.85} = \mathbf{296}$$

The sample size (n) will be increased by 10% so as to cover for those who may not complete the questionnaire correctly.

10% (attrition rate) = of n = $\frac{10}{100}$ x 296 = 29.6 = 30

Sample size (n) = 296 + 30 = **326.**

To get the different sample size for the two institutions, the researcher needs to get the proportionate representation of the two institutions.

Hence, UNTH= $\frac{65}{95}$ x 100= 68.4 = **68% = 201+ 15= 216 respondents (68 x 296 / 100)**

ESUTH= $\frac{30}{95}$ x 100 = 31.6 = **32% = 95+15=110 respondents (32 x 296 / 100)**

TOTAL= 326 Respondents

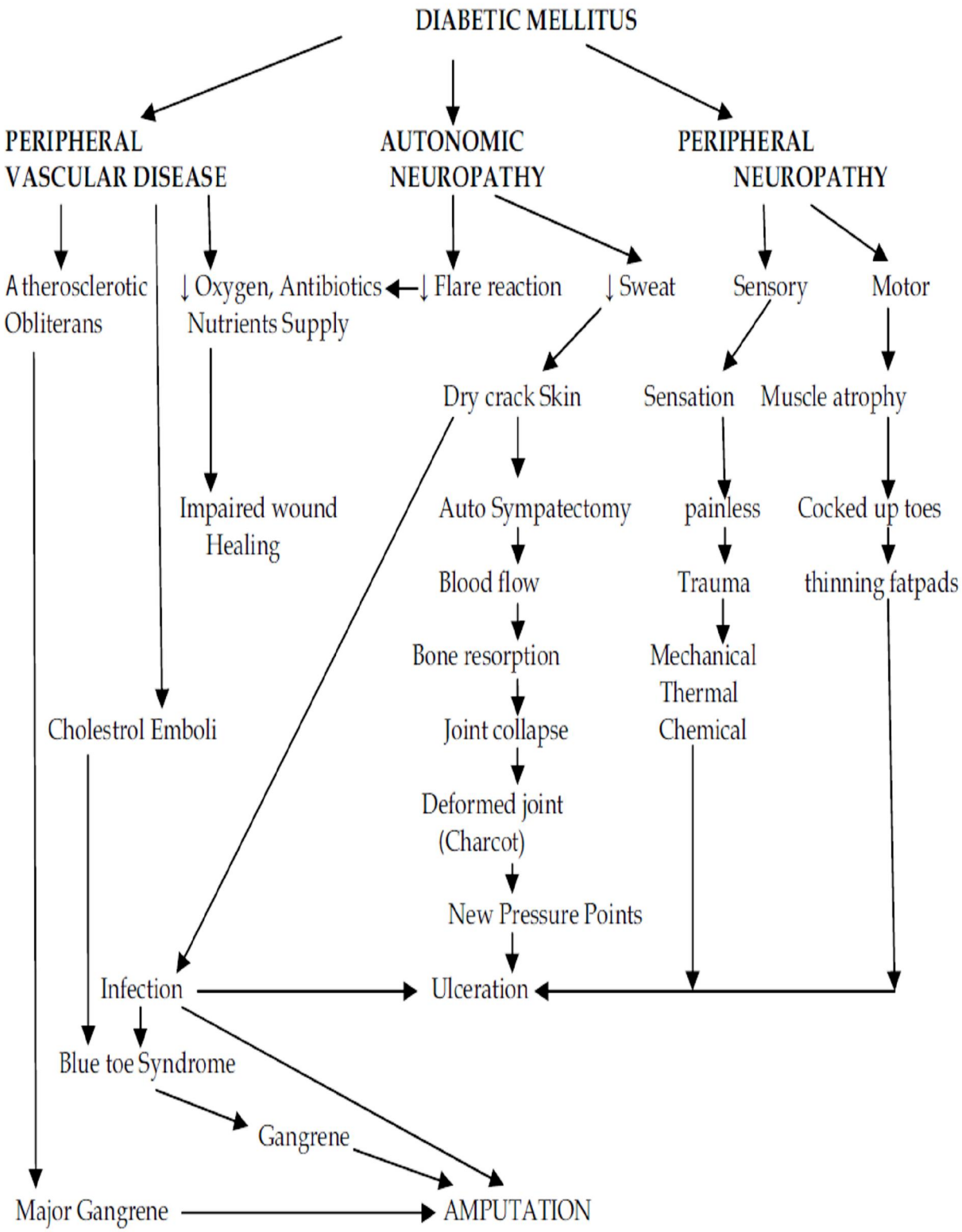


Figure 1 Pathophysiology of Diabetic foot ulceration

Table 1: WAGNERôS classification of DFU

Grade 0	Foot symptoms like pain,only
Grade 1	Superficial ulcers
Grade 2	Deep ulcers
Grade 3	Ulcer with bone involvement
Grade 4	Forefoot gangrene
Grade 5	Full foot gangrene

Wagner (1983) grades lesions of diabetic foot from 0-5 by depth and extent.

ÅGrade 0: No ulcer in a high risk foot.

ÅGrade 1: Superficial ulcer involving the full skin thickness but not underlying tissues (commonest site is head of 1st metatarsal).

ÅGrade 2: Deep ulcer, penetrating down to ligaments and muscle, but no bone involvement or abscess formation.

ÅGrade 3: Deep ulcer with cellulitis or abscess formation, often with osteomyelitis.

ÅGrade 4: Localized gangrene.

ÅGrade 5: Extensive gangrene involving the whole foot.

Table 2: University Of Texas Classification of Diabetic Foot Ulceration Grade

	GRADE-0	GRADE-1	GRADE-2	GRADE-3
STAGE-A	Pre-ulcerative or post-ulcerative lesion completely epithelialized	Superficial wound, not involving tendon, capsule or bone	Wound penetrating to tendon or capsule	Wound penetrating to bone or joint
STAGE-B	Infection	Infection	Infection	Infection
STAGE-C	Ischemia	Ischemia	Ischemia	Ischemia
STAGE-D	Infection and Ischemia	Infection and Ischemia	Infection and Ischemia	Infection and Ischemia

ÅGrade I-A: non-infected, non-ischemic superficial ulceration.

ÅGrade I-B: infected, non-ischemic superficial ulceration.

ÅGrade I-C: ischemic, non-infected superficial ulceration.

ÅGrade I-D: ischemic and infected superficial ulceration.

ÅGrade II-A: non-infected, non-ischemic ulcer that penetrates to capsule or tendon.

ÅGrade II-B: infected, non-ischemic ulcer that penetrates to capsule or tendon.

ÅGrade II-C: ischemic, non-infected ulcer that penetrates to capsule or tendon.

ÅGrade II-D: ischemic and infected ulcer that penetrates to capsule or tendon.

ÅGrade III-A: non-infected, non-ischemic ulcer that penetrates to bone or joint.

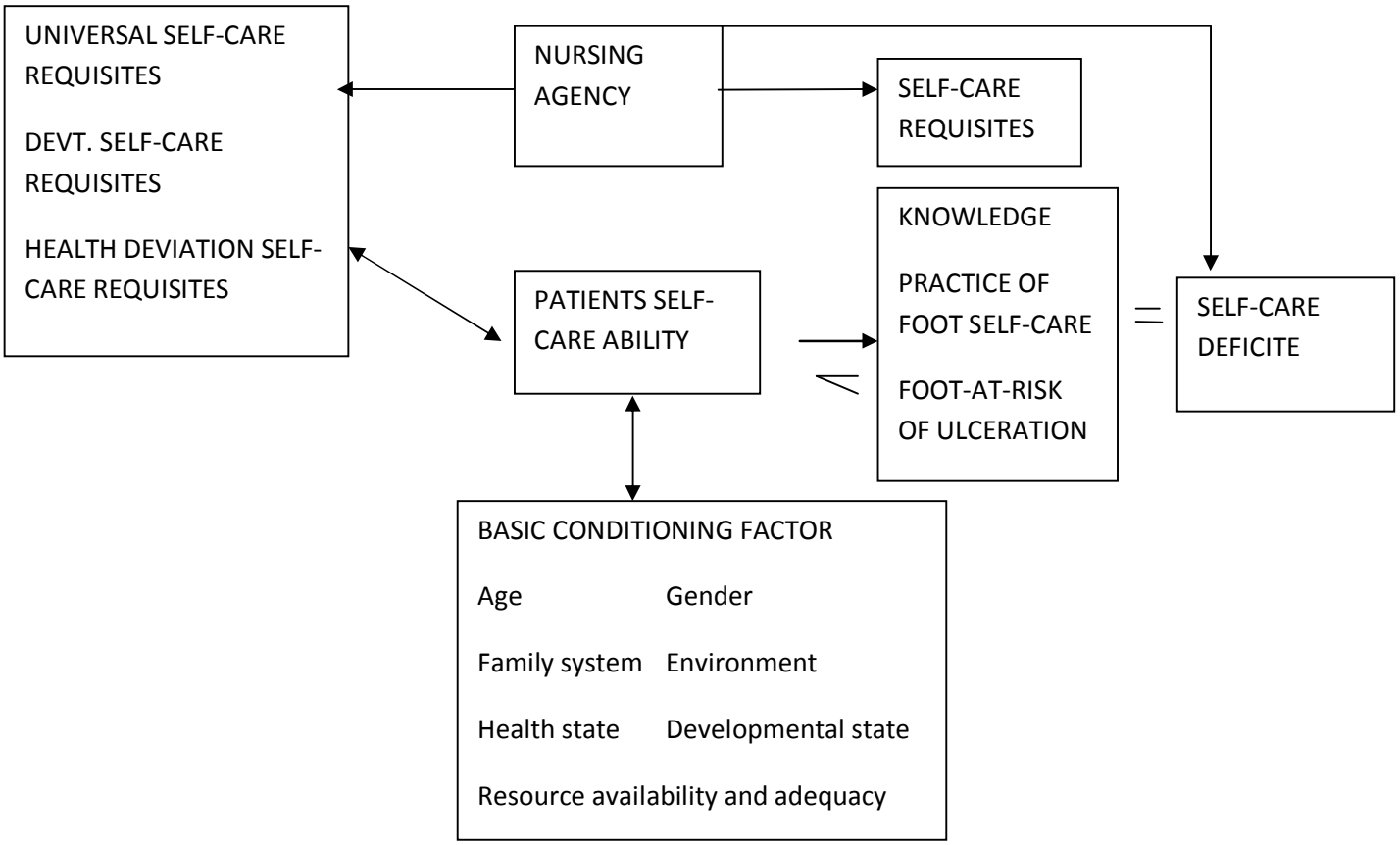
ÅGrade III-B: infected, non-ischemic ulcer that penetrates to bone or joint.

ÅGrade III-C: ischemic, non-infected ulcer that penetrates to bone or joint.

ÅGrade III-D: ischemic and infected ulcer that penetrates to bone or joint.

The most substantial point is no matter the grade; the overall outcome depends upon the stage of the disease. Increasing the stage leads to decreased healing which in turn enhances the possibility of amputations. Early detection of any of the developing sore and prompt treatment to restore the foot in perfect, healthy condition can save lots of time, money and undue stress.

FIGURE 4: APPLICATION OF OREM SELF-CARE DEFICIT



DIAGNOSTIC OPERATIONS