DIABETES SELF MANAGEMENT KNOWLEDGE AND FOOT COMPLICATIONS AMONG TYPE 2 DIABETES PATIENTS AT JARAMOGI OGINGA ODINGA TEACHING AND REFERRAL HOSPITAL, KISUMU COUNTY, KENYA.

LUCY KAGEHA KAVINGUHA

A Research Thesis Submitted in Partial Fulfillment of the requirements for the Award of Master of Science in Nursing degree of Masinde Muliro University of Science and Technology

November, 2017

DECLARATION

This thesis is my original work and has not been presented for a degree or an award in any other university

Signature..... Date.....

Lucy Kageha Kavinguha

HNR/G/53/14

APPROVAL

This thesis has been submitted with our approval as university supervisors

Signature…….. Date…….

Professor A. J. Oloo

Chairman of Department School of Public Health

Masinde Muliro University of Science and Technology

Signature..... Date.....

Ms Dorcas Maina

School of Nursing and Midwifery

University of Nairobi

ACKNOWLEDGEMENT

I wish to extend my sincere gratitude to everyone who contributed towards the successful completion of my thesis. I thank the almighty God for His grace which is sufficient for me and has ensured completion of this work.

Special acknowledgement to my supervisors Prof James Oloo, Ms Dorcas Maina and Mr. John Arudo for their immense guidance and assistance. I have truly learnt a lot under your supervision. I would also wish to appreciate all my other lecturers and classmates for their mentorship, assistance and support.

Special gratitude goes to the staff at Jaramogi Oginga Odinga Teaching and Referral Hospital for their support in ensuring successful data collection.

Last, but most of all, thank you to my husband, Ephrahim, who is a source of strength and unwavering support, patience, guidance, and love during my long nights toiling on my thesis. Thank you for being the wind under my wings.

DEDICATION

This thesis is dedicated to my husband, Ephrahim Okal Ochola, who has been with me on this journey to complete my thesis.

My children, Eunice and Aiden, who are my greatest source of inspiration.

ABSTRACT

The global burden of Diabetes is increasing. It is estimated by the year 2035 over 592 million people in the world will suffer from Diabetes. In Kenya, the prevalence of Diabetes is 4.56% while about 14% have impaired glucose metabolism. Since Diabetes is a complex disease affecting all areas of a person's life, management by the patient remains central to the control and reduction of short term and long term complications. Diabetes self-management is a process in which the knowledge, skills and abilities required for a patient to adequately manage his or her conditions are facilitated. Poor management of diabetes has been linked to long term diabetic complications. The aim of this study was to examine the association between diabetes self-management knowledge and diabetic foot complications amongst patients with type 2 diabetes at Jaramogi Oginga Odinga Teaching and Referral Hospital. The target population was patients with type II diabetes and a sample of 100 participants was randomly selected. Data was collected using a researcher administered questionnaire. A multiple logistic regression model was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) between diabetes self-management knowledge and foot complications of type 2 diabetes, adjusting for potential confounders. A total of 81 questionnaires were clean and complete for data analysis. Descriptive statistics was used to report respondents' characteristics. Mean age of respondents was 43years. Majority of the respondents were males (64%), were married (77%) and had secondary level education and above (64%).Knowledge level was assessed using the diabetes knowledge test. Respondents who were knowledgeable were 60.5%. Respondents who had experienced a diabetic foot related complication were 22.2% and 72.2% amongst them were not knowledgeable on diabetes self-management. Knowledge of diabetes self-management was associated with age (OR: 0.4; 95% CI 0.14-0.91), sex (OR: 0.4; 95% CI 0.14-0.92), marital status (OR: 4.9; 95% CI 1.62-14.9), education (OR: 9.8; 95% CI 3.42-28) and years with diabetes (OR: 3.2; 95% CI 1.26-8.18). Development of diabetic foot complication was influenced by patients' knowledge level of diabetes self-management (OR: 0.07; 95% CI 0.02-0.26) and availability of diabetic educators (OR: 0.17; 95% CI 0.05-0.53). This study has shown that type 2 diabetic patients at JOOTRH were knowledgeable about diabetes self-management and that knowledge of diabetes self-care is dependent on the knowledge of diabetes, however efforts are needed to realize 100% of the patients being knowledgeable; this can be achieved by giving diabetes management health education every day before patients see clinicians. The study recommends more intensive foot care education with subsequent follow up either through telephone call or home visit as most patients who developed foot complications reported examining their feet only at the clinic. The study also recommends that the government of Kenya through Ministry of Health should ensure adequate capacity building and training of diabetes specialists. This will increase knowledge of patients and subsequently reduce number of foot complications.

TABLE OF CONTENT

Contents

LIST OF TABLES

LIST OF FIGURE

LIST OF ABBREVIATIONS AND ACRONYMS

ADA	**:**	American Diabetes Association
AFR	:	African Regions
AIDS	:	Acquired Immunodeficiency Syndrome
AMPATH	:	Academic Model Providing Access to Healthcare
CDA	:	Canadian Diabetes Association
CDC	:	Center for Disease Control and Prevention
CVD	:	Cardiovascular Diseases
DM	:	Diabetes Mellitus
DMI	:	Diabetes Management and Information Centre
DNCD	:	Division of Non-Communicable Diseases
DSME	:	Diabetes Self-Management Education
DSMS	:	Diabetes self-monitoring system
FBO	:	Faith Based Organizations
GDP	:	Gross Domestic Product
HCP	:	Health care Provider
HIV	:	Human Immunodeficiency Syndrome
HMIS	:	Health Information Management System
IDF	:	International Diabetes Federation
JOOTRH	:	Jaramogi Oginga Odinga Teaching and Referral Hospital
LMICs	:	low- and middle-income countries
MDG	:	Millennium Development Goals

MENA	:	Middle East and North Africa
MOH	:	Ministry of Health
NCDs	:	Non-communicable diseases
NGOs	:	Non-Governmental Organizations
SEA	:	South East Asia
SPSS	:	Statistical Package for Service Solution
SSA	:	Sub Saharan Africa
T2DM	:	Type two diabetes Mellitus
WDF	:	World Diabetes Federation
WHO	:	World Health Organizations

CHAPTER ONE

INTRODUCTION

1.1 Overview

The thesis was organized into six chapters; Chapter one gave background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, limitations of the study and the definition of significant terms. Chapter two reviewed the literature on diabetes self-management and foot complications from global, regional and local perspective based on the objectives of the study and further looked at the theoretical framework and eventually the summary of research gaps identified. Chapter three explained the research methodology of the study. Data from the field was analyzed interpreted and presented in form of tables in Chapter four. Chapter five summarized the key findings and finally chapter six with conclusion, recommendations, and areas for further research.

1.2 Background Information

Diabetes mellitus is a chronic disease and is among the top four non communicable diseases [NCDs]. Just like the other three NCDs (cardiovascular diseases (CVD), cancers, and chronic respiratory diseases) diabetes is of long duration and generally of gradual progression, World Health Organization (WHO, 2015).

WHO (2014) in a global status report on NCDs defines diabetes mellitus as a chronic disease which occurs when the pancreas does not produce enough insulin or when the body cannot effectively use insulin it produces leading to increased glucose in the blood (hyperglycemia). There are three types of diabetes. Type 1 diabetes (Juvenile Diabetes) which affects mostly children and young adults, it results from insulin insufficiency due to destruction of pancreatic cells. Type 2 diabetes mellitus [T2DM] accounting for 85% to 95% of all cases characterized by insulin resistance when the body no longer uses the insulin properly. The third type is gestational diabetes which occurs during pregnancy (WHO, 2014). This study focused mainly on T2DM which is quite prevalent and can easily be prevented.

1.2.1 The symptoms of Diabetes Mellitus

According to Canada Diabetes Association (2012), diabetes mellitus is a complex, chronic illness requiring continuous medical care with multi factorial risk-reduction strategies beyond blood glucose control. The commonest symptoms include: frequent urination in large quantities; unusual and excessive thirst; extreme hunger at all times; unusual weight loss; extreme fatigue; irritability; nausea and vomiting; and sweet smelling breath especially in type 1 diabetes. T2DM symptoms include: blurred visions, frequent infections such as recurring skin, gum, or bladder infections; slow healing of wounds; tingling or numbness in the hands or feet; itching of the skin and genitals and drowsiness.

1.2.2 Causes of Diabetes

The major causes of diabetes mellitus are rapid, unplanned urbanization, globalization and lifestyle modifications; ethnicity; gender, age and socio economic burdens. In Europe, Tamayo *et al.,* (2013) equates the high prevalence of T2DM cases to be associated with age, obesity and dietary intake, genetic predisposition alongside modifiable risk factors such as smoking behavior, environmental pollutants, psycho social factors and social economic deprivation. Majeed, Sayeed, Khoja, Alshamsan, Millett, & Rawaf (2013), highlights the disease prevalence from rapid economic development, urbanization, physical inactivity, overweight and obesity to consumption of highly processed carbohydrates in MENA. While in Africa Peer *et al.,* (2013) cites that diabetes mellitus prevalence is due to: increasing age of its communities; rapid urbanization leading to change in lifestyle, with a marked decrease in physical activities leading to obesity and overweight; In addition, changes in nutrition where focus is on western and highly processed foods full of saturated fats and sugars contributes to the disease prevalence.

In Kenya, Maina, Ndegwa, Njenga, & Muchemi (2010), indicate that increased dependency on highly processed foods, decline in physical activity, tobacco and alcohol use are the risk factors attributed to the incidences of diabetes trend.

1.2.3 Diabetes on the Rise

Non-communicable diseases (NCDs) are the leading cause of death globally and diabetes mellitus is the 4th main contributor (Global status report on non-communicable diseases, 2010). In 2013 the global burden of diabetes was estimated to be 382 million people. The International Diabetes Federation (IDF) estimates that this figure is likely to rise to 592

million by the year 2035 (IDF Atlas, 2013). This rise in diabetes is associated with demographic and social changes such as globalization, urbanization, aging population and adoption of unhealthy lifestyles such as consumption of unhealthy diets and physical inactivity.

In Kenya, diabetes mellitus prevalence has been on increase and is currently classified among the leading non-communicable diseases of public concern. The Ministry of Health [MOH] notes a diabetes prevalence of 10% of the population. Epidemiological surveys conducted by the Nairobi-based Diabetic Management and Information Center [DMI] gave the estimated prevalence of diabetes mellitus in Kenya above 6% in 2007. In some rural parts of the country such as Nyeri in Central Kenya and Kilifi in the Coast province the prevalence is as high as 11.6% and above 20% among the richer families in the major urban centers (Chege, 2007). This figure is based on regional projections and is likely to be an underestimation as over 60% of people diagnosed to have diabetes in Kenya usually present to the health care facility with seemingly unrelated complaints.

It is also estimated that about14% of the population in Kenya have impaired glucose (Kenya National strategy for the prevention and control of non-communicable diseases 2015-2020). As the prevalence of Diabetes mellitus is escalating, patients face an even greater threat from long term complications like foot, cardiovascular, eye, nerve and renal complications that are common among patients with diabetes. Owing to poor glycemic control, a majority of patients referred for specialized end organ damage treatment at the national referral hospitals and outside the country are diabetes patients.

Diabetes is increasing at an alarming rate globally. It is a complex, chronic condition that affects all areas of a person's life and requires high quality care. To this end, diabetes education is of critical importance and should be considered an integral part of diabetes prevention and care. Management by the patient remains central to the control and reduction of long term complications (McIntosh, et *al.*, 2013)

1.2.4 Diabetes in the World and Sub-Saharan Africa

Diabetes is an increasing problem worldwide. Currently, the International Diabetes Federation puts the prevalence at about 285 million people across the globe.

The majority of these people (80%) live in under-developed or low-income countries, (IDF, Atlas 2013). The incidence of diabetes, especially type 2, is rapidly growing in the world. In 1985, an estimated 30 million people suffered with this chronic disease, which, by the end of 2006, had increased to 230 million, representing 6% of the world population. Of this number, 80% is found in the developing world, (Roglic *et al.,* 2010).

It is estimated that, during the next 35 years, diabetic world-wide prevalence will reach 25%, with India being the hardest hit. For a long time, Africa was considered safe from many of the diseases that are called "diseases of affluence," which plague the Western world. Similarly, there was a time when Africa was thought to be a continent, relatively free of diabetes mellitus illnesses. By 1994, the continent-wide prevalence of diabetes mellitus stood at 3 million and was then predicted to double or triple by the year 2010 (IDF, Atlas 2013).

Approximately, 7.1 million Africans were said to be suffering from diabetes at the end of 2000, a figure that was expected to rise to 18.6 million by 2030 (Wild, *et al*, 2004).

In Tanzania, more than one million people had diagnosed diabetes in 2006 and the diabetes prevalence rate had reached 9.1% by 2012 (WHO, 2012). The Africa Region (AFR) is facing a health time bomb with diabetes having an increasing impact on people of working age.

Pierer, Pascal, Motala, & Mbanya (2013) in a study on diabetes in Africa say that the prevalence of undiagnosed diabetes in Africa Regions [AFR] is escalating. The considerable variance in the prevalence of the disease and its risk factors among AFR communities and urban rural locations and sub populations is a reflection of the varying rate at which communities are developing. The risk factors exacerbating diabetes mellitus prevalence in AFR include; Urbanization and ageing, obesity especially in urban areas; insufficient and inaccessible affordable and optimal health care facilities and medication for management of diabetes coupled with poor knowledge on diabetes information.

In Africa more than three-quarters of deaths due to diabetes in 2013 were in people under the age of 60. With diabetes hitting people in the prime productive years, the threat to Africa's economic development is clear. Over the next two decades the number of people with diabetes is expected to more than double, threatening many of the development gains Africa has achieved. The challenge for governments is to strengthen existing health systems to improve health for people currently with diabetes and to prevent the projected almost two-fold increase in diabetes prevalence.

According to the global diabetic scorecard, out of the 104 countries that completed the score card survey, only 14% had integrated diabetic self-management education in care. Kenya did not participate in the survey hence there is no data available to ascertain if diabetic self-management education is integrated in care.

1.2.5 Diabetes in Kenya

Kenya has a population of about 40 million people. Half of the population is comprised of adults aged between 20 and 79 years (Mwenda, 2012). The prevalence rate of diabetes in this age group is 4.66% (720, 730 cases). In 2012, 17,733 Kenyans died of diabetes related causes and 595,400 remained undiagnosed (International Diabetes Federation [IDF], 2012). In 2010, Maina *et al.*, were able to show that only 23-30% of the non-diabetic population had a good understanding of diabetes' signs and symptoms, its causes, and complications. Conversely, 70-77% had little to no knowledge on these three scales. Slight variances depended on education level attained and country district. Recent data was not found for diabetes related education of the diabetic population.

When a survey consisting of 10 questions on diabetes was administered to 1,700 people in the streets of Nairobi recently, only 20% of the respondents had 70% of the questions correctly answered. The results underscored the great need for improving knowledge about diabetes, which the government is attempting to implement (world diabetes foundation summit, 2007). The need to improve diabetes knowledge is evident however unlike the studies done by Maina and World diabetes foundation summit, the current study focuses on persons with diabetes.

1.3 Statement of the Problem

In 2012 NCDs, diabetes being the lead cause, accounted for more than 50% of total hospital admissions and over 55% hospital deaths in Kenya (Health Management Information System, HMIS 2012). The Ministry of Health (2010), estimated that five per cent of the population may be living with diabetes by 2025 translating to almost two million Kenyans, and 1000 new cases diagnosed each day. In fact, WHO, (2013) resonates that the disease is expected to triple between now and 2030 if nothing is done.

Kenya national diabetic strategy that was launched in 2010 had a target of educating 250,000 people with diabetes annually. According to the world diabetes federation, there is no data available to ascertain if this expectation was met. The National Diabetes Educators Manual (2010) was produced acknowledging the need for further education of healthcare staff and the public. The effectiveness of the scheme is yet to be confirmed.

Diabetes is a silent disease: many sufferers become aware that they have diabetes only when they develop one of its life-threatening complications. Knowledge of diabetes mellitus can assist in early detection of the disease and reduce the incidence of complications. Levels of knowledge about diabetes among the at-risk population and among those who suffer from the disease are unknown, but more knowledge is associated with better outcomes *(*Wee, *et al.,* 2002).

A global consensus has emerged that self-management plays an important role in the care of chronic diseases (Becker, Gates & Newsom, 2004). Diabetes self-management is a process in which the knowledge, skills, and abilities required for a patient to adequately manage his or her condition are facilitated (Corobian *et al.,* 2001). Diabetes self-

management activities include a range of activities, such as ensuring adequate nutrition, regular physical activity, appropriate medication use, feet care, regularly monitoring blood glucose levels, and maintaining a healthy lifestyle (Schoenberg *et al.,* 2008).

Previous studies have suggested that individuals with diabetes may not follow recommended guidelines for diet and exercise management (Wens *et al.,* 2005). Some studies have found that poor diabetes self-management among diabetes patients led to long-term diabetic complications (Shansi *et al.,* 2011). The purpose of the current study was to examine associations between diabetes self-management knowledge, and foot related complications in patients with type 2 diabetes.

1.4 Objectives of the Study

1.4.1 Broad Objective

To examine the association between diabetes self-management knowledge and foot complications among type 2 diabetic patients at JOOTRH

1.5 Specific Objectives

1. To determine knowledge level with regards to diabetic self-management amongst diabetic patients at JOOTRH.
2. To assess the incidence of foot related complications amongst diabetic patients at JOOTRH
3. To assess availability of resources to aid in facilitating diabetes self-management knowledge.

1.6 Research Questions

1. What is the self-management knowledge level of diabetic patients at JOOTRH?
2. What is the incidence of diabetic foot related complications amongst type 2 diabetic patients at JOOTRH?
3. Which resources are available to aid in facilitating diabetes self-management knowledge?

1.7 Justification of the Study

Diabetes knowledge is the cornerstone to improving self-care practice of the patients. Patients are the key to achieving therapeutic goals in ambulatory care. Research by the American Pharmacists Association (APhA) Foundation (2000) and the Asheville Project (2003) have shown that when patients are engaged and understand their role, they become much more active and are capable of achieving significant improvements in adherence and other health outcomes.

Self-management knowledge among patients with chronic illnesses has been linked with better therapeutic outcomes and reduced incidences of complications (Adibe. *et al.,* 2009) however there is no local data to show the level of diabetes self-management knowledge among type two diabetic patients at JOOTRH which is a very important aspect of management and their diabetes outcomes. JOOTRH was preferred as the study site because it is the Major Referral Hospital in Nyanza, Western & North Rift Kenya, serving a population in excess of 5million; average annual outpatient visits are 197,200

and inpatient admissions of about 21,000. It also receives the highest number of diabetes patients in the region.

1.7 Significance of the Study

The study findings will be of great significance to a number of parties including health service providers, policy designers, Kenyan national Government and Government of Kisumu County, diabetic patients, and future scholars interested in diabetes education and self-management. The health service providers within and outside JOOTRH will benefit from an empirically proven audit in determining association between diabetes self-management knowledge and development of foot complications. This will in addition enable them redesign and refine their strategy towards improving delivery of health education to diabetic clients safeguarding tenets of healthy families.

Policy designers are also expected to be rewarded through study recommendations as inputs in formulating policies and approaches that are anchored on appropriate health safeguards. Both national and regional Governments, through the Ministry/department of Health, are expected to be kept abreast from the independent inferences so as to quantify progress towards Vision 2030 and realization of MDG goals. The resident citizens will benefit from possible improved investment from interested stakeholders based on the established gaps. And, scholars will find an additional reference in focusing future related or advanced studies.

1.8 Limitations of the Study

The following limitations were inherent in the study and the results were interpreted in this light.

The sample size was small but representative. The study period might be short but all the diabetic patients who came to hospital within study period and satisfied the inclusion criteria were included in the random sampling. This approach was rationale to avoid double sampling of patients though some potential patients who did not come within study period were left out.

1.9 Conceptual framework

The model is illustrated in Figure 1. It provides a comprehensive framework to explore the relationships that influence type two diabetes self-management knowledge and development of foot complications.

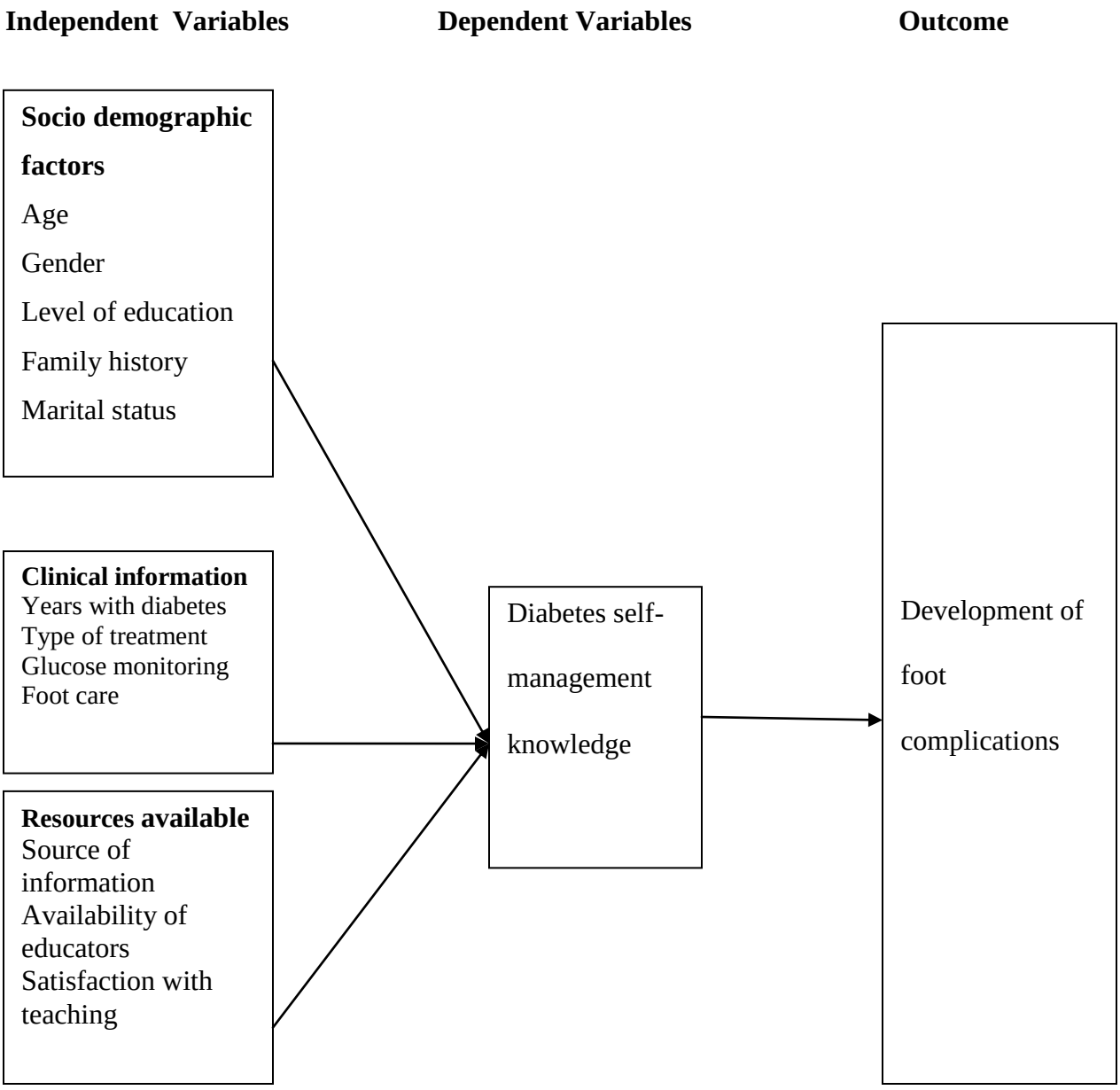


Figure 1: Study's Conceptual Framework

Source: Self conceptualized

1.10 Definition of Operational Terms

DIABETES: A metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both.

DIABETES COMPLICATIONS: The long-term effects of diabetes mellitus include progressive development of the specific complications of retinopathy with potential blindness, nephropathy that may lead to renal failure, and/or neuropathy with risk of foot ulcers, amputation, Charcot joints, and features of autonomic dysfunction, including sexual dysfunction. People with diabetes are at increased risk of cardiovascular, peripheral vascular and cerebrovascular disease.

DIABETES EDUCATOR: Specialized trained nurses in diabetes management that teach patients at the diabetic clinic about diabetes.

FOOT CARE: Daily inspection of the feet includes checking for changes in color, breaks in the skin, swelling, numbness, or pain, and dryness and cracks in the skin.

FOOT COMPLICATIONS: Foot problems associated with diabetes including; Tingling, pain (burning or stinging), loss of sensation, very dry cracked or peeled skin, calluses, foot ulcers and amputation.

HEALTH CARE PROVIDER: An individual who provides preventive, curative, promotional or rehabilitative services in a systematic way to people, families or communities.

RESOURCES: Materials, energy, services, staff, knowledge, or other assets that are utilized to enable patients gain self-management knowledge and skills.

SELF MANAGEMENT: Patient adherence to a "self-treatment regimen" inclusive of diet, maintaining physical activity, daily monitoring of blood glucose levels, and adhering to medication therapy and foot care, all of which are vital to maintaining glycemic

SELF MANAGEMENT EDUCATION: A systematic intervention that involves active patient participation in self-monitoring and/or decision making. It recognizes that patient-provider collaboration and the enablement of problem-solving skills are crucial to the individual's ability for sustained self-care.

TEACHING AIDS: Resources (objects, machines, devices) used by a teacher to clarify or enliven a subject.

Type 2 DIABETES: This form of diabetes, which accounts for ~90–95% of those with diabetes, previously referred to as non–insulin-dependent diabetes, type 2 diabetes, or adult-onset diabetes, encompasses individuals who have insulin resistance and usually have relative (rather than absolute) insulin deficiency control.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter presents a review of the empirical literature on the topic Diabetes self-management knowledge and foot complications amongst type 2 diabetes patients. It provides a global, regional, national and local perspective of type 2 diabetes. The study focused on the key variable themes used in review of literature which included: Diabetes self-management knowledge, diabetes complications, resources to aid in facilitating self-management knowledge and a summary of the research gaps.

2.2 Diabetes Self-management knowledge

Self-management of diabetes places the patient at the center of the care and empowers them to make daily decisions about their disease to improve health outcomes (Baghbanian & Tol, 2012). Self-management also requires the patient to adopt lifestyle changes, balance their resources, values and preferences with a preventive regimen complete with eating healthy, regular physical activity, self-monitoring of blood glucose and medication adherence. Self-management of Type 2 diabetes is linked to self-care concept, which includes activities that individuals initiate and engage in voluntarily to maintain life, health and wellbeing. Poorly controlled diabetes is closely linked with poor self-management that has increased diabetes related complications and treatment cost (Venkatesh, Weatherspoon, Kaplowitz, & Song, 2013). This study conquers that self-

management is key to better control of diabetes however the current study would like to examine self-management knowledge and not the practices.

Individuals affected with diabetes are often without adequate knowledge about the nature of their disease, its risks factors and associated complications and that this limitation of awareness maybe an underlying factor affecting their self-management (Abdo & Mohamed, 2010). Xu, Pan, and Liu (2010) concluded in their study that individuals with less education were less likely to engage in diabetes self-management. Additionally, the study revealed that individuals with longer period of diabetes and insulin treatment were more actively engaged in blood glucose self-monitoring than those with a shorter period and using oral hypoglycemia medication.

Patient education is now a well-accepted and essential part of practice for all health professionals, it is a cornerstone of diabetes self-management, and it is central to achieving improved outcomes of care, (Redman., 2007).

Redman, 2007, refers to education as "practice and movement," i.e., the practice of education is based on a set of theories, research findings, skills learned and practiced, and movement, whereby the education of patients and teachers is constantly evolving. Some health educators consider diabetes education, in its current state as demonstrated in the Diabetes Control and Complications Trial, to be the most fully developed patient education program in any health field.

Calabretta (2012), described a shift in provider roles from the traditional medical model to more patient-centered education goals and clinical management. This shift is particularly evident in diabetes education, in which the person with diabetes, rather than the health care team, provides the majority of diabetes care. The teacher is now a team of teachers: medical and lay professionals who facilitate or lead a learning process. Patients are referred to as "people with diabetes," "learners," or "students." The learning process also includes others affected by diabetes, such as family members, friends, and others in the social support network. Classes are styled as "sessions," "groups," or "gatherings." For most people diagnosed with Type 2 diabetes their condition is life-long and while new types of medication and medical devices are constantly being produced, the basic foundation for good diabetes care still focuses on healthy eating and physical activity, monitoring blood glucose levels and taking medication. The management of Type 2 diabetes involves behavioral change best achieved through integrated care and education.

Diabetes is a complex chronic disease that requires active patient participation to manage their condition on a daily basis, which necessitates education (Kemper, Savage, Niedebaumer, & Anthony, 2005). Diabetes self-management education can lead to empowerment of diabetic patients (Aghili *et al.,* 2013). It has been identified as "the gold standard" for diabetes management and has proven to be an integral component in the care of diabetes as well as being economically effective in the prevention of diabetes related complications (Hill & Clark, 2008; Kemper *et al.*, 2005). The goals of self-management education are to improve metabolic control, prevent acute and chronic complications, enhance quality of life, and maintain cost effectiveness (Funnell *et al.,* 2013).

Studies have shown that there is little public knowledge about diabetes. As an example, Maina *et al.,* (2010) in four provinces in Kenya found that only 29% of participants in the research were well aware about diabetes symptoms and its complications.

Ulvi *et al.,* (2009) in Pakistan showed that rural communities were unaware of risk factors and complications of diabetes; in addition, the common reason of being aware of diabetes was that a family member of them had diabetes.

Ulvi *et al.,* (2009) showed that positive family history has a direct relationship with the amount of knowledge while education has no effects. On the contrary, González *et al.,* (2009) research showed that in Latin countries higher levels of knowledge had a significant relationship with education. The results of Rani *et al.,* (2008) in India showed that awareness of females were more than males.

Poor diabetes knowledge is common among individuals with low literacy, which results in difficulties learning advanced self-management skills needed to improve glycemic control. Literacy was found to be an important factor for predicting those individuals who would benefit from an intervention for self-management of diabetes (Kisokanth, Prathapan, Indrakumar, & Joseph, 2013). Additionally, studies also indicated that diabetes self-management education should be provided at the patients' education level so that it meets their level of understanding (Elliott, Abdulhadi, Al-Maniri, Al-Shafaee, & Wahlstrom, 2013).

Gill, Kumar, & Wiskin (2008) reported that individuals 65 years and less were more knowledgeable than their older counterparts. It was concluded that this was due to the older adult's experience with more diabetes related complications leading to confusion about the signs and symptoms of diabetes.

Successful self-management is often a challenge for older individuals especially in the presence of mild cognitive impairment and a longer duration of diabetes.

Individuals with good memory are able to maintain vigilance in foot checking and blood glucose monitoring (Tomlin & Asimakopoulou, 2014). Studies that reported the use of self-management education in developed countries have deduced the positive impact this intervention has on the prevention of complications (Ezenwaka & Eckel, 2011).

The National Standards for Diabetes Self-Management Education have led the way towards providing quality education. These standards encourage more creative educational options that can be implemented in diverse settings and will improve health care outcomes. The National Standards define 10 content areas: diabetes disease process, nutritional management, physical activity, medications, monitoring, acute complications, risk reduction, goal setting, psychosocial adjustment, and preconception care/pregnancy, (Mensing *et al.*, 2013).

New educators may find that adapting an existing commercial curriculum to meet these standards is easier than developing their own. More experienced educators may develop their own curriculum, focusing on unique ways to deliver their information, adding creative alternatives, and encouraging more interaction in encounters with learners, (DCCT Research group, 2006).

Xu, Pan, & Liu (2010) concluded in their study that more education and longer periods with diabetes improved self-management whereas Gill, Kumar, & Wiskin showed that individuals 65 years and less were more knowledgeable than their older counterparts. This study combines all these factors in one study to identify which specific factors influence self-management knowledge in our setting.

Numerous studies have successfully used the Diabetes Knowledge Test (DKT) questionnaire, which was developed by the Michigan Diabetes Research and Training Center (MDRTC) at the University of Michigan (MDRTC), 1998) to evaluate study participants' knowledge on diabetes. Adibe, *et al*, 2009, utilized the tool and were able to identify 78% of the studied population as being knowledgeable on diabetes self-care. Another study by Rondalyn Dennis-Bradshaw, 2015, evaluating the short-term effectiveness of a diabetes self-management education intervention on diabetes-related knowledge amongst type two diabetes patients indicated that the participants' knowledge level increased. Perara, DeSilva, & Perera (2013) assessed the knowledge of diabetes among Type 2 diabetic patients at a primary health care clinic and the findings revealed 70% of patients had a good score on knowledge test. There are no locally available tools used to assess diabetes self-management knowledge. No study has used DKT in Kenya. This study aims to utilize this tool.

The questionnaire has been used successfully in studies to determine diabetes self-management knowledge among patients with diabetes. The DKT instrument has been tested for reliability and validity (Cronbach's alpha of > 0.71 overall) (McCleary-Jones, 2011).

2.3 Diabetes Complications

Diabetes mellitus is associated with substantial morbidity and mortality risks because of cardiovascular, renal, and neurologic complications and is also linked to end stage renal failure, blindness, and lower-extremity amputation that result in disability and a reduction of life of 10 years (Schiotz *et al.,* 2012).

Chronic diseases are now the major causes of death and disability globally. According to the World Bank, 72% of deaths due to chronic diseases occur in low-income countries. Regrettably, these countries bear the dual burden brought about by infectious and chronic diseases. Diabetes is undoubtedly for them a public health concern epidemiologically and economically. It accounts for 3.8 million deaths worldwide per year, a number similar in magnitude to the mortality attributed to HIV/AIDS (World diabetes foundation summit, 2007). Studies suggest that these deaths can be prevented, especially in economically productive individuals between the ages of 35 and 64 years of age. Currently, however, statistics show that, every 10 minutes, someone dies from a diabetes-related complication (Azevedo, 2008).

Unfortunately, the resources and responses to meet this epidemic have not kept pace with its demographic spread and impact. Therefore, African countries, as well as other countries in the world, must redouble their efforts to ensure follow-up of patients, whenever treatment has commenced and thus help reduce and/or prevent the high death toll from this chronic and debilitating disease (WHO, 2007). The gap identified by WHO underscores the challenge faced when trying to manage diabetes related complications.

In Kenya, Type II diabetes accounts for 85-90% of the diabetic disease burden. Many diabetics in Kenya are diagnosed with irreversible complications Azevedo (2008), likewise half of TIIDM patients in the UK have complications at diagnosis (UKPDS Group, 1991). In Africa infection and acute metabolic complications are the most common causes of death compared to cardiovascular/renal complications in Western countries.

Diabetic ketoacidosis (DKA) accounted for 8% of diabetic admissions in a study at KNH, 30% of patients died within 48 hours of presentation (Mbugua, 2005).

2.3.1 Diabetic Foot Complication

Foot complications have the capacity to diminish a person's quality of life. Foot self-care behaviors, including daily inspection of feet, professional treatment, hygiene, and proper shoe gear help minimize the risk of foot complications. McCook-Martinez *et al.,* (2009) found that when patients were properly informed about foot care, disease-associated morbidity, hospitalization, and amputation rates were lower than for those that did not have foot care information (Lavery *et al.,* 2013)**.** Diabetic patients account for 70% of all patients experiencing lower extremity amputations. The risks of lifetime diabetic foot ulcer could be as high as 25% and studies also revealed that 15% to17% of theses ulcers result in surgical intervention (Abu-Oamar, 2014).

Males especially had more amputations at a younger age than women and also suffered more co morbidities (Bruun, Siersma, Guassora, Hostein, & Oivarius, 2013).

The CDC also reported that diabetes accounted for 65,700 or 65% of non-traumatic, lower limb amputations (CDC, 2011). According to Abu-Qamar (2014) diabetes self-management education was a key strategy in the prevention of foot ulceration, which was one of the most common causes for hospitalization for patients with Type 2 diabetes.

Patients with lower limb amputations are faced with numerous challenges and experts have acknowledged that with appropriate self-management knowledge on preventative activities the risk of amputations can be reduced up to half. Numerous studies have demonstrated that regular inspections and proper foot wear were very important in foot ulcer prevention (Abu-Qamar, 2014).

Foot ulcers are seen frequently at many tertiary clinics in Kenya and are associated with poor glycemic control, infection, hypertension and dyslipidaemia (Kenya National Diabetic Strategy, 2010).

The WHO report that diabetics require up to triple the healthcare resources compared to non-diabetics. Diabetes threatens Kenya's healthcare system and the wider economy with loss of productive workforce (Maina *et al.,* 2011). Whereas most foot complications are seen in tertiary clinics, the current study will assess foot complications in a tier five teaching and referral hospital. In addition, anecdotal evidence shows that there is a high prevalence of foot related complications. Studies are yet to be done to confirm this.

2.4 Resources to aid in acquisition of diabetes self-management knowledge

Management and control of diabetes mellitus success solely relies on robust health care system. Availability and accessibility to right equipment and health facilities; adequate training and capacity building of health workers to enhance diabetes care and management is prudent. Darkwa (2010) in a survey on "Prevalence of diabetes mellitus and resources available for its management in the Cape Coast Metropolis" in a study population made up of 10 health facilities in the Cape Coast Metropolis. Care for diabetic patients showed that equipment, services and drugs available for diabetes care and management were highly inadequate. Masoud (2011) in "Quality of glycemic control among insulin treated ambulatory patients with diabetes mellitus at Kenyatta National Hospital" identified inadequacy in sugar monitoring by patients demonstrating poor services that is associated with limited resources and inaccessibility to screening tests due to lack of glucometer machines and strips, syringes ,intermittent supply of insulin, blood and urine reagents; explaining the high uncontrolled sugars in most patients especially those from rural areas. This study will assess patients from rural, urban and peri urban areas, as JOOTRH's catchment population comprises of all these groups.

A similar study "Knowledge on Diabetes Mellitus among Diabetes Patients attending Kenyatta National Hospital Outpatient clinic" by Gitonga, (2008) administered on 105 patients observed lack of training and teaching aids such as information pamphlets, charts, brochures and audio visual aids an indication of an ill equipped facility. Nalwa, (2010) in a descriptive cross sectional study in a referral hospital in Kisumu, New General Nyanza Hospital "Glycemic control, Cardiovascular Risk Profile and therapeutic

interventions in Type 2 Diabetes Mellitus Patients at New Nyanza Provincial General Hospital in Kisumu" administered on 118 participants equated limited resources especially in laboratory technology and limited knowledge on diabetes especially from patients from peripheral clinics a major factor in diabetes management in the region. Nalwa's study points out lack of sufficient health facilities compounded with limited screening machines; low stocked pharmacies with essential drugs; unskilled and poorly qualified health personnel to handle the diabetes pandemic as contributors of the high prevalence of the disease in the region.

WHO cited, Kenya as one of the 57 countries with a critical shortage of health workers. This was attributed to poor work environment among other challenges that delayed service delivery a demonstration of poor infrastructure that hampers management and control of NCDs. M'Kiunga (2011) in a cross sectional descriptive survey investigating "Barriers to preventing long term complications among patients with type 2 Diabetes Mellitus at Kenyatta National Hospital" involving 147 participants found that co-morbidity, irregular check -ups and follow- up visits, non-adherence to treatment regimens and lack of physical activities and inadequate dietary intake compromised optimum diabetes care. This study highlights inadequate infrastructure services in terms of personnel, lack of affordable medications for the patients and inaccessibility to health facilities due to distance and cost implications. High prevalence of co morbidity cases demonstrated late detection caused by lack of basic screening equipment like glucometers. The cases also emphasize lack of awareness on the dangers of diabetes; insufficient drugs and long queues discouraged follow up visits. The gaps identified in this study thus called for inquiry to find out whether availability of resources was a factor

in acquisition of self-management knowledge amongst type 2 patients with diabetes mellitus.

Diabetes education is widely accepted to be an integral part of comprehensive diabetes care as it allows patients to assume greater responsibility for their own care. Foma *et al.*, (2013) in a descriptive study "Awareness of diabetes mellitus among diabetic patients in the Gambia: A strong case for health Education and Promotion, found that patient education is the cornerstone of diabetes prevention and management as it accounts for almost 50% in management. The study further shows that diabetes education should be a continuing process with regular visits for reinforcement and not a process to be completed after one or two visits to a healthcare worker or facility. Therefore, with consequent improvements in knowledge, attitudes and skills, diabetes education will lead to better control of the disease.

According to Mutw'iwa, (2008) in "Prevalence of Lifestyle Risk Factors among Diabetes Patients at Kenyatta National Hospital", there are some drawbacks in effective education which regrettably results in increase of diabetes mellitus and the development of related complications. For instance, lack of updated educational reviews, lack of proper documentation in most health institutions, few qualified diabetes educators and low socio-economic or cultural consideration such as a syllabus for diabetes education. It is prudent that diabetes education be offered by professionals like nurses, dieticians, Pharmacist with specialized patient education skills and certified in diabetes education. The study underscores the challenges experienced in management and control of diabetes that need to be effected as soon as possible.

Marrero (2013) & Martin, Sima *et al*., (2012) say that current best practice of DSME is a skill-based approach that focuses on helping those with diabetes mellitus make informed self-management choices. Continuous DSME and DSMS in people with T2DM maintain effective self-management throughout a lifetime of diabetes as they face new challenges and as treatment advances become available. This study correlates with that of Gitonga (2008) that self-management includes adherence to medication regimens are essential in diabetes management. However, inadequate diabetes specialists, limited quality health care services in Kenya hinder promotion of DSMS and DSME among patients.

In a descriptive survey Maina, Njenga, & Muchemi (2010) "Knowledge Attitude and Practices Related to Diabetes among Community Members Across Four Provinces in Kenya " found lack of comprehensive primary care programmes for diabetes; health education done within health facilities through microteaching targeting those with diabetes only, lack of structured guidelines regarding diabetes education coupled with low knowledge of diabetes among health care workers resulted to uncoordinated health promotion jeopardizing public knowledge and awareness on diabetes. The study identified the peoples' perceptions about diabetes and knowledge however it did not give an insight of measures in place to address management and control of this disease.

M'Kiunga (2011) in a study "Barriers in preventing Long term complications among Type 2 Diabetes Mellitus at Kenyatta National Hospital" found that majority of diabetic patients lack knowledge on the dietary intake. For instance, the patients could not differentiate between protein, carbohydrates and fat sources from a daily diet. Besides, the food portions taken at one meal serving were not considered as an essential component of adherence to dietary recommended regime with a significant proportion

routinely adding salt to food at the table. The findings revealed a gap in nutrition education to the patients. The health workers do not offer adequate general lifestyle modification information when tackling nutrition education to the patient probably due to few nutritionists, time constrain, inadequate training and teaching facilities and equipment; given the large population served daily by the overstretched health workers. The insufficient services offered to the patients at KNH a regional referral facility in Kenya, was an indication of a grave picture in the peripheral facilities especially in the rural areas.

Muchemi (2013) noted that if the 2.5 million people living with diabetes in Kenya (of the productive age 18-60 years) did not adopt a healthy lifestyle, the number will triple by 2025. The statistics demonstrates a gap of education awareness to the patients signaling a deficiency of skilled knowledgeable personnel, facilities offering diabetes education among others hindering disease management and control. Therefore, this study proved crucial to informing policies and actions of various institutions and stakeholders in diabetes management. However, Muchemi only provided prediction through the statistics of the diabetes increase without offering solutions to current and future situations. It is this gap that this study sort to seek through assessing availability of resources to aid in facilitating acquisition of diabetes self-management knowledge.

2.5 Research Gap and Summary

This chapter reviewed the relevant literature in relation to the research questions presented in the study. The discussion tackles all the research objectives posed and provided a firm theoretical background for the study.

VARIABLE	AUTHOR (YEAR)	TITLE	FINDINGS	KNOWLEDGE GAP
Diabetes self-management knowledge level	Maina *et al.,* 2010	Knowledge, attitude, and practices related to diabetes among community members in four provinces in Kenya: a cross sectional study	Only 23-30% of the non-diabetic population had a good understanding of diabetes' signs and symptoms, its causes, and complications. Conversely, 70-77% had little to no knowledge on these three scales	The study was amongst non-diabetic population
	World diabetes summit, 2007		When a survey consisting of 10 questions on diabetes was administered to 1,700 people in the streets of Nairobi, only 20% of the respondents had 70% of the questions correctly answered	The survey was randomly carried out and did not specifically target diabetic patients
	Abdo & Mohamed, 2010	Effectiveness of health education program for type 2 diabetes mellitus patients attending Zagazig university diabetes clinic, Egypt	Individuals affected with diabetes are often without adequate knowledge about the nature of their disease, its risks factors and associated complications and that this limitation of awareness maybe an underlying factor affecting their self-management	This study was carried out in Egypt and no similar study has been carried out in Kenya
Incidence of diabetic foot	Lavery *et al.,* 2013		when patients were properly informed about foot care, disease associated-morbidity,	No local data is available to ascertain the incidence of foot complications and if that the foot

	Kenya National Diabetic Strategy, 2010	Kenya, R. O. (2012). Kenya National Diabetes Strategy. First Edition	hospitalization, and amputation rates were lower than for those that did not have foot care information Foot ulcers are seen frequently at many tertiary clinics in Kenya and are associated with poor glycemic control, infection, hypertension and dyslipidaemia	complications are associated with knowledge of diabetes self-management No such study has been conducted at a teaching and referral hospital such as JOOTRH.
Availability of resources	Sarah Darkwa (2011)	Prevalence of diabetes mellitus and resources available for its management in the Cape Coast Metropolis	Equipment, services and drugs available for diabetes care and management in the Cape Coast Metropolis are highly inadequate	The study was done in Ghana and none has been done at JOOTRH Kenya. The gap identified was that inadequate facilities greatly contributes to prevalence of diabetes mellitus

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This section outlines various stages and phases that were followed in completing the study. In this chapter the researcher presents the methodology that was used to carry out the study. This chapter therefore presents the overall research design, target population, study sample size, sampling techniques, methods of data collection, data collection instruments and procedures and the data analysis.

3.2 Research Design

Research design refers to the plan and structure of investigating so conceived as to obtain answers to research question. Creswell (2009) and Cooper and Schindler (2007), define a descriptive survey as a design concerned with finding out the what, where and how of a phenomenon. This study used a descriptive cross sectional survey design to obtain pertinent and precise information concerning diabetes self-management knowledge and foot complications amongst type 2 diabetic patients at JOOTRH.

3.3 Study Area

The study was conducted at JOOTRH, located in Kisumu County. Kisumu County is one of the 47 Counties in Kenya. It lies within longitudes 33° 20’E and 35° 20’E and latitudes 0° 20’South and 0° 50’South. The County is bordered by Homa Bay County to the South, Nandi County to the North East, Kericho County to the East, Vihiga County to the North West and Siaya County to the West. The County covers a total land area of 2,009.5 km2 and another 567 km2 covered by water. The population of the county according to the

2009 Population and Housing Census was estimated at 968,909 persons with 474,687 males and 494,222 females. The County consists of seven constituencies namely: Kisumu East, Kisumu West, Kisumu Central, Seme, Nyando, Muhoroni and Nyakach. There are a total of 35 wards in the county. JOOTRH was preferred as the study site because it is the Major Referral Hospital in Nyanza, Western & North Rift Kenya, serving a population in excess of 5million; average annual outpatient visits are 197,200 and inpatient admissions of about 21,000. JOOTRH serves this population as the regional referral hospital.

Jaramogi Oginga Odinga Teaching hospital is a tier five health facility funded by the Government of Kenya and overseen by the Ministry of Health.

There are approximately 502 operational inpatient beds and four dedicated outpatient clinics available to all citizens of Kisumu and Nyanza province. The diabetic services here encompass both inpatient and outpatient.

Every day of the week, besides Saturday and Sunday, the clinic at JOOTRH sees diabetic patients. On average they serve about eleven patients a day, both type 1 and type 2 diabetics. On Fridays, specifically trained diabetic doctors work at the clinic and they can see up to thirty patients.

3.4 Target Population

The target population was type two diabetic patients at JOOTRH. According to the hospital's permanent diabetes register, the hospital sees an average of 220 patients per month. Out of this number, the hospital sees an average of 120 type 2 diabetics per month.

3.5.1 Inclusion Criteria

All type two diabetic patients being managed at JOOTRH

All the patients who consent to the study

3.5.2 Exclusion Criteria

Patients with type two diabetes who were too ill to participate in the study.

3.6 Sampling Design

The study will utilize simple random method. The accessible population in this study is approximately 120 patients.

Sample size calculated using Fisher *et al.*, (1998):

$$nf = \frac{n}{1 + (n/N)}$$

According to the above formula:

nf= desired sample size when the population is less than 10,000,

n= desired sample when the population is more than 10,000,

N= estimate of the population size.

Using the above formula sample size is:

Nf=384/1+(384/120)

=91 patients

An additional 10% of this study population was added to carter for those respondents that would decline to participate or drop out in the process. The study therefore proposed to use 100 patients. The sample was picked through random simple method. The first type 2 diabetic patient who came to the diabetic clinic and met the inclusion and exclusion

criteria was picked as respondent number one. Every other alternate patient that also met the criteria was included in the study for example the first client that met these criteria was respondent number one, the third client was respondent number two, the fifth client was respondent number three and so on. Patients that had already participated in the study were not included in case they were met in subsequent visits to the clinic during the study period. Type 2 diabetes patients in the medical and surgical wards who met the inclusion and exclusion criteria also participated in the study. They were selected randomly through balloting. The study aimed to collect data from 100 respondents within one-month period from 1st May 2016 to 1st June 2016.

3.7 Research Instruments

The data was obtained using structured and interviewer administered questionnaires. The questionnaire was in three parts i.e. socio-demographic factors, clinical information and a 28-item questionnaire consisting of 5-point response scale (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, and strongly disagree = 1) modified from Michigan Diabetes Research Centre according to whom the alpha coefficient for the twenty-eight items was .76, suggesting that the items have relatively high internal consistency. Scale scores were computed by summing the scores for the individual items constituting the scale. Each item on the scale had a maximum score of one and a minimum of zero. If respondent knew the answer either by strongly agreeing or agreeing or by strongly disagreeing or disagreeing they would get a score of one. If the respondent said that they did not know or answered wrongly then they would score a zero. The highest possible score was 28 and minimum was zero. Patients who scored 14 and below

were classified as not knowledgeable and those that scored 15 and above were classified as knowledgeable.

3.8 Pilot Study

A pilot study was conducted at Kisumu County Hospital and it included 15 respondents who were conveniently sampled. The data collection tool was pre-tested with the aim of checking for consistency, acceptability and approximating time required for completion.

3.9 Validity of the Instrument

According to Creswell (2003), validity is the degree by which the sample of test items represents the content the test is designed to measure. Mugenda &Mugenda (2003) contend that the usual procedure in assessing the content validity of a measure is to use a professional or expert in a particular field. In this study, professional advice was sought from experts in the subject matter, especially my supervisor. Construct validity was measured by administering a few questionnaires to some respondents and analyzing the results to evaluate whether the questionnaire measured what it was required to measure. Criterion validity was measured by analyzing outcome provided by the data collected using the questionnaires.

3.10 Statistical Data Analysis

The completed questionnaires were checked for errors and completeness and entered into Microsoft 2010 Excel and subsequently analyzed with version 20 of Statistical Package for the Social Sciences (SPSS Inc. Chicago). Raw data collected was analyzed by assigning numerical values to each response and entered into a coding table. Thereafter

the numerical numbers representing responses from the questionnaires were transferred to a code sheet so as to obtain quantitative results from the closed ended questionnaires. Categorical variables were compared using chi-square tests. A multiple logistic regression model was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) between diabetes self-management knowledge and the foot complications of type 2 diabetes, adjusting for potential confounders.

3.11 Ethical Considerations

Ethical approval was sought from Masinde Muliro Research and Ethics committee after which the researcher obtained a letter of introduction from Masinde Muliro University of Science and Technology School of Graduate Studies which aided in securing ethical approval and a research permit from the National Council for Science and Technology. At JOOTRH, the researcher sought ethical approval from the institution's ethics and review committee, permission from the medical superintendent and diabetic clinic in charge. On recruitment, the respondents were informed about the objectives of the study and were assured confidentiality. They were informed that they were free to withdraw from the study at any time without any repercussions and verbal and signed informed consent sought. The respondents were also assured that the information obtained from them will be used solely for academic purposes.

CHAPTER FOUR

RESULTS

4.1 Overview

This chapter presents the study findings which have been discussed in line with the study objectives as follows: questionnaire response rate, the demographic information of the respondents, knowledge of diabetes self-management, incidence of foot complications, and availability of resources to aid in acquisition of diabetes self-management knowledge. The main objective of the study was to examine the association between knowledge of diabetes self-management and development of foot complications. To enhance quality, the collected data from all the respondents was analyzed using the Statistical Package for Social Sciences (SPSS). Results are presented in this section in form of frequency tables, percentages, mean and bar graphs.

4.2 Questionnaire Response Rate

Questionnaires were administered to the respondents present both at the diabetes clinic and at the wards. Out of the 100 questionnaires administered to the respondents, a total of 81 fully responded to the questionnaire giving a response rate of 81%. The high response rate can be attributed to the fact that the diabetic patients answered all the questionnaires on the spot after the preliminary observations as they awaited the arrival of the medical doctors who were still attending to inpatients in the wards. The response rate was sufficient and representative and conforms to Mugenda & Mugenda (2003) stipulating

that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and above is excellent.

4.3 Distribution of Demographic Characteristics

This section sought to identify the demographic information of the respondents including age group, gender, marital status and the level of education. These characteristics are important because they are known to influence the variables in a given study. The gender and age of the respondents was important as type 2 diabetes is more prevalent amongst persons aged 30 years and above and complications have been documented to be more prevalent in one gender than the other. The general information points at the respondents' suitability in answering the questions and their vast knowledge on diabetes self-management.

4.3.1: Demographic Characteristics of the respondents (Age)

The study sought to establish the age distribution of the respondents.

The study findings presented in Figure 4.1 established that 78% of the respondents were aged 41 years and above with a mean age of 43 years indicating that type two diabetes is more prevalent in relatively older people.

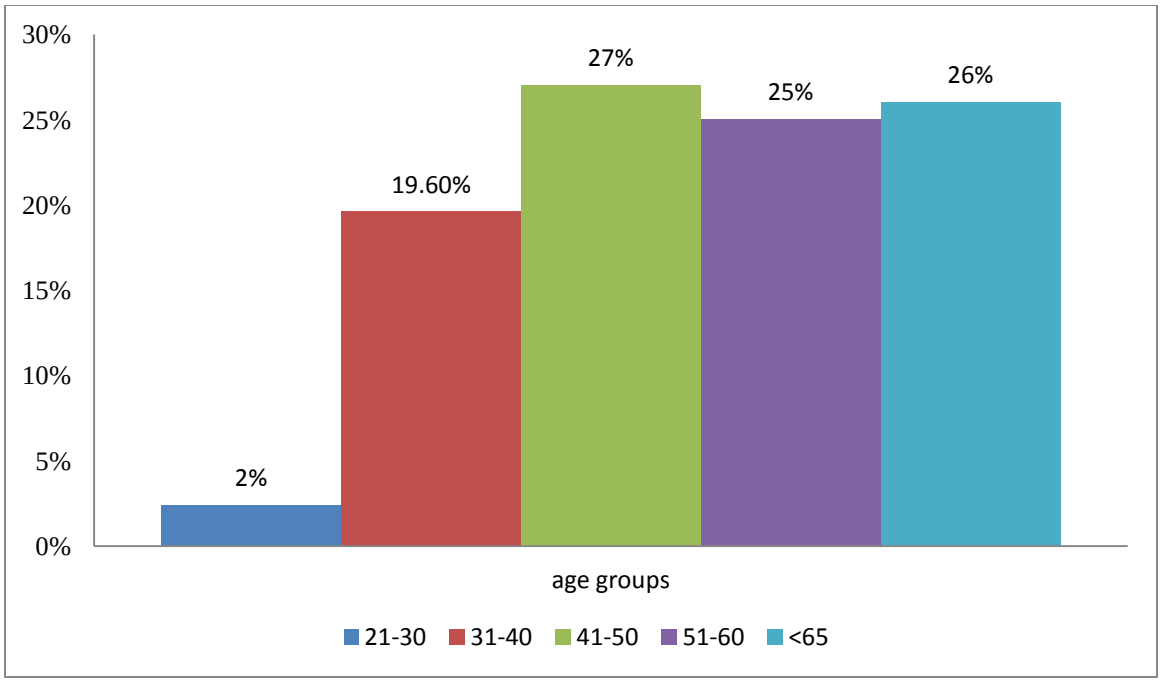


Figure 4.1: Age of respondents

4.3.2: Distribution of respondents by gender

The study further established that male patients were more than their female counter parts at 64% as demonstrated in Figure 4.2.

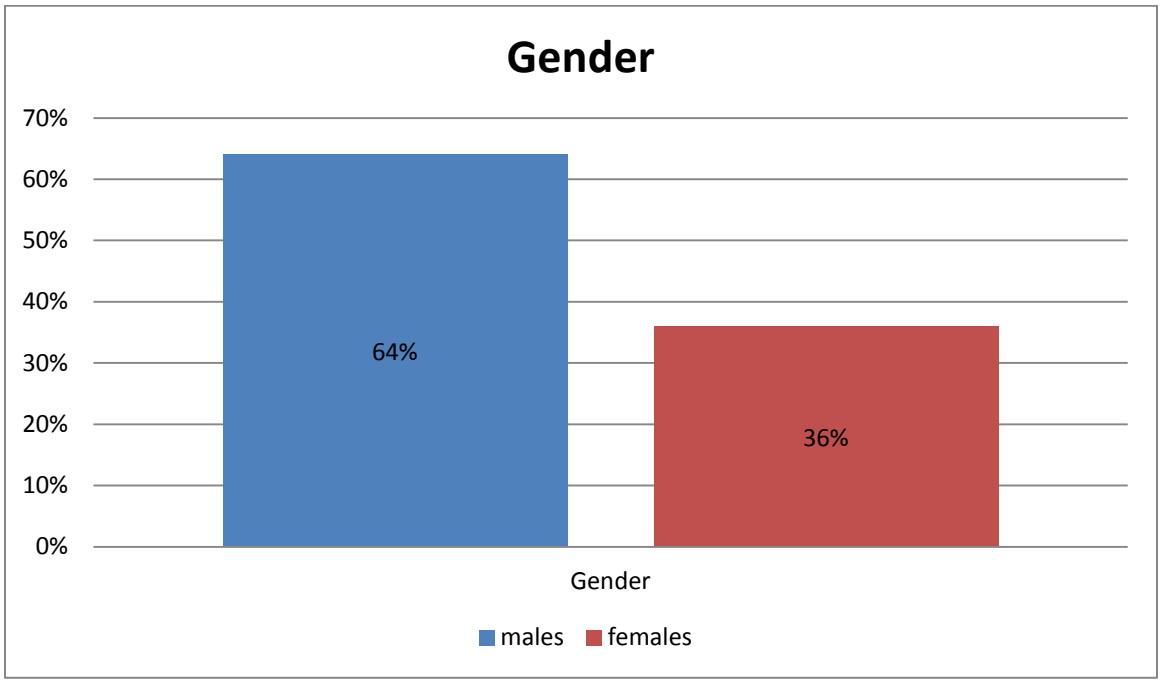


Figure 4.2 : Gender of respondents

4.3.3: Marital status of respondents

Figure 4.3 below represented marital status of respondents. Results from the study showed that majority of the respondents were married (77%) which could be an indication of a strong social support system thereby encouraging the patient to go to the clinic/Hospital as scheduled and follow given instructions thereby reducing complications,

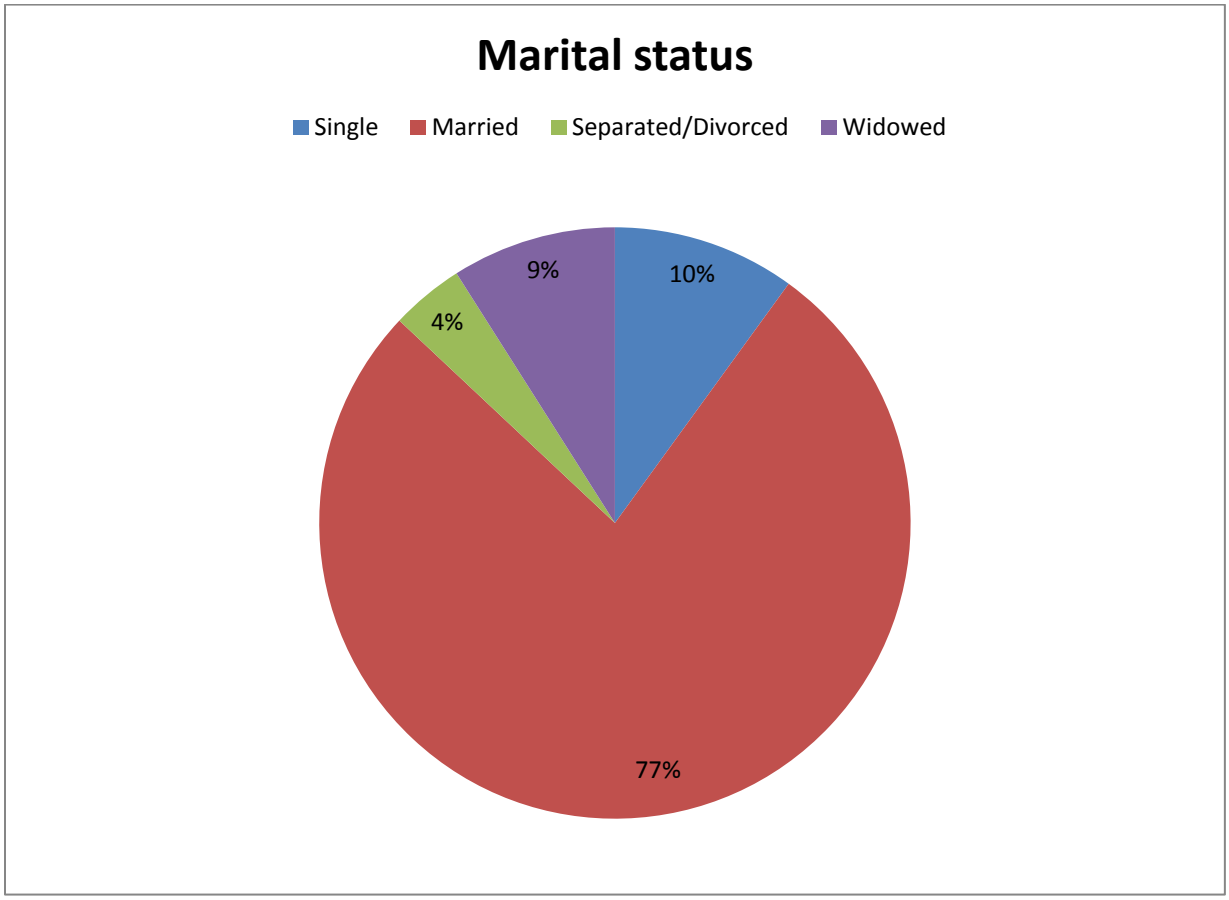


Figure 4.3: Marital status of respondents

4.3.4 Level of Education of the Respondents

The study also sought to establish the level of education attained by the respondents. Most of the patients had secondary level of education and above with a percentage of 64% as shown in Figure 4.4.

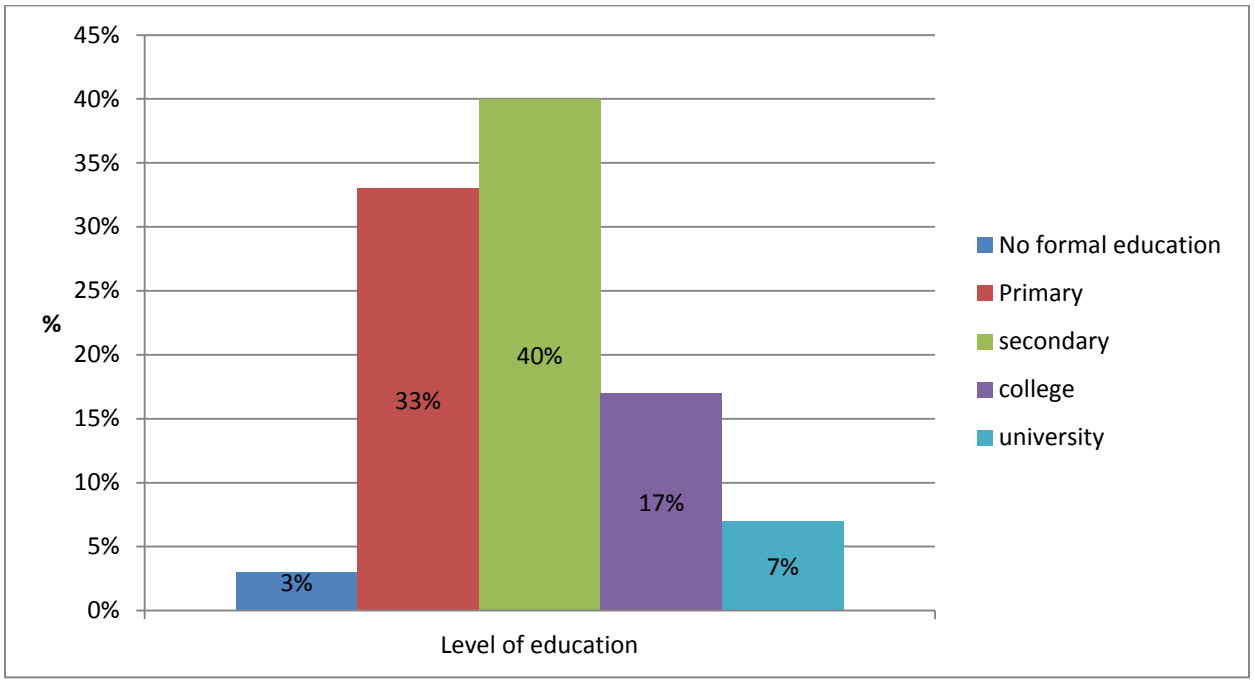


Figure 4.4: level of education.

4.4: Knowledge level with regards to diabetic self-management amongst diabetic patients at JOOTRH

The study sought to examine the factors that influence diabetes self-management knowledge and looked at demographic characteristics, clinical information, patient management practices and resources available to aid in acquisition of diabetes self-management knowledge. The knowledge level was assessed using the diabetes knowledge test and depending on the score, patients were categorized as either being knowledgeable or not knowledgeable.

4.4.1: Knowledge and demographic Characteristics

P value, Odds Ratio (OR) and 95% Confidence Interval (CI) were used to demonstrate association between knowledge and the demographic characteristics. Statistically significant (p</=0.05) values are in bold.

Knowledge of diabetes self-management is influenced by age, gender, marital status and level of education. The younger and more educated the respondent, the higher the probability of being knowledgeable on diabetes self-management. Male respondents and those that were married were also more likely to be knowledgeable as shown in Table 4.1.

Table 4.1: Diabetes self-management knowledge and demographic characteristics

Demographic Variables		Knowledgeable			
Variable	Characteristic	Yes N(%)	No N(%)	OR (95% CI)	*P* Value
Age (Years)	Below 50	29(72)	11 (28)	0.361 (0.14-0.91)	**0.029**
	Above 50	20(49)	21(51)		
Gender	Male	36(69)	16(31)	0.361 (0.14-0.92)	**0.031**
	Female	13(45)	16(55)		
Marital status	Not Married	6(32)	13(68)	4.904 (1.62-14.9)	**0.003**
	Married	43(69)	19(31)		
Level of education	Primary and Below	8(28)	21(72)	9.784 (3.42-28)	**0.000**
	Secondary and Above	41(79)	11(21)		

4.4.2: Clinical information and Knowledge on diabetes self-management

The number of years a patient had lived with diabetes significantly influenced their knowledge on self-management. The less the number of years a patient had diabetes the more likely they were to be knowledgeable on self-management. Respondents who had had diabetes for eight years or less were three times more likely to be knowledgeable on diabetes self-management compared to those who had had diabetes for more than eight years. The study further looked at the type of treatment the respondent was on whether oral medication, injectables or lifestyle modification and established that the type of treatment the respondent was on did not significantly influence knowledge on self-management. Family history of diabetes also did not significantly influence knowledge on self-management as demonstrated in Table 4.2.

Table 4.2 :Clinical information and diabetes self-management knowledge

Characteristic		Knowledgeable			
Variable	Categories	Yes N(%)	No N(%)	OR (95% CI)	P value
Years With Disease	Above 8 Years	14 (44)	18(56)	3.21 (1.26 - 8.18)	0.013
	Below 8 Years	35(71)	14 (29)		
On Diabetic Drugs	Yes	38 (61)	24(39)	1.15 (0.41-3.27)	0.79
	No	11 (58)	8 (42)		
Family history of DM	Yes	31 (61)	20 (39)	1.03 (0.41-2.6)	0.94
	No	18 (60)	12 (40)		

3.4.3: Knowledge and Self-Management Practices in DM patients

The study sought to establish if respondents' self-care practices influenced self-management knowledge. Blood glucose monitoring is a key self-care practice that can assist detect acute diabetes complications and delay long term complications such as foot complications amongst diabetes patients. Testing of blood glucose as a self-management practice did not significantly influence their diabetes self-management knowledge as demonstrated in Table 4.4.

Table 4.4: Testing blood glucose and diabetes self-management knowledge

Test blood glucose		Knowledgeable			
	Categories	Yes N(%)	No N(%)	OR (95% CI)	P value
Before breakfast	Yes	33(67)	16(33)	6.19 (2.28-16.79)	0.941
	No	8(25)	24 (75)		
After meals	Yes	27 (55)	22(45)	6.63 (2.19-20.07)	0.943
	No	5(16)	27 (84)		
Only at the clinic	Yes	9 (18)	40 (81)	0.10 (0.04-0.29)	0.062
	No	22 (69)	10 (31)		

Daily foot care and use of special foot wear as self-care practices also did not seem to significantly influence a respondent knowledge of self-management as shown in Table 4.5.

Table 4.5: Foot self-care and diabetes self-management knowledge

Self-care practices		Knowledgeable			
	Categories	Yes N(%)	No N(%)	OR (95% CI)	P value
Daily foot care	Yes	43(88)	6(12)	38.7 (10.75-139.2)	0.845
	No	5(16)	27 (84)		
Use of special footwear	Yes	46 (94)	3(6)	29.27 (7.38-116)	0.056
	No	11(34)	21 (66)		

4.5 Knowledge and Availability of Resources for DM self-Management

The study viewed resources as source of information on diabetes self-management and diabetes educator. Respondents who said they were aware of diabetes educators at JOOTRH appeared to be knowledgeable than those who said they were not aware of the diabetes educators as shown in Table 4.6.

Table 4.6 : Diabetes self-management knowledge and resources

Resources for Self Care Information	Grouping	Knowledgeable on DM Self Care		OR (95% CI)	P value
		Yes	No		
Information Source	Other*	14(87)	2(13)	0.167 (0.04-0.79)	0.114
	Health Worker	35 (54)	30 (46)		
DM Educator Available	Yes	47(87)	7(13)	8.39 (1.62-43.4)	<0.001
	No	2(7)	25(93)		

P value, Odds Ratio (OR) and 95% Confidence Interval (CI) were used to demonstrate difference within different groups. Statistically significant (p</=0.05) values are in bold.

* Media, Family, Friend.

Table 4.7 Logistic regression analysis of predictors of diabetes self-management knowledge

Predictor variable	B	wald	sig	Exp(B)	95% CI lower	For Exp(B) Upper
Age	-.156	.056	.81	0.86	0.24	3.107
Sex	-2.22	8.81	0.003	0.11	0.25	0.47
Marital status	.291	.115	.74	1.34	.25	7.20
Level of education	3.397	16.0	.000	29.88	5.66	157.8
Diabetic educator	4.07		.001	.017	.002	.174

A logistic regression analysis was conducted to predict diabetes self-management knowledge using age, sex, level of education and availability of diabetic educators as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between those that were knowledgeable on diabetes self-management and those that were not (chi square = 45.598, $p < .001$ with df = 5). Nagelkerke's R square of .583 indicated a moderately strong relationship between prediction and grouping. Prediction success overall was 84.05% (83.7% correctly classified as knowledgeable and 84.4% correctly classified as not knowledgeable). The Wald criterion demonstrated that sex (p=0.003), level of education ('p<.001') and availability of diabetic educator (p=0.001 significantly contribution to prediction. Marital status and age were not significant predictors. Exp(B)

value indicates that when level of education is raised by one unit (secondary level of education and above) the odds ratio is 29 times as large and therefore respondents with secondary level of education and above are 29 more times likely to be knowledgeable on diabetes self-management. Male respondents were twice as likely to be more knowledgeable compared to their female counter parts. Respondents who were aware of the availability of diabetic educators also appeared to be more knowledgeable compared to those who said that they were not aware of any diabetic educators at JOOTRH.

4.6: Incidence of foot related complications amongst diabetic patients

The study's second objective was assessing prevalence of foot complications amongst type two diabetes patients at JOOTRH. It looked at factors influencing development of foot complications and also examined the association between diabetes self-management knowledge and foot complications**.**

Age, gender and marital status did not significantly influence development of foot complications.

Respondents' level of education was the only demographic characteristic that significantly influenced development of foot complications s shown in Table 4.8

Table 4.8: Demographic characteristics and Foot Complications

Demographic Characteristics		Had DM Related Foot Complication			P value
Characteristic	Categories	Yes N (%)	No N (%)	OR (95%CI)	
Age (in years)	Below 50	8 (20)	32(80)	1.29 (0.45-3.7)	0.635
	Above 50	10 (24)	31 (76)		
Gender	Male	9(17)	43 (83)	2.15 (0.74-6.24)	0.154
	Female	9(31)	20(69)		
Marital status	Not Married	5(26)	14 (74)	0.74 (0.23-2.44)	0.62
	Married	13(21)	49 (79)		
Level of education	Primary and Below	11 (38)	18 (79)	0.26 (0.09-0.76)	0.011
	Secondary and Above	7 (13)	45 (87)		

4.7: Foot complication and clinical information

This study established that the number of years a patient had had diabetes, the type of treatment they were on and their family history of diabetes did not significantly influence their development of foot complications as shown in Table 4.9.

Table 4.9: Foot complication and clinical information

Disease & Care Characteristic		Had DM Related Foot Complication			P	OR
Characteristic	Categories	Yes	No	Total	Value	(95% CI)
Years With Disease	Above 8 Years	7 (22)	25 (78)	32	0.95	1.03
	Below 8 Years	11 (22)	38 (78)	49		(0.35-3.03)
On Treatment	Yes	13 (21)	49 (79)	62	0.62	0.74
	No	5 (26)	14 (74)	19		(0.23-2.44)
Family history of diabetes	Yes	12 (24)	39(76)	51	0.71	1.23
	No	6(20)	24 (80)	30		(0.41-3.71)

P value, Odds Ratio (OR) and 95% Confidence Interval (CI) were used to demonstrate difference within different groups. Statistically significant (p</=0.05) values are in bold.

4.8: Foot Complications and Self-Care Related Characteristics

The sought to determine whether development of foot complications was influenced by the respondent's blood glucose monitoring activities. The study established that timing of blood glucose levels did not significantly influence development of foot complications as shown in Table 4.10.

Table 4.10: Blood glucose testing and foot complications

Test blood Glucose		Had a DM related complication			
	Categories	Yes N(%)	No N(%)	OR (95%CI)	P value
Before breakfast	Yes	35(85)	6(15)	0.4 (0.13-1.2)	0.96
	No	28(70)	12 (30)		
After meals	Yes	26(81)	6(19)	0.71 (0.24-2.14)	0.54
	No	37(76)	12(24)		
Only at the clinic	Yes	20(65)	11 (35)	3.38 (1.14-10)	0.24
	No	43(86)	7(14)		

4.9: Foot care practices and foot complications

Studies have shown that foot care practices are the single most important factor in preventing and managing foot related complications. The study sought to establish if daily foot inspection, use of special foot wear and satisfaction with self-management teaching influenced development of foot complications amongst diabetes patients at JOOTRH. P value, Odds Ratio (OR) and 95% Confidence Interval (CI) were used to demonstrate difference within different groups. Values were statistically significant if p</=0.05. Daily inspection of feet, use of special protective footwear, and satisfaction with self-care education received at JOOTRH, significantly influenced development of foot complications as shown in Table 4.11.

Table 4.11: Foot care practices and foot complications

Foot care practices		Had a DM related complication			
	Categories	Yes N(%)	No N(%)	P Value	OR (95% CI)
Foot inspection	Daily	4(8)	44(92)	**<0.001**	0.12 (0.04-0.38)
	Not daily	14(42)	19 (58)		
Protective footwear	Yes	6(11)	51(89)	**<0.001**	0.12 (0.04-0.42)
	No	12(50)	12(50)		
Satisfied with teaching	Yes	4(8)	46 (92)	**<0.001**	0.11 (0.03-0.37)
	No	14(45)	17(55)		

4.10: Foot related complication and resources to aid in acquisition of self-care management knowledge

The study viewed resources as source of information regarding diabetes self-management knowledge and diabetes educators who are instrumental in implementation of diabetes related health policies and facilitating diabetes self-management teaching.

Source of information whether from health care worker, print media, friends etc did not seem to significantly influence development of foot complications. Respondents who said they were aware that diabetes educators are available at JOOTRH had fewer foot related complications compared to those who said that they were not aware or that the educators were not always present as demonstrated on Table 4.12.

Table 4.12: Foot related complication and Resources

Self-Care Resource Characteristic		Had DM Related 1Foot Complication		OR	OR
Characteristic	Grouping	Yes	No	(95%CI)	(95% CI)
Information Source	Other*	4(25)	12(75)	0.82	0.765
	Health Worker	14(22)	51 (78)	(0.23-2.95)	
DM Educator Available	Yes	4 (7)	50 (93)	0.07	<**0.001**
	No	14(52)	13 (43)	0.02-0.26)	

Table 4.13: Predictors of Foot Complication

Predictor variable	B	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
					Lower	Upper
Education(1)	-1.247	2.773	.096	.287	.066	1.247
Diabetes educator	-2.066	6.838	.009	.127	.027	.596
Satisfaction with teaching	-2.851	3.596	.058	.058	.003	1.101
FootCare(1)	1.829	1.273	.259	6.229	.260	149.529
Use_Special_Footware(1)	-.578	.396	.529	.561	.093	3.389

The greatest predictor of development of diabetes related foot complications interaction with a diabetes educator at JOOTRH according to the Wald criterion. Respondents who said they had not been taught by a diabetic educator were twice as likely to suffer from foot complications compared to their counterparts who were had interacted with a diabetic educator at JOOTRH.

CHAPTER FIVE

DISCUSSION

5.1Introduction

This chapter presents summary of study findings on diabetes self-management knowledge and development of foot complications amongst type two diabetes patients at Jaramogi Oginga Odinga Teaching and referral hospital, Kisumu County, Kenya.

5.2 Summary of Findings

This section presents a summary of the findings as per the research objectives and the research questions as summarized in themes below.

5.2.1 Knowledge level of type two diabetes patients at JOOTRH

The results of this research found that the studied population was knowledgeable with 60.5% of respondents scoring above average on the diabetes knowledge test. This level of knowledge might be attributed to inherent patients' characteristics such as being younger, educated, and having stayed more than eight years with diabetes, factors which were significantly associated to knowledge of self-care. Age (OR: 0.4; 95% CI 0.14-0.91, P value=0.029) patients below 50 years were likely to be more knowledgeable, gender (OR: 0.4; 95% CI 0.14-0.92, P value=0.031) males appeared more knowledgeable than females, marital status (OR: 4.9; 95% CI 1.62-14.9, P value=0.003) married persons were most knowledgeable. Patients with secondary education and above (OR: 9.8; 95% CI 3.42-28, P value=0.000) were more knowledgeable, people with diabetes (>8years) were likely to be more knowledgeable (OR: 3.2; 95% CI 1.26-8.18). These findings are

consistent with research findings conducted in other parts of the world. Xu, Pan, and Liu (2010) concluded in their study that individuals with less education were less likely to engage in diabetes self-management. A study conducted by Perara, DeSilva,&Perara (2013), concluded that indeed patients who had secondary level education and above were more knowledgeable than their counterparts with primary education and below. The same study concluded that females were more knowledgeable than their male counterparts and that people who had lived with diabetes for more than 10 years were likely to be more knowledgeable. This difference might have been brought about by the fact that majority of the respondents in the current study were males (64%) and had lived with diabetes for more than five years but less than ten years. Gill, Kumar, and Wiskin (2008) reported that individuals 65 years and less were more knowledgeable than their older counterparts. It was concluded that this was due to the older adults' experience with more diabetes related complications leading to confusion about the signs and symptoms of diabetes. A study by Abdo & Mohamed (2010), revealed significant low levels of knowledge among females (31%), not educated and older age knowledge (78% and 72%).

5.2.2 Incidence of diabetes related foot complications

The study established that 18 (22.2%) of the respondents had experienced a diabetic foot related complication. Out of this 72.2% were not knowledgeable on diabetes self-management. Age, gender, marital status, level of education, years with diabetes, type of treatment, family history of diabetes, do not significantly influence development of foot related complications.

Use of special foot wear (OR: 1.2; 95% CI 0.04-0.38, 'P<.001'), daily foot care OR: 0.12; 95% CI 0.04-0.42, ('P<.001') and satisfaction with diabetes self-management teaching at JOOTRH (OR: 0.11; 95% CI 0.03-0.37, 'P<.001') significantly influence development of foot complications. According to Abu-Qamar (2014) diabetes self-management education was a key strategy in the prevention of foot ulceration, which was one of the most common causes for hospitalization for patients with Type 2 diabetes. Respondents who were satisfied with the diabetes self-management teaching at JOOTRH appeared to be more knowledgeable and better motivated than their counterparts who were not satisfied with the teaching. According to Jalilian, Motlagh, Solhi, & Gharibnavaz (2014), self-management participation is vital to success in the treatment of diabetes, which demands "motivation, knowledge and compliance to a difficult and complex lifetime regimen". 78% of the respondents that had foot complications did not check their feet daily. Gale *et al.,* (2009) noted that how people with diabetes know and actually care for their feet is largely unknown. Several studies concluded that most patients have insufficient knowledge about how to reduce the risk of ulceration. The supposition has generally been, therefore, that increasing the amount of advice and health education would lead to improved self-care, although there is little empirical support for this approach (Kartel *et al.,* 2010).

A few surveys have concluded that most diabetic patients have insufficient knowledge about how to reduce the risk of foot ulceration (Kartel *et al.,*2010 Systematic reviews of educational interventions for improved preventive foot self-care have found short-term effects (Gael *et al.,* 2008). This study therefore concurs with these studies that indeed

insufficient knowledge on self-care significantly influences development of foot complications.

5.2.3 Availability of resources to aid in acquisition of diabetes self-management knowledge

(54) 66.7% of respondents stated that they were aware that there are diabetes educators at JOOTRH who had taught them about diabetes self-management. Availability of diabetes educators significantly influenced diabetes self-management knowledge (OR: 8.3; 95% CI 1.62-43.4, P=<0.001). 93% of respondents who said that they were not aware whether diabetes educators were available at JOOTRH or not were not knowledgeable on diabetes self-management. Diabetes education is widely accepted to be an integral part of comprehensive diabetes care as it allows patients to assume greater responsibility for their own care. Foma *et al.,* (2013) in a descriptive study "Awareness of diabetes mellitus among diabetic patients in the Gambia: A strong case for health Education and Promotion, found that patient education is the cornerstone of diabetes prevention and management as it accounts for almost 50% in management. The study further shows that diabetes education should be a continuing process with regular visits for reinforcement and not a process to be completed after one or two visits to a healthcare worker or facility. Therefore, with consequent improvements in knowledge, attitudes and skills, diabetes education will lead to better control of the disease. WHO cited, Kenya as one of the 57 countries with a critical shortage of health workers. Whereas acquisition of diabetes self-management requires continuous teaching and evaluation by diabetes educators, this has not been forthcoming at JOOTRH majorly because of the staff shortage.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study therefore concludes that patients at Jaramogi Oginga Odinga Teaching and Referral hospital are knowledgeable on diabetes self-management and that knowledge of diabetes self-care is dependent on knowledge of diabetes, however more efforts are needed to realize 100% of the patients being knowledgeable as opposed to the current 60.5%. The study further established that development of foot complications was associated with the patients' knowledge on self-care. The study further established that there are diabetic educators at JOOTRH though they do not always engage the patients in self-management education.

6.2 Recommendations

The study therefore recommends the following

- Diabetic educators should give diabetes management health education every day before patients see clinicians.
- The study recommends more intensive foot care education with subsequent follow up either through telephone call or home visit as most patients who developed foot complications reported examining their feet only at the clinic.
- The study also recommends that the government of Kenya through Ministry of Health should ensure adequate capacity building and training of diabetes

specialists. This will increase knowledge of patients and subsequently reduce number of foot complications.

6.3 Further Research

1. The researcher noted with concern that most patients also suffered from eye related complications and erectile dysfunction (men) and therefore further recommends that more intensive research should be conducted with regards to other diabetes related complications.

2. The researcher recommends that further studies on diabetes self-management knowledge could be done in other counties in Kenya in order to generalize the results.

REFERENCES

Abdo, N. M., & Mohamed, M. E. (2010). Effectiveness of health education program for type 2 diabetes mellitus patients attending Zagazig university diabetes clinic, Egypt. *Journal Egypt Public Health Association, 18*(3&4), 113-130. Retrieved from http://www.researchgate.net/publication/49764805 Effectiveness Of Health Education Program For Type 2 Diabetes Mellitus Patients Attending Zagazig University Diabetes Clinic Egypt.

Abu-Qamar, M. Z. (2014). Knowledge and practice of foot self-care among Jordanians with diabetes – An interview-based survey. *Journal of wound care.*

Adibe M.O., Okonta M. J., Ukwe C.V(2009). Knowledge of self-care among type 2 diabetes patients in two states of Nigeria. European Journal of pharmaceutical technology.

Aghili, R., Kahmseh, M. E., Malek, M., Banikarimi, A. S., Baradaran, H. R., & Valojerdi, A. E. (2013). *Development and validation of diabetes empowerment questionnaire in Iranian people with type 2 diabetes*. International Nursing Review.

Azeem Majeed, Adel A. El Sayeed, Tawfik Khoja, Riyadh Alshamsan, Christopher Millett and Salmam Rawaf, (2013) Diabetes Mellitus in Middle East and North Africa. An update

Azevedo, M., & Alla, S. (2008). *Diabetes in sub-saharan Africa*: kenya, malimozambique, Nigeria, South Africa and zambia. Int J Diabetes Dev Ctries,

Baghbanian, A., & Tol, A. (2012). The introduction of self-management in type 2 diabetes care: A narrative review. *Journal of Education and Health Promotion.*

Becker G, Gates RJ, Newsom E (2004). *Self-care among chronically ill African Americans*: culture, health disparities, and health insurance status. Am J Public Health.

Bruun, C., Siersma, V., Guassora, A. D., Holstein, P., & Olivarius, N, de (2013). Complications amputations and foot ulcers in patients newly diagnosed with type 2 diabetes mellitus observed for 19 years. The role of age,gender and comorbidity. *Diabetic Medicine, 30,* 964-972.

Calabretta, N. (2012). *Consumer-driven, patient-centered health care in the age of electronic information*.

Centers for Disease Control and Prevention (CDC). (2011). National diabetes fact sheet, 2011. Retrieved from http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf

Chege M, (2007) Risk Factors for Type 2 Diabetes Mellitus among Patients Attending a Rural Kenyan Hospital.

Corabian P., Harstall C., Alberta Heritage Foundation for Medical Research (2001). Patient diabetes education in the management of adult type 2 diabetes. Edmonton: AlbertaHeritage Foundation for Medical Research.

Cranor C.W, Christensen DB (2003). The Asheville Project: short-term outcomes of a community pharmacy diabetes care program.

Cranor C.W, Bunting B.A, Christensen D.B (2003). The Asheville Project: longterm clinical and economic outcomes in a community pharmacy diabetes care program.

Creswell J. W.,(2003. Research design: Qualitative, quantitative and mixed methods approaches (2nd edition) Thousand Oaks, CA: Sage

Diabetes-UK. (2012). Diabetes care across the UK. *Extract of the Global Diabetes Scorecard Tracking Progress for Action (idf)Diabetic complications* Retrieved from http://www.diabetes.org.uk/Guide to diabetes/Support_for_managing_your_diabetes/diabetes_care_and_you/Diabete_ care_UK/

Darkwa S, (2011). Prevalence of diabetes mellitus and resources available for its management in the Cape coast metropolis. *Journal of health and environmental sciences* Vol.1 (1)pg 1-7

Ezenwaka, C., & Eckel, J. (2011). *Prevention of diabetes complications in developing countries*: Time to intensify self-management education. Archives of Physiology and Biochemistry.

Funnell M., Brown T., Childs, B., Haas, L., Hosey, G., Jenson, B.,Weiss, M. (2013). National standards for diabetes self-management education. *Diabetes Care, 30*(6),246-250

Gill, J. K., Kumar, R., & Wiskin, C. M. (2008). *Diabetes self-management study (DSS) – A demographic and clinical approach to patients' diabetes knowledge.* International Journal of Health Promotion and Education.

Global status report on non-communicable disease 2014 (journal of clinical and Applied Research Education Vol 38/supplement 1

González H.M., Vega W.A., Rodríguez M.A., Tarraf M., & Sribney W.M. (2010). *Diabetes Awareness and Knowledge Among Latinos*: Does a Usual Source of Healthcare Matter?

Hill, P., & Clark, R. (2008). The Australian diabetes educators; skills and readiness for the tsunami of diabetes in the 21st century. Australian *Journal of Advanced Nursing.* Retrieved from http://www.ajan.com.au/Vol26/26-2_Hill.pdf

International Diabetes Atlas. (2012). *The global burden*. (5th ed.). Retrieved from http://www.idf.org/diabetesatlas/5e/the-global-burden

International Diabetes Federation (2013) Atlas, 6th ed. Brussels Belgium

Kemper, P. Savage, C., Niedebaume, P., & Anthony, J. (2005). A study of the level of knowledge about diabetes management of low-income persons with diabetes. *Journal of Community Health Nursing*.

Kisokanth, G., Prathapan, S., Indrakumar, J., Joseph, J. (2013). Factors influencing self management of diabetes mellitus: A review article. *Journal of Diabetology*, 3(1). Retrieved fromhttp://www.journalofdiabetology.org/Pages/Releases/FullTexts/TWELFTISSUE/RA-1-JOD-13-018.aspx

Lavery L. A., Higgins K. R., Lanctot D. R., Constantinides G. P.,(2010): Risk factors for foot infections in individual with diabetes- diabetes care. Retrieved from www.care.diabetesjournals.org

Learning About Diabetes, Inc. (2006). Retrieved from www.learningaboutdiabetes.org

International Diabetes Foundation (2003). Diabetes Atlas. 2nd edition. Belgium: IDF, Brussels

Kenya, R. O. (2012). *Kenya National Diabetes Strategy. First Edition*. Retrieved. From http://diabetes-communication.org/wordpress/wpcontent/uploads/2012/09/Kenya-National-Diabetes-Strategy-2010-2015 Complete.pdf.

Mafomekong Ayuk Foma, Yauba Saidu, Semeeh Akinwale Omoleke and James Jafali **(**2013): Awareness of diabetes mellitus among diabetic patients in the Gambia: A strong case for health Education and Promotion

Maina, W., Ndegwa, A., Njenga, E., & Muchemi, E. (2010). Knowledge, attitude, and practices related to diabetes among community members in four provinces in Kenya: a cross sectional study. *African Journal of Diabetes Medicine.*

Marrero DG, Ard J, Delamater AM, *et al* (2013); Twenty-first century behavioral medicine: a context for empowering clinicians and patients with diabetes: a consensus report. Diabetes Care 2013; 36:463–470

Martin D, Lange K, Sima A, (2012); Recommendations for age-appropriate education of children and adolescents with diabetes and their parents in the European Union. Pediatric Diabetes 2012;13 (Suppl. 16):20–28

Masoud S. R. (2011); Quality of Gylcemic control among Insulin Treated Ambulatory patients with Diabetes Mellitus at Kenyatta National Hospital

Mbanya J.C.N, Motala AA, Sobngwi E,Assah FK Enoru ST. (2010) ' Diabetes in Sub Saharan Africa' Lancet,375 (9733) 2254-2266

Mbugua, P. K., Otieno, C. F., Kayima, J. K., Amayo, A. A., & McLigeyo, S. O. (2005). *Diabetic ketoacidosis*: clinical presentation and precipitating factors at Kenyatta National Hospital, Nairobi. *East Afr Med J, 82*(12 Suppl),

McCleary-Jones, V. (2011). Health literacy and its association with diabetes knowledge, self-efficacy and disease self-management among African Americans with diabetes mellitus. Association of Black Nursing Faculty *Journal, 22*(2), 25-32.Retrieved from http://web.a.ebscohost.com.ezp.waldenulibrary.org/ehost/pdfviewer/pdfv Ewer/sid=3a5e8089-cfbc-41ce-a88c-e27e0619b6a1%

McIntosh, A., Peters, J., Young, R., Hutchinson, A., Chiverton, R., Clarkson, S., et al. (2013). *Prevention and management of foot problems in Type 2 diabetes:* Clinical Guidelines and Evidence University of Sheffield. University of Sheffield.

Mensing C., Boucher J., Cypress M., Weinger K., Mulcahy K., Barta P., et al(2013) *National Standards for Diabetes Self-Management Education.* Diabetes Care 26 (Suppl. 1).

Michigan Diabetes Research Training Centre (MDRTC). (1998). Diabetes knowledge test (DKT). Retrieved from http://www.med.umich.edu/mdrtc/profs/survey.html

Nyamu David Gitonga (2008), *Knowledge on Diabetes Mellitus among Diabetes Patients attending Kanyatta National Hospital Outpatient clinic Nairobi.*

Pirier F. J., Pascal, Motala A. A., Omar M. A., Pirie FJ.(2013) Epidemiology of type 1 and type 2 diabetes in *Africa*. J Cardiovascular Risk.

Mugenda and Mugenda (2003), Research Methods: Quantitative and Qualitative Approaches

Mutw'iwa, N. S. (2008) Prevalence of Lifestyle Risk Factors among Diabetes Patients at Kenyatta National Hospital

Nalwa Z. W. (2010): *Glycemic control, Cardiovascular Risk Profile and therapeutic interventions in Type 2 Diabetes Mellitus Patients at New Nyanza Provincial General Hospital in Kisumu.*

Perara D. P, DeSilva, R. E. E., & Perera, W. L. S. P. (2013). Knowledge of diabetes among type 2 diabetes patients attending a primary health care clinic in Sri Lanka. *Eastern Mediterranean Health Journal, 19*(7). Retrieved from http://www.emro.who.int/emhj-vol-19-2013/7/knowledge-of-diabetes amongtype- 2-diabetes-patients-attending-a-primary-health-care-clinic-in sSri-lanka.html

Rani P.K., Raman R., Subramani S, Perumal G., Kumaramanickavel G. G. & Sharma G.(2008). *Knowledge of diabetes and diabetic retinopathy among rural populations in India, and the influence of knowledge of diabetic retinopathy on attitude and practice,* Rural and Remote Health (Online*)* Available at http://www.rrh.org.au

Redman, B. (2007). *The Practice of Patient Education*: Mosby. Republic of Kenya. Ministry of public health and sanitation.

Republic of Kenya (2010); Ministry of Public health and Sanitation (Kenya National Diabetes Strategy)

Rondalyn Dennis- Bradshaw (2015): Diabetes self-management education for adults with type two diabetes. Journal of diabetes care.

Kenya National Diabetes Strategy. First Edition. 2010; http://diabetes communication.org/wordpress/wp-content/uploads/2012/09/Kenya-National-Diabetes-Strategy-2010-2015-Complete.pdf

Roglic, G., Unwin, N., Bennett, P., Mathers, C., Tuomilehto, J., & Nag, S. (2010). *The burden of mortality attributable to diabetes*: Realistic estimates for the year 2000. Diabetes Care.

Schiotz, M., Strandberg-Larsen, M., Frolich, A., Krasnik, A., Bellows, J., Kristensen, J.K., Vedsted, P., …Hsu, J. (2012). *Self-care management support to people with type 2 diabetes:* A comparative study of Kaiser Permanente and Danish health care system. Bio Med Central Health Services Research,

Schoenberg N.E., Traywick L.S., Jacobs-Lawson J., Kart C.S (2008). *Diabetes self-care among a multiethnic sample of older adults*. J Cross Cult Gerontol.

Shamsi M. Shrifi Rad G. H, Kachouee A., Hsanzadeh A., Dejam S (2011). *Knowledge, attitude And practice of female patients with type 2 diabetes about walking out*. Payesh Health Monit.

Sousa, V. D., Hartman, S. W., Miller, Eh. H., & Carrou, M. A. (2008). New measures of diabetes self-care agency, diabetes self-efficacy, and diabetes self-management for insulin-treated individuals with type 2 diabetes. *Journal of Clinical Nursing.*

Sobngwi E, Mauvais-Jarvis F, Vexiau P, Mbanya JC, Gautier JF.(2001) *Diabetes in Africans*: Part 1: Epidemiology and clinical specificities. Diabetes Metabolism.

Stephen M'Kiunga (2011): Barriers in preventing Long term complications among Type2 Diabetes Mellitus at Kenyatta National Hospital.

Tomlin, A., & Asimakopoulou, K. (2014). Supporting behavior change in older people with type 2 diabetes. British Journal of Community Nursing.

The Burden of Chronic Diseases in the African Region, Preventing Chronic Diseases a Vital Investment (2007). *World Diabetes Foundation Summit,* World Health Organization Africa.

The D.C.C.T-Research-Group. (2006). The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *The New England Journal of Medicine.*

"The Impact of Chronic Disease in Africa," World Health Organization (2007). Available from: *Cross RefMedline*

Ulvi O.S., Chaudhary R.Y., Ali T., Alvi R.A., Aman Khan M.F., & Khan M. (2009). Investigating the awareness level about Diabetes Mellitus and associated factors in Tarlai (Rural Islamabad).

Venkatesh S., Weatherspoon L., Kaplowitz S., & Song W. (2013). Acculturation and glycemic control of Asian Indian adults with type 2 diabetes. *Journal of Community Health.*

Wee H.L., Ho H.K., Li S.C.(2002): Public Awareness of Diabetes Mellitus in Singapore. Singapore Med J.

Wens J., Vermeire E., Royen P.V., Sabbe B., Denekens J (2005). *GPs' perspectives of type 2Diabetes patients' adherence to treatment*: a qualitative analysis of barriers and solutions. BMC Fam Pract.

W.H.O. (2007). *The Burden of Chronic Diseases in the African Region, Preventing Chronic Diseases a Vital Investment*. . Geneva: WHO. Document Number)

W.H.O. (2010). *Global Status Report on non-communicable disease*. o. Document Number)

World Health Organization (2012) Diabetes Fact Sheet no 312. Diabetes Programme Country and Regional Data on Diabetes African Region; http://www.who int/diabetes facts /world figures/en website (accessed on 8th July 2016)

World Health Organization. (2015). Diabetes. Retrieved from http://www.who.int/mediacentre/factsheets/fs312/en/

Wild, S., Roglic, G., Green, A., Sicree, R., & King, H. (2004). *Global prevalence of diabetes: estimates for the year 2000 and projections for 2030*. Diabetes Care,

Xu, Y., Pan, W., & Liu, H. (2010). *Self-management practices of Chinese Americans with type 2 diabetes.* Nursing and Health Sciences.

APPENDIX I: INFORMATION SHEET AND INFORMED CONSENT

INFORMATION SHEET

The following information is to enable you to give voluntary, informed consent to participate in this study. Please read the information carefully before signing the consent form (part B).To be verbally read for those who are not able to read.

Study title: Diabetes self-management knowledge and diabetic foot complications amongst type 2 diabetic patients at JOOTRH.

Investigators Name: Lucy Kageha Kavinguha

Address Lucy Kageha Kavinguha,

P.O Box 17525-00500,

Nairobi.

Cell- 0714340621

Aim and Significance of the study

This study aims to examine the association between self-management knowledge and diabetic foot complications amongst type 2 diabetic patients at JOOTRH. Findings will thus be instrumental in redesigning and refining strategies of empowering diabetic patients and ensuring better diabetic self-management.

What participation will involve

Participation in the research is dependent upon signing the informed consent form. Upon signing the consent form, you will be asked detailed questions on your knowledge of diabetes and its management, availability of resources to facilitate diabetes self-management education and incidence of foot complications. This information will be recorded onto forms. The participant in this study will be required to give honest information to their level best.

Data Security

All information you provide will remain confidential. Only the study team will have access to this information and will be treated with confidentiality unless your express permission is obtained.

You may withdraw from participating in this study at any time without giving reasons. This will not affect services you are receiving.

Risks

The researcher will use a questionnaire to ask you about accessibility to diabetes self-management education. The questions will not last more than 20 minutes and will not cause you any physiological, financial and psychological harm.

CONSENT FORM

Please read the previous information sheet (or have the information read to you) carefully before completing and signing this consent form. Should you have any questions about the study please feel free to ask the investigator prior to signing your consent

Consent Form for the Study Diabetes self-management knowledge and foot complications amongst type 2 diabetic patients at JOOTRH.

Investigator's Name: Lucy Kageha Kavinguha

Address Lucy Kageha Kavinguha,

P.O Box 17525-00500,

Nairobi.

Tel: 0714340621

FOR COMPLETION BY PARTICIPANTS

I have read (or the enumerator has read to me) the following sheet concerning this study and I understand what will be required of me if I take part in the study.

I understand that at any time I may withdraw from the study without giving a reason and this will not affect the care that I am receiving.

I AGREE TO TAKE PART IN THE STUDY:

Name Initials of participant:……

Signed…….. (Or thumb print)

Date:……..

APPENDIX II: QUESTIONNAIRE

Dear Respondent,

This questionnaire is designed to collect data relating diabetes self-management knowledge and foot complications amongst type two diabetic patients at JOOTRH. Kindly complete it as appropriate as possible. All responses will be kept confidential and only for the purpose of this academic study.

SECTION A (SOCIODEMOGRAPHIC DATA)

Please tick the most appropriate response

1. Age (years)

21 – 30 ☐
31-40 ☐
41 – 50 ☐
51 – 60 ☐
>61 ☐

2. Gender

Male ☐
Female ☐

3. Marital status

Married ☐
Single ☐
Widow/Widower ☐
Separated/Divorced ☐

4. Education

Primary ☐
Secondary ☐
College ☐
University ☐
No formal education
Other (please specify)……

SECTION B (CLINICAL INFORMATION)

1. Since how long have you had diabetes?

a) Less than 5 years ☐ b) 5 – 10 years ☐ c) More than 10 years ☐

2. Type of diabetic treatment

Insulin ☐ b) Pills ☐ c) No medication ☐

3. Blood glucose self-monitoring

Test blood glucose before meals

Yes ☐ b) No ☐

Test blood glucose after meals

Yes ☐ b) No ☐

Test only at the hospital during clinic visits

Yes ☐ b) No ☐

4. Foot care

How often do you check your feet?

Daily ☐ b) Weekly ☐ c) Never ☐

Any special foot wear you use to protect your feet?

Yes b) No

If your answer to 4.2 above is yes, kindly explain your answer

……
…….……
5. Have you ever suffered from any foot related complication?

Yes b) No

6 Family history of diabetes

Yes ☐ b) No ☐

7. What is your source of information regarding diabetes self-management
(Please circle the most appropriate)

a) Print media
b) Electronic media
c) Church
d) groups/friends
e) Health care provider
f) Other (please specify)…….

8. Are there diabetic educators at JOOTRH that teach you about diabetes?

(Please circle the most appropriate)

a) Yes
b) No
c) Sometimes
d) I don't know

9. To what extent are you satisfied with the diabetic self-management teaching at JOOTRH?

(Please circle the most appropriate)

a) Extremely high
b) High
c) Moderate
d) Low
e) Extremely low

Diabetes Knowledge Test

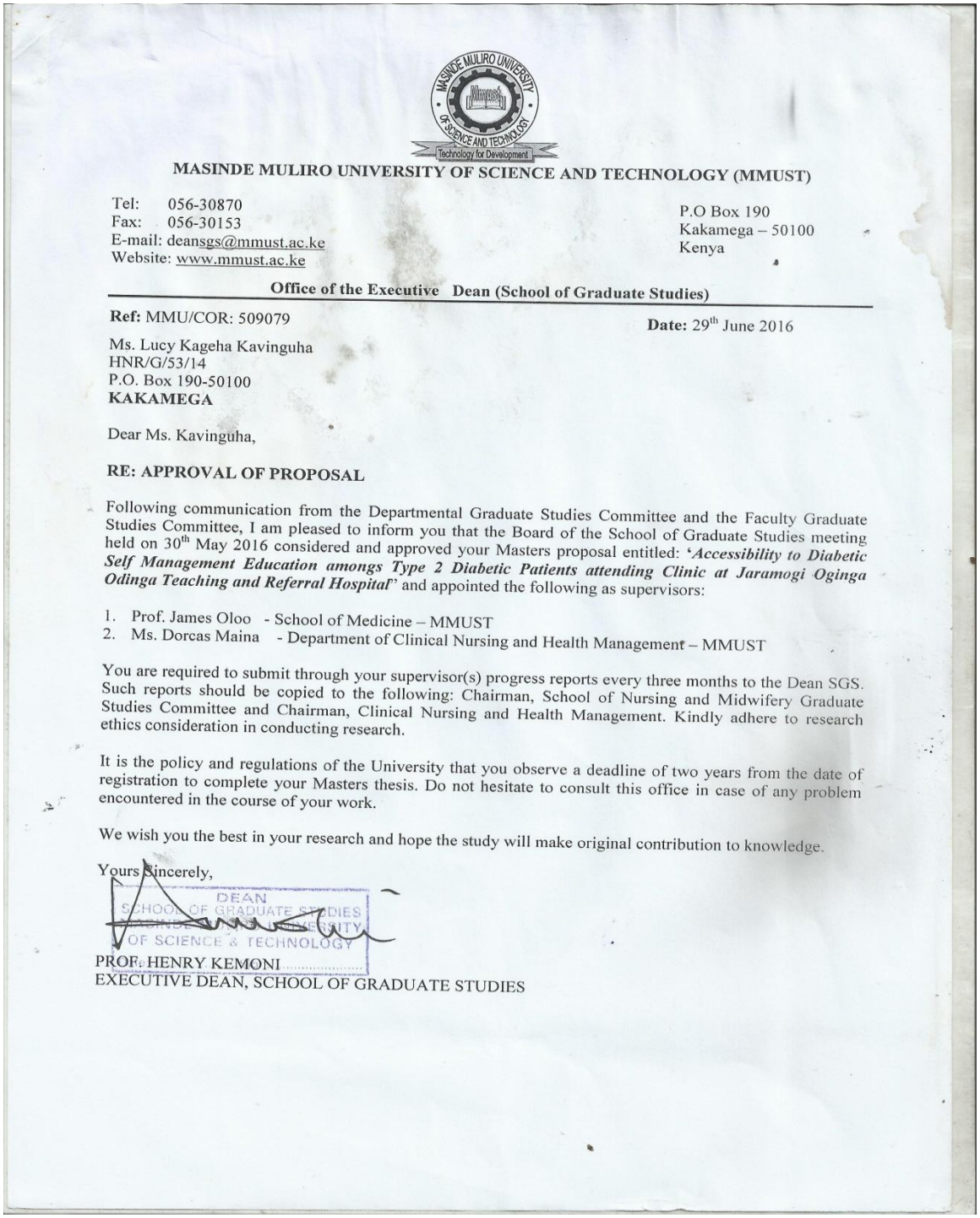
No.	Question	I strongly agree	I agree	I don't know	I disagree	I strongly disagree
1	Eating too much sugar and other sweet foods is a cause of diabetes.					
2	The usual cause of diabetes is lack of effective insulin in the body.					
3	Diabetes is caused by failure of the kidneys to keep sugar out of the urine.					
4	Kidneys produce insulin.					
5	In untreated diabetes, the amount of sugar in the blood usually increases.					
6	If I am diabetic, my children have a higher chance of being diabetic.					
7	Diabetes can be cured.					
8	A fasting blood sugar level of 210 is too high.					

9	The best way to check my diabetes is by testing my urine.					
10	There are two main types of diabetes: Type 1 (insulindependent) and Type 2 (noninsulin dependent).					
11	An insulin reaction is caused by too much food.					
12	Medication is more important than diet and exercise to control my diabetes.					
13	Diabetes often causes poor circulation.					
14	Cuts and abrasions on diabetes heal more slowly.					
15	Diabetics should take extra care when cutting their toenails.					
16	A person with diabetes should cleanse a cut with iodine and alcohol.					
17	The way I prepare my food is as important as the foods I eat.					
18	Diabetes can damage my kidneys.					
19	Diabetes can cause loss of feeling in my hands, fingers and feet.					

20	Shaking and sweating are signs of high blood sugar.					
21	Frequent urination and thirst are signs of low blood sugar.					
22	Tight elastic hose or socks are not bad for diabetics.					
23	A diabetic diet consists mostly of special foods.					
24	A diabetic diet can be consumed by non diabetics					
25	An infection is likely to cause an increase in blood sugar					
26	Exercise can help control diabetes					
27	Diabetes can lead to infertility					
28	Any person can get diabetes					

Thank you very much for your time.

APPENDIX III: ETHICAL APPROVAL TO CONDUCT RESEARCH



MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

Tel: 056-30870
Fax: 056-30153
E-mail: deansgs@mmust.ac.ke
Website: www.mmust.ac.ke

P.O Box 190
Kakamega – 50100
Kenya

Office of the Executive Dean (School of Graduate Studies)

Ref: MMU/COR: 509079

Date: 29th June 2016

Ms. Lucy Kageha Kavinguha
HNR/G/53/14
P.O. Box 190-50100
KAKAMEGA

Dear Ms. Kavinguha,

RE: APPROVAL OF PROPOSAL

Following communication from the Departmental Graduate Studies Committee and the Faculty Graduate Studies Committee, I am pleased to inform you that the Board of the School of Graduate Studies meeting held on 30th May 2016 considered and approved your Masters proposal entitled: '***Accessibility to Diabetic Self Management Education amongs Type 2 Diabetic Patients attending Clinic at Jaramogi Oginga Odinga Teaching and Referral Hospital***" and appointed the following as supervisors:

1. Prof. James Oloo - School of Medicine – MMUST
2. Ms. Dorcas Maina - Department of Clinical Nursing and Health Management – MMUST

You are required to submit through your supervisor(s) progress reports every three months to the Dean SGS. Such reports should be copied to the following: Chairman, School of Nursing and Midwifery Graduate Studies Committee and Chairman, Clinical Nursing and Health Management. Kindly adhere to research ethics consideration in conducting research.

It is the policy and regulations of the University that you observe a deadline of two years from the date of registration to complete your Masters thesis. Do not hesitate to consult this office in case of any problem encountered in the course of your work.

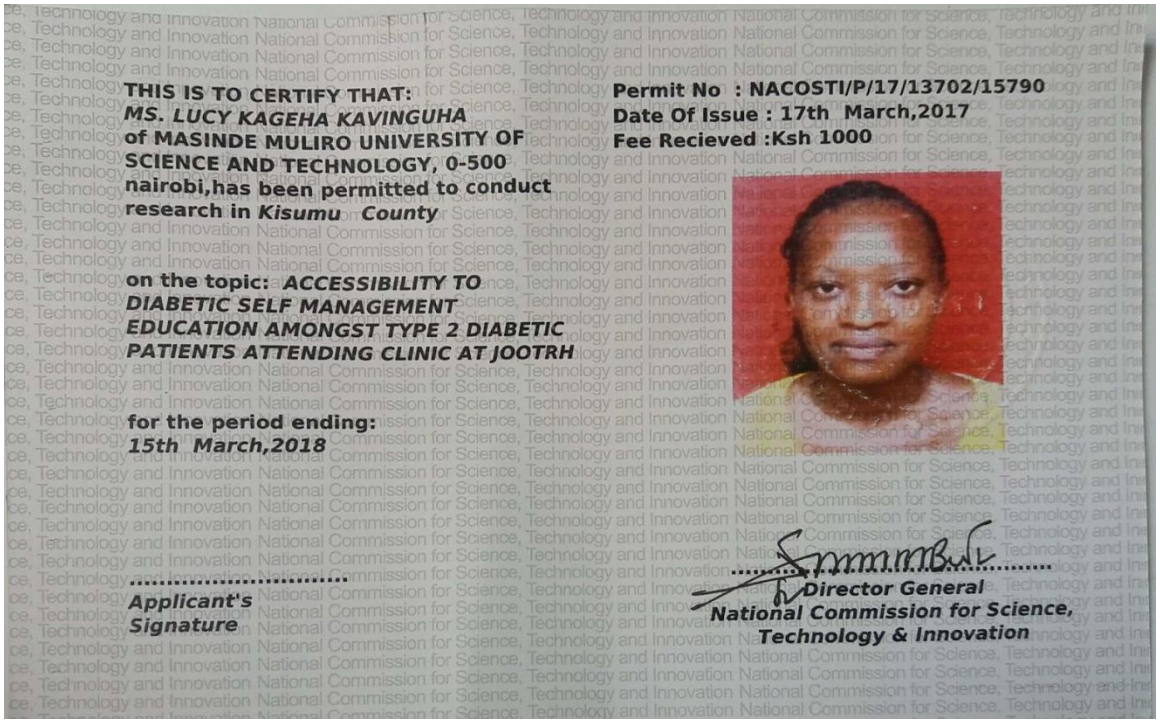
We wish you the best in your research and hope the study will make original contribution to knowledge.

Yours Sincerely,

DEAN
SCHOOL OF GRADUATE STUDIES
OF SCIENCE & TECHNOLOGY

PROF. HENRY KEMONI
EXECUTIVE DEAN, SCHOOL OF GRADUATE STUDIES

APPENDIX IV: RESEARCH PERMIT



THIS IS TO CERTIFY THAT:
MS. LUCY KAGEHA KAVINGUHA
of MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY, 0-500 nairobi,has been permitted to conduct research in *Kisumu County*

on the topic: *ACCESSIBILITY TO DIABETIC SELF MANAGEMENT EDUCATION AMONGST TYPE 2 DIABETIC PATIENTS ATTENDING CLINIC AT JOOTRH*

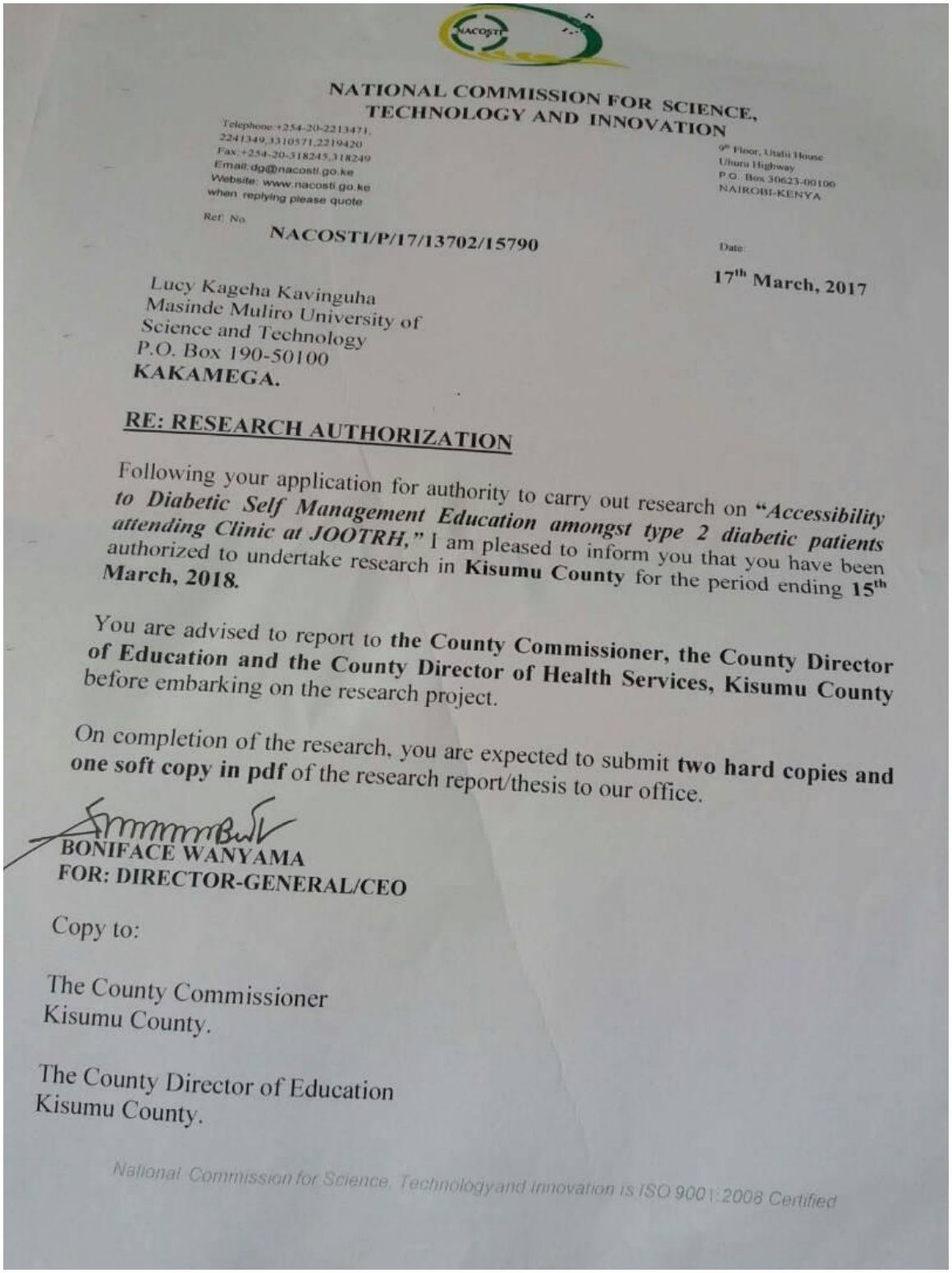
for the period ending:
15th March,2018

.....
Applicant's Signature

Permit No : NACOSTI/P/17/13702/15790
Date Of Issue : 17th March,2017
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation

APPENDIX V: AUTHORIZATION TO CARRY OUT RESEARCH



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471, 2241349,3310571,2219420
Fax:+254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. NACOSTI/P/17/13702/15790

Date: 17th March, 2017

Lucy Kageha Kavinguha
Masinde Muliro University of
Science and Technology
P.O. Box 190-50100
KAKAMEGA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Accessibility to Diabetic Self Management Education amongst type 2 diabetic patients attending Clinic at JOOTRH,"*** I am pleased to inform you that you have been authorized to undertake research in **Kisumu County** for the period ending **15th March, 2018.**

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

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kisumu County.

The County Director of Education
Kisumu County.

National Commission for Science, Technology and Innovation is ISO 9001:2008 Certified

APPENDIX VI: MAP OF STUDY AREA

The study will be carried out in Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) a level five hospital located in Kisumu County, Kisumu East Constituency as shown in the figure below.

Map showing the location of JOOTRH (2013)