RELATIONSHIP BETWEEN KNOWLEDGE OF TYPE 2 DIABETES MANAGEMENT, HEALTH SEEKING BEHAVIOR AND BLOOD SUGAR LEVEL AMONG DIABETIC PASTORALISTS IN WEST POKOT, KENYA

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DECLARATION

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Jane C. Limang'ura

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DEDICATION

This Thesis is dedicated to my family: James Chebon my children Peter Kibet, Madeline

Jepkeitany and Aurelia Jepkoros for their moral and financial support.

Thank you and God bless you all.

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ABSTRACT

Diabetes is a chronic metabolic condition associated with the highest co-morbidities and complications affecting people of diverse social-economic status. Even though diabetes is considered a manageable condition-by regulating blood sugar levels using medication or through the diet, having nutrition education and going for frequent checkups- the rates of mortality are still alarming. It is estimated that 1.5 million people succumbed to it or its related complication worldwide in 2013 alone. This scenario necessitates the need to determine how bloods sugar levels- an indicator of diabetes- is regulated as well as the health seeking behavior at an individual level. Furthermore, the need is greater in a nomadic population because of their unique lifestyle. Therefore, the purpose of this study is to determine the relationship between knowledge of Type 2 Diabetes (T2D) management, health seeking behavior and blood sugar levels among diabetic pastoralists. This study was conducted at Kapenguria Referral Hospital in West Pokot. The study employed cross-sectional descriptive research design and 79 participants who met the inclusion criteria were consented and recruited into the study using simple random sampling. Data was collected using a pre-tested self-administered questionnaire. Data was analyzed in 3 phases. Phase 1was analyzed using descriptive statistical and presented as numbers and proportions. Phase 2: Pearson's chi square test was used to determine the difference between knowledge of T2Dmanagement categories, Health seeking behavior categories and blood sugar levels. In the last phase, logistic regression was used to determine the relationship between knowledge of T2D management, health seeking behavior and blood glucose levels. Odds ratio and the 95%CI were presented at an alpha of 0.1. Among the 79 participants, 75.9% reported nutrition knowledge and regular physical exercises, 84.8% had the knowledge on foot care-that cutting toe nails should be done carefully and 63.3% did not keep the clinic appointments. Even with high knowledge on diabetes management high blood sugar levels were presented. The findings showed that those participants with high knowledge on dietary and on symptoms and complication were less likely to have blood sugar levels higher than 7.2 mmol/L with an odd of 0.31 (0.08, 1.26) and 0.23 (0.06, 1.36) respectively. In addition, the health seeking behavior of participants who had at least an annual checkup were less likely to have blood glucose levels higher than 7.2mmol/l at *pvalue ≤ 0.05*. Keeping clinic appointment helps improves the blood sugar levels hence the management and control of T2D. Having the knowledge on symptoms and the complications of diabetes is equally important since they reflect on whether the blood glucose levels are regulated or not. This study therefore, recommends that more sensitizationon the strategies of managing T2D as well as the importance of keeping clinical appointments in a nomadic population.

Key Words: *Type 2 Diabetes (T2D), Pastoralists, knowledge of T2D Management, Health Seeking Behavior, Blood Glucose level.*

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LIST OF ABBREVIATIONS AND ACRONYMS

ADA   American Diabetes Association

DLF   Diabetes Leadership Forum

T2D   Type two Diabetes

GoK   Government of Kenya

HIV   Human Immunodeficiency Virus

IDF   International Diabetes Federation

KCRH   Kapenguria County Referral Hospital

KDHS   Kenya Demographic and Health Survey

KNBS   Kenya National Bureau of Statistics

MoH   Ministry of Health

NCDs   Non Communicable Diseases

NGOs   Non-Governmental Organizations

STATA   Statistical Package

SSA   Sub Saharan Africa

WHO   World Health Organization

OGTT   Oral glucose tolerance test

T2D   Type 2 diabetes

WPC   West Pokot County

OPERATIONAL DEFINITION

Diabetic Pastoralist: People diagnosed with diabetes and practice herding animals with frequent movements in search of pasture and water.

Knowledge of T2D Management: What patient knows about predisposing factors, causes of morbidity, mortality and diabetes management

Health Seeking Behavior: What the patient does in response to managing diabetes condition including going for checkups, refilling medications.

T2D: RBS of ≥ 7.2 mmol/l and FBS of ≥ 7.0 mmol/l, or a prior diagnosis or receiving diabetes drug treatment.

Fasting Blood Sugar: A test of blood sugar without caloric intake for at least 8 hours

Random Blood Sugar: A test of blood sugar taken at any time the client is assessed irrespective of food intake.

1.1 Introduction

This chapter presents the background of the study, statement of the problem, purpose of the study, objectives, research hypothesis, scope of the study, Justification and limitations of the study. The chapter also operationalizes the key terms used in the study.

1.2 Background to the Study

Non communicable diseases (NCDs) are a global concern and a threat to economic development. In the recent past, majority of the deaths that occurred worldwide were as a result of non-communicable diseases. Among the diseases classified as non-communicable is diabetes and it has been associated with the highest co-morbidities and complications that can affect people of diverse social-economic status(Bloom et al., 2011).

Diabetes is a chronic metabolic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin- a hormone that regulates blood sugar-it produces. The condition is characterized by raised blood sugar levels (hyper-glycaemia) which over time leads to serious damage to many of the body systems such as nerves, blood vessels, the renal system, heart-if left uncontrolled (Sardesai, 2011; World Health Organization, 2021).

According to the international diabetes federation(2015), every six seconds a person dies from diabetes and related conditions in the world and the death toll was 5.1 million people in 2013. Of the different types of diabetes, Type two diabetes (T2D) is the most common and affects many adults-both the middle aged and the elderly; accounting for approximately 90% of people with diabetes around the world. There area number of risk

factors that are associated with diabetes and these include: Age, poor dietary habits, overweight, family history, ethnic background and lack of physical activity(WebMD & Dansinger M, 2022). Majority of these risk factors are modifiable hence they can be key management strategies.

According to Siddharthan and colleagues (2015) Type 2Diabetes Mellitus (T2DM) plays an important causal role in the development of other chronic conditions such as: hypertension, upper body obesity, coronary heart disease, blindness, renal failure and disability through amputations of lower limbs, making the condition undoubtedly one of the most challenging health problem in the 21st Century.

Globally, World Health Organization estimates that 284 people live with diabetes and 90% of them have Type two diabetes mellitus (T2D)(World Health Organization, 2021).It is further projected that 415 million adults worldwide will have Type 2 Diabetes Mellitus (T2DM) in 2030representing a whopping 110 % absolute increase and of these, 14.2 million will be from Sub Sahara Africa and living in low-and middle-income countries(International Diabetes Federation, 2015; Saeedi et al., 2019).

In 2019, it is estimated that 436 million people had diabetes and of these, 19 million lived in sub-Saharan Africa and 60% of them were not aware of their condition. It is projected that the number of those with diabetes are more likely to double in 25 years with an estimate of 45 million by 2045 in sub- Saharan alone (International Diabetes Federation, 2021; Sobngwi et al., 2001) simply because of potential risk of diabetes-prediabetes.

Various authors have also alluded to the fact that diabetes is indeed a concern for sub-Saharan region. According to Mbanya and Ramiaya(2006) in their evaluation of disease and mortality of diabetes in sub-Saharan Africa, showed that the number of people

suffering from the condition is likely to double by the year 2025 from a population of 7 million in 2003 to 15 million by 2025. In another study by Peer and colleagues (2014) on the prevalence of diabetes in the African population mentioned that while 45 million Africans aged 20 to 79 years had impaired glucose tolerance, over 21.5 million (5.1%) adults of the same age group will suffer from T2D, a trend that is expected to rise to 41.5 million adults by 2035.On mortality, the World Health Organization(WHO) projects that over the next ten years, Sub Sahara region will experience more death rates from diabetes combine with other NCDs (World Health Organization, 2021). Such trends therefore, demands that governments and relevant stakeholders strategize and put up appropriate preventive nutrition and health diagnostic including use of biochemical parameters like blood sugar level to improve measures to curb the disease.

Internationally there is a demonstrated political good will to address the threat of diabetes; this was expressed in World Health Organization regional committee for Africa, where diabetes was recognized as a chronic, debilitating and costly disease associated with severe complications, which poses severe risks for families hence the need to develop strategies for prevention (World Health Organization, 2007).

As the prevalence of diabetes worldwide increases, Kenya is also receiving a fair share. The latest country wide survey on non-communicable diseases indicates that diabetes is on the rise with varying magnitude for rural and urban dwellers (Ministy of Health Kenya, 2015). A review on the burden of disease in Kenya, showed that of the28% of deaths that occurred, 2% are due to diabetes(World Health Organization, 2012).A number of studies have estimated the prevalence of diabetes to range from 2% to 10% in rural and urban Kenya (Chege, 2010; Christensen et al., 2009; World Health Organization, 2012)with a projected rise to 4.5% by 2025 (Mcferran, 2014). However,

almost two-thirds of diabetics may be undiagnosed. This therefore calls for an urgent need to develop strategies that can curb the disease.

There are a number of factors that have been shown to contribute to the rise of diabetes, these include changing life style practices, poverty, urbanization and globalization (Pastakia et al., 2011).

The body of evidence on the burden of diabetes as well as the rising trend in the prevalence calls for concerted efforts towards prevention and curbing of the disease.The management of diabetes is therefore, a critical component toward reducing the prevalence of the disease. There are various working recommendations on what forms important strategies for management and prevention of T2D.

According to the World Health Organization regional committee report(2007), strategies for reducing the burden associated with morbidity and mortalities from diabetes would require a focus towards the modifiable risk factors. Specific strategies however may vary from location to location but are underpinned on the following principles: 1. Offering economical services for comphrehensive services, 2. Including diabetes in non communicable national programs, 3. Assessible and equitable quality health services 4. Total participation of stakeholders in fight against diabetes and lastly knowledge sensitization (creating awareness) on diabetes.

In line with these conditions, Kenya has been able to develop policy guidelines that outlines key strategies for curbing non communicable diseases by ensuring that the health sectors is upgraded to that of mid-income countries as well as focusing the prevention strategies for NCDs on the risk factors (Department of non-communicable diseases, Kenya, 2021; Ministry of Public Health and Sanitation, 2010; Ministry of Health Kenya, 2018). Eventhough delibarate effort has been made by the government,

the problem still persits in the country, with more people either not diagnosied, diagnonised late and many still sufferring or at risk of suffering from diabetes related complications.

Among the strategies for prevention and control is sensitization through offering nutrition education or nutrition counseling and health seeking behavior. Various studies have been conducted in different popuation to determine the level of knowledge in the management of T2D as well has healthseeking behaviors. In these studies, knowledge levels have been found to be low among diabetic patients and health seeking behaviors generally poor with no consencus on the the frequency of the health seeking behavior (Kiberenge et al., 2010; Mufunda et al., 2012; SoniaJebalalitha et al., 2015; Uchenna et al., 2009; Upadhyay et al., 2008).This notwithstanding, very few studies have been conducted in a pastrolist population.

Kenya is inhabited by pastoralist populations spread in 23 Counties of the arid and semi-arid lands (ASAL) of the Northern and Rift valley regions where the Pokot pastoralists live. This population resides in remote rugged terrain rocky areas and they depend on livestock all species cows, goats, sheep, camels and donkeys with many now practicing subsistence farming. The pastoralists experience frequent shocks from drought, floods and recently mudslides from steep hills that have been stripped of vegetation from human activities, insecurity, with few distant or poorly equipped social amenities for health care, market centers, roads and schools(West Pokot County & Ministry of Heath, 2018). The community experiences low social determinants of health including service accessibility, high illiteracy levels, high child poverty index levels among other determinants of health. The pastoralists lack employment and earning meager income as a result of their lifestyle characterized by movement with animals from place to place in

search of pasture and water, hence living in temporary homes(Kenya National Bureau of Statistics et al., 2015).As the pastoralists move in search of food for their animals, there are no amenities like water points, permanent shops on the migration routes, they rely on scheduled weekly markets which are makeshift structures that end within 2 hours after battering mostly food items with neighbors. Nevertheless, because of diminishing land, many are now living more settled lives in permanent homes. Of great concern however, is that a non communicable disease has transcended boundaries even to the pastoralist population. In a study conducted among different rural and urban communities in which the Maasai who are pastoralists were among the participants, showed that the prevalence of prevalence of diabetes and IGT was 4.2% and 12.0% respectively(Christensen et al., 2009).According to the Stepwise survey-a nationwide survey that estimate prevalence by settlements (urban and rural)- showed that the prevalence of raised blood glucose was 1.4% which is almost half of the county's estimated prevalence (Ministry of Health Kenya, 2015). And since diabetes is an increasing public health problem in Kenya, the pastoralists community could be greatly affected too.

Moreover, since knowledge and health seeking behavior are critical in the management of diabetes and has been observed to be low across populations, pastoralist population is no exception. Therefore, this study sought to determine what pastoralist know with regards to management of diabetes, their health care practices and whether or not blood sugar levels are controlled.

1.3 Problem Statement

Diabetes is a chronic non-communicable disease that can be managed. Individuals diagnosed with this condition are able to manage the condition by regulating their blood

glucose levels using diet and ensuring that they go for frequent medical check-ups where they receive treatment as well as diabetes education (World Health Organization, 2021).

Nevertheless, diabetes prevalence and incidence continue to grow at unprecedented rate, making diabetes a condition of public health concern affecting not only individuals but also families, communities and the society at large. The double burden of disease -both communicable and non-communicable diseases is also a contributing factor(Ministry of Public Health and Sanitation, 2010).

Globally concerted efforts to prevent, treat and manage diabetes are in place. The measures include policy statements(World Health Organization, 2007),nation specific guidelines(Ministry of Heath, 2016) as well as guidelines for health workers and nutrition education material that can be used by diabetic patient on the management of diabetes(Ministry of Public Health and Sanitation, 2010).In addition, there are also robust diagnostic and treatment measures available(International Diabetes Federation, 2013; Pastakia et al., 2011).

Despite of these measures being in place, the prevalence including those who are undiagnosed is still increasing. Several factors could be attributed to the rising prevalence of diabetes, and the inability to adequately manage the disease at an individual level. These factors may include: slow roll out of diagnostic services, scarcity of human and other medical resources in poor resource setting resulting to late detection/diagnosis and treatment of diabetes, unawareness of the nutrition knowledge and how it contributes in the management of diabetes, as well as infrequent health check-ups (Pastakia et al., 2011). These cumulatively, result to high mortality, morbidity and disability from diabetes and its related complications. Moreover, in nomadic

population, the risk is compounded with the difficulties posed by nomadic lifestyle among the pastoralist.

In a study by Mandha and colleagues (2015), showed that less than one third of rural communities experience challenges in completing treatment due to poor infrastructure and distance to health facilities. Furthermore, pastoralists have generally poor living standards and they consume improper diets since they rarely practice crop farming (Khamis et al., 2022). Since pastoralists are among rural communities, undetected and untreated diabetes could be an impending threat that would simply result to human suffering and disability (Pastakia et al., 2011).

In the recent years, West Pokot County Referral Hospital has had an increase in patients diagnosed with diabetes including those hospitalized (West Pokot County & Ministry of Heath, 2018).However, what they know and what they do in the management of T2D in relation to their nutrition status-blood sugar level, is largely unknown.

Therefore, the aim of this study was to determine the relationship between knowledge of T2D management, health seeking behavior and blood sugar level among diabetic pastoralists in West Pokot.

1.3 Objectives

1.3.1 Broad Objective

To explore the association between knowledge ofT2Dmanagement, health seeking behavior and blood glucose levels among diabetic pastoralist attending Kapenguria County referral hospital (KCRH), West Pokot, Kenya.

1.3.2 Specific Objectives

i. To assess the social demographic characteristics of pastoralists with T2D attending Kapenguria County Referral Hospital in West Pokot.

ii. To assess the knowledge of T2D management among diabetic pastoralist attending Kapenguria County Referral Hospital in West Pokot.

iii. To determine the differences in the level of knowledge of T2D management and blood sugar levels among diabetic pastoralist attending Kapenguria County Referral Hospital in West Pokot.

iv. To describe the health seeking behavior of diabetic pastoralist attending Kapenguria County Referral Hospital in West Pokot.

v. To determine the health seeking behavior and blood sugar levels of diabetic pastoralist attending Kapenguria County Referral Hospital in West Pokot.

vi. To explore the association between knowledge ofT2Dmanagement and blood sugar levels among diabetic pastoralist attending Kapenguria County Referral Hospital in West Pokot.

vii. To explore the association between health seeking behavior and blood sugar levels among diabetic pastoralist attending Kapenguria County Referral Hospital in West Pokot.

1.4 Hypothesis of the Study

H_{01}: There is no association between knowledge of T2D management, health seeking behavior and blood sugar levels of nomadic pastoralists.

H_{02}: There is an association between knowledge of T2D management, health seeking behavior and blood sugar levels of nomadic pastoralists

1.5 Study Justification

Diabetes is a global health problem that affects a large population of adults in both developing and developed countries. According to World health Organization (2012), an estimated 422 million people live with diabetes and there is a rising prevalence observed in Low and Middle Income countries. In addition, there has been a 5% increase in preventable mortality from diabetes between the year 2000-2016. It is also worth noting that diabetes has been ranked the 9th leading cause of death with approximately 1.5 million deaths recorded in 2019(World Health Organization, 2020).The alarming rise in deaths and prevalence warrants precautionary measures to curb the disease; a step that will ensure the achievement of SDG 3- "ensuring healthy lives and promoting well-being for all at all ages"(United Nations Department of Economic and Social Affairs, 2016)Consequently, since the outlined preventive measures include managing blood sugar levels with diet, medication and continuous screening (health checks), determining the knowledge of managing T2D and understanding the health seeking behavior within a nomadic population would help evaluate whether as a nation we are on course towards achieving the target indicators of reducing mortality rates from non- communicable disease.

1.6 Significance of the Study

Diabetes being a condition of concern as well as a manageable condition, the study results will be useful in understanding how best the condition can be managed.

These findings would be useful to the ministry of health and national government because it will inform them of the need to improve the service provision to especially rural communities so as to effectively manage diabetes. To the participants and the community, the findings would highlight areas of importance for the management of

diabetes as well as developing health promotion session in a bid to sensitize on the proper management of diabetes. The finding would also contribute to the wealth of knowledge regarding the management and health seeking behavior of a nomadic population.

1.7 Scope of the Study

The study focus was on the knowledge of management of T2D as well as the health seeking behavior among diagnosed diabetic pastoralist who attend clinic at Kapenguria County Referral Hospital in West Pokot County. This has been done as a baseline to determine how much a nomadic population know in the management of T2D considering their stressful living conditions.

1.8 Limitations of the Study

This study employed across sectional research design and therefore the results was not able to establish the cause effect relationship.

This study investigated issues in relation to the knowledge of T2D management, health seeking behavior and blood glucose levels, hence the investigation may be considered as an infringement into an individuals' privacy making majority of the respondents reluctant in responding to the questionnaire. To deal with these problems the researcher assured the respondents of privacy and confidentiality throughout the study period.

Being facility based, the study was limited to those who came for treatment in the health facility as opposed to any participant who would have met the inclusion criteria but was not accessing services at the health facility.

The study was limited to West Pokot County and therefore, it may not be an true reflection of the situation in other areas.

The study relied on hospital blood glucose test and did not utilize the HbA1c test result as a measure of long-term blood glucose control because of lack of diagnostic instruments.

1.9 Assumptions of the Study

According to Simon and Goes(2013), assumptions of the study are things that are bound to happen and therefore the researcher will have to accept them without a sustainable proof. The assumptions of this study is that the respondents understood the reason for research and that they gave objective and true answers to the questions asked.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section contains literature review on the relationship between knowledge of T2D management, health seeking behavior and blood sugar level among pastoralist diabetic participants. Related literature was reviewed according to the objectives of the study to bring out the gaps.

2.2 Burden of Type 2 Diabetes

Diabetes is believed to be the most common and devastating chronic disease in human history. The condition has and is continuing to afflict mankind at unprecedented rate because of poor management due to unregulated blood sugar (Nwankwo et al., 2010). Globally, it is estimated that there will be a 51% increase in the prevalence of diabetes among adults 20 – 79 years, meaning that approximately700 million people will be affected by 2045(International Diabetes Federation, 2019, 2021; World Health Organization, 2021).

In Africa, it is estimated that 47 million people will be affected by the year 2045 and this translates to 143% increase from 2019. Interestingly, both middle east and north Africa is estimated to have 96% increase in the prevalence of diabetes by 2045. In addition, it has been noted that some of Africa 's most populous countries have the highest numbers of people with diabetes and these include: Nigeria 3.9 million, South Africa 2.6 million, Ethiopia 1.9 million, and the United Republic of Tanzania 1.7 million(International Diabetes Federation, 2013, 2019). Consequently, the International Diabetes Federation estimates that of 522,600 people in the region died from diabetes-related causes in 2013 and this represented 8.6% of deaths from all causes in adults, with about 76% of those

deaths occurred in people under the age group of 60 years (International Diabetes Federation, 2013, 2015). Moreover, it would be worth nothing that most of the sub-Saharan diabetic cases remain undiagnosed at 85% (Motala, 2010). For T2D patients living in rural areas, this is often complicated by other issues including practical and financial problems such as the difficulty of reaching treatment centers; affording medicines for which they usually have to pay for and the problem for both patients and family carrot remaining in employment or being effective in family livelihood production (International Diabetes Federation, 2021). As diabetes in Sub-Saharan Africa commonly presents during the peak income-earning period in an individual's life, those affected are often the breadwinners of their family (Stephani et al., 2018).This therefore is an indication that diabetes is becoming an epidemic in African countries ravaging the young adults at their productive age(International Diabetes Federation, 2017). Usually, the onset of T2D is hard to determine resulting in long pre-diagnostic period leading to 1/3 to half of the people with T2D remaining undiagnosed. Undiagnosed often becomes a risk factor to complications of body organs including retinopathies, cardiovascular system eyes and lower limbs ulcers that take long to heal and may sometimes present during diagnosis (American Diabetes Association, 2010).

Globally, issues of poverty are associated with rural life, with challenges in health coverage a common phenomenon in developing countries. Health systems are said to be consistently inequitable, providing more and higher quality services to the well-off rather than to the poor, who need them more (Strasser, 2003). The economic and social consequences of diabetes are expected to be greatest among the poor; reportedly utilizing up to 25% of their income on care and predominantly affecting the breadwinners of these communities (Motala, 2010).

2.3 Etiology, Risk Factors and Diagnosis of Diabetes

While the cause of diabetes is not clearly understood, it is known that the disease is a group of metabolic disorders that occur due to impaired insulin production, use or both. This results to hyperglycemia -high blood sugar levels and insulin resistance- where the cells are unable to use the insulin that facilitate the uptake of glucose hence improper functioning of the cells (Sardesai, 2011; World Health Organization, 2021). Diabetes can be classified into two types that are most common. That is: (i). Type 1 diabetes-characterized by β cells destruction leading to absolute insulin deficiency and it begins in childhood and (ii) Type 2 diabetes- characterized by insulin resistance and associated with age(American Diabetes Association, 2010; CDC, 2022c). Deficiency or impaired insulin utilization does have an effect in the way fat, carbohydrates and proteins are metabolized and used in the tissues(Medical News Today, 2018).

In non-communicable disease, risk factors are important element to consider since they help in prediction as well as identifying preventive strategies for a particular disease. Various studies that have been done in varied contexts have been able to identify some of the cross-cutting risk factors for diabetes. These studies have shown a strong link between ethnicity, overweight, increasing age, family history, diet, sedentary lifestyle and the occurrence ofT2D(CDC, 2022b; Choi & Shi, 2001; Masaki et al., 2015; World Health Organization, 2021, p. 1).These risk factors, particularly those that are modifiable form a basis for the management of diabetes. Various studies have identified strategies that have proven efficient in the regulation of blood sugar levels and these include: dietary changes from consuming a processed diet to a whole based diet (Bazzano et al., 2005), lifestyle changes- physical activity (LaMonte et al., 2005), using medication(Gomes et al., 2019), as well as frequent health check for the purpose of

monitoring blood sugar and to check out for the development of complications(Islam et al., 2021; Vaishnavi & Mishra, 2021).

One of the main challenges that has contributed to the high prevalence, morbidity and mortality from diabetes is late screening. Lack of screening directly results to late diagnosis when the quality of life of the individual has deteriorated (Edelman et al., 2002). Frequent screening in mid and late adulthood is therefore essential for early management and to change the prognosis of the disease. The diagnosis of diabetes depends on the blood sugar levels of an individual. Sometime one could experience signs and symptoms of diabetes, nevertheless a blood test that is confirmatory would determine whether one has diabetes. By definition, diabetes can be a blood glucose level of greater than or equal to 126 milligrams per deciliter (mg/dL) of blood after an 8-hour fast (not eating anything) or A non-fasting glucose level greater than or equal to 200 mg/dL, along with symptoms of diabetes which according to American Diabetes Association, this is the most common method of diagnosis (Expert committee on diagnosis of diabetes, 2021). In addition, a glucose level greater than or equal to 200 mg/dL on a 2-hour glucose tolerance test and finally A1c greater than or equal to 6.5% can be used to diagnose diabetes (Pastakia et al., 2011; WebMD & Dansinger M, 2022). The prolonged high blood sugar in the vessels (hyperglycemia) results in long term damage, dysfunction and failure of body organs including the eyes, heart, nerves and blood vessels (American Diabetes Association, 2010).

2.4 Signs, Symptoms of Diabetes and Complications

Diabetes is a multi-causative metabolic condition with multiple etiologic causes and classification. This depends on clinical presentation, natural history and differences in cause with classic presentation of high blood glucose. The condition results from failure

of glucose to enter into cells for utilization, therefore excess remain in the blood and is excreted (run over) through urine a condition glycosuria or sweet urine.T2DM is classified to include obese persons with diabetes and non-obese persons with diabetes(Ministry of Public Health and Sanitation, 2010)presenting with cluster of cardiovascular risk factors like hypertension dyslipidemia and visceral fat.

It is critical for a diabetic patient to know the classical signs and symptoms of diabetes. According to Center of Disease Prevention (2022a), some of the classical signs of diabetes can include: frequent urination, thirst and hunger as well as blurred vision. The individual may also suffer from numb or tingling hands or feet, slow healing sores, multiple infections including unwanted weight loss, palpitations, rapid respiration, excessive perspiration, difficulties in concentrating, confusion, dizziness and visual disorders (Mbanya & Ramiaya, 2006).

Persistent unregulated blood sugar could result to various complications that affect both macro and microvascular systems of the body (Bloomgarden, 2004). Some of the common complications among diabetic individuals include: nephropathy, neuropathy and impaired vision. Moreover, neuropathy has been shown to be the cause of amputation among diabetic worldwide (Hicks & Selvin, 2019). Furthermore unchecked blood glucose levels could triggers cardiovascular related disease which have been shown to be the leading cause of deaths among diabetes patients(Mathenge et al., 2010; Viigimaa et al., 2020).

Comorbidities Uncontrolled diabetes in Adults with T2D and high Body Mass Index have shown high susceptibility to types of cancer, breast and endometrial in women and colorectal and hepatic cancers in both sexes(Kong et al., 2013; Pastakia et al., 2011). On oral health there is evidence that uncontrolled diabetes greatly affects the soft and hard

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tissues responsible for reversible and irreversible tooth health. These include deep cavities, yeast infections, taste alterations diminished saliva flow leading to decreased quality of life. As a result, chair side screening for diabetes is recommended as routine care to detect and prevent periodontitis (Kudiyirickal & Pappachan, 2015; Leite et al., 2013).The stress involved in managing diabetes, if not controlled can often lead to mental issues such as depression, especially for young people with diabetes, so support from health professionals and family members is vital(Roy & Lloyd, 2012). Therefore, most feasible, cost-effective interventions to improve health in diabetes include blood pressure and glycemic control as well as foot care which is particularly important in low- and middle-income countries should be considered.

Studies from different regions showed that early detection of diabetes and achieving glycemic controls are vital in reduction of development of micro vascular complications; retinopathy, nephropathy and neuropathy of diabetes (Alharithy et al., 2018; Bloomgarden, 2004; Harding et al., 2019), Provision of both clinical management and self-management of diabetes care to the patient while considering and respecting individual needs and values is important to achieve glycemic control. This should be done with reference to guidelines that regulate care giver not to jeopardize patients' rights and their values in making various clinical and social decisions.

2.5 Management of Diabetes

Diabetes, is a chromic manageable disease, and a diagnosed person with well-regulated blood glucose levels can lead a high quality of life. The main goal therefore, in the management of T2D is to eliminate symptoms and delay or slow down the occurrence of complications that occur as a result of hyperglycemia. Several approaches can be used in the management of diabetes and these may include: dietary modification in

combination with physical activity, pharmacological treatment- Intake of oral diabetic drugs or use of insulin to regulate blood sugar levels. In addition to these approaches, is diabetic education to ensure that the patient and the family has adequate knowledge and skill of managing diabetes (Ministry of Public Health and Sanitation, 2010).

2.6 Knowledge of T2D Management

As clearly noted by Ministry of health Kenya in a document on diabetes education of(2010), is that structured diabetes education was new in the country, and that this has not fully been utilized across the country and yet it should be the integral care intervention, agreeing that the ministry requires a structured diabetes program for quality patient care. Patient education gives them knowledge to set treatment goals and how to achieve these goals, the choice available to them, self-care skills, and problem solving, to enhance life quality of the patient and family.

In a study conducted in Nigeria, on the knowledge and management of diabetes also found that patients lacked in knowledge in the areas of the signs and symptoms, what they should eat, and the complications. The study further recommended the need for structured and regular training so that the patients can be equipped with the skill of practices self-care (Uchenna et al., 2009)

A healthy diversified diet consumed in the life course is important to prevent nutrient deficiencies that bring malnutrition and non-communicable diseases. However, the world has experienced a change in lifestyles, increase in production and consumption of highly processed high sugar and salt food products, and low consumption of whole grains and cereals, fruits and vegetables-a shift of dietary patterns that has seen the abandonment of the traditional diets (Maiorino et al., 2017; Ministry of Health Kenya, 2015).

Many governments and public health planners are increasingly becoming aware of the current magnitude and future potential for diabetes increase in being a chronic disease. Globally and regionally, advocacy efforts that include nutrition education by different organizations including governments, private sector, civil society and individuals are enhanced to improve accessibility of diabetes treatment. Though governments follow useful WHO guided strategies in managing non-communicable diseases, it is worth to note that one   strategy may work in an area and may not work in another(International Diabetes Federation, 2019).   Kenya government has produced a guideline on management of all forms of Diabetes, though this has not been cascaded to all health care workers, although some studies allude that health education materials disseminated through public health campaigns, though they raise awareness have not shown to be effective in T2D prevention(International Diabetes Federation, 2019). Other fronts include online short continuous medical education courses targeting diabetes educators and clinical staff. Since diabetes is a slow insidious and progressive disease in many instances, patients would be undiagnosed for years.

Diabetes is a preventable disease, evidence have shown that T2Dcan be prevented by identifying populations at risk, identifying and addressing the risk factors especially modifiable factors early in life (Chege, 2010). A person may always be asymptomatic and glycosuria present and normally overweight. Lifestyle changes that include healthy diet, cassation of smocking and reduction of alcohol, regular physical exercise, including maintenance of healthy body weight forms the cornerstone for T2D management as IDF recommendations for primary care in (2017). Lifestyle modification strategies in longitudinal studies in the USA, China, Finland and India confirmed varying risk reduction levels among populations and follow up periods and were found to be safe achievable, cost effective and are recommended(International Diabetes Federation,

2021), **i**n the event the lifestyle modification strategies are not effective oral pharmacological agents are administered, some of the pharmacological preparations however have side effects that include increase in weight gain, diarrhea, and vomiting, and this would form important knowledge for the clinician and the patient(International Diabetes Federation, 2021; World Health Organization, 2007).To effectively learn to manage diabetes; those with the disease must identify symptoms of emerging health crisis, adhere to complex medication schedules and modify long standing lifestyle behaviors such as their diet and physical activity levels. Diabetes management education has become an important part of the clinical management of diabetes however the process is often complex, demanding and not given much emphasis at professional level because of the time constraint of clinicians.(Nwankwo et al., 2010).

2.6.1 Role of Physical Exercises

In low- and medium-income countries including Kenya, the factors that exacerbate prevalence of T2DM is associated with increase in preventable risk factors that include poor dietary habits like non diversification, excessive body weight resulting from inactivity and poor nutrition.

Regular physical activity reduces risk from diabetes and cardiovascular disorders and on the contrary, insufficient physical activity causes the death of 3.2 million people each year by increasing death from all causes by 20 – 30% while sedentary lifestyles alongside obesity is fueling diabetes condition, so are the complexities of non-modifiable factors (age, gender, family history) and risk factors propel diabetes development (Colberg et al., 2016).

The realities of poverty, hunger and malnutrition in Africa cannot be under estimated where majority live below poverty lines and many of the women are malnourished

(World bank, 2013) T2D benefits of reducing body weight and increasing physical activity also play a role in reducing heart disease, high blood pressure amongst others(Ministry of Public Health and Sanitation, 2010). This has now enabled effective interventions in varied settings.

2.6.2 Role of Dietary Knowledge

Diet holds a significant role in the management of diabetes but diagnosed patients are less conversant with the type of foods they should eat (Abioye-Kuteyi et al., 2005). In a general population, choosing the right foods to eat is more often challenge, and the challenges increase when dietary modification is required (Sami et al., 2020). Choosing the right kind of food and developing a healthy and wholesome dietary pattern depends on the knowledge a patient has on the recommended diet(TSEDEY et al., 2016). Moreover, the shift from a wholesome diet to an overly processed diet in a rural population cannot be ruled out as contributors to diabetes (Peer et al., 2014). A study conducted in Saudi Arabia on the level of dietary knowledge found that majority of the participants had low levels of knowledge. In the assessment, it was further established that the participants had trouble determining how much carbohydrate should be consumed(Sami et al., 2020).Moreover, a cross-sectional study that sought to identify gaps in knowledge among diabetic patients in Zimbabwe, established that the participants lack adequate knowledge on diet (Mufunda et al., 2012). According to Sacova and Miller (2001), the gaps in food selection and the role diet plays in the management was highly attributed to the levels of knowledge the patient had. In this qualitative study, participants had challenges applying the dietary recommendations. From these studies it can be concluded that diet is at the center in the management of diabetes, however the gap in the role of diet depends on whether the patients have had prior knowledge or not.

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2.6.3 Treatment of Diabetes

Pharmacological methods of diabetes management can be used depending on patient glycemic presentation(Gomes et al., 2019). According to the American Diabetes Association(2021), the first line of therapy for adults with diabetes and comorbidities is use of oral medication (metformin) and lifestyle modification. Other types of treatments can include use of insulin therapy or a combination of both insulin and oral medication. However, in all cases the patient needs to be accurately evaluated before administration of medication.

2.7 Health Seeking Behavior

Several studies have pointed that early and intensified glycemic control for patients with erratic blood sugar is important to reduce and delay complications arising from diabetes. The morbidity and mortality resulting from micro and macro vascular complications of T2D place a considerable financial burden on individual patients and on society. Annual review for all patients is important to asses health status (Ministry of Public Health and Sanitation, 2010). Frequent visits to the doctor has proven helpful because it helps determine the risk of diabetes complications. However, studies that assessed health seeking behaviors did not determine the frequency as either important or not (Astrup, 2001; Islam et al., 2021; Viigimaa et al., 2020).

Among health care management team, the diabetic patient plays an integral role in not being forced to take a certain course of action to manage their condition, but to take the best action possible based on what has been seen and known to work in the present knowledge those with Action taken early in the course of diabetes is more beneficial in terms of quality of life and is more cost-effective.

The management of high blood pressure and raised blood lipids (fats) , alongside control of blood glucose, substantially reduces the risk of developing complications that include blindness, cardiovascular disorders, neurological diseases is equally important (International Diabetes Federation, 2019).

2.8 Glycemic Control- Blood Sugar Level

The goal of diabetes management is to improve the quality of life, increase productivity and prevent long and short term morbidities among diabetic patients(Ministry of Public Health and Sanitation, 2010). Nutrition assessment is a key step in evaluating the nutritional health of a person. In so doing, nutrition related problems are identified and corrective measure proposed and implemented(Heiss et al., 1999). In conducting a nutrition assessment several approaches can be used – in combination to bring out and objective assessment. These approaches include: Anthropometric assessments, Biochemical assessments, Clinical assessment and dietary assessment. The scope of this study was to relate knowledge of T2D management, health seeking behavior and blood sugar levels. (Combs, 2012).

In the management of T2D, nutrition screening is usually employed to monitor whether blood glucose levels are controlled. Here, the patients' blood glucose levels and assessed against a standardized range so as to determine whether the blood sugar levels are controlled or not. According to Selvin (2022), Glycated hemoglobin is the mostly used biochemical methods of evaluating glycemic control since it correlates best with mean blood glucose over the previous 8 to 12 weeks. Nevertheless, this may not be a practical option in a resource poor setting and more so in a pastoralist population. Another widely used biochemical method used to monitor whether glycemic targets for individuals are being met is fasting blood sugar of <7.2 mmol/l, or 2 hour post prandial 4 – 8mmol/l are

considered stable(Ministry of Public Health and Sanitation, 2010). In this study the fasting blood sugar levels would be used considering that the study area has limited health care resources.

2.9 Summary of Literature Review

In conclusion, globally diabetes is a concern. As a chronic condition, an increase in prevalence has been observed and it is estimated to affect 415 million adults by the year 2030 with many often going undiagnosed. This make management of diabetes of great concern. To ensure proper management, acquisition of the right knowledge in the management, prescription of the right treatment as well as maintain frequent health checks is key. However, various populations still experience challenges in management of diabetes especially in the translation of knowledge to actual practice hence escalating the disease. A nomadic population is unique and it faces challenges not only at individual management of the disease but also systemic- health system challenges. Therefore, this study seeks to determine the association between Knowledge of T2D, Health seeking behavior and blood sugar levels.

2.10 Conceptual Framework

A conceptual framework in research is used to show the variable that will be used in the study (Independent and dependent) as well as showing their relationship (McGaghie et al., 2001).The conceptual framework in this study was developed based on the observation made from the review of literature. The variables that were used in this study include: knowledge of T2D management and health seeking behavior as the independent variable, while blood sugar levels was the dependent variable as shown in Figure 1 below.

Figure 1

The Conceptual Framework
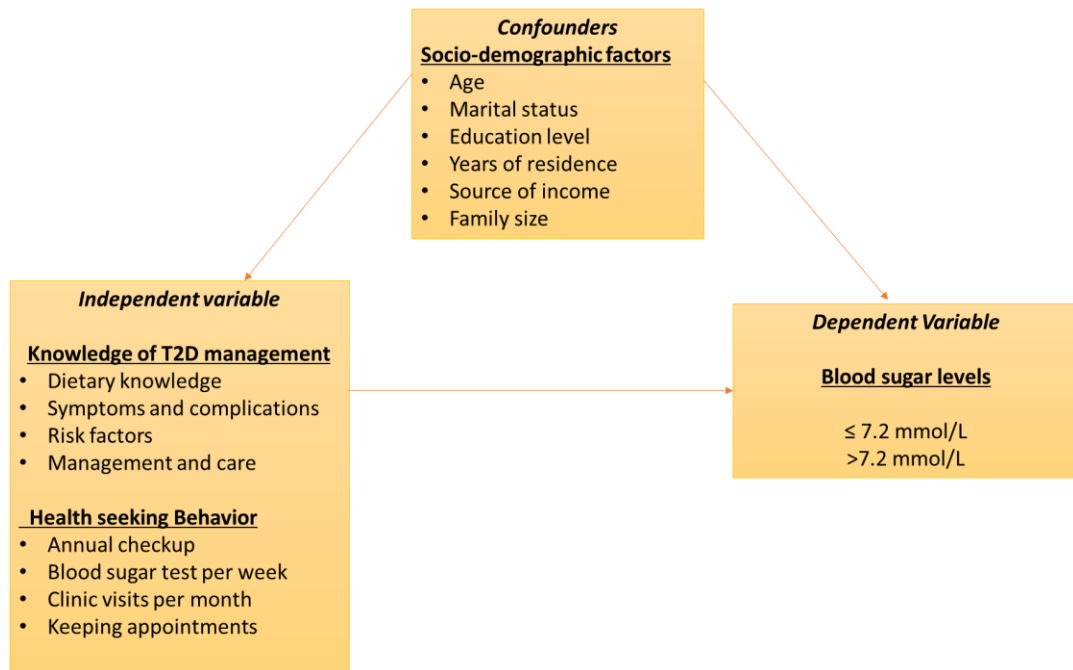
From the Figure it shows the relationship between T2D knowledge, health seeking behavior and blood sugar levels among pastoralists attending Kapenguria County Referral Hospital west Pokot.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter illustrates the process used in undertaken this study. Within the chapter are descriptions of the following:research design, study area, target population of the study, sample size determination and sampling, sampling technique, data collection methods, research instrumentation, data processing and analysis, as well as legal and ethical considerations.

3.2 Research Study Design

The study employed descriptive cross-sectional research design with quantitative approach. The design was deemed suitable because all the variables of study were collected at one point in time (Nedarc, 2019).While the quantitative approach was chosen because it allows to objectively evaluate the data (Quick & Hall, 2015).

3.3 Location of the study

3.3.1 Profile of West Pokot County

West Pokot County, isone of the Arid and Semi-Arid Lands, North of RiftValley Kenya, covering an area of 9,169.4 km^2 with an estimated population of 672,298persons as per 2019 Population projections with a population density of 56 people per Km^2 and an annual growth rate of 3.1%. More than 60% of the county is pure pastoralism and agro pastoralism. These pastoralists occupy four (4) of the sub counties that isPokot West, Pokot South, Pokot North and Pokot Central).

Administratively the County is divided into four sub-counties (West Pokot population comprise of 51% female and 49% male.83 percent of the population is below 35 years.Monetary poverty stands at 57% compared to the national average of 36.1%.

Nutrition, Sanitation, water and Housing are the top drivers of multidimensional poverty in West Pokot County.

The study was conducted at Kapenguria County Referral Hospital that is located in West Pokot Sub-County. The location was chosen because most of the specialized services including diabetic care are offered at the Hospital.

Something to note is that most of these patients are diagnosed late with diabetes and most diagnosis happen accidentally because of the slow insidious progression of T2D.This subsequently becomes the patients' facility to seek specialized treatment as most of them may have developed complications that require specialized management in eyes, foot care, neurological, and cardiological examinations(West Pokot County & Ministry of Heath, 2018).

3.3.2 Kapenguria County Referral Hospital (KCRH)

Kapenguria County Referral Hospital (KCRH) is the main Hospital in the County. The Hospital was founded in the year 1936 as a treatment center. The facility is situated in West Pokot County, Kapenguria Division, within Kapenguria municipality; with catchment population of 27,604 (West Pokot County & Ministry of Heath, 2018). The facility has twenty (20) wards, offers all level 4 and 5 services including diabetes prevention, promotion, diagnosis, care, treatment, rehabilitation and referral services. The most common diseases among all age cohorts include, malaria, upper respiratory disease, diarrhea and Non-Communicable Diseases (NCDs) are making appearances.

3.4 Study Population

The target population in this study are diagnosed and registered diabetic pastoralist patients attending Kapenguria County Referral Hospital to receive care, treatment as well as clinical visits.

3.4.1 Inclusion Criteria

The participants that were included in this study were adults aged eighteen (18) years and above and who were diagnosed with diabetes mellitus and are attending the Kapenguria County Referral Hospital(KCRH)for the last 3 months for diabetes management. The participant should be pastoralists who have been residing within the study area of West Pokot for the last 3 years.

The participants should also have consented to participate in the study.

3.4.2 Exclusion Criteria

The study excluded all participants with diabetes who were below eighteen (18) years of age. Further, all those people who resided in West Pokot during the study period and for the last 3years but were non-pastoralist were also excluded.

Other groups that met the criteria of having T2D but were either pregnant, too ill to respond or consent to participate, or are mentally disable were excluded from the study

3.5 Sample Size and Sampling Procedure

3.5.1 Sample Size Determination

A sample refers to a subset of a population from which inference can be made(Dixon et al., 2016). In this study, the sample size was determined using the (Fisher et al., 1998). A study conducted in Kenya indicated a prevalence of diabetes as5.3%a value that was used in calculating the sample size (Ayah et al., 2013). A true proportion was determined at 95% confidence level. A ten percent (10%) was added to cater for the non-response rate among the selected study participants (Naing et al., 2006)

$$n = \frac{z^2 P q}{d^2}$$

Where

n= minimum sample size

z= 1.96 standard deviation correspondence to 95% CI)

p = Prevalence of T2DM at 5.3 % in Kenya

q = 1-p

d = 0.05 (Level of precision at 5%)

$\mathbf{n} = \dfrac{(1.96)^2(1-0.05)\,(0.05)}{0.05^2}$ =73

10% is added to cater for non-response.

= 73+ 7.3

<div align="center">

n=80.3 participants

</div>

3.5.2 Sampling Procedure

The study population was selected from all pastoralist adult patients diagnosed with T2D and were being managed at Kapenguria County Referral Hospital. Simple random sampling was employed to obtain the number of patients who will participate in the study. The Hospital has two days of medical outpatient clinics(MOPC) per week. Patient's records were reviewed to confirm the total number of adultwith T2D. The patients were each given a number from 1 to n^{th} on each clinic day. The Emergency Nutrition Assessment random number table (Smart Methodology, 2020) was then used to randomly select 20patientson each clinic day, yielding a total of 40 patients per week. This process was repeated until the desired sample size was achieved.

3.6 Research Instruments

Data was obtained using a structured questionnaire that was researcher administered. The questionnaire covered the following areas; Socio-demographic characteristics, Knowledge on T2D management that focused on the knowledge on diet, signs and symptoms, management and care of the disease; Clinical information and health seeking

behavior and a last section on blood sugar levels in which the recent blood sugar values were obtained from the patient's clinic book.

3.6.1 Pre-test of the Research Instruments

The research instrument was pre-tested at Chepareria County Hospital. This hospital is located at Pokot South Sub-County. The hospital offers services to both pastoralist as well as those who practice mixed farming. The hospital was selected because its target population is similar to the one to be used in the study. Therefore, the pre-test was conducted on a population that represented 10% of the sample size. In addition, the participants were also less likely to participate in the main study.

3.6.2 Validity

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)further mentions that the usual procedure in assessing the content validity of a measure is to use a professional or experts in a particular field. In this study, professional advice was sought from experts in the subject matter, especially my supervisors. Criterion validity was measured by analyzing the outcome provided by the data collected using the questionnaires.

3.6.3 Reliability

This is the ability of an instrument to give consistent results on multiple measurements. The findings form the pretest were then analyzed Cronbach's coefficient test. According to (Zohrabi, 2013) a reliability of 0.7 or higher is ideal hence indicates that the question lacks ambiguity and that it is fit for purpose.

3.7 Data Collection Procedure

After obtaining all the perquisite approvals, research assistants with a medical background and knowledge of the local language-to assist in the translation of the questionnaire from English and Kiswahili to the local dialect- were recruited and trained. At the outpatient clinic, the researcher identified patients who met the inclusion criteria and approached them. In the consenting the patients who met the inclusion criteria, the researcher explained the details of the study to them and assuring them of privacy and confidentiality during data collection period and throughout the study. In addition, the patients were informed that they were free to withdraw from the study at any time without any repercussions. The patients were given time to ask any questions with regard to the study. Thereafter, the patients were asked to give a written consent voluntarily agreeing to participate in the study without any pay (Appendix III for consent form). Once the study participants were recruited, they were required to have their blood sugar test at hand. Therefore, they were given a few minutes to undertake blood sugar tests as routinely done during clinical visits. Thereafter, the research assistants administered the questionnaire in a private room within the hospital. After completing the questionnaire, the respondents were further assured that the information obtained from them will be de-identified and that it will be solely used for academic purposes including publications. Thenceforth, the researcher collected all the filled questionnaire and reviewed them to ensure that all questions were filled. The data collection period was successfully completed in 2 weeks.

3.8 Data Management and Analysis.

Before analysis, data was cleaned, coded and entered into an excel file. The data was analyzed in several phases according to the objectives of the study. In the first phase, the blood sugar levels were divided into two different categories according to the WHO's

cutoff levels of fasting blood glucose, that is, the level greater than 7.2 mmol/L is high blood sugar level, while less than or equal to 7.2 mmol/L is considered otherwise.

The socio-demographic factors were measured using six variables that is: age group (i.e., categorized as ≤ 45 years vs. > 45 years), marital status (i.e., categorized as married vs. singles; the singles included unmarried, widow(er), divorced and separated), education level (i.e., categorized as primary and below, secondary and college or university), years of residence (i.e., categorized as ≤ 2 years vs. > 2 years), income source (i.e., categorized as herding, business and other), and family size (i.e., categorized as ≤ 6 members vs. > 6 members).Thereafter, the social demographic characteristics data was described in the form of numbers and proportions in relation to blood glucose levels and presented on tables to answer objective 1.

In the second phase, descriptive statistics- percentages- was used to assess the knowledge of T2D management as well as health seeking behavior. This was used to answer objective 2 and 4.

In the third phase, the differences between the categories of knowledge ofT2D management and health seeking behavior variables were explored by blood sugar levels using the Pearson's Chi-Square technique. This was done to answer objective 3 and 5. On the one hand, the knowledge indicators were combined to determine the binary categories of knowledge of T2D management as follows: (1) Dietary-related knowledge [i.e., high knowledge defined as 'yes' in the 4 indicators = 1; otherwise = 0]; (2) Symptom and complication knowledge[i.e., high knowledge defined as 'yes' in at least any 7 or more indicators = 1; otherwise = 0]; (3) Knowledge of other risk factors[i.e., high knowledge defined as 'yes' in the 3 indicators = 1; otherwise = 0]; (4) Knowledge

of management and care[i.e., high knowledge defined as 'yes' in at least any 4 or more indicators = 1; otherwise = 0].

On the other hand, the health seeking behavior were measured using three variables that is: duration with diabetes (i.e., categorized as ≤ 4 years vs. > 4 years), diabetes treatment type (i.e., categorized as insulin dependent vs. other), and family history of diabetes (i.e., categorized as "no" vs. "yes").

In the final stage of the analysis, logistic regression technique was used to answer objectives 6and 7 on the association between knowledge of T2D management, health seeking behavior and blood sugar levels. The unadjusted and adjusted models were presented with their odds ratios (ORs), 95% confidence intervals (CIs) and the level of significance. The level of significance was set at an alpha level of 0.10 instead of 0.05 because of the small sample size in this study. STATA version 13.1 was used to conduct all the analyses (StataCorp, 2013).

3.9 Ethical Consideration

Ethical approval was sought from Kabarak University Research and Ethics committee, followed by a research permit and authorization from the National Council for Science and Technology (NACOSTI) Ref No 574103.

Permission was sought at the County's, ministry of interior and coordination as well as the ministry of education. Each received the NACOSTI permit as well as the ethical clearance and a written approval was issued to carry out the study at the county.

In addition, permission was further sought at the hospital, the medical superintendent then issued a letter of introduction to the in charge of diabetic clinic.

At the point of data collection, the respondents were consented and assured of privacy and confidentiality. After entering the data in to an excel file, the researcher ensured that the file was encrypted stored in a password protected computer. All hard copies of the questionnaires were stored in a private room with limited access in a metallic cabinet that is lockable. The data will be discarded through shredding after the successful completion of the study.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This section presents the quantitative findings of the study. All data was analyzed using STATA version 13.1. Both descriptive statistics such as percentages and inferential statistics such as Pearson Chi-square and logistic regression were employed to obtained the presented results. All the results are presented according to the study objectives.

4.2. General Information

This study was conducted in a pastoralist population. The participants interviewed had come for their regular clinic appointment. The response rate for the study was at 99%.

4.3. Findings as per the Objective of the Study

4.3.1 Socio-demographic Characteristics of Diabetic Pastoralists attending Kapenguria County Referral Hospital

Data on the socio-demographic characteristics of the study participants were analyzed and the findings showed that half of the participants were 45 years and below of which 28 (58.3%) had high blood sugar levels. Likewise, majority of the participants who were above 45 years were found to have high blood sugar 28 (90.3%), $p= 0.002$ Table 1. In addition, majority of the participants who had high blood sugar were married, had attained at least primary education, has lived in West Pokot for more than 2 years and had a family size (30 (71.4),25 (75.8), 38 (77.5) and 30 (78.9) respectively. However, these were not found to be statistically significant.

The differences between the categories of the potential confounders was only statistically significant in two variables, that is, age group (p-value = 0.002) and years of residence (p-value = 0.096). Over 90% of participants who were aged above 45 years had blood sugar levels greater than 7.2 mmol/L, while 77.5% of those who were

residence in the community for more than 2 years had blood sugar levels greater than 7.2 mmol/L.

Table 1

Socio-Demographic Characteristics of Diabetic Pastoralists attending Kapenguria County Referral Hospital

| | **Total n** | **Blood Sugar levels, *n* (%)** | | **P- value[a]** |
		≤ 7.2 mmol/L	**> 7.2 mmol/L**	
Sociodemographic Factors				
Age group				0.002
≤ 45 years	48	20 (41.7)	28 (58.3)	
> 45 years	31	3 (9.7)	28 (90.3)	
Marital status				0.910
Married	42	12 (28.6)	30 (71.4)	
Single	37	11 (29.7)	26 (70.3)	
Education level				0.356
Primary and below	33	8 (24.2)	25 (75.8)	
Secondary	27	7 (25.9)	20 (74.1)	
College/university	19	8 (42.1)	11 (57.9)	
Years of residence				0.096
≤ 2 years	30	12 (40.0)	18 (60.0)	
> 2 years	49	11 (22.5)	38 (77.5)	
Income source				0.574
Herding	20	4 (20.0)	16 (80.0)	
Business	27	9 (33.3)	18 (66.7)	
Other	32	10 (31.3)	22 (68.7)	
Family size				0.129
≤ 6 members	41	15 (36.6)	26 (63.4)	
> 6 members	38	8 (21.1)	30 (78.9)	

[a], Pearson's χ^2 was used to test the difference between groups

4.3.2 Knowledge of T2D Management among Diabetic Pastoralists

Table 2presents the knowledge indicators of T2D management among the seventy-nine diabetic pastoralists. On dietary-related knowledge, the majority of the participants knew that high sugar intake (72.2%), some types of food (83.5%) and food preparation techniques (73.4%) were important in the management of T2D. The majority also knew symptoms and complications associated with T2DM, except for the knowledge on poor

blood circulation (35.4%). In the knowledge of other risk factors category, the effect of exercise in regulating insulin (75.9%) was known and that regular physical exercise was important (83.5%) in the management of T2D. However, few knew that family history of diabetes was a risk factor (40.5%). In the knowledge of the management and care, 40.5% and 31.6% respectively, believed that T2D is curable and that urine test is important.

Table 2

Knowledge of T2D Management among Diabetic Pastoralist attending Kapenguria County Referral Hospital in West Pokot n=79

Variables	No, *n* (%)	Yes, *n* (%)
Knowledge of type 2 diabetes mellitus		
Dietary-related knowledge		
High sugar intake	22 (27.8)	57 (72.2)
Some foods are good	13 (16.5)	66 (83.5)
Diet controls diabetes	43 (54.4)	36 (45.6)
Food preparation method is important	21 (26.6)	58 (73.4)
Symptoms & complication knowledge		
High blood sugar damages kidney	27 (34.2)	52 (65.8)
Eye problems	17 (21.5)	62 (78.5)
Damaged blood vessels	36 (46.2)	42 (53.8)
Dizziness	23 (29.1)	56 (70.9)
Poor blood circulation	51 (64.6)	28 (35.4)
Slow healing wounds	12 (15.2)	67 (84.8)
Diabetes damages kidney	30 (38.0)	49 (62.0)
Diabetes causes loss of feeling in extremities	22 (27.8)	57 (72.2)
Shaking and sweating	28 (35.4)	52 (64.6)
Knowledge of other risk factors		
Exercise assist body to use insulin	19 (24.1)	60 (75.9)
Family history of diabetes	47 (59.5)	32 (40.5)
Regular physical exercise is important	13 (16.5)	66 (83.5)
Knowledge of management & care		
Diabetes is curable	47 (59.5)	32 (40.5)
Urine test is necessary	54 (68.4)	25 (31.6)
Diet and exercise controls diabetes	25 (27.8)	57 (72.2)
Cutting toenails should be done carefully	12 (15.2)	67 (84.8)
Comfortable shoes and socks necessary	15 (19.0)	64 (81.0)

4.3.3 Differences in the knowledge of T2D Management by the Blood Sugar Levels

Table 3 presents the results of the difference between different categories of knowledge of T2D management by blood sugar levels. Worthy to not is that 70.9% of all of the participants had high blood sugar levels above 7.2 mmol/L. In the knowledge indicators, only the difference between the categories on the knowledge of risk factors was statistically significant at p-value = 0.077, with 82.8% of those who had high knowledge having a higher blood sugar levels greater than 7.2 mmol/L. From the results.

Table 3

Prevalence of High Blood Sugar and the difference in the knowledge of T2D Management by Blood Sugar Levels among Diabetic Pastoralist attending Kapenguria County Referral Hospital in West Pokot, n = 79

Variables	Blood sugar levels, *n* (%)			
	Total *n*	≤ 7.2 mmol/L	> 7.2 mmol/L	*P*-value[a]
Total number of participants	79	23 (29.1)	56 (70.9)	
KNOWLEDGE OF T2D MANAGEMENT				
Dietary-related knowledge				0.621
Low	48	13 (27.1)	35 (72.9)	
High	31	10 (32.3)	21 (67.7)	
Symptom & complication knowledge				0.749
Low	40	11 (27.5)	29 (72.5)	
High	39	12 (30.8)	27 (69.2)	
Knowledge of other risk factors				0.077
Low	50	18 (36.0)	32 (64.0)	
High	29	5 (17.2)	24 (82.8)	
Knowledge of management				0.293
Low	45	11 (24.4)	34 (75.6)	
High	34	12 (35.3)	22 (64.7)	

4.3.4 Health seeking behavior of pastoralist attending Kapenguria County Referral Hospital

In the health seeking behavior presented in Table 4, the majority of the participants were receiving two or more annual checkups (53.2%). Nineteen percent were however not receiving any checkup. Also, only 34.2% of the participants were conducting two or more blood sugar tests per week, while 36.7% of them were having two or more clinic visits per month. The majority of the participants also indicated that they do not keep clinic appointments (63.3%).

Table 4

Health seeking behavior of Diabetic Pastoralist attending Kapenguria County Referral Hospital in West Pokot, n=79

Variables	*n* (%)
Health seeking behavior	
Diabetic annual checkup	
None	15 (19.0)
Once	22 (27.8)
Twice or more	42 (53.2)
Blood sugar test per week	
Once	52 (65.8)
Twice or more	27 (34.2)
Clinic visits per month	
Once	50 (63.3)
Twice or more	29 (36.7)
Keep clinic appointments	
No	50 (63.3)
Yes	29 (36.7)

4.3.4.1 Health seeking behavior of Pastoralist attending Kapenguria County Referral Hospital by Blood Sugar

A further description of the participant's health seeking behavior by blood sugar found that only diabetic annual checkup was statistically significant at *p*-value = 0.030, with 86.7% of those who do not go for annual checkups having a higher blood sugar levels greater than 7.2 mmol/L as shown in Table 5.

Table 5

Health seeking behavior of Diabetic Pastoralist attending Kapenguria County Referral Hospital in West Pokot by Blood Sugar Levels, n=79

	Blood sugar levels, *n* (%)			
	Total *n*	**≤ 7.2 mmol/L**	**> 7.2 mmol/L**	***P*-value[a]**
HEALTH SEEKING BEHAVIOR				
Diabetic annual checkup				0.030
None	15	2 (13.3)	13 (86.7)	
Once	22	11 (50.0)	11 (50.0)	
Twice or more	42	10 (23.8)	32 (76.2)	
Blood sugar test per week				0.653
Once	52	16 (30.8)	36 (69.2)	
Twice or more	27	7 (25.9)	20 (74.1)	
Clinic visits per month				0.775
Once	50	14 (28.0)	36 (72.0)	
Twice or more	29	9 (31.0)	20 (69.0)	
Keeps clinic appointments				0.189
No	50	12 (24.0)	38 (76.0)	
Yes	29	11 (37.9)	18 (62.1)	

[a], Pearson's χ^2 was used to test the difference between groups; T2DM, type-2 diabetes

4.3.5 Association between knowledge of T2D Management and Blood Sugar among Pastoralist Attending Kapenguria County Referral Hospital by blood sugar

Table 6 presents the results of the association between Knowledge of T2D management and blood sugar levels. After adjusting for all the variables, those who had high dietary-

related knowledge and high knowledge of symptoms and complication were 0.31 (95% CI: 0.08 − 1.26; $p \leq 0.10$) and 77% (95% CI: 0.07 − 1.36; $p \leq 0.10$) less likely to have blood sugar levels higher than 7.2 mmol/L, respectively.

However, the result on the participants who had high knowledge of other risk factors was unexpected before and after adjustment. After adjusting for all the variables, participants who had high knowledge of other risk factors were 10.5 times (95% CI: 1.84 − 60.53; $p \leq 0.05$) more likely to have blood sugar levels higher than 7.2 mmol/L.

Table 6

Unadjusted and Adjusted Model of the Association between Knowledge of T2D Management and Blood Sugar Levels among Diabetic Pastoralist attending Kapenguria County Referral Hospital in West Pokot, n=79

	Odds ratio (95% Confidence interval)	
Variables	**Unadjusted**	**Adjusted[a]**
KNOWLEDGE OF T2DM MANAGEMENT		
Dietary-related knowledge		
Low	1	1
High	0.78 (0.29, 2.09)	0.31 (0.08, 1.26)*
Symptom & complication knowledge		
Low	1	1
High	0.85 (0.32, 2.26)	0.23 (0.06, 1.36)*
Knowledge of other risk factors		
Low	1	1
High	2.70 (0.88, 8.30)*	10.5 (1.84, 60.53)**
Knowledge of management		
Low	1	1
High	0.59 (0.22, 1.58)	0.46 (0.11, 1.90)

[a], adjusted for age group, marital status, education level, years of residence, income source, family size, duration with diabetes, diabetes treatment type and family history of diabetes; T2D, type-2 diabetes mellitus; * $p \leq 0.10$; ** $p \leq 0.05$

4.3.6 Association between Health Seeking Behavior and Blood Sugar among Pastoralist Attending Kapenguria County Referral Hospital by Blood Sugar

Table 7 shows the ORs and 95% CI of the association between health seeking behavior and blood sugar levels. Only diabetic annual checkup was associated with blood sugar levels, with the participants who had at least one checkup yearly being 0.15 times (95% CI: 0.03 – 0.85; $p \leq 0.05$) less likely to have blood sugar levels higher than 7.2 mmol/L before adjusting for all the variables. After adjustment, they became 91% (95% CI: 0.01 – 0.68; $p \leq 0.05$) less likely to have blood sugar levels higher than 7.2 mmol/L. The participants who were keeping clinic appointments were also 62% less likely to have blood sugar levels higher than 7.2 mmol/L, though the association was marginally significant at $p \leq 0.10$.

Table 7

Unadjusted and Adjusted Model of the Association Between Health Seeking Behavior and Blood Sugar Levels of Diabetic Pastoralist attending Kapenguria County Referral Hospital in West Pokot, n=79

	Odds ratio (95% Confidence interval)	
Variables	**Unadjusted**	**Adjusted[a]**
Health Seeking Behavior		
Diabetic annual checkup		
None	1	1
Once	0.15 (0.03, 0.85)**	0.09 (0.01, 0.68)**
Twice or more	0.49 (0.09, 2.56)	0.56 (0.08, 4.15)
Blood sugar test per week		
Once	1	1
Twice or more	1.27 (0.45, 3.60)	1.35 (0.31, 5.90)
Clinic visits per month		
Once	1	1
Twice or more	0.86 (0.32, 2.35)	1.19 (0.31, 4.62)
Keeps clinic appointments		
No	1	1
Yes	0.52 (0.19, 1.39)	0.38 (0.10, 1.44)

[a], adjusted for age group, marital status, education level, years of residence, income source, family size, duration with diabetes, diabetes treatment type and family history of diabetes; T2D, type-2 diabetes mellitus; * $p \leq 0.10$; ** $p \leq 0.05$

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings and relates it to literature that support or do not support the findings. Both important findings and those that were assumed to be critical in the management of diabetes are discussed. In addition, the researcher's views will be added as possible reasons for the unique findings observed in the study. The discussion is presented in three broad areas that is: Socio demographic and economic characteristics of pastoralists, knowledge of T2D management among pastoralists and health seeking behavior of diabetic pastoralist seeking care at Kapenguria referral hospital in West Pokot, Kenya. At the close of the chapter, will be the conclusion of the study as well as key recommendations that are drawn from the discussion.

5.2 Discussion of the Findings

5.2.1 Demographic characteristics of diabetic pastoralists

Among the demographic characteristics of the study participants, only, age group (p-value = 0.002) and years of residence (p-value = 0.096)were statistically significant, it was observed that majority of the participants who were aged above 45 years had high blood sugar levels a finding that is supported by literature. In this regard, various studies on the factors associated with diabetes identifies age as a key determinate for diabetes (Asamoah-Boaheng et al., 2019; Chege, 2010; Choi & Shi, 2001; Mohamed et al., 2018; Zafar et al., 2011).

On the year of residence, it was observed that participants who were residence in the community for more than 2 years had blood sugar levels greater than 7.2 mmol/L. This presented an interesting picture of the pastoralists who are known to move from place to

place in search of pasture and water for their animals. The probable explanation could be pastoralists are now settling to permanent homes due to population increase, animal diseases being more controlled as well as the transition to agro-pastoralist where they practice crop production in addition to keeping livestock. In a study that assessed the dietary patterns among agro-pastoralists in Tanzania and the risk for metabolic syndromes observed that a diet rich in maize, bean and dairy increases the risk of one being overweight (Khamis et al., 2022); this could be a predisposing factor to the high blood sugar levels observed in this study.

5.2.2 Knowledge of T2D Management

In addition to the demographics of the study participants, this study also evaluated the participant's knowledge of T2D management. This was analyzed by describing the general knowledge on management followed by relating knowledge with blood sugar levels. This study found that while majority of the participants attested that there are good foods than others 66 (83.5%), over half of the participants 43 (54.4%).

did not consider diet to be important for managing diabetes but further observed that food preparation is important58 (73.4%). Diet is considered an important element in the management of diabetes and hence it forms part of the nutrition education that is given to patient (Ley et al., 2014). In a study conducted in Saudi Arabiaon dietary knowledge showed that adults with T2D had poor dietary knowledge (Joshi & Joshi, 2009; Sami et al., 2020; SoniaJebalalitha et al., 2015). This concurred with our findings and further suggest that many diabetic patients may not have a clear understanding of the role of diet in the management of diabetes.

On the association between knowledge of T2D management and blood sugar level, this study found that those with high dietary knowledge were 0.31 times less likely to have

high blood sugar levels after adjustment of all variables. These finding were supported by a study conducted in Nigeria that showed that patients with a higher mean dietary knowledge score were more likely to have good dietary practices and controlled blood sugar levels (Abioye-Kuteyi et al., 2005). This justifies the need for nutrition advice among diabetic patients, making dietary knowledge a critical determinant for controlled blood sugar level. When a patient knows what to eat and understands how diet affects their blood sugar they would be in a better position to manage diabetes.

An assessment on sign and symptoms as a knowledge indicator showed that more than half of the participants did not know that poor blood circulation could be a symptom and a sign of complication (64.6%). A further analysis also showed an association between high knowledge of symptoms and complications and blood sugar levels with an odds ratio of 0.23(0.06,1.36). It is important for a diabetic patient to know signs and symptoms that may present in the cause of the disease since this may be an indication of poor self-care leading to unregulated blood sugar(Song, 2010). In addition, Song(2010), suggests that a knowledge of signs and symptom could enable the patient to make an active choice in seeking care or even ensuring that blood sugar levels are well regulated hence improving health outcomes. Furthermore, the patient would be aware that frequent occurrence of signs and symptoms could be a predisposing factor to complications. In a study that evaluated blood flow in diabetic patients found that those without evident complications still had low blood volume compared to control which could be a predisposing factor to complication if blood sugar levels are not controlled(An et al., 2018).

This study also assessed risk factors as a knowledge indicator. The findings showed that more than half of the participants did not know that family history of diabetes is a risk

factor for diabetes (59.5%). The difference in the knowledge of risk factors byblood glucose levels was significant p= ≤0.07, with majority of those who had high knowledge having high blood sugar of greater than 7.2 mmol/L. In addition, the study findings also showed that those with high knowledge on risk factors were 10.3 times more likely to have high blood glucose levels. In a systematic review conducted among an adult Ghanaian population showed that family history is a major risk factors for diabetes (Asamoah-Boaheng et al., 2019).Similarly, a cross-sectional study conducted in Northern Punjab of Pakistan also identified family history among the risk factors of diabetes (Zafar et al., 2011). The lack of knowledge that family history is a risk factor insinuates that pastoralist may not be getting adequate diabetic education especially on the risk factors of diabetes. According to Baptiste-Roberts and colleagues(2007), who conducted a cross-section study among the American observed that participants with family history of diabetes were more aware of the diabetes risk factors and practiced positive health seeking behavior such as early screening.

This finding could easily be interpreted that those who are more aware of risk factors, could easily manage and prevent diabetes as well as complications that may arise but on the contrary, in this study, the finding showed that majority of the participants who has high knowledge of T2D management had high blood sugar and were more likely to have high blood sugar. Similar findings were observed in a study by (Alharithy et al., 2018) that patients with family history of diabetes were likely to have cerebrovascular events while those with parental history had predisposing factors to diabetes such as high Body Mass Index (BMI) and a high waist hip circumference. Overall, these interesting findings of having knowledge of risk factors and high blood sugar could mean that the condition is developing, preventive measures have not been put in place or that the preventive measures are not practiced. The 10.5 times more likelihood of having high

blood sugar with high knowledge could be attributed to the following: 1. The stressful conditions that pastoralist face on a day to day basis looking for pasture. In other studies, that evaluated the role of stress in diabetes showed that participants exposed to different levels of stress would have high bloods sugar levels (Sancini et al., 2017; Yitshak-Sade et al., 2020).In these stressful situations, various hormones that have a role in carbohydrate metabolism come into play - epinephrine (adrenaline), glucagon, growth hormone and cortisol - which could explain this association(diabetes and stress).Lastly is the small sample size used in this study hence this may not necessarily be a true picture of the pastoralist population. Therefore, conducting this study in a bigger population is recommended.

In the knowledge indicators for management, almost half of the participants mentioned they did not know that urine test was necessary 54 (68.4%). In addition, having knowledge in management showed a trend of a less likelihood of having high blood sugar. This finding was similar to a study conducted in Nigeria that showed that many diabetic patients did not know the need of urine testing (Uchenna et al., 2009).Furthermore, Marsden& Pickering (2015), suggest that urine test is not necessary for diagnosis but they can be a good screening tools for already diagnosed patients to evaluate the level of blood glucose level or presence of ketone bodies. As a result, better and more efficient methods of diagnosing and screening have been developed. This therefore, explains the reason why majority of the participants did not know the importance of a urine test.

5.2.3 Health seeking behavior of diabetic pastoralist

Health seeking behavior refers to the action taken by an individual suffering from a particular condition with the aim of managing the condition (Latunji & Akinyemi,

2018). As a diabetic patient an individual's health seeking behavior forms a critical component in the management of the condition and prevention of complications. Key actions may include but not limited to presentation to health facilities and compliance to treatment (Vaishnavi & Mishra, 2021). In this study, health seeking behavior was measured using annual check-up, blood sugar testing, clinical visits and keeping clinical appointments. However, only diabetic annual checkup was statistically significant at p-value = 0.030, with majority of those who go for checkups twice or more times having a higher blood sugar levels greater than 7.2 mmol/L. In an in-depth analysis of the association of health seeking behavior and blood sugar levels, the findings showed that those who had an annual checkup one were 91 times less likely to have high blood sugar levels p-value = < 0.05. This finding is similar to a study conducted in Bangladesh among diabetic patients that evaluated the need for health care visit by the patients. The finding showed that those who did not visit a physician in three months preceding the study were more likely to have uncontrolled blood sugar (Islam et al., 2021). Furthermore, there are chances that when one has annual checkup regardless of the frequency, the patients could receive diabetes education including nutrition education, setting social and economic goals which helps to keep blood glucose levels on check. In addition, this could be a time to evaluate the risk for compilations by visiting medical specialist as observed by (Stephani et al., 2018). Nevertheless, more studies need to be done to evaluate the frequency of various health seeking behavior and the impact is can have on glycemic control.

5.3 Conclusion

In conclusion, the rise in the prevalence of diabetes is a major concern worldwide and therefore effective strategies for management of T2D are of great importance. However,

there are many factors identified that can influence management positively or negatively and hence the prognosis of the condition.

In this study, an assessment of the Knowledge of T2D management and health seeking behavior of diabetic patients in relation to blood sugar levels was determined. The findings showed that majority of the participants had high blood sugar levels as well as low knowledge of T2D management. This study also observed that health seeking behavior was an important aspect of management since those who had health checks had a lesser odd of having high blood sugar levels. Therefore, to curb the rising trend in the prevalence of T2D, more emphasis to be geared towards nutrition education as well as encouraging more frequent health seeking behaviors.

The findings showed that majority of the participants had high blood sugar levels as well as low knowledge of T2D management.

5.4 Recommendations

This study therefore presents the following recommendation based on the findings.

1. There is large body of literature that has shown the role of knowledge in the management of T2D and this study has contributed by relating the level of knowledge to blood sugar levels. Overall, it has been noted that the level of knowledge is low among diabetic patients. Therefore, this study recommends the needs for emphasizing nutrition education and assisting the patient in developing individualized strategies towards management of T2D.

2. Health seeking behavior has been identified as a component in the management of T2D. In this study, the evaluation by frequency further emphasizes its importance. Therefore, this studies recommends more education that is geared

towards promoting and adhering to health seeking behaviors such clinical visits, frequent checkups, frequent blood sugar testing as part of the treatment regime.

3. For research, there is still limited evidence with regard to T2D in a pastoralist population. In as much as the study contributes to this body of evidence by assessing the knowledge of T2D management and health seeking behaviors among pastoralists, there is need to further explore the dietary practices of the population. In addition, studies with bigger sample size will be beneficial in generalizing the findings to the population.

4. In a hardship area like West Pokot, and with the pastoralist lifestyle, access to services can be a challenge. Therefore, the study recommends upgrading facilities with modern infrastructure and personnel to ensure comprehensive services are offered for improved treatment outcomes.

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Appendix I: Research Tools

Questionnaire
Section A: Demographic Information

Please tick the most appropriate response

1. Age (years)-……………………………………

2. Gender

      Male   ☐   Female   ☐

3. Marital status: Married ☐Single ☐Divorced ☐Widow/Widower   ☐

Separated   ☐

4. Education

      Completed primary   ☐   completed Secondary   ☐

      College   ☐   University   ☐

      No formal education   ☐

1. How long have you lived in your current home?

   < One year   ☐one to two years ☐> 5 years☐

2. What is your source of income ………………………..

   Hearding animals☐ business☐

   Other specify…………………………☐

3. How many people live in your house?

   1 -3☐   4- 6☐>7☐

Section B: Clinical Information

1. 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   ☐

      If insulin

a)Who injects you a) self ☐   b) Health worker ☐   c) other specify ☐

b)Which sites are injected …………..

c)Where do you get your diabetes medical supplies?(insulin ,syringes, medicines)

3. Family history of diabetes

a)Yes ☐   b) No ☐

If yes Paternal   ☐Maternal ☐

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

     a) Print media

     b) Electronic media

c) Religious organization(Church, mosque) tick appropriate

`   d) Groups/friends

e) Health care provider

f) Other (please specify)……………………

5. Are there diabetic educators at the hospital that teach you about diabetes? (Please circle the most appropriate)

     a) Yes   b) No

c) Sometimes   d) I don't know

6. To what extent are you satisfied with the diabetic management teaching at the hospital? (Please circle the most appropriate)

     a) Extremely high

     b) High

c) Moderate

d) Low

e) Extremely low

Section C: Diabetes Knowledge Test

Questions under each sub-heading on self-management

- Blood sugar monitoring

- Footcare

- Medication

- Exercise

- Food

Diabetes Knowledge Test (SA- Strongly Agree, A-Agree, NS- Not Sure, D-Disagree, SD- Strongly Disagree)

No	Question	SA	A	NS	D	SD
1	Eating too much sugar and other sweet foods is a cause of diabetes.					
2	Specific foods are good for diabetics					
	High blood sugar levels over time damages kidneys					
2	Unconrolled blood sugar causes eye conditions					
3	High blood sugar over time damage the blood vessels					
4	Kidneys produce insulin					
5	Physical exercise help the body use insulin					
6	If I am diabetic, my children have a higher chance of being diabetic.					
7	Diabetes can be cured.					
8	Dizziness and blurring of vision is a sign of low blood sugar					
9	The best way to check my diabetes is by testing my urine					
10	There are two main types of diabetes: Type 1 (insulin dependent) and Type 2 (noninsulin dependent).					
11	Diet is more important than medication in controlling my diabetes.					
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	Diabetics should put on comfortable shoes and socks					
17	The way I prepare my food isas 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	Diabetic need regular physical exercise					

Section D: Health Seeking Practices

1. Where did you first seek help from when you become ill?

      Hospital   2) Herbalist   3) Other specify

2. How often do you attend diabetic annual checkup?

    a) None ☐   b) once ☐   c)> 2 times ☐

3. How often do you take your blood sugar tests per week?

    a) Once☐   b) Twice☐   c)> 3 times☐

4. If using insulin, which sites do you inject insulin?.................................

5. How often do you attend clinic per month?

    a) Once ☐   b) Twice☐   c) >3 Twice☐

6. Are there times you skip clinics? a) Yes ☐   b) No☐

7. If yes why? Specify

    a)Facility far ☐ b)when am not feeling ill☐ c) Ihave not been told☐

Glycemic Control

8. What is the blood glucose level for today

    Normal ☐   Low ☐   High ☐

9. Where do you test your blood glucose?   Home ☐   Facility ☐

10. Which gender had poor glycemic control? Female ☐   Male ☐

Thank you very much for your time

Translated Questionnaire

To Obtain The Responses for Knowledge of Type 2 Diabetes Management, Health Seeking Behavior and Blood Sugar Level among Diabetic Pastoralist in West Pokot Viambatanisho

Kiambatisho I: Zana Za Utafiti

Dodoso

Sehemu ya A: Maelezo ya Idadi ya Watu

Tafadhali tick majibu sahihi zaidi

1. Umri (miaka)-...

2. Jinsia

      Mwanamke wa   ☐   Mwanamume ☐

3. Hali ya ndoa :   Mjane ☐ Mmoja Aliyetalikiana ☐Hajaoa/olewa

      ☐Atenganishwa   ☐

4. Elimu

      Kukamilika kwa msingi   ☐ Sekondari iliyokamilika☐

          Chuo Kikuu cha Chuo ☐Hakuna elimu   rasmi☐

1. Umeishi kwa muda gani katika nyumba yako ya sasa?

   < Mwaka   ☐mmoja hadi miwili miaka ☐> 5☐

2. Nini chanzo chako cha mapato ....

   Kusikia biashara☐ ya wanyama☐

   Nyingine zinabainisha.......................... ☐

3. Ni watu wangapi wanaishi katika bomba lako

   1 -3☐   4- 6☐>7☐

Sehemu B: Taarifa za Kliniki

1. Umepata ugonjwa wa kisukari kwa muda gani?

      a) Chini ya miaka 5   b) miaka ☐ 5 – 10☐

      c) Zaidi ya miaka ☐ 10

2. Aina ya matibabu ya kisukari

      Insulin ☐   b) Vidonge ☐ c) Hakuna dawa   ☐

      Kama insulini

a)Anayekudunga sindano a) nafsi ☐ b) Mhudumu wa ☐ afya

 c) wengine wanataja ☐

     b)Ni maeneo gani yanayodungwa ....

     c)Unapata wapi vifaa vyako vya matibabu ya kisukari? (insulini ,sindano, dawa)

3. Historia ya familia ya ugonjwa wa kisukari

a)Ndiyo   ☐   b) Hapana   ☐

Kama ndio Paternal   ☐Maternal ☐

4. Nini chanzo chako cha habari kuhusu usimamizi wa ugonjwa wa kisukari (Tafadhali duara inayofaa zaidi)

     a) Vyombo vya habari vya uchapishaji

     b) Vyombo vya habari vya kielektroniki

c) Shirika la kidini (Kanisa, msikiti) linalofaa

'd) Vikundi/marafiki

e) Mhudumu wa afya

f) Mengine (tafadhali taja)......................

5. Je, kuna waelimishaji wa kisukari hospitalini wanaokufundisha kuhusu ugonjwa wa kisukari? (Tafadhali duara inayofaa zaidi)

    (a) Ndiyo) Hapana

c) Wakati mwingine) sijui

6. Kwa kiwango gani umeridhika na ufundishaji wa usimamizi wa kisukari hospitalini? (Tafadhali duara inayofaa zaidi)

    a) Juu sanab) Juuc) Wastanid) Chinie) Chini sana

Sehemu C: Mtihani wa Maarifa ya Kisukari

Maswali chini ya kila kichwa kidogo juu ya usimamizi wa kibinafsi

- Ufuatiliaji wa sukari kwenye damu
- Utunzaji wa nyayo
- Dawa
- Zoezi
- Chakula

Mtihani wa Maarifa ya Ugonjwa wa Kisukari (SA- Kukubaliana sana, A-Agree, NS- Not Sure, D- Disagree, SD- Kutokubaliana sana)

La	Swali	Yake	A	NS	D	Sd
1	Kula sukari nyingi na vyakula vingine vitamu ni sababu ya ugonjwa wa kisukari.					
2	Vyakula maalum ni vizuri kwa wagonjwa wa kisukari					
	Kiwango cha juu cha sukari kwenye damu baada ya muda huharibu figo					
2	Sukari isiyokobolewa ya damu yasababisha hali ya macho					
3	Sukari ya juu ya damu baada ya muda huharibu mishipa ya damu					
4	Figo zazalisha insulini					
5	Mazoezi ya mwili husaidia mwili kutumia insulini					
6	Ikiwa nina ugonjwa wa kisukari, watoto wangu wana nafasi kubwa ya kuwa na ugonjwa wa kisukari.					
7	Ugonjwa wa kisukari unaweza kutibika.					
8	Kizunguzungu na kufifia kwa uoni ni dalili ya sukari ndogo kwenye damu					
9	Njia bora ya kuangalia kisukari changu ni kwa kupima mkojo wangu					
10	Kuna aina kuu mbili za kisukari: Aina ya 1 (insulini tegemezi) na Aina ya 2 (noninsulin tegemezi).					
11	Lishe ni muhimu zaidi kuliko dawa katika kudhibiti ugonjwa wangu wa kisukari.					
12	Dawa ni muhimu kuliko lishe na mazoezi ya kudhibiti ugonjwa wangu wa kisukari					

13	Ugonjwa wa kisukari mara nyingi husababisha mzunguko duni					
14	Kupunguzwa na kukatika kwa ugonjwa wa kisukari hupona polepole zaidi.					
15	Wagonjwa wa kisukari wanapaswa kuchukua tahadhari ya ziada wakati wa kukata toenails zao.					
16	Wagonjwa wa kisukari wanapaswa kuvaa viatu vizuri na soksi					
17	Jinsi ninavyoandaa chakula changu ni muhimu kama vyakula ninavyokula.					
18	Kisukari kinaweza kuharibu figo zangu					
19	Ugonjwa wa kisukari unaweza kusababisha kupoteza hisia mikononi, vidoleni na miguuni.					
20	Kutetemeka na kutokwa na jasho ni dalili za kuwa na sukari nyingi kwenye damu.					
21	Kisukari kinahitaji mazoezi ya mwili mara kwa mara					

Sehemu Ya D: Mazoea Ya Kutafuta Afya

1. Kwanza ulitafuta wapi msaada kutoka wakati unaugua?

1) Hospitali 2) Herbalist 3) Nyingine yabainisha

2. Ni mara ngapi unahudhuria uchunguzi wa kila mwaka wa kisukari? a) Hakuna ☐ b) mara moja ☐

c)> mara ☐ 2

3. Ni mara ngapi unachukua kipimo cha sukari kwenye damu yako wiki? a) Mara moja ☐ b) Mara ☐ mbili c)> mara ☐ 3

4. Ikiwa unatumia insulini, ni maeneo gani unaingiza insulini?.................................

5. Ni mara ngapi unahudhuria kliniki kwa mwezi? a) Mara moja ☐

b) Mara mbili☐ c) >3 Mara mbili☐

1. Kuna nyakati unaruka kliniki? a) Ndiyo ☐   b) Hapana☐

2. Kama ndiyo kwa nini? Bainisha

a)Kituo mbali ☐   b)wakati hajisikii vibaya☐ c) Ihave hakuambiwa☐

Udhibiti wa Glycemic

1. Kiwango cha sukari ya damu kwa leo

   Chini ☐   ya kawaida ☐   Kawaida ☐
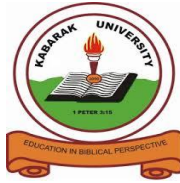
2. Unapima wapi glucose yako ya damu?

   Kituo cha Afya   ☐   Nyumbani ☐

3. Ni jinsia gani iliyokuwa na udhibiti duni wa glycemic?

   Wanaume ☐   Wanawake ☐

Asanteni sana kwa muda wenu.

PARTICIPANT EXPALANATORY SHEET

Project Title Diabetes Management among pastoralists of West Pokot: Knowledge and Practices**.**
My name is Jane…… and I am conducting a study on Diabetes management knowledge and practices among Pastoralists in West Pokot. I am a student at KABU working towards a Masters degree .
This means that I will be writing a thesis based on this research.
You are being invited to take part in this project because you are a pastoralist within the West Pokot community and attending the Diabetic clinic at the KCRH.
Aim (What is the purpose of this research project?)
The aim of this project is to understand   how our patients in the community are managing diabetes and therefore informthe county and hospital how to plan diabetes services.

Possible benefits (What are the possible benefits?)
Diabetes is a major health problem in our community ………. We want to
find out whatdo patients know about diabetes and how do they manage it
We also want to help improve diabetes service delivery to ensure ……
Inconvenience/discomfort (What are the possible risks?)

Aside from the small amount of time it will take to collect the data, you should not experience any inconvenience or discomfort related to taking part in the project. If you do feel inconvenienced or uncomfortable as a result of participating, please let the data collecting researcher know or contact the University via the contact details given below.
What does the research involve?
How much time does it take?

How much time will the research take?
You can withdraw from the research
Participating in this project is voluntary. You are under no obligation to participate and you may refuse toparticipate or withdraw from the project at any time without jeopardy to your medical care.
We may ask you the reasons for your decision but you do not necessarily have to answer. If you do withdraw from the project, you can also choose to withdraw any data that has already been collected. However, once the research is submitted for publication, this will not be possible.

Confidentiality (What will happen to information about me?
Deidentified data will be disclosed to the research team. However, no one external to the research team will have access to your information and your identity will not be disclosed in any reports arising from the study of data

Data collected will be stored in accordance with Kabarak University regulations, kept on University premises, in a locked filing cabinet for 5 years. A report of the project may be submitted for publication in a scientific journal, but individual participants will not be identifiable in such a report.

Use of data for other purposes (What will happen to information about me?)
Aggregated results will be used for research purposesonly and may be reported in scientific and academicjournals as well as in the relevant Masters thesis and related talks at conferences. Individual participants will not be identifiable in such reports.

Results
A thesis report and journal articles will be generated from the of the research findings at the end of the project.

Thank you for considering whether or not you will participate in this project. We sincerely hope you are able to participate.

If you would like to contact the researcher about any aspect of this project, please contact the lead Investigator:	If you have a complaint concerning the manner in which this research (include IREC number) is being conducted, please contact:
Jane Limangura Email: jane limangura	Executive Officer Kabarak University Research Ethics Committee (IREC) Address Tel: +61 3 9905 2052 Email:

Appendix III: NACOSTI Research Permit
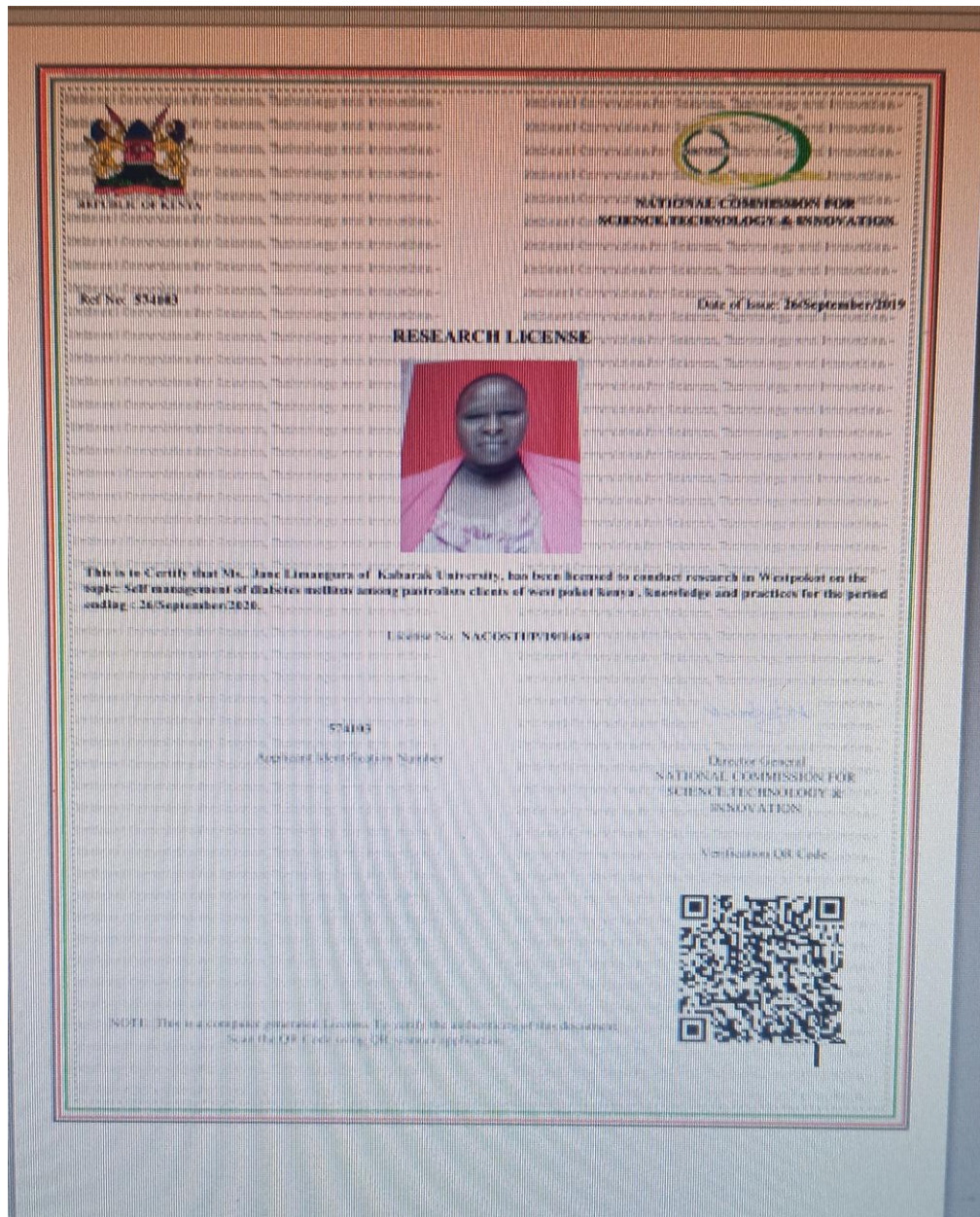
Appendix IV: Interior and Coordination

THE PRESIDENCY
MINISTRY OF INTERIOR AND COORDINATION
OF NATIONAL GOVERNMENT

Telegrams: **"DISTRICTER"**
COUNTY COMMISSIONER
Telephone
Email: ccwestpokot@gmail.com

County Commissioner's Office
West Pokot County,
P.O BOX 1-30600,
KAPENGURIA.

REF: OOP.CC.ADM.15/14 VOL.I/284

3rd **September, 2019**

TO WHOM IT MAY CONCERN

RE: **RESEARCH AUTHORIZATION**
MS. JANE LIMANGURA – REG. NACOSTI/P/19/1469

Reference is made to the Director General National Commission for Science, Technology & Innovation letter no. 574103 dated 26th September, 2019 on the above subject.

This is to inform you that the above named person of Kabarak University, has been dully authorized to carry out research on "***Self-management of diabetes mellitus among pastoralists clients*** within West Pokot County.

The purpose of this letter therefore, is to request you to accord her your cooperation, guidance and necessary assistance she may require during her tour of research.

(APOLLO O. OKELLO)
COUNTY COMMISSIONER
WEST POKOT COUNTY

Copy to:
COUNTY DIRECTOR OF EDUCATION
WEST POKOT COUNTY

Appendix V: Approval From -West Pokot County Government

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF WEST POKOT

OFFICE OF THE GOVERNOR

Email: governor@westpokot.go.ke
When replying please quote our reference
WPC/OCG/VOL.I/031/2019

West Pokot County Headquarters
P.O Box 222-30600
Tel.053214000-4

Date: 4/10/2019

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION

MS. JANE LIMANGURA, REG-NACOSTI/P/19/1469

Reference is made to the Director General National Commission for Science Technology & Innovation letter no. 574103 dated 26th September, 2019 on the above subject.
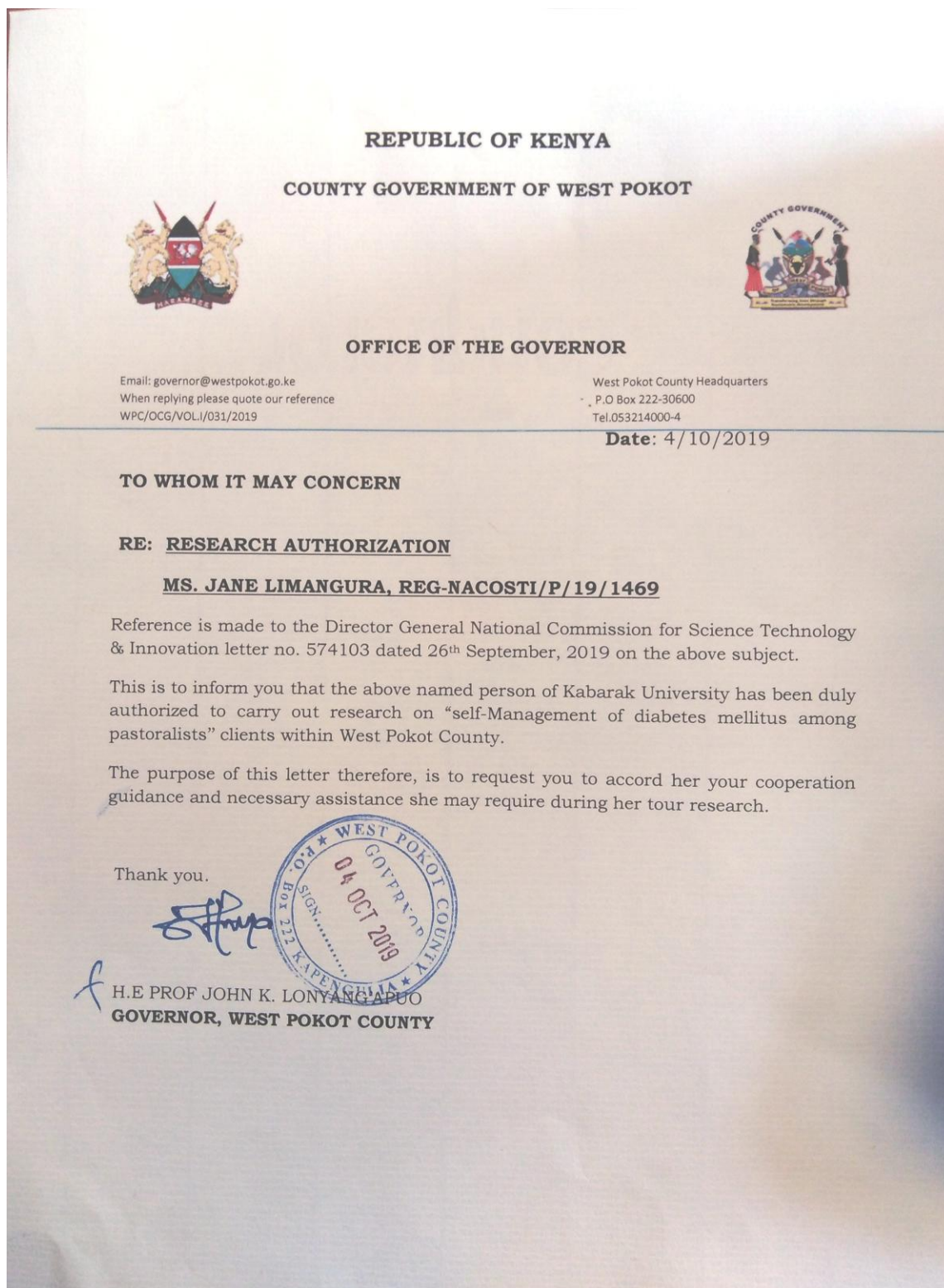
This is to inform you that the above named person of Kabarak University has been duly authorized to carry out research on "self-Management of diabetes mellitus among pastoralists" clients within West Pokot County.

The purpose of this letter therefore, is to request you to accord her your cooperation guidance and necessary assistance she may require during her tour research.

Thank you.

H.E PROF JOHN K. LONYANG'APUO
GOVERNOR, WEST POKOT COUNTY

Appendix VI: Approval Ministry of Education - West Pokot County

REPUBLIC OF KENYA

MINISTRY OF EDUCATION,
STATE DEPARTMENT OF EARLY LEARNING & BASIC EDUCATION

-Email: elimu|cdewest pokot @ education.go.ke
Web: www.education.go.ke
-cdewestpokot@yahoo.com.
When replying please quote date $ Ref.

COUNTY EDUCATION OFFICE
WEST POKOT COUNTY
P.O. BOX 17
KAPENGURIA.

4th October, 2019.

REF: WPC/EDUC/ADM/15/20/VOL.1/440

TO WHOM IT MAY CONCERN

**RE: RESEARCH AUTHORIZATION**
MS. JANE LIMANGURA

The above named person is a student from Kabarak University.
She has been authorized to carry out research on *"Self-management of diabetes mellitus among pastoralists clients within West Pokot County, Kenya.*

Through this letter therefore, you are requested to accord her any necessary cooperation and assistance she may require.

(JOSHUA KOSILEI)
FOR: COUNTY DIRECTOR OF EDUCATION
WEST POKOT COUNTY.

Appendix VII: Map of West Pokot County
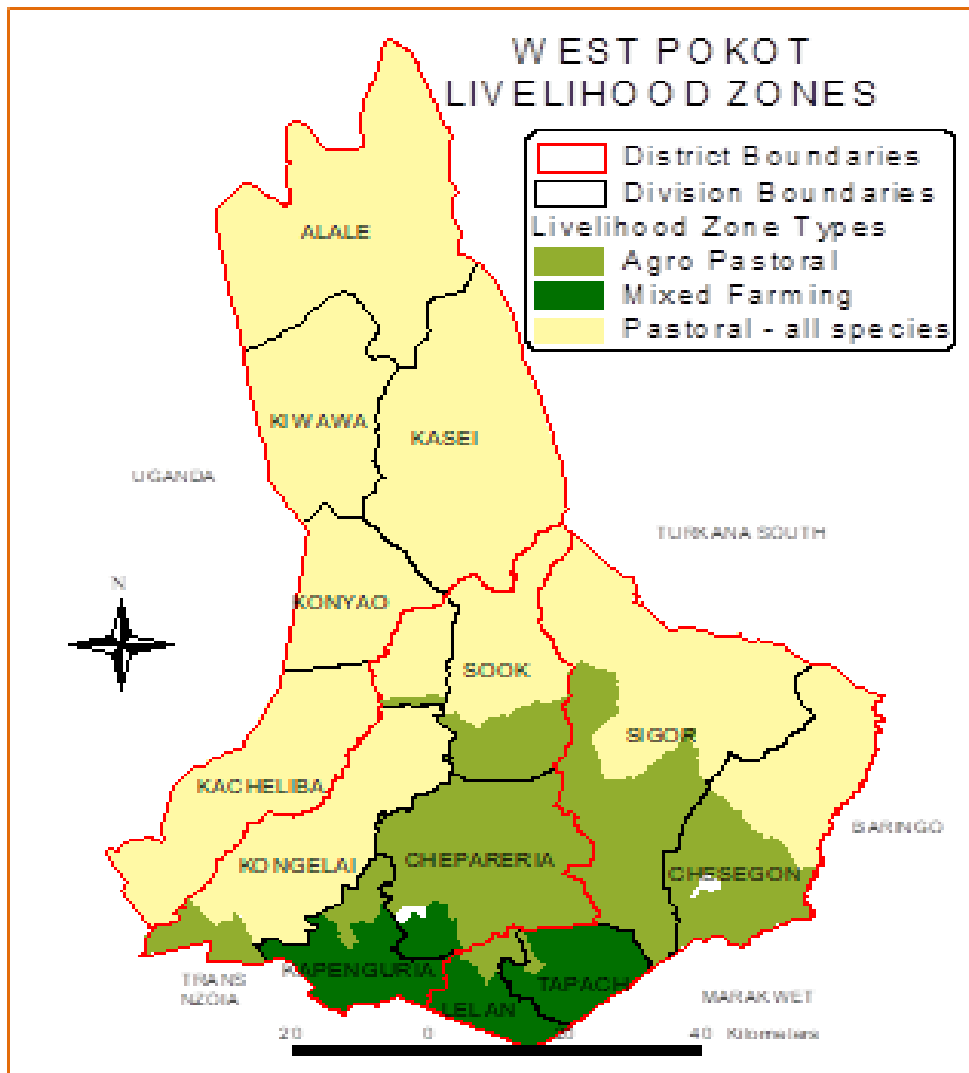
Appendix VIII : Maps of Kenya Showing Location of West Pokot County and that of
West Pokot Showing the Study Area

Appendix IX: List of Publication

KABARAK JOURNAL OF RESEARCH & INNOVATION

OUR REF: KABU01/KJRI/14/01/22   23rd November, 2022

Dear L, Jane,

SUBJECT: ACCEPTANCE OF MANUSCRIPT FOR PUBLICATION

We are pleased to let you know that your submission to Kabarak Journal of Research & Innovation (KJRI) has been accepted for publication. Details of the submission are as follows:

TITLE

RELATIONSHIP BETWEEN KNOWLEDGE OF TYPE 2 DIABETES MANAGEMENT AND BLOOD SUGAR LEVELS OF DIABETIC PASTORALIST IN WEST POKOT KENYA

AUTHORS

[1]Jane LIMANGURA, [2]Miriam MUGA, and [3]Wesley BOR

ISSUE

No. 2(2022)

VOLUME

Vol. 12

Congratulations on this achievement and thank you so much for choosing KJRI.

Sincerely,

Prof. Mellitus N. Wanyama
Editor in Chief

Appendix X: Evidence of Conference Participation

KABARAK UNIVERSITY

Certificate of Participation

Awarded to

Jane Limangura

for successfully participating in the Kabarak University School of Medicine and Health Sciences & School of Pharmacy International Research Conference from 23rd – 24th June 2022 and presented a paper entitled *"Relationship between Knowledge of type 2 diabetes management and blood sugar levels of pastoralists in West Pokot Kenya."*

Conference Theme

Bridging the Gaps in Global Health

Dr. Pamela Kimeto
Dean, School of Medicine and
Health Sciences

Dr. Miriam Muga
Ag. Director Research, Innovation
and Outreach

Kabarak University Moral Code
As members of Kabarak University family, we purpose at all times and in all places, to set apart in one's heart, Jesus as Lord.
(1 Peter 3:15)

Kabarak University is ISO 9001:2015 Certified