PSYCHOLOGICAL INSULIN RESISTANCE PREVALENCE AMONG TYPE II DIABETES PATIENTS AND ITS ASSOCIATION WITH DEPRESSION AND ANXIETY IN CHOGORIA HOSPITAL

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A Thesis Submitted to the Institute of Postgraduate Studies of Kabarak University in Partial Fulfillment of the Requirements for the Award of Master in Family Medicine Degree

KABARAK UNIVERSITY

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ABSTRACT

Psychological insulin resistance (PIR) is a major obstacle to effective Type 2 Diabetes Mellitus (T2DM) management because it delays or prevents the initiation and continuation of insulin therapy. This study, conducted at PCEA Chogoria Hospital in rural Kenya, examined the prevalence of PIR among adults with T2DM and assessed its relationship with glycemic control, measured through glycated hemoglobin (HbA1c), as well as its association with depression and anxiety. The study used a descriptive cross-sectional design and included 121 participants with T2DM. Data collection employed validated instruments: the Insulin Treatment Appraisal Scale (ITAS) to measure PIR, the Generalized Anxiety Disorder 7-item scale (GAD-7) for anxiety screening, and the Patient Health Questionnaire 9-item scale (PHQ-9) for depression assessment. Chi-square tests and Fisher's exact tests were used to evaluate associations between PIR, HbA1c categories, and mental health measures. PIR was present in 62.8 percent of participants, indicating substantial hesitation to initiate insulin therapy. Prominent contributors to PIR included feelings of personal responsibility for the illness, reported by 77 percent, and fear of injections, reported by 58 percent. These findings reflect significant emotional and practical barriers to insulin acceptance. Poor glycemic control was common. A total of 42.1 percent had HbA1c values between 7.1 percent and 9.0 percent, and 20.7 percent had values above 9.0 percent. Despite this, no statistically significant relationship was found between PIR and HbA1c levels ($p = 0.226$). Associations between PIR and mental health indicators were mixed. Chi-square analyses suggested significant associations between PIR and both depression ($p = 0.023$) and anxiety ($p = 0.049$). Fisher's exact tests did not confirm these findings, with p-values of 0.287 for depression and 1.0 for anxiety. These discrepancies may reflect limited statistical power due to the relatively small sample and the low number of participants screening positive for mental health conditions. The results highlight the importance of psychological factors such as self-blame, emotional distress, and fear of injections in shaping resistance to insulin therapy. Integrated strategies that combine mental health support, structured diabetes education, and individualized counseling are needed to reduce PIR. Incorporating these approaches into routine diabetes care in rural Kenya may enhance willingness to initiate insulin, improve glycemic control, and reduce barriers to effective T2DM management

Keywords: *Insulin Resistance; Diabetes; Insulin Therapy*

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LIST OF ABBREVIATIONS AND ACRONYMS

ACCORD	Action to Control Cardiovascular Risk in Diabetes
BITQ	Barriers to insulin treatment questionnaire
CHASIQ	ChASIQ: Chinese attitudes to starting insulin questionnaire
DCCT	Diabetes Control and Complications Trial
DM	Diabetes Mellitus
GAD-7	Generalized anxiety disorder scale- 7
HADS	Hospital anxiety and depression scale
IDF	The International Diabetes Federation
ITAS	Insulin Treatment Appraisal Scale
NACOSTI	National Commission for Science, Technology and Innovation
NHIF	National health insurance fund
PHQ-9	Patient Health Questionnaire-9
PIR	Psychological Insulin Resistance
SHA	Social health authority
WHO	World Health Organization

CHAPTER ONE

1.1 Introduction

This section introduces the premise of the dissertation, states the problem and justify why this study needs to be undertaken.

1.2 Background of the Study

Non-communicable diseases are now the leading cause of mortality worldwide. Diabetes is among the most common non-communicable diseases, with its incidence having quadrupled in the last two decades (WHO, 2014). Diabetes in itself is a progressive disease therefore; good control of sugars is paramount to reduce the complications associated with it. (Weir, 2004). Management of diabetes is multi factorial encompassing dietary changes, lifestyle changes, and medication. Medication to manage diabetes includes different classes of oral glucose lowering agents and injectable medications. Typically, newly diagnosed individuals begin with lifestyle modifications combined with oral medications. If a target Hba1c of <7% is not attained upon initiation of dual oral hypoglycemic agents or are intolerant to these medications are then transitioned to insulin therapy. Early initiation of insulin therapy improves insulin sensitivity by avoiding prolonged hyperglycemia periods. This induces remission of beta cell function**.** (Swinnen, 2009).

Historically, there has been a stepwise approach to the management of diabetes resulting in years of delay in commencing insulin therapy. (Chen *et al*., 2020). In 2018, there were 516million 1000 IU vials of insulin in use per year among type II diabetic patients across the globe. This value is projected to increase by 2030 to 633 million 1000 IU vials (Basu et al., 2018). As insulin reliance grows, it's vital to tackle obstacles and eliminate any barriers associated with insulin use. This may include either the provider or patient

beliefs that insulin therapy is permanent and restrictive, signifying a personal failure. (Polonsky, 2005).

Psychological insulin resistance (PIR) was coined to explain a phenomenon whereby patients or healthcare providers have trepidation to start and maintain insulin therapy. The prevalence and the reasons cited for PIR have been shown to vary across continents. Western countries are shown to have a lower prevalence of PIR compared to lower-income countries. Polonsky *et al*., 2005 demonstrated a prevalence of 28.2 % in the USA among 1267 diabetic patients. Permanence and dependence on the health care provider were among the top causes of PIR in this setting. In a study done in Congo among 91 participants, the prevalence of PIR was 42.7%. (Rita *et al*., 2019). PIR in the Kenyan Population was at 82.6% in a study done at Kenyatta National Referral Hospital in 2017. It was postulated that comorbid depression could have been a major contributing factor. (Gulam *et al.*, 2017). The main factor contributing to PIR, according to Gulam *et al*., was perceived self-blame. Most patients cited that been put on insulin therapy was equivalent to medication failure and that their disease was worsening. This sentiment was more common among patients who have never used insulin before.

Depression has been suggested to adversely influence diabetes management (Makine et al., 2009). Findings from the ADAPT-DM study in Malaysia emphasized the importance of screening for coexisting depression and anxiety when designing a multidisciplinary diabetes care plan. These mental health conditions can interfere with self-care practices and compromise the effectiveness of diabetes treatment. Consequently, prompt identification and appropriate management of such comorbidities are essential for optimal clinical outcomes (Woon et al., 2015). The objective of the present study is to estimate the prevalence of psychological insulin resistance (PIR) in patients with type II

diabetes mellitus attending primary care and to examine its association with anxiety and depression.

1.3 Statement of the Problem

Type 2 diabetes mellitus (T2DM) represents the predominant form of diabetes, making up approximately 90% of all global cases, and continues to pose a major public health challenge. Insulin therapy is a cornerstone in the management of type 2 diabetes mellitus (T2DM) for achieving optimal glycemic control. However, many patients hesitate to initiate it due to psychological barriers collectively referred to as Psychological Insulin Resistance (PIR). PIR often stems from negative beliefs, fear of injections, and the stigma associated with insulin use, and it is further compounded by comorbid depression and anxiety, which worsen diabetes outcomes. Evidence from major clinical trials, including the Diabetes Control and Complications Trial (DCCT) and the Action to Control Cardiovascular Risk in Diabetes (ACCORD) study, emphasizes the importance of maintaining adequate glycemic control to reduce diabetes-related complications (DCCT Research Group, 1993; ACCORD Study Group, 2008).

Research indicates that nearly half of individuals with diabetes require insulin within ten years of diagnosis, highlighting the need for primary care providers to address barriers to insulin initiation (Ndege et al., 2014). Delays in starting insulin are common, with Chen (2020) reporting an average postponement of about two years among eligible patients. Such delays, often driven by PIR, contribute to worsening glycemic control and increased risk of complications.

Globally, PIR is widespread, and a study conducted at Kenyatta National Hospital in Kenya reported a rate of 83% (Gulam et al., 2017). Still, information specific to rural regions is limited. The leading obstacle to beginning insulin treatment involved patients'

perception that they had unsuccessfully managed their condition through oral blood sugar-lowering drugs and that their illness was progressing.

The interaction between PIR and mental health comorbidities warrants critical attention. Otieno et al. (2017) demonstrated that among 220 diabetic patients at Kenyatta National Hospital, 33% were diagnosed with depression, with two-thirds of this subgroup experiencing poor glycemic control. This finding aligns with international evidence, such as that reported by Ghamri (2020), which underscores that depression among individuals with diabetes undermines decision-making and self-care behaviors, thereby aggravating poor metabolic outcomes Although diabetes is an increasing health challenge in Kenya, the majority of studies and programs have concentrated on urban referral centers, with scarce information from rural areas where healthcare access and diabetes management resources are frequently limited.

The majority of local studies, including that by Gulam et al. (2017), were conducted in tertiary or referral hospitals such as Kenyatta National Hospital, which cater to more complex and referred cases. These environments may not accurately reflect the beliefs, resources, and challenges faced by patients in rural primary care settings. Consequently, rural populations remain underrepresented in national diabetes care strategies, despite evidence suggesting that healthcare access, education levels, and cultural perceptions of insulin therapy vary significantly between urban and rural contexts (Oti et al., 2022). This lack of rural-specific data limits the ability of policy-makers and clinicians to design context-appropriate interventions aimed at improving insulin uptake in primary care.

Individuals in rural regions often face restricted access to specialized diabetes treatment and tend to have elevated rates of depression and anxiety (Probst, 2006), both of which are linked to psychological insulin resistance (PIR). For instance, the East African

Diabetes Study Group (EADSG) guidelines (Bahendeka et al., 2018) highlight that across Eastern Africa, including Kenya, many patients have limited knowledge and misconceptions about insulin therapy (e.g., fear of injections, hypoglycemia, and perceptions of permanence or severity), while healthcare providers frequently face constraints such as inadequate training, high workloads, inconsistent insulin supplies, lack of monitoring tools, and poor infrastructure in rural facilities. These factors contribute to clinical inertia, amplify psychological insulin resistance (PIR), and delay timely initiation. This underrepresentation of rural-specific data in the broader evidence base creates a gap in evidence-based planning and resource allocation, as national policies and programs often generalize findings from better-resourced or urban-focused studies to the entire population.

The clinical consequences of delayed insulin initiation are profound. Chronic hyperglycemia accelerates the progression of both microvascular and macrovascular complications, increasing the burden of disease and healthcare costs. Evidence from landmark trials such as the DCCT and ACCORD has firmly established that the early initiation of insulin therapy is critical in preventing or delaying the onset of diabetes related complications, while also reducing long-term healthcare expenditures (DCCT Research Group, 1993; ACCORD Study Group, 2008). Despite this evidence, translation into clinical practice remains inconsistent, with many eligible patients experiencing delays of up to two years before being initiated on insulin (Chen, 2020). Such postponements have profound clinical consequences, as inadequate glycemic control persists during this period, predisposing patients to both microvascular and macrovascular complications.

Psychological and psychosocial factors appear to play a major role in this delay. Otieno et al. (2017), for example, demonstrated that two-thirds of patients with comorbid depression had poorly controlled blood sugar levels, suggesting that mental health disorders not only exacerbate diabetes management challenges but also contribute indirectly to resistance or postponement of insulin therapy. These findings align with broader evidence linking depression and anxiety to diminished adherence and reduced self-care in diabetes populations.

At the healthcare system level, clinical inertia is also evident. A recent study by Mwaniki et al. (2023) conducted at Embu Level 5 Hospital revealed that, despite clear indications, only a minority of patients with poor glycemic control were initiated on insulin. The study attributed this gap both to patient-level resistance and to hesitancy among healthcare providers, who may lack adequate training, time, or confidence in supporting insulin initiation in primary care contexts. This dual barrier of patient reluctance and provider inertia reflects the pervasive influence of Psychological Insulin Resistance (PIR), which acts as a significant impediment to timely and effective treatment intensification.

Taken together, these findings emphasize that the challenge of insulin initiation in Type 2 Diabetes Mellitus extends beyond biomedical criteria and is instead deeply intertwined with psychological, behavioral, and systemic factors. Addressing PIR through targeted interventions, such as structured insulin initiation protocols, provider training, and integrated psychosocial support, is therefore essential for translating the clinical benefits demonstrated in trials like DCCT and ACCORD into real-world outcomes.

Moreover, depression has been recognized as a significant non-communicable disease among men in Kenya, impacting around 2.2% of those surveyed, ranking it among the

more common NCDs following hypertension. The research by Asiimwe et al. (2025) also noted that "the most common combination was hypertension and depression," highlighting the frequent co-occurrence of depression with other chronic illnesses and its potential impact on participation in diabetes care pathways. Depression may amplify feelings of hopelessness, perceived failure, and fear of injections, further entrenching resistance to insulin. These findings underscore the necessity of integrating psychological screening into routine diabetes care, especially when considering therapy escalation.

While some studies have shown that depression has a negative impact on insulin appraisal (Makine et al., 2009; Woudenberg, 2011), others have reported no significant relationship (Giesje et al., 2013). Most studies have emphasized depression over anxiety, yet anxiety may play a comparable role in insulin resistance. In fact, this study's focus on both depression and anxiety addresses a previously overlooked dimension, as fear and worry are frequently cited by patients as key drivers of resistance to insulin initiation. Lee et al. (2023) and Holmes-Truscott et al. (2021) found that fear of injections and anxiety about insulin use significantly contributed to PIR, even in patients who understood the importance of glycemic control. These psychological barriers are particularly pronounced in rural settings, where mental health resources are limited and stigma remains high.

Ultimately, the failure to address psychological insulin resistance, particularly in underserved rural areas, compromises the broader goal of improving diabetes outcomes in Kenya. This study aims to bridge that gap by exploring PIR in a rural setting and identifying its association with anxiety and depression, thereby contributing to the development of more effective and context-sensitive diabetes management strategies.

1.4 Justification of the Study

This research supplements existing data on psychological insulin resistance (PIR) in Kenya, addressing a critical gap in understanding its prevalence and psychological correlates in rural settings. In line with Sustainable Development Goal 3, which aims to reduce mortality from non-communicable diseases and promote mental health, this study provides evidence to ensure holistic care provision for diabetic patients. The findings will inform strategies to enhance insulin therapy acceptance, ultimately improving diabetes management outcomes in underserved populations.

The prevalence of diabetes in rural Kenya is rising, as evidenced by studies reporting 16% prevalence in 2014 (Hemed, 2014) and 20% in 2015 (Gikonyo, 2015). This trend underscores the urgency of addressing barriers to effective treatment, particularly in rural areas where healthcare access is limited. The study by Gulam et al. (2017) at Kenyatta National Hospital reported 83% PIR prevalence, highlighting self-blame as a primary barrier. However, this urban-based study does not reflect the unique challenges faced by rural patients, such as limited healthcare infrastructure, lower health literacy, and cultural perceptions that may amplify PIR. By focusing on PCEA Chogoria Hospital in Tharaka Nithi County, this research provides context-specific insights into PIR among rural Type 2 Diabetes Mellitus (T2DM) patients, where resources for diabetes education and psychological support are scarce.

This study is vital for addressing the underrepresentation of rural populations in diabetes research. Rural patients often face delays in insulin initiation due to logistical barriers, such as insulin stockouts and high out-of-pocket costs, as noted in Meru County's Base of the Pyramid project (Novo Nordisk, 2019). These barriers exacerbate PIR, contributing to poor glycemic control and increased complications. By estimating PIR

prevalence and its association with depression and anxiety, this study identifies psychological barriers that can be targeted through tailored interventions, such as patient education and cognitive-behavioral therapy (Chew et al., 2022). Such interventions could reduce clinical inertia and improve insulin uptake, aligning with the International Diabetes Federation's call for equitable diabetes care (IDF, 2023).

The study's focus on depression and anxiety addresses a critical gap in understanding their interplay with PIR. Depression affects approximately 33% of diabetic patients in Kenya (Otieno et al., 2017), and its coexistence with anxiety may intensify negative perceptions of insulin, such as fear of injections or perceived failure. By quantifying these relationships, the study provides evidence for integrating mental health screening into routine diabetes care, a practice currently limited in rural settings due to stigma and resource constraints (Sow & Gichuhi, 2024). This is particularly relevant given Kenya's high burden of mental health disorders, with one in three individuals affected by anxiety or depression (Kwobah, 2017).

The findings will also guide policymakers in developing context-sensitive diabetes management programs. National strategies often rely on urban data, overlooking rural disparities in healthcare access and cultural attitudes toward insulin. By highlighting PIR's prevalence and psychological drivers in a rural context, this study supports the design of targeted interventions, such as community-based education and mental health support, to reduce diabetes-related morbidity and mortality. Additionally, it contributes to global health research by providing data from a low-resource setting, enhancing the evidence base for addressing PIR in similar contexts across sub-Saharan Africa. This study's rural focus, combined with its examination of PIR's psychological dimensions, positions it to influence clinical practice and policy, advocating for multidisciplinary care

models that integrate psychological support to improve patient outcomes and reduce the economic burden of diabetes complications in Kenya.

1.5 Purpose of the Study

To ascertain the prevalence of PIR among type II diabetic patients and its association with depression and anxiety in patients at PCEA Chogoria hospital in Tharaka Nithi County, Kenya.

1.6 Objectives of Study

i. To estimate the prevalence of PIR among type 2 DM patients aged 18-80 years attending PCEA Chogoria hospital over a month period.

ii. Determine the relationship between depression and PIR in patients with type II diabetes aged 18-80 years attending PCEA Chogoria Hospital over a month period.

iii. Determine the association between anxiety and PIR in patients with type II diabetes aged 18-80 years at the PCEA Chogoria Hospital over a month period

1.7 Research Questions

i. What is the Prevalence of PIR among type II Diabetes patients aged 18- 80 years at Chogoria hospital in Tharaka Nithi County, Kenya?

ii. What is the relationship between depression and PIR among type II Diabetes patients aged 18-80 years at PCEA Chogoria hospital in Tharaka Nithi County, Kenya?

iii. What is the relationship between anxiety and PIR among type II Diabetes patients aged 18-80 years at PCEA Chogoria hospital in Tharaka Nithi County, Kenya?

1.8 Significance of the Study

This research will improve care for people with type 2 diabetes by understanding all aspects of their care and possibly eradicating barriers to effective treatment.

1.9 Limitations of the Study

i. This study shall not evaluate diabetes-related distress, clinical inertia, medication adherence which may have an impact on the association recommended for future research to focus on this area of research.

ii. Due to the cost of HBa1C some clients may not have an upto-date lab test. This may lead to insufficient data collection- To mitigate this, data collection shall be extended to 6-12 months rather than preceding 3 months. Patient with missing HBA1c data shall be excluded for missing data.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on psychological insulin resistance (PIR), its association with depression and anxiety, and the psychometric tools used for assessment in the context of Type 2 Diabetes Mellitus (T2DM) management, with a focus on rural Kenya. It explores the natural history and burden of diabetes, the interplay of mental health disorders with diabetes, and validated tools for primary care settings, emphasizing gaps in rural-specific research.

2.2 Natural History of Diabetes

The American Diabetes Association, 2014 defines diabetes mellitus (DM) as a metabolic disease characterized by hyperglycemia due to insufficient insulin secretion, insulin action defects, or both. This chronic condition impacts the body's ability to regulate blood sugar levels effectively. Diabetes Mellitus is broadly classified into two categories: Type I and Type II DM. Type I diabetes, also known as insulin-dependent diabetes, is characterized by an absolute deficiency of insulin production. This means that the pancreas fails to produce sufficient amounts of insulin, a hormone necessary for the regulation of blood sugar levels. As a result, people with Type I diabetes require insulin injections to survive. The highlight of Type I diabetes lies in its autoimmune nature. The body's immune system mistakenly attacks and destroys the insulin-producing beta cells in the pancreas.

Type II diabetes is characterized by insulin resistance at the peripheral tissues. The beta cells responsible in production of insulin deteriorate over the course of the illness. Initially there is a compensatory increase in insulin production to maintain normal

glucose levels. The steady rise in glucose levels is toxic to the beta cells, this causes beta cell mass starting to reduce. (Weir, 2004). Over time the body is unable to compensate and thus; exogenous insulin becomes necessary. Good glycemic control is paramount to limit the rate of progression of beta cell destruction. In the A Diabetes Outcome Progression Trial (ADOPT) oral anti-diabetic Monotherapy was shown to fail over time necessitating add-on therapy (Kahn *et al.,* 2006) The UK prospective diabetes study (UKPDS,1998) showed in nine years, only 25% of the participants who were under intensive glycemic control had maintained an HbA1c of less than 7% with oral medication alone.

This highlights the background that diabetes is a progressive disease, and many patients will progress to requiring insulin therapy. In sub-Saharan Africa, delayed diagnosis and limited insulin access accelerate T2DM progression, increasing complication rates (Mbanya et al., 2010). In rural Kenya, patients face unique challenges, including inadequate monitoring, limited diabetes education, and logistical barriers like insulin stockouts (Oti et al., 2022). These factors delay insulin initiation, making it critical to understand PIR in such settings to improve glycemic control and reduce complications.

2.3 Burden of Diabetes

The global estimates by the World Health Organization in 2014 indicated that 422 million individuals, up from 108 million in the year 1980 were surviving with diabetes. (WHO,2014) As of 2021 International Diabetic Federation (IDF) put this figure at 537 million. The prevalence of diabetes has been on the rise, particularly in low- and middle-income nations. By 2030, it is expected that the number of people living with diabetes would rise by 25%. According to the IDF, in 2021, there were 6.7 million deaths

attributed to diabetes; this translates to 1 death every five seconds. For every four persons with diabetes three reside in a low- and middle-income nation (IDF, 2021).

The International Diabetes Federation (IDF, 2023) estimates that 3.1% of Kenyan adults (≈ 813,300 individuals) live with diabetes, with nearly 50% undiagnosed (IDF Kenya data). Across sub-Saharan Africa, prevalence soared from ~4 million in 1980 to over 23 million by 2021, and is projected to exceed 54 million by 2045 (IDF, 2023;). Notably, the AWI-Gen study reported a doubling of diabetes prevalence in Kenya, Ghana, Burkina Faso, and South Africa over six years, reaching 10.9% in some adult populations (University of the Witwatersrand, 2025). With the trends of industrialization in Africa, there has been an increase in the consumption of highly processed foods, and with urbanization, people are now living a more sedentary lifestyle. Observational studies have shown the correlation between lifestyle factors such as physical activity and good dietary habits and the reduction in the prevalence of diabetes (Mozaffarian, 2009).

In Kenya, 14% of adults have impaired glucose tolerance and 4.56% are living with diabetes (STEPS survey, 2015). In order to reach Sustainable Development Goal 3, which calls for a one-third reduction in the number of deaths from communicable diseases by 2030, it is critical to effectively and holistically manage diabetes. Appropriate management, prompt initiation of insulin, and minimizing barriers to treatment strategies will help reduce diabetes-related deaths. Poorly managed diabetes carries a huge financial burden. In Kenya, approximately 35% of people with type 2 diabetes (T2DM) experience at least one complication, including diabetic retinopathy (46.5%), kidney disease (7%), and diabetic foot (13%) (Otieno et al., 2021).

The national economic cost of T2DM in 2021 was estimated at USD 633 million, with 59% spent on complications, particularly dialysis and nephropathy-related care (Barasa

et al.,2021). The UKPDS and ACCORD trials, demonstrated the long-term benefits of early glycemic intensification. Despite this knowledge, access to insulin in Kenya is unequal. In Meru's Base of the Pyramid (BoP) facilities, insulin is priced at ~500 KSh; however, stock-outs often force patients to purchase insulin privately at up to 1,800 KSh per vial (BoP evaluation; Novo Nordisk, 2019). Rural and peri-urban areas suffer more frequent shortages and higher out-of-pocket costs. NHIF coverage is inconsistent across counties, exacerbating inequities in access to insulin and consistent diabetes care (Barasa et al., 2020; In Kenya, the Base of the Pyramid (BoP) project implemented in Meru County significantly improved insulin affordability reducing prices to between KSh 500 and 600 per vial and enhanced early uptake of insulin among patients with type 2 diabetes mellitus (T2DM) who had previously resisted escalation to insulin therapy. This intervention also contributed to a reduction in hospitalization rates for poorly controlled diabetes (Novo Nordisk, 2019).

2.4 Depression and Anxiety

Without mental health, there can be no true physical health.", *Dr Brock Chrisholm – 1st Director General WHO* (1954). Depression and anxiety are the two most debilitating psychological disorders. They were ranked among the top twenty-five causes of disability worldwide according to the Diseases, Injuries, and Risk Factors Study (GBD 2019 Diseases and Injuries Collaborators, 2020). According to WHO estimates, depression accounts for 4.3% of the global disease burden and is one of the main causes of disability, causing 11 years of impairment annually. (WHO, 2018) The prevalence of depression and anxiety has been rising with a notable increase in Africa. The population of Africa increased by 49% between the year 2000-2015; however, in the same period, the disability due to mental disorders and substance use increased by 52%. (WHO, 2017).

According to global health estimates report by WHO in 2017, Kenya ranks 6th in Africa in the burden of depression and anxiety. Approximately one in three Kenyans suffer from either anxiety or depressive disorder. This is per a study done among 400 community members in western Kenya. This burden has been noted to differ based on age and gender. (Kwobah 2017, Jenkins 2013). In Kenya, depression is the second most common non-communicable disease after hypertension, often co-occurring with diabetes (Asiimwe et al., 2025). Rural Kenyan patients face additional stressors, such as financial strain and limited healthcare access, drug stockouts which worsen mental health and self-care. (Bahendeka et al 2018)

2.4.1 Association between Depression, Anxiety, and Diabetes

Chronic illnesses usually require a lot from the patient in terms of time and resources. Having a chronic illness increases the odds of having depression four times. This is according to a study carried out among 7620 patients in primary care (Gunn, 2010). While it is evident that chronic illnesses increase the risk of mental illnesses, an inverse relationship has also been demonstrated. When using the Beck Anxiety Index score, for every 10-point increment, the odds of developing incident diabetes increased by 1.6-fold over 2 years. (Atlantis,2012) Epidemiologic studies have shown that diabetes and depression occur twice as frequently, an association that cannot be predicted by chance alone. (Anderson, 2001) The combination of these two diseases poses a significant clinical conundrum as the presence of the other worsens the outcomes.

A meta-analysis conducted across sub-Saharan Africa found that approximately 40% of patients with type 2 diabetes mellitus experience depression (Asmamaw et al., 2021), while a more recent study in Ethiopia reported a pooled prevalence of 34.6% among 5,808 diabetic patients (Tegegne, Gebeyehu, & Kassaw, 2023). Naicker 2018

demonstrated that mortality among people living with diabetes was increased among patients diagnosed with comorbid depression. A diagnosis of depression has frequently occurred together with anxiety. In a study by Hirschfeld, 2001 up to 50% of patients who had a diagnosis of major depressive disorder also had concurrent anxiety. Rural Kenyan patients face amplified challenges due to limited mental health resources and cultural stigma, which deter treatment-seeking and worsen PIR (Sow & Gichuhi, 2024).

2.4.2 Psychological Insulin Resistance

Psychological insulin resistance (PIR) is a well-documented phenomenon characterized by reluctance or refusal to initiate and adhere to insulin therapy, despite clear medical indications (Brod et al., 2008). PIR presents a critical barrier to optimal glycemic control in patients with type 2 diabetes mellitus (T2DM), a condition that accounts for over 90% of diabetes cases globally (International Diabetes Federation [IDF], 2021). A landmark cohort study involving 14,824 patients with T2DM demonstrated a mean delay of 7.7 years between the initiation of the last oral hypoglycemic agent and the eventual commencement of insulin therapy, even though participants consistently maintained HbA1c levels above 8% (Calvert et al., 2007).

This therapeutic inertia has profound consequences, as postponing treatment intensification increases the risk of microvascular and macrovascular complications. The Diabetes Control and Complications Trial (DCCT, 1994) and the UK Prospective Diabetes Study (UKPDS, 1998) both demonstrated that early glycemic control significantly reduces long-term diabetes complications. Furthermore, delaying insulin initiation by a single year in individuals with HbA1c levels exceeding 7.5% was associated with a 64% increased risk of fatal cardiovascular events (Paul et al., 2015).

The implications of PIR extend beyond physical outcomes, influencing psychosocial well-being and treatment satisfaction. Patients with PIR often report poorer adherence to self-care practices, including diet and exercise, leading to increased vulnerability to complications (Song, 2010). Additionally, PIR negatively impacts quality of life by fostering frustration, guilt, and anxiety among patients who view insulin therapy as a personal failure (Polonsky & Fisher, 2005). These findings emphasize the multifaceted burden of PIR, which operates at the intersection of psychological, cultural, and health system-related factors.

Globally, the prevalence of PIR varies widely, reflecting diverse sociocultural contexts and health system structures. In the UKPDS, approximately 27% of participants randomized to insulin therapy declined initiation (UKPDS, 1998). High prevalence rates have been reported in North Africa and sub-Saharan Africa: Libya documented PIR in 94.6% of patients (Sabei & Sammud, 2015), South Africa reported 51.9% (Ngassa et al., 2020), while 42.7% was observed among patients in the Democratic Republic of Congo (Rita et al., 2019). Such findings suggest that PIR is not merely a Western phenomenon but a global challenge that is particularly pronounced in resource-limited settings.

In East Africa, studies have similarly demonstrated high levels of PIR. In Kenya, Gulam et al. (2017) reported a striking prevalence of 83% among patients attending the diabetes clinic at Kenyatta National Hospital (KNH). The predominant reason cited by patients was the perception of insulin initiation as an indicator of personal failure to manage the disease with oral agents. Stigma, fear of injections, and concerns about the permanence of insulin therapy also contributed significantly. Complementing these findings, a more recent study at Lamu County Hospital highlighted similar barriers, where lack of knowledge about insulin, cultural misconceptions, and inadequate counseling services

amplified resistance (Abdulkadir et al., 2021). Adding further depth, a 2024 study in Nairobi's urban clinics revealed that 68% of T2DM patients resisted insulin initiation due to misconceptions that it was a permanent, restrictive therapy that would curtail lifestyle flexibility (Manyara et al., 2024). Patients feared dependency and loss of autonomy, and these misconceptions were closely tied to insufficient counseling and health education.

Uganda and Tanzania, though with limited data, provide further insight into regional trends. A study conducted in Uganda noted that while patients acknowledged the potential benefits of insulin, misconceptions regarding side effects, fear of dependency, and stigma surrounding injections hindered acceptance (Kansiime et al., 2019). In Tanzania, qualitative reports from urban and peri-urban clinics suggest that resistance was frequently linked to healthcare provider hesitancy, reflecting a form of clinical inertia that intersects with PIR (Mosha et al., 2020). Taken together, these East African findings underscore that PIR in the region cannot be attributed solely to patient perceptions but is also influenced by systemic and provider-level barriers.

Several interrelated factors contribute to PIR. Patient-level factors include fear of hypoglycemia, anticipated pain from injections, and concerns about lifestyle disruptions (Brod et al., 2008). Many patients equate insulin initiation with advanced or terminal disease, reinforcing the perception of failure (Gulam et al., 2017). In South Africa, for instance, Ngassa et al. (2020) found that inadequate diabetes knowledge was the most cited reason for resistance, while in Kenya, the sense of personal failure predominated. Cultural stigma around injections,where injectable therapy is equated with weakness or shame also exacerbates reluctance.

Healthcare provider attitudes significantly influence PIR. Studies in Kenya (Mwaniki et al., 2023) and Tanzania (Mosha et al., 2020) revealed that provider hesitancy, driven by concerns about patient compliance, lack of structured diabetes education programs, and fear of hypoglycemia, delayed insulin initiation even when clinically indicated. Such provider-related inertia compounds patient reluctance and results in prolonged periods of poor glycemic control.

The relationship between mental health and PIR can be inferred. Depression is common among individuals with diabetes, with estimates ranging from 20% to 40% (Ali et al., 2006). In Kenya, Otieno et al. (2017) found that 33% of diabetic patients attending KNH outpatient clinics had comorbid depression, and two-thirds of these individuals had poorly controlled blood sugar. Depression has been linked to poorer decision-making, reduced motivation, and neglect of self-care practices, all of which exacerbate PIR (Ghamri, 2020). Evidence from Europe and North America has shown that patients with depression are more likely to negatively appraise insulin therapy (Gherman & Alionescu, 2015; Woudenberg et al., 2012).

However, findings remain mixed. Some studies, such as those by Lee (2015) and Nefs et al. (2013), reported no significant association between depression and PIR, suggesting that contextual factors, including cultural attitudes and healthcare systems, may moderate the relationship. Anxiety also appears to have a weaker but notable correlation with PIR. Holmes-Truscott et al. (2016) identified fear of injections and anxiety regarding long-term insulin use as significant contributors to resistance, although the strength of association was less robust than that observed for depression.

Evidence suggests that targeted interventions can mitigate PIR. Educational initiatives are particularly effective. A randomized controlled trial demonstrated that structured

diabetes education improved insulin acceptance by 20% among older adults (Munshi et al., 2020). In low-resource contexts, community-based peer support groups have proven valuable in reducing PIR by addressing stigma and misinformation (Chew et al., 2022). In Kenya, the Base of the Pyramid Project, spearheaded by Novo Nordisk, successfully increased insulin uptake by enhancing affordability and incorporating patient-centered education programs (Novo Nordisk, 2019). These strategies not only reduced PIR but also improved continuity of care in underserved populations. Similarly, in Uganda, peer-led education programs improved insulin initiation rates by fostering culturally appropriate dialogue about myths and fears surrounding insulin (Kansiime et al., 2019).

Despite these successes, rural-focused interventions remain scarce. Most initiatives have been concentrated in urban referral centers, leaving rural patients who often have limited access to specialized diabetes care without adequate support. Overall, PIR emerges as a global challenge, but East African studies highlight particularly acute barriers shaped by sociocultural beliefs, misinformation, and systemic limitations. The Kenyan context is especially concerning, with prevalence rates as high as 83% at KNH (Gulam et al., 2017) and 68% in Nairobi's urban clinics (Manyara et al., 2024).

The Lamu study (Abdulkadir et al., 2021) further demonstrates how cultural misconceptions and weak health education persist even in semi-rural areas, suggesting PIR is both an urban and rural issue. Coupled with high rates of comorbid depression and anxiety (Otieno et al., 2017), these findings reveal a multi-layered problem that requires more than pharmacological solutions. This study at PCEA Chogoria Hospital in Tharaka Nithi County, Kenya, aims to bridge rural data gaps by exploring PIR prevalence and its links to depression and anxiety, informing tailored interventions to enhance T2DM outcomes in underserved Kenyan populations.

2.4.3 Tools for Psychometric Analysis of Depression, Anxiety, and Psychological Insulin Resistance

A number of depression and anxiety tools with various specificity and sensitivity levels have been developed and validated for use in primary care. The Cronbach alpha, a coefficient of consistency, is used to denote the reliability of a tool. A value of more than 0.7 has been shown to signify good internal reliability of a tool (Bland, 1997). Some of the commonly used tools are elucidated below.

2.4.4 The Hospital Anxiety and Depression Scale (HADS)

Zigmond and Snaith in 1983 developed the HADS tool. It was to identify anxiety and depression outside of non-psychiatric facilities making it a good tool for use in primary care. It is a bimodal scale consisting of 14 questions. 7 questions address depression (HADS-D) and the other 7 address anxiety. (HADS- A). The initial HADS tool was developed using a population of patients below the age of 65 years. However, Djukanovic, 2017 demonstrated it could be used for adults above the age of 65 with good internal consistency. Each question has a score ranging from zero to three where a score of eight out of the possible twenty-one indicates the presence of either depression or anxiety. The tool has been validated for use among the African population. (Abiodun, 1994). However, this tool has not been validated in Swahili.

2.5 The Patient Health Questionnaire-9 (PHQ-9)

Nine of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) major depression criteria are included in the self-administered PHQ-9 questionnaire. Each symptom is rated by the participant based on how worrisome it was in the preceding two weeks. It's a tool that has been approved for use in primary care settings and has undergone validation. The PHQ-9 has exceptional internal reliability, yielding a

Cronbach's alpha of 0.89 based on research by Spitzer et al. 1999 including three thousand primary care patients. It was found to have good accuracy among diabetic patients in Malawi, accruing a Cronbach alpha score of 0.83 (Udedi et al., 2019). In Kenyatta National Hospital, a Swahili translation of the PHQ-9 was validated among cancer patients with high internal consistency.(Omoro *et al.,* 2006). The tool has been shown to perform well among elderly patients given certain symptoms such as insomnia and anorexia overlap. (Phelan *et al.,2010).* This tool therefore will be appropriate for this study population.

2.5.1 Generalized Anxiety Disorder Scale (GAD-7)

Based on the symptoms described in the DSM-V, the GAD 7 scale is used to identify generalized anxiety disorder. It consists of seven questions, each of which is evaluated from 0 to 3 on a Likert scale. Participants are questioned about how frequently in the two weeks prior they had experienced issues like anxiety, concern, or restlessness. The total score ranges from 0 to 21. Summated values between 5 and 9 denote mild symptoms, summated ratings between 10 and 14 denote moderate symptoms, and summated scores beyond 15 denote severe symptoms. A Swahili-validated version that had a Cronbach alpha value of 0.82 was developed among HIV patients. (Nyongesa et al. 2020). Among senior citizens, the tool has been shown to be efficient. (Wild *et al.*,2014).

2.5.2 The Insulin Treatment Appraisal Scale (ITAS)

Snoek et al. devised the ITAS tool in 2007. During the development, they included 282 type-2 diabetic patients who were either insulin naïve or treated. With a Cronbach alpha of 0.89, the score demonstrated strong internal validity. The 20-item ITAS assessment is self-administered and intended to gauge how patients feel about receiving insulin therapy. On a 5-point Likert scale, the scale is composed of sixteen things that are

negatively expressed and 4 items that are positive. The sum of the inverted positive (4–20) and negative (16–80) ITAS values yields the total ITAS score, which ranges from 20 to 100. A score below 65 denotes a more positive attitude, whereas a score above 65 denotes a negative attitude. A validated Swahili version of the ITAS tool has been used in a different study at the Kenyatta National Hospital. (Gulam, 2017).

2.5.3 Barriers to Insulin Treatment Questionnaire (BITQ) Scores

This was a tool developed by Petrak et al. in 2007. It was developed among 897 participants in Germany. The participants involved in the development of this questionnaire were insulin naïve patients. The 14 items and five subscales of the BITQ tool measure anxiety linked to insulin injections and self-testing, expectations of effective insulin-related outcomes, expected problems with insulin treatment, stigmatization brought on by insulin injection, and anxiety related to hypoglycemia. It had a Cronbach alpha of 0.78 for internal dependability. The BITQ tool does not fit this study population because this study will cover individuals on dietary, oral, and insulin therapy.

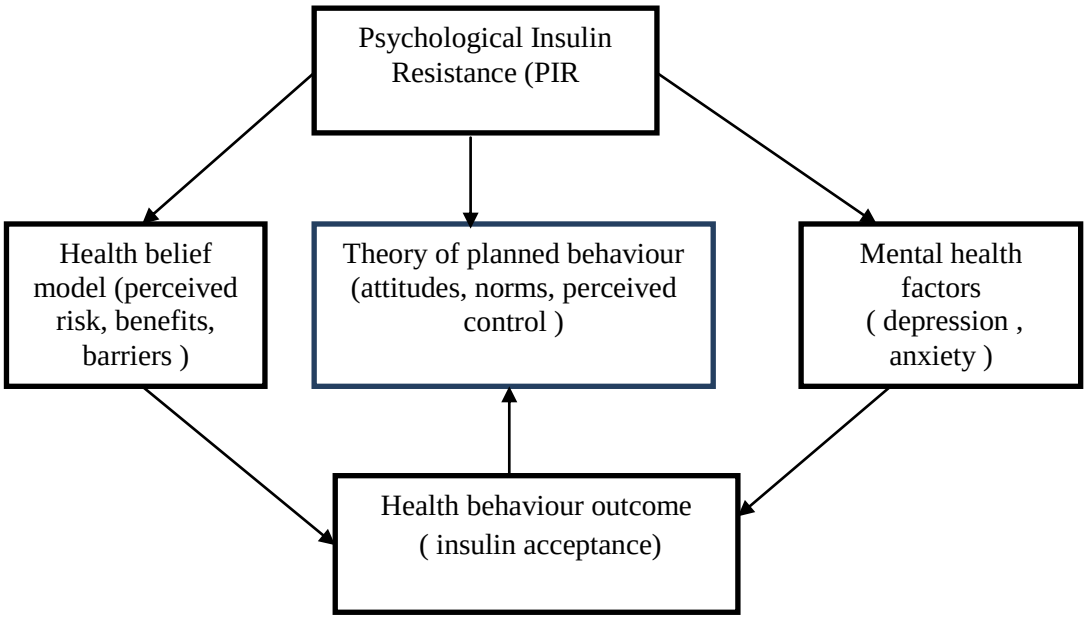
2.5.4 Chinese Attitudes to Starting Insulin Questionnaire (Ch-ASIQ)

This is a 13-point tool developed by Fu *et al*. in 2013. It was developed among 300 participants. The tool specifically addressed psychological insulin resistance among elderly patients. It had internal reliability of Cronbach alpha 0.725. (Fu et al., 2013). Given this tool was validated among Chinese patients, less educated and elderly patients, it may not be reflective of this study participants.

2.6 Theoretical Framework

Figure 1

Theoretical Framework



Source: Author, 2025

This integrated model combines the Health Belief Model (HBM), Theory of Planned Behavior (TPB), and mental health constructs to explain psychological insulin resistance (PIR) among patients with type 2 diabetes. PIR arises when a patient delays or refuses to initiate insulin therapy despite medical indication. The HBM component addresses patients' beliefs about their condition specifically their perceived susceptibility to complications, perceived severity of diabetes, perceived benefits of insulin, and perceived barriers such as fear of injections or cost.

These beliefs form the cognitive foundation of PIR. The TPB component adds a behavioral lens, focusing on how attitudes toward insulin (e.g., viewing it as a last resort), subjective norms (e.g., stigma or family influence), and perceived behavioral control (e.g., confidence in self-injection) shape a patient's intention to initiate insulin

therapy. Together, these psychological and social factors determine the likelihood of insulin uptake.

Mental health factors such as depression and anxiety act as cross-cutting modifiers. They distort perception, reduce self-efficacy, and exacerbate fears or indecision. These emotional states can strengthen resistance, even when cognitive and social factors are favorable. The intersection of these domains ultimately influences health behavior, particularly insulin acceptance or refusal. This integrated model uses the Health Belief Model (HBM), Theory of Planned Behavior (TPB), and mental health constructs to explain PIR. The HBM addresses beliefs about diabetes severity and insulin benefits, while the TPB focuses on attitudes, norms, and control. Depression and anxiety distort these perceptions, reducing self-efficacy and amplifying resistance, particularly in rural Kenya where mental health and diabetes care gaps persist

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the methodology used to examine psychological insulin resistance (PIR) and its association with depression and anxiety among Type 2 Diabetes Mellitus (T2DM) patients at PCEA Chogoria Hospital in rural Tharaka Nithi County, Kenya. It explains the study design and the methodical approach to data collecting and analysis.

3.2 Research Design

This study employs a descriptive cross-sectional research design to investigate psychological insulin resistance (PIR) and its association with depression and anxiety among Type 2 Diabetes Mellitus (T2DM) patients at PCEA Chogoria Hospital in Tharaka Nithi County, Kenya. This design was chosen for its efficiency in estimating the prevalence of PIR, previously reported at 83% in urban Kenya (Gulam et al., 2017), and identifying associations with depression and anxiety without the need for longitudinal follow-up, which is resource-intensive in low-resource rural contexts .The cross-sectional approach suits the study's objectives of generating baseline data on PIR in a rural population, where such data are scarce, and informing targeted interventions to improve insulin therapy acceptance. By capturing concurrent data on PIR, depression, and anxiety, this design enables the identification of psychological barriers to diabetes management, aligning with the need for context-specific evidence to support equitable care in rural Kenya.

3.3 Location of the Study

The PCEA Chogoria hospital, which is located in Tharaka-Nithi County, was the site of study. Participants were sampled from the diabetic clinic.

3.4 Population of the Study

The county's general population as of the 2019 population and housing census is 393,177. Chogoria Hospital serves a catchment area of about 3000 km2 with 36,130 households as per the 2019 census. Tharaka Nithi is among the counties with the highest burden of non-communicable diseases in the country. Tharaka Nithi County is estimated to be above 45 % (NCD strategic plan MOH 2019). This makes it among the top ten counties in Kenya with the highest burden of non-communicable diseases. The study was carried out among patients who are diagnosed with diabetes and in follow up within chogoria hospital diabetic clinic.

3.4.1 Inclusion Criteria

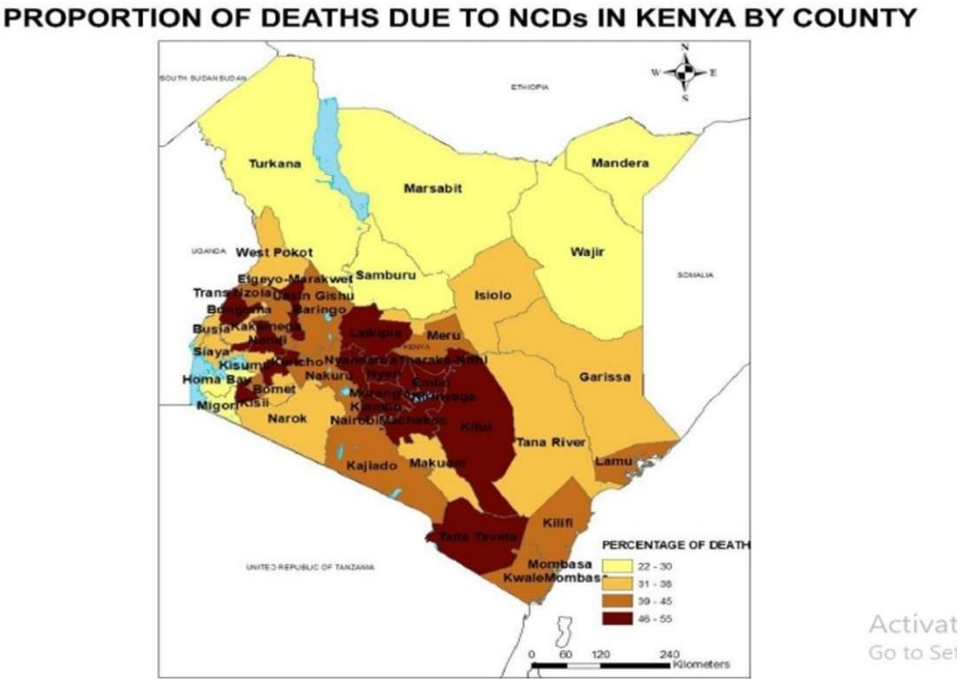
- A person who had clinically diagnosed type II diabetes for more than six months.
- The patient was on either dietary, oral medications or insulin therapy
- Aged between 18-80 years
- Ability to read and understand English or Swahili

3.4.2 Exclusion Criteria

Patients with cognitive impairment and other major life-threatening diseases. Patients hospitalized within the preceding two weeks. This is because GAD 7 and PHQ tools evaluate in the preceeding 2 weeks and this could be a confounder.

Figure 1

NCD Burden



3.5 Sample Size

Based on the Cochran (1977) formula, the sample size was approximated. n 0 = z ^{2} pq

e ^{2} for infinite population (Cochran, 1977).

Where:

n 0 is the necessary sample size,

z is the proposed critical value of chosen confidence level (taken as 1.96 at 95% CI)

p is a projected proportion of a characteristic that the population possesses. (ie. prevalence of the desired attribute – in this case PIR in type II diabetes patients – no known rural prevalence, hence prevalence taken as 0.5

q = 1− p

e is the desired level of precision – ie. margin of error (taken as 0.05) Thus,

$$n^0 = \frac{1.96^2 * 0.5 * (1 - 0.5)}{}$$

$$0.05^2$$

= 384

Since the population is finite (less than 10,000), the correction formula (Cochran, 1977) was applied as indicated

$$n_0 = \frac{z^2pq}{e^2}$$

for infinite population (Cochran, 1977)

Where:

n0 is the required sample size,

z is the selected critical value of desired confidence level (taken as 1.96 at 95% CI)

p is the estimated proportion of an attribute that is present in the population (prevalence of the desired attribute – in this case psychological insulin resistance among type II diabetes patients taken as 0.8 from the estimated prevalence by Gulam *et al* 2017).

$$q = 1 - p$$

e is the desired level of precision – ie. margin of error (taken as 0.05)

$$n^0 = \frac{1.96^2 * 0.5 * (1 - 0.5)}{0.05^2}$$

Thus,

$$n = \frac{n^0}{1 + \frac{(n^0 - 1)}{N}}$$

Since the population is finite (less than 10,000), apply sample size correction formula (Cochran, 1977)

Where:

n_0 is the sample size when the population is infinite (ie. 245.86)

N is the population size (180 is the average number of patients attending clinic in a particular month.)

$$n = \frac{384}{1 + \frac{(384 - 1)}{180}}$$

Thus, the sample size will be 123

3.6 Sampling Process

Convenient sampling technique was employed in this study by engaging the diabetic patients attending the daily DM clinic. All the potential respondents were subjected to a set eligibility criterion. This was repeated till the desired sample size was attained. While this sampling technique is practical and cost-effective, it introduces several limitations that may affect the generalizability of the findings. First, participants were recruited based on their availability and willingness to participate rather than through a randomized process, increasing the risk of selection bias. This may have led to overrepresentation of individuals who are more engaged in their care, more accessible within clinic settings, or more open to discussing psychosocial issues, such as insulin resistance, depression, and anxiety.

3.7 Data Collection Tools

This study utilized a datasheet, Generalized anxiety disorder -7 scale (GAD-7), the Insulin Treatment Appraisal Scale (ITAS) and patient health questionnaire scale (PHQ-9) .

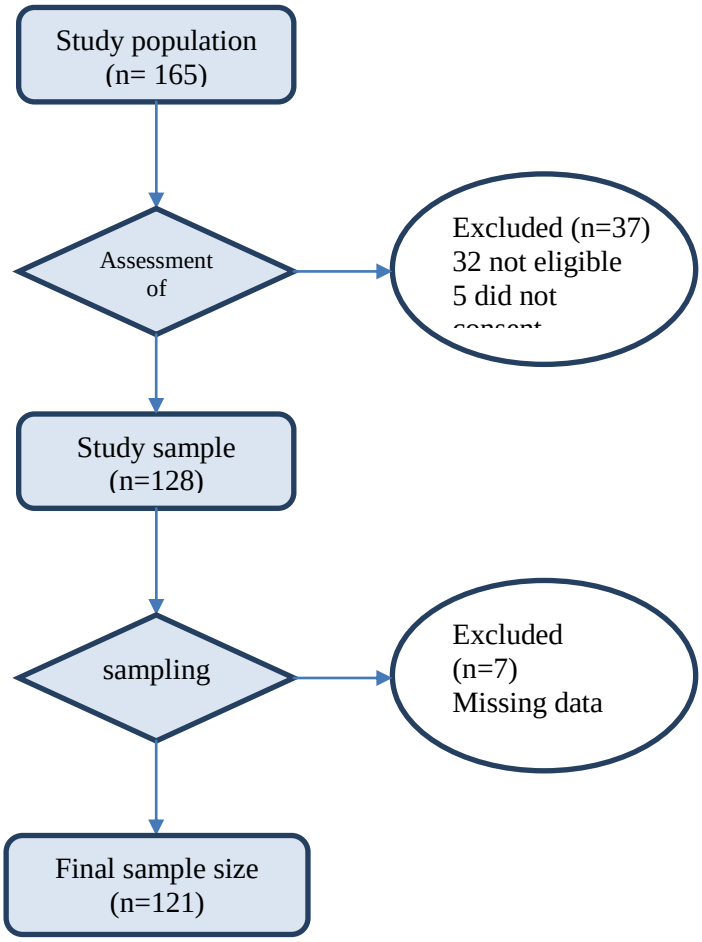
The data sheet included age, gender, medication type, how long one has lived with diabetes and used insulin, mode of purchasing insulin, HBA1c level, and ongoing mental

health treatment. The information needed was gathered from the data sheet, either provided by the patients themselves or retrieved from their electronic medical records. GAD-7 , ITAS and PHQ- 9 tools have demonstrated good internal reliability with Cronbach alpha value of 0.82, 0.89 and 0.89 respectively (Nyongesa et al. 2020, Snoek et al. 2007, Spitzer et al. 1999).

3.7.1 Recruitment Procedure

Figure 3

Recruitment Procedure



Source: Author, (2025)

3.7.2 Study Subjects

Patients attending the diabetic clinic

3.8 Data Collection Procedures

Patients attending the diabetes clinic were identified for participation upon registration. They were introduced to the Principal Investigator or the assistants by the nurse taking vital signs. The principal investigator or the assistants took the identified patients, one at a time, to one of the consultation rooms which was designated for interview and to offer privacy. The principal investigator or the assistants introduced themselves, explained the study and the objectives and requested the patients to voluntarily participate in the study. If the patient was eligible to participate and had agreed to participate, he/she gave a written consent by signing the consent form.

The principal investigator or the research assistants administered the structured questionnaire and a standard validated tool called Insulin Treatment Appraisal Scale (ITAS) A data sheet, PHQ-9, and GAD-7. Medical information was also retrieved from the electronic medical records. Medical records also helped in correlating information given by participants to minimize on recall bias. Participants with missing data on the EMR were excluded from the study. A sticker was placed on the patients' diabetic card and the daily log of enrolled patient unique numbers were kept to countercheck when doing subsequent interviews to avoid double enrolment.

3.8.1 Data Management and Analysis

This details the measures implemented to ensure data integrity, participant protection, and systematic monitoring of study activities:

Adverse Event Reporting- With regard to adverse events, none were observed or reported over the course of data collection. Participants were informed that any discomfort or concerns arising during the interviews could be communicated directly to the triage nurse or to the principal investigator for prompt attention. Any events arising

was to be reported was to be address by the lead researcher and notify hospital management.

Data Management: Data collected during the study was entered into computerized data entry sheets that were available only to the PI and research assistants. The data did not bear the names of the participants.

Quality Assurance: The Principal Investigator (PI) and the assistants ensured the data collected was of high quality by checking through the questionnaire immediately after every interview, before the study participant left the hospital. Any missing or unclear response on the questions was to be corrected by requesting the patient for additional time to clarify the responses.

Confidentiality: Data collection was carried out in designated private rooms to ensure participant comfort and privacy. All information obtained from respondents was anonymized, and strict confidentiality was maintained throughout the study. The data were used exclusively for the purposes outlined in the study protocol. No invasive procedures were undertaken, and participants were not subjected to any additional financial costs as a result of their involvement.

The outcomes of the research will be disseminated through multiple channels: a copy will be deposited in the Kabarak University library as well as Chogoria Hospital administration. In addition, a summary of the findings will be shared with participants upon request, and the work will be made accessible online to facilitate broader access for researchers, practitioners, and other stakeholders.

3.9 Ethical Considerations

Ethical approval to undertake this study was obtained from the Kabarak University Research Ethics Committee (KUREC), reference number KUREC-050824, and further

authorization was granted by Chogoria Hospital management through a formal email confirmation. In addition, a research permit was secured from the National Commission for Science, Technology and Innovation (NACOSTI) under license number NACOSTI/P/24/414487.

Prior to enrollment, the investigators provided potential participants with a clear explanation of the study objectives, procedures, and their rights as research subjects. Written informed consent was subsequently obtained, either through signature or thumbprint for participants who were unable to sign. To ensure privacy and confidentiality, interviews were conducted in a secure and private setting, and no personal identifiers such as names or hospital numbers were recorded on the questionnaires. Participation in the study was strictly voluntary, and participants retained the right to withdraw at any stage without penalty or need for justification.

Special ethical considerations were applied for participants who screened positive for moderate to severe levels of depression or anxiety. In such cases, additional informed consent was sought to allow disclosure of this information to their primary healthcare provider, with the aim of facilitating timely clinical management and support. Data collection for the study was conducted in December 2024.

Risks

There were no overt risks involved in participating in this study.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSIONS

4.1 Introduction

This chapter gives analysis of the collected data that was conducted using SPSS version 25 as the main data collection tool. The collected data was sorted, entered and corrected for errors after which the statistical tool was applied to the data.

4.2 Demographic Information

Table 1

Age of the Respondents

	Frequency	Percent
26-35	1	.8
36-46	3	2.5
46-55	26	21.5
Above 55	91	75.2
Total	121	100.0

The study findings in Table 1 indicate that majority of the respondents (75.2%) were above 55 years of age while the least respondents were between the ages of 26-35 years.

Table 2

Sex of Respondents

	Frequency	Percent
F	67	55.4
M	54	44.6
Total	121	100.0

The study findings in Table 2 indicates that the study was not gender biased as both genders were given equal chances of participation however majority of the respondents were female gender at 55.4%.

Table 3

Duration of Diabetes

Years	Frequency	Percent
0-4.9	52	43
5-9.9	31	26
10-14.9	20	17
15-19.9	7	6
>20	11	9
	121	100

Table 4

Medication Type

		Frequency	Percent
Valid	Orals	83	68.6
	Orals + Insulin	36	29.8
	Diet	1	.8
	Insulin	1	.8
	Total	121	100.0

The study findings in Table 4 indicate that majority of the respondents take oral pills as given by 68.6% followed by those taking orals + insulin as given by 29.8% while the least of the respondents go for diet and insulin for less than 2% respectively.

Table 5

Mode of Payment

		Frequency	Percent
Valid	NHIF	40	33.1
	NHIF+POCKET	64	52.9
	POCKET	14	11.6
	INSURANCE	2	1.7
	NHIF + INSURANCE	1	.8
	Total	121	100.0

The payment method used by majority of the respondents is NHIF + Pocket for 52.9% followed by NHIF for 33.1% while the least payment method used is NHIF + Insurance at less than 1%

4.2 The Glycemic Control Based on Gender

Table 6

Sex and HBA1C Cross-Tabulation

		HBA1C2							
		<5	5.0 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 -9	>10	9-10	Total
Sex	F	1	16	12	12	12	10	4	67
	M	2	9	5	8	19	9	2	54
Total		3	25	17	20	31	19	6	121

The analysis of glycemic control by gender among type 2 diabetes patients at PCEA Chogoria Hospital reveals distinct patterns in diabetes management between male and female patients. Female patients demonstrated relatively better glycemic control, with 43.3% (29 out of 67) achieving HbA1c levels below 7.0%, which is generally considered the threshold for good control. Within this group, 41.8 % of participants had good control of their sugars. They exhibited Hba1c of < 7 %. However, a significant proportion of female patients (37.3%) still exhibited suboptimal control, with HbA1c levels exceeding 7.1%, including 10 patients (14.9%) with dangerously high levels above 10%.

In contrast, male patients displayed poorer glycemic control overall. Only 29.6% (16 out of 54) had HbA1c levels below 7.0%, with just 9 patients (16.7%) in the pre-diabetic range (5.0–6.0%) and 5 (9.3%) near the target range (6.1–7.0%). Notably, more than half of the male patients (53.7%) had HbA1c levels of 8.1% or higher, indicating inadequate control. This included 19 patients (35.2%) in the 8.1–9.0% range and 9 (16.7%) with

levels exceeding 10%, highlighting a critical need for intervention. The data also revealed a small subset of patients with very low HbA1c levels (<5.0%), which may suggest potential overtreatment. This was observed in 1 female (1.5%) and 2 male (3.7%) patients, warranting further clinical review to avoid risks associated with excessively tight glycemic control, such as hypoglycemia.

These findings underscore significant gender disparities in diabetes management, with male patients facing greater challenges in achieving optimal glycemic control. Possible contributing factors could include differences in medication adherence, lifestyle behaviors, or biological responses to treatment. The results emphasize the need for targeted interventions, particularly for male patients, to improve diabetes outcomes.

Table 7

Average Blood Sugar Levels (HBA1C)

	Frequency	Percent
<5	3	2.5
5.0-6.0	25	20.7
6.1-7.0	17	14.0
7.1-8.0	20	16.5
8.1-9.0	31	25.6
9.1-10.0	6	5
>10	19	15.7
Total	121	100.0

The study findings revealed significant variations in glycemic control among type 2 diabetes patients attending PCEA Chogoria Hospital. The HbA1c results showed that only 37.2% of patients achieved good glycemic control (HbA1c <7.0%), with a mere 2.5% demonstrating tight control below 5%. The majority of patients (62.8%) exhibited suboptimal to poor control, including 42.1% with HbA1c levels between 7.1-9.0% and a concerning 20.7% with dangerously high levels above 9.0%. The distribution pattern indicated that the largest single group (25.6%) fell within the 8.1-9.0% range, suggesting

many patients were approaching but not reaching target control levels. These results highlight a critical need for improved diabetes management strategies, particularly for the substantial proportion of patients with HbA1c levels exceeding 7.1%, who may require treatment intensification to reduce their risk of diabetes-related complications.

Table 8

The Relationship between HBA1C and PIR in Patients with Type II Diabetes

		Value of HBA1c						
		<5	5.0-60	6.1-70	7.1-8.0	8.1-10.0	>10	Total
PIR2	Below 65	16	1	4	2	6	14	43
	Neutral	0	1	0	0	0	0	1
	Above 65	36	5	5	5	9	17	77
Total		52	7	9	7	15	31	121

The study finding in Table 8 gives the relationship between Average Blood Sugar Levels (HBA1c) and the PIR among type 2 DM patients. A majority of participants who had a HbA1c of more than 7 had a negative appraisal of insulin with a PIR score of more than 65. On examining the relationship between HBA1c and PIR using Chi square and Fischer's exact test as shown by Table 9 there was no significant relationship.

Table 9

Fischers Exact Test: The Relationship between HBA1C and PIR in Patients with Type II Diabetes

Test	Statistic	P-value	interpretation
Fischer's exact test	Odds ratio=0.63	0.254	No significant association
Likelihood Ratio test	G= 1.46	0.226	No significant association
Chi- square test	χ^2= 1.47	0.226	No significant association

4.3 Prevalence of Psychological Insulin Resistance and Depression, Anxiety Correlation

Table 10

Classification of Patients for PIR based on ITAS Score

	Frequency	Percent
Below 65	43	35.5
Above 65	76	62.8
Neutral	2	1.7
Total	121	100.0

Scores are summed and standardized to a 0 – 100 scale, with higher scores indicating higher emotional distress with patients. Using a score of 65 as the base value, there was a negative score of 62.8% where the respondents recorded ITAS sum of 65 and above based on the ITAS tool used. The Prevalence of PIR among type 2 DM patients attending PCEA Chogoria Hospital is therefore given as 62.8% as in Table 11.

Table 11

ITAS Tool and Frequencies

Question			Strongly Disagree	Disagree	Agee nor disagree	Agree	Strongly Agree
Q1	Taking insulin means I have failed to manage my diabetes with diet and tablets	n	1	13	12	45	49
		%	0.8	10.7	9.9	37.2	40.4
Q2	Taking insulin means my diabetes has become much worse	n	2	6	24	54	35
		%	1.7	5	19.8	44.6	28.9
Q3	Taking insulin increases the risk of low blood glucose levels (hypoglycaemia)	n	1	12	44	48	15
		%	0.8	9.9	36.4	39.7	12.4
Q4	Insulin causes weight gain	n	4	26	53	24	14
		%	3.3	21.5	43.8	19.8	11.6
Q5	Taking insulin means my health will Deteriorate	n	8	43	24	34	12
		%	6.6	35.5	19.8	28.1	9.9
Q6	Taking insulin means other people see me as a sick person	n	0	26	33	37	25
		%	0	21.5	27.3	30.6	20.
Q7	Taking insulin makes life less flexible	n	6	20	25	51	19
		%	4.9	16.5	20.7	42.1	15.7

Q8	Being on insulin causes family and friends to be more concerned about me	n	1	34	42	35	9
		%	0.8	28.1	34.7	28.9	7.4
Q9	Taking insulin makes me more dependent on my doctor	n	3	24	33	34	27
		%	2.5	19.8	27.3	28.1	22.3
Q10	I'm afraid of injecting myself with a Needle	n	11	26	18	49	17
		%	9.1	21.5	14.9	40.5	14.0
Q11	Managing insulin injection takes a lot of time and energy	n	3	35	37	37	8
		%	2.5	28.9	30.6	30.6	6.6
Q12	Taking insulin means I have to give up activities I enjoy	n	4	36	34	33	13
		%	3.3	29.7	28.1	27.3	10.7
Q13	Injecting insulin is embarrassing	n	17	34	21	23	26
		%	14.1	28.1	17	19	21
Q14	Injecting insulin is painful	n	9	21	19	38	33
		%	7.4	17.4	15.7	31.4	27.3
Q15	It is difficult to inject the right amount of insulin correctly at the right time every day	n	9	35	34	35	8
		%	7.4	28.9	28.1	28.9	6.6
Q16	Taking insulin makes it more difficult to fulfil my responsibilities (at work, at home)	n	2	29	52	29	8
		%	1.7	23.9	42.9	23.9	6.6
Q17	Taking insulin helps to maintain good control of blood glucose	n	0	13	44	59	5
		%	0	10.7	36.4	48.7	4.1
Q18	Taking insulin helps to prevent complications of diabetes	n	0	6	35	54	26
		%	0	5	28.9	44.7	21.5
Q19	Taking insulin helps to improve my energy level	n	3	18	53	45	2
		%	2.5	14.9	43.8	37.2	1.7
Q20	Taking insulin helps to improve my Health	n	0	8	47	52	14
		%	0	6.6	38.8	42.9	11.6

Table 11 indicates the individual items in the ITAS scale. There are 4 thematic areas that emerge in the ITAS tool .

i. Psychological Impact and Perceived Physical Concerns

As highlighted by red. (questions 1-5) 77 % of respondents had perceived self-blame that taking insulin meant that they had failed to take control of their diabetes. The view that insulin would worsen their health was present in 42% of respondents, however did not think that taking insulin would make them gain weight.

ii. Perceived Social stigma or burden

As highlighted by blue (questions 6-9)

Of the respondents 50.6 % agreed that insulin therapy would make the society view them as sicker persons with 57% of the opinion that insulin therapy would make their life more rigid.

iii. The Practicality of Utilizing Insulin

As highlighted by green (questions 10-16). Fear of injection was very common among the respondents, 58 % were afraid of needles and 54% thought insulin injections to be very painful. However, 42 % did not think that injecting insulin was an embarrassing task.

iii. The Perceived Benefits of Insulin

As highlighted by yellow (questions 17-20) majority of participants had a positive appraisal to insulin with 65% are in agreement that it minimized the complications that come with diabetes. 51% of respondents agreed that using insulin improved their overall health however 43% were uncertain on whether insulin improved the overall energy levels.

Table 12

Frequency of Depression Using Patient Health questionnaire 9(PHQ-9)

		Scale	Frequency	Percent
Valid	Not at all/haijatok-elezea kabisa	0	80	66.1
	Several days/siku kadhaa	1	10	8.3
	More than half the days/zaidi ya nusu ya siku hizo	2	18	14.9
	Nearly every day/takriban kila siku	3	13	10.7
	Total		121	100.0

The responses obtained indicate that majority of the respondent's (66.1%) have not experienced depression and anxiety on a daily basis as indicated by the response of 'Not at all/ haijatokelezea kabisa'. However, there were responses for 'More than half the days/zaidi ya nusu ya siku hizo' anxiety and depression as given by 14.9% and 10.7% for 'Nearly every day/takriban kila siku' and 8.3% for 'Several days/siku kadhaa'.

Table 13

Frequency of Anxiety using General Anxiety Disorder Symptoms GAD-7 Scale

		Scale	Frequency	Percent
Valid	Not at all sure/halijatokeleza kabisa	0	79	65.3
	Several days/siku kadhaa	1	23	19.0
	Over half the days/zaidi ya nusu ya siku hizo	2	10	8.3
	Nearly every day/ takriban kila siku	3	9	7.4
	Total		121	100.0

The study findings in Table 13 indicate that majority of the respondents have not experienced general anxiety disorder as given by 65.3% for 'Not at all sure/ halijatokeleza kabisa'. However, there were responses for general anxiety disorder as given by 19% on 'Several days/siku kadhaa' and 8.3% for 'Over half the days/zaidi ya nusu ya siku hizo'.

4.4 The Relationship between Depression and PIR in Patients with Type II Diabetes Attending PCEA Chogoria Hospital

Table 14

Patient Health Questionnaire 9-item Scale (PHQ-9) and PIR in Patients with Type II Diabetes

		Not at all/haijatok-elezea kabisa	Several days/siku kadhaa	More than half the days/zaidi ya nusu ya siku hizo	Nearly every day/takriban kila siku	
PIR2	Below 65	27	2	8	6	43
	Neutral	2	0	0	0	2
	Above 65	51	8	10	7	76
Total		80	10	18	13	121

Table 14 indicate that majority of the respondents with the PIR above 65 among type 2 DM patients had not experienced depression symptoms as given by 51 out of 80 patients for No depression at all. However, there were responses for nearly every day and more than half the days.

Table 15

Chi-Square Test for the Relationship between Depression and PIR in Patients with Type II Diabetes (2 tailed)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.586[a]	10	.023
Likelihood Ratio	9.215	10	.512
Linear-by-Linear Association	1.912	1	.167
N of Valid Cases	121		

a. 11 cells (61.1%) have expected count less than 5. The minimum expected count is .06.

Table 16

Fischer's Exact Test Analysis: Relationship between Depression and PIR

	PIR+ve	PIR-ve
Depression	1	2
No depression	77	41
Total	78	43

The Pearson Chi-Square test ($\chi^2 = 19.586$, df = 10, p = 0.023) suggests a statistically significant association between depression and Psychological Insulin Resistance (PIR) in Type II Diabetes Mellitus patients at the 5% significance level. However, with 61.1% of cells (11 out of 18) having expected counts less than 5 (minimum 0.06), the Chi-Square test's reliability is compromised. Fisher's exact test, more suitable for low expected counts, yielded a non-significant result (p = 0.287), indicating no robust evidence of an association. The effect size (Cramer's V ≈ 0.284) suggests a moderate relationship, not a strong one. Thus, while there may be a link between depression and PIR, the small sample size (n = 121) and low expected counts limit the strength of this conclusion. Further research with larger samples or aggregated categories is needed to clarify this relationship.

4.5 The Association between Anxiety and PIR in Patients with Type II Diabetes

Table 17

General Anxiety Symptoms GAD-7 Scale and PIR in Patients with Type II Diabetes

		Not at all sure/halijato keleza kabisa	Several days/siku kadhaa	Over half the days/zaidi ya nusu ya siku hizo	Nearly every day/ takriban kila siku	
PIR2	Below 65	29	10	0	4	43
	Neutral	2	0	0	0	2
	Above 65	48	13	10	5	76
Total			79	23	10	9

Table 17 indicate that majority of the respondents with the PIR above 65 among type 2 DM patients had not experienced general anxiety as given by 48 out of 79 patients for Not at all. However, there were responses for nearly every day and several days.

Table 18

Chi-Square Test for Generalized Anxiety Disorder-7(GAD-7) Scale - and PIR in Patients with Type II Diabetes (One-Tail)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.389[a]	6	.049
Likelihood Ratio	4.060	6	.669
Linear-by-Linear Association	.812	1	.368
N of Valid Cases	121		

a. 6 cells (50.0%) have expected count less than 5. The minimum expected count is .17.

Since the calculated Chi-Square value (3.389) is greater than the chosen significance level (0.05) and the degree of freedom is 6, which implies that there is NO relationship anxiety and psychological insulin resistance is rejected and the study therefore concludes that there is a relationship between general anxiety and psychological insulin resistance The study is significant at 5% significant level (Sig<0.05) since the p-value is 0.049 using a one tail test.

Table 19

Chi-Square Tests for General Anxiety Symptoms GAD-7 Scale and PIR in Patients with Type II Diabetes (Two-Tail)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.732[a]	6	.021
Likelihood Ratio	11.555	6	.073
Linear-by-Linear Association	.503	1	.478
N of Valid Cases	121		

a. 6 cells (50.0%) have expected count less than 5. The minimum expected count is .15.

Table 20

Fischer's Exact Test Analysis: Relationship Between Anxiety and PIR

	PIR +ve	PIR-ve
Anxiety	3	1
No anxiety	76	41
Total	79	42

The Pearson Chi-Square test ($\chi^2 = 7.732$, df = 6, p = 0.021) suggested a statistically significant association between anxiety and Psychological Insulin Resistance (PIR) in Type II Diabetes Mellitus patients at the 5% significance level ($p < 0.05$, two-tailed test). However, with 50% of cells (6 out of 12) having expected counts less than 5 and a minimum expected count of 0.15, the Chi-Square test's reliability is compromised. Fisher's exact test, which is more appropriate for low expected counts, yielded a non-significant result (p = 1.0), indicating no robust evidence of an association between anxiety and PIR. The effect size (Cramer's V ≈ 0.179) suggests a small to moderate relationship.

Given the small sample size (n = 121) and low expected counts, the study does not provide sufficient evidence to reject the null hypothesis of no association between anxiety and PIR. Further research with larger samples or aggregated categories is recommended to clarify this relationship.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary

Psychological insulin resistance (PIR) remains a significant barrier in the effective management of Type 2 Diabetes Mellitus (T2DM), despite advances in pharmacological treatment and education. The present study, conducted at PCEA Chogoria Hospital, aimed to evaluate the prevalence of PIR and its association with demographic factors, glycemic control, depression, and anxiety. The findings are consistent with global literature that underscores the multifactorial nature of PIR, with psychological, social, and practical concerns shaping patients' attitudes towards insulin therapy.

5.1.1 Prevalence of Psychological Insulin Resistance and Patient Demographics

The prevalence of psychological insulin resistance (PIR) in this study was 62.8%, indicating a substantial proportion of patients expressing reluctance to initiate insulin therapy. This magnitude of resistance aligns with evidence that psychosocial, economic, and structural barriers continue to impede optimal diabetes management in low-resource settings (Polonsky & Henry, 2016). Although PIR is frequently conceptualized as an attitudinal or emotional response to insulin, in rural contexts it is also closely linked to practical constraints that influence patient readiness to begin treatment.

The prevalence reported here is lower than the 82.6% documented by Gulam et al. (2017) at Kenyatta National Hospital, an urban tertiary referral center. However, the persistence of high PIR in a rural population underscores the importance of context-specific determinants. In urban settings, PIR is often shaped by misconceptions that insulin signifies advanced disease, personal failure, or irreversible clinical deterioration (Rubin et al., 2009). In contrast, rural patients face tangible barriers that strengthen

psychological resistance. These include limited access to refrigeration for insulin storage, unreliable electricity supply, and financial difficulties that make long-term insulin use challenging (Ogle et al., 2016). Many rural Kenyan households lack dependable cold-chain capacity, which contributes to concerns about insulin spoilage and potential harm and increases reluctance to begin insulin therapy.

Demographically, most of the study participants were older adults, with 75.2% aged 55 years or older. This aligns with broader regional trends showing that type 2 diabetes mellitus (T2DM) prevalence increases markedly with age in sub-Saharan Africa, peaking in those aged 55 years and older (International Diabetes Federation, 2021; Atun et al., 2017). Additionally, the study had a slight female majority (55.4%), consistent with literature indicating a higher diabetes burden among women in many parts of Africa, potentially due to higher rates of obesity, gender roles affecting physical activity and healthcare access, and differences in chronic disease self-management (International Diabetes Federation, 2021; Hilawe et al., 2013)

5.1.2 Perceptions and Attitudes toward Insulin Therapy

Patient beliefs and emotional responses toward insulin significantly influence psychological insulin resistance (PIR). This study found that 77% of participants felt starting insulin indicated personal failure in diabetes management. This belief, prominent in both rural and urban populations, resonates with findings from South African studies using the Insulin Treatment Appraisal Scale (ITAS), where insulin-naïve patients frequently viewed insulin as evidence of self-management failure or disease worsening (Ngassa Piotie et al., 2022; Kolla et al., 2023). Patients often perceive insulin not as a proactive treatment step but as a symbol of deterioration or poor self-discipline. In qualitative interviews conducted in Cape Town public facilities, documented recurrent

themes of guilt, shame, and self-blame; patients described insulin as a “punishment” for past lifestyle choices or as proof that they had “let the disease win,” emotions that often led to outright refusal even when clinically indicated.

These attitudes are not unique to South Africa: comparable high negative ITAS scores for self-blame and perceived failure have been reported in Ethiopia (Stephenson et al., 2022) and in multi-country African reviews (Mohan et al., 2021), confirming that viewing insulin as a personal defeat rather than a neutral therapeutic tool remains one of the most consistent and powerful drivers of PIR across sub-Saharan Africa. Patients often perceive insulin not merely as another medication but as a highly visible symbol of deterioration, loss of autonomy, and poor self-discipline a framing that sustains reluctance long after objective clinical need is established.

Fear of injections was another strong theme, with over 58% of participants citing fear of needles or pain. Such fears are well documented in African and global literature. In a qualitative study from primary care facilities in Cape Town, South Africa, fear of injections and pain were key patient-level barriers to insulin initiation, particularly in resource-constrained settings (Kolla et al., 2023). In rural environments characterized by resource limitations, this apprehension may be exacerbated by the absence of guidance from qualified diabetes educators who are capable of illustrating appropriate injection technique or providing reassurance to patients. A notable proportion of patients (54%) believed insulin would reduce their quality of life or daily flexibility.

This belief is reinforced by rigid routines required for insulin administration and the additional burden of glucose monitoring. In qualitative studies from rural South Africa and Ethiopia, similar concerns about lifestyle disruption, social stigma, perceived dependency, and restrictions on daily activities were associated with delayed insulin

initiation and strong PIR (Stephenson et al., 2022; Kolla et al., 2023). Additionally, some patients expressed concern about insulin leading to dependency on healthcare services, which in rural areas may be irregular or inaccessible due to transportation or cost constraints. Despite these fears, the study also found positive attitudes. Approximately 65% of respondents acknowledged insulin's effectiveness in preventing complications. This dichotomy reflects a cognitive dissonance observed in previous literature where patients often intellectually understand the benefits of insulin but remain emotionally resistant. Targeted, culturally sensitive education can help reconcile these opposing beliefs by reframing insulin not as a "last resort" but as an effective early intervention.

5.1.3 Relationship between Depression and PIR

Depression is a well-recognized comorbidity in diabetes, affecting both clinical outcomes and treatment uptake. In this study at PCEA Chogoria Hospital, relatively few patients screened positive for depression. This low prevalence may reflect the influence of stronger social support structures in rural communities, which can buffer against psychological distress and foster coping mechanisms. By contrast, Otieno et al. (2017) reported that approximately one-third of patients with type 2 diabetes at Kenyatta National Hospital exhibited depressive symptoms, and among those, two-thirds had suboptimal glycemic control, highlighting the link between emotional well-being and metabolic stability.

Although Fisher's exact test in the present study did not detect a statistically significant association between depression and psychological insulin resistance (PIR), the Pearson chi-square test suggested a trend approaching significance. Depression may influence perceptions of insulin therapy by fostering feelings of inadequacy, guilt, or hopelessness, which can exacerbate fears and misconceptions about insulin initiation. Supporting this,

Ghamri et al. (2020) found that individuals with depression were less adherent to diabetes self-management and more resistant to treatment changes, including insulin initiation.

Recent Kenyan research further illustrates the burden of mental health comorbidity in diabetes. In Murang'a County, Kimathi, Nyagwencha, and Karanja (2022) reported very high prevalence of depressive (85.1%) and anxiety (95.7%) symptoms among patients with type 2 diabetes. Similarly, Njiru (2022) found that at Kenyatta National Hospital, 39.6% of patients had depression, 47.4% had anxiety, and 36.2% experienced both conditions. These findings highlight that emotional distress is not only common but often co-occurring, and likely contributes to poor adherence and resistance to insulin therapy.

Depression also impacts patient–provider communication, as individuals with depressive symptoms may underreport concerns, resulting in delays in treatment escalation. In rural Kenyan settings, where mental health resources are scarce and stigma is prevalent, depression may remain undetected and unaddressed. The PHQ-9 instrument used in this study provides a practical method to integrate mental health screening into routine diabetes care.

Addressing PIR effectively therefore requires interventions that consider psychological barriers. Strategies may include training community health volunteers in mental health literacy, establishing peer support groups, and developing structured referral systems to mental health professionals. By addressing depression and anxiety in diabetes care, it is possible to enhance both mental well-being and timely initiation of insulin therapy.

5.1.4 Relationship between Anxiety and PIR

Anxiety, alongside depression, plays an important role in shaping Psychological Insulin Resistance (PIR), yet it remains under examined in African diabetes research. In the

present study at PCEA Chogoria Hospital, only a small proportion of participants screened positive for anxiety; however, even at low prevalence, anxiety symptoms were linked to heightened PIR tendencies. These tendencies were particularly associated with fears of needle injections, concerns about insulin's safety, and worries about long-term lifestyle constraints. Anxious patients often magnify perceived risks, and the daily, lifelong nature of insulin therapy may intensify these fears. This aligns with findings by Holmes-Truscott et al. (2021), who reported that anxiety was strongly associated with fears of hypoglycemia, dosing errors, and the perception of insulin as a permanent and burdensome treatment.

The current study suggests that anxiety may amplify existing misconceptions in rural settings, including beliefs that insulin is painful, unaffordable, or indicative of severe disease progression. In rural Kenya, where diabetes education is variable and mental health stigma persists, anxiety frequently goes undetected. Similar observations were noted by Joubert et al. (2022) in South Africa, where patients with anxiety seldom disclosed their fears unless explicitly asked, yet demonstrated significant reluctance toward insulin initiation.

The association between anxiety and PIR in this study may also have been influenced by the limitations of the Generalized Anxiety Disorder–7 (GAD-7) tool, which, while validated, may not fully capture culturally specific manifestations of anxiety in rural Kenyan populations.

To address these gaps, diabetes care in rural settings would benefit from integrating targeted mental health implementation strategies. These may include:

- Routine mental health screening (using PHQ-9 and GAD-7) during clinic visits or at points of treatment intensification.

- Brief, structured psycho-education sessions delivered by nurses or diabetes educators to address fears about injections, hypoglycemia, and insulin safety.
- Peer-support groups where patients can share experiences about insulin use, reducing fear through exposure to positive narratives.

Integrating these strategies into routine diabetes care can help uncover hidden psychological barriers, reduce PIR, and improve overall Type 2 diabetes management in resource-constrained rural environments

5.2 Glycemic Control and PIR

Achieving stable blood glucose levels is the cornerstone of diabetes care. In this study at PCEA Chogoria Hospital, 62.8% of participants recorded HbA1c levels above 7%, with 20.7% surpassing 9%, reflecting suboptimal metabolic management. However, only 29.8% were on insulin therapy, indicating a significant gap in treatment escalation. This discrepancy points to clinical delays and Psychological Insulin Resistance (PIR) as barriers to timely insulin adoption, despite evident uncontrolled glucose levels.

Notably, this study found no statistically significant link between PIR and poor glycemic control. This could stem from the multifaceted causes of elevated HbA1c, including non-adherence to medications, dietary habits, limited physical activity, provider hesitancy, and healthcare system constraints. Nevertheless, PIR may indirectly exacerbate poor glucose regulation by postponing insulin use in patients unresponsive to oral hypoglycemic agents, as observed by Gulam et al. (2017) in a Kenyan cohort.

A study by Romera et al. (2020) noted that delays in starting insulin were associated with increased hospitalization rates and worse long-term health outcomes. These findings highlight that addressing PIR is not solely a psychological or educational objective but a critical step to curb disease progression.

Implementing structured insulin initiation protocols, paired with patient-focused education and emotional support, can enhance insulin uptake and improve glycemic outcomes. Such strategies are vital in rural settings like Tharaka Nithi County, where access to diabetes care and mental health resources are limited, underscoring the need for integrated approaches to overcome PIR and optimize T2DM management.

5.3 Impact of NHIF/SHA Funding

The transition from the National Health Insurance Fund (NHIF) to the Social Health Insurance Fund (SHIF) under the Social Health Authority (SHA) became operational in October 2024. This change was intended to expand coverage for chronic conditions including diabetes through the core SHIF benefits and the Emergency, Chronic, and Critical Illness Fund. However, as of late 2025, significant implementation gaps persist. Many patients, especially in faith-based or rural facilities like Chogoria Hospital, still face substantial out-of-pocket payments for insulin and supplies. Providers report reimbursement delays, incomplete empanelment of facilities, inconsistent drug tariffs, and effective annual limits on chronic care allocations that often fall short of full costs (frequently cited as around KES 8,000 or less per patient for routine diabetes management in practice).

This ongoing financial burden continues to worsen psychological insulin resistance (PIR) in rural Kenyan settings. Cost-related stresses intensify feelings of self-blame and fear of injections or pain, which delays insulin initiation and contributes to poor glycemic control. Pre-transition data from public facilities showed average annual out-of-pocket costs for diabetes care at approximately US$148 (around KES 19,000–25,000 at current rates), with medications comprising 52–70% of direct expenses and over half of patients experiencing catastrophic health expenditure (Oyando et al., 2020). Limited effective

coverage also hinders access to mental health screening for depression and anxiety, both strongly linked to PIR.

To reduce out-of-pocket costs, improve insulin acceptance, prevent complications, and close rural-urban gaps in diabetes care, priorities include removing restrictive per-patient caps on chronic reimbursements, accelerating contracting of faith-based and rural providers, ensuring reliable insulin supply under SHA tariffs, and incorporating psychosocial support into chronic care pathways.

5.4 Rural Versus Urban

A key strength of this study lies in its rural focus, which complements and extends urban-based findings such as those by Gulam et al. (2017). While Gulam's study reported a higher prevalence of PIR (82.6%), the similarities in attitudinal barriers such as the belief that insulin represents personal failure, fear of injections, and lifestyle concerns demonstrate that PIR is a widespread phenomenon in Kenya, regardless of setting. However, differences are also evident. Urban patients may have more access to structured diabetes education, diabetes nurses, and specialist clinics, which can reduce PIR through consistent reinforcement and support. In contrast, rural patients often rely on general practitioners with limited time and training, leading to missed opportunities for counseling and education. This study showed 86% of participants use SHA to purchase medications. A consistent and reliable social funding is important for control. The findings from this study therefore suggest that while PIR has common psychological roots, its manifestation and intensity are shaped by contextual factors that differ between rural and urban environments.

5.5 Limitations and Implications for Practices

While the study provides robust insights, it has limitations. The reliance on a single hospital setting may limit generalizability, and the cross-sectional design precludes causal inferences. Additionally, the small sample size (n=121) may have reduced the power to detect associations, particularly in the Fischer's exact test analyses, which found no significant relationship between PIR and depression/anxiety (p=0.287 and p=1.0, respectively). Future research should employ longitudinal designs and larger, multicenter samples to better elucidate causal pathways. These findings emphasize that effective diabetes management must extend beyond clinical indicators to address emotional and psychological barriers. Moreover, interventions targeting PIR should integrate psychological support, such as cognitive-behavioral therapy, to address depression and anxiety, as suggested by a 2022 study by Chew et al. (Chew et al., 2022).

5.6 Conclusion

This study reinforces the complexity of psychological insulin resistance among patients with type 2 diabetes. PIR is influenced more by beliefs, stigma, emotional factors, and practical concerns than by glycemic control alone. The significant associations with depression and general anxiety highlight the need for holistic, patient-centered care models. Future research should prioritize longitudinal interventions designed to reduce psychological insulin resistance (PIR) while enhancing both mental and physical health outcomes among individuals with diabetes. Such studies should also track PIR over time to better understand its trajectory and to identify potential causal relationships and contextual influences in rural settings.

This study's findings on psychological insulin resistance (PIR), depression, and anxiety among Type 2 Diabetes Mellitus patients at PCEA Chogoria Hospital will be

disseminated to enhance diabetes care in rural Kenya. Results will be published in peer-reviewed journals. Policy briefs will be shared with Kenya's Ministry of Health and local health authorities to inform rural diabetes management strategies, addressing barriers like insulin access. Community workshops at PCEA Chogoria Hospital will engage patients and providers, promoting education to reduce PIR stigma. Presentations at conferences, like the Kenya Diabetes Study Group regional meetings. Digital platforms, including health-focused websites, will extend reach to rural stakeholders. This multifaceted dissemination ensures evidence-based interventions improve insulin therapy acceptance and health outcomes in underserved communities.

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APPENDICES

Appendix 1: Adult Informed Consent Form

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE

ADULT INFORMED CONSENT FORM

STUDY TITLE :PSYCHOLOGICAL INSULIN RESISTANCE PREVALENCE AMONG TYPE II DIABETES PATIENTS AND ITS ASSOCIATION WITH DEPRESSION AND ANXIETY IN CHOGORIA HOSPITAL

PRINCIPAL INVESTIGATOR – LILIAN KAMITA

CO- INVESTIGATOR

Introduction

You are invited to participate in this research study being undertaken by the above listed investigators. This form will help you gather information about the study so that you can voluntarily decide whether you want to participate or not. You are encouraged to ask any question regarding the research process as well as any benefit or risk that you may accrue by participating. After you have adequately been informed about the study, you will be requested to either agree or decline to participate. Upon agreeing to participate in the study, you will be further requested to affirm that by appending your signature/thumbprint on this form. Accepting or declining to participate in this study does not in any way waive the following rights which you're entitled to:

a)Voluntary participation in the study;

b) Withdrawing from the study at any time without the obligation of having to give an explanation and;

c) Access to services which you're entitled to

A copy of this form will be provided to you for your own records should I continue YES/NO _____

This study has been reviewed and approved by Kabarak University Research Ethics Committee (KUREC)

What is the Purpose of the Study?

We are doing a study to see how people with diabetes are ready to use insulin and to check for depression and anxiety.

Who can Take Part in the Study?

A person who has had clinically diagnosed type II diabetes for more than six months

The patient should be on either dietary,oral medications or insulin therapy

Aged between 18-80 years

Ability to read and understand English or Swahili

Exclusion criteria

Patients with cognitive impairment and other major life-threatening diseases.

Patients hospitalized within the preceding two weeks. This isbecauseGAD7andPHQtools evaluate in the proceeding 2 weeks and this could be a confounder

Sample Size

123 participants are required to help achieve This

In Case You Agree to Participate in the Study, What Will Happen?

This is what is going to happen once you have agreed to participate in the study: This exercise should take about 15 minutes to complete

a) A qualified and well-trained interviewer will ask you questions in a private place where you will feel comfortable. In case there is any question you feel uncomfortable responding to, you will not be coerced to respond. The questions will be on the following areas area.

i. Age, gender, marital status, level of education, type of medication used. Perception of insulin therapy. If you have not used insulin therapy, you can

answer based on your thoughts and knowledge on what you think insulin therapy is like?

ii. How you have been feeling in previous 2 weeks to help screen for anxiety or depression.

iii. Last, you are requested to provide your contact details. This will help reach you incase new information regarding the study emerges. The contact details you will provide shall remain confidential to the lead researcher (PI).

iv. What Potential Risks are Associated with Participation in this Study?

Any research involving human subjects has the potential of imposing a number of risks/harms or discomfort including psychological, physical, emotional, environmental, cultural etc.

You may experience some discomfort giving some details about yourself.

Privacy &Confidentiality

Privacy is the right of an individual to have some control over how his or her personal information/data is collected, used, and/or disclosed. Confidentiality is the duty to ensure information is kept secret only to the extent possible/reasonable. Your identity shall be kept confidential.

The answers that you provide will not be disclosed to anyone. They will be used exclusively for the purposes of this study. However, if you score moderate to severe in the depression and anxiety scale this information can be shared to your primary care doctor with your permission for comprehensive care

In case you aren't comfortable answering any of the questions during the interview because of feeling embarrassed or uncomfortable, it will be within your rights to decline. Otherwise every measure has been taken to ensure that the interview is conducted in a private area with minimal to no interference so that you feel comfortable. If at all you suffer any injury, illness or complication(s) by participating in this study, kindly contact us immediately using the contact details provided at the bottom of this form. You will be attended to by the study clinician and if there is need for further assessment or treatment you will be referred accordingly

What Benefits are you going to Accrue by Participating in the Study?

There is no immediate gain from taking part in this study. The data acquired will help to improve overall diabetes treatment by helping to better understand how people feel about insulin therapy.

What will it Cost You to Participate in the Study?
This exercise should take about 15 minutes to complete
Will Any Expenditure that You Incur by Participating in the Study be refunded?
There is monetary compensation to participate in this study
In Case I Have any Further Questions/ Concerns in Future Whom Should I Contact?

In the event that you need further clarification or questions regarding your continued participation in the study feel free to contact the PI {Lilian Kamita 0719338802 }.Incase of concerns regarding your rights and/or obligations as a research participant do not hesitate to contact the secretary, KUREC on {Dr Muga 0710 360700}

We invite you to ask any unanswered questions you may have about the study. In the future, you are welcome to contact us with any questions
What Alternative Options are Available to Me?

The decision on whether to participate or not is absolutely voluntary. You will be free to withdraw from the study at any point during the study without providing any explanation. Should you decide to leave, your care in this facility won't be in any way impaired.

How Will the Findings of this Study be Communicated or Shared?
After the interview you are free to ask for information regarding how you scored on the different tools. information from this study shall be published in peer reviewed journals .
We invite you to ask any unanswered questions you may have about the study.In the future, you are welcome to contact us with any questions.

Investigator:

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Statement of Consent

I have comprehensively read the consent form or/the information has been comprehensively read to me by the researcher. I have understood what the study is about and all the questions and concerns that I had have been responded to in a clear and concise. The study benefits and foreseeable risks have been explained to me. I totally understand that my decision to participate in this study is voluntary and I have the right to withdraw at any point during the study.
I freely consent to participate in this study

Signing this form does not in any way imply that I have given up the rights am entitled to as a participant

I agree to participate in this research YES_____NO_____. I agree to provide my contact details for follow-up YES_____NO Participant's initials _____
Participant's Signature/Thumbprint_____Date _____

Appendix II: Swahili Version of Consent Form

KAMATI YA MAADILI YA UTAFITI YA CHUO KIKUU CHA KABARAK

FOMU YA RIDHAA YA WATU WAZIMA

JINA LA UTAFITI: Uthabiti wa Kisaikolojia wa Kukataa Insulini Miongoni mwa Wagonjwa wa Kisukari cha Aina ya Pili na Uhusiano Wake na Unyogovu na Wasiwasi katika Hospitali ya Chogoria

MTAFITI WA MSINGI: Lilian Kamita

MTAFITI MWENZA:

UTANGULIZI

Umealikwa kushiriki katika utafiti huu unaofanywa na watafiti waliotajwa hapo juu. Fomu hii itakusaidia kukusanya taarifa kuhusu utafiti ili uweze kuamua kwa hiari iwapo unataka kushiriki au la. Unahimizwa kuuliza maswali yoyote kuhusu mchakato wa utafiti pamoja na faida au hatari zinazoweza kutokea kwa kushiriki. Baada ya kuelimishwa vya kutosha kuhusu utafiti, utaombwa kukubali au kukataa kushiriki. Ukikubali kushiriki, utaombwa zaidi kuthibitisha hilo kwa kuweka saini yako au alama ya kidole kwenye fomu hii. Kukubali au kukataa kushiriki katika utafiti huu hakutavunja haki zako zifuatazo:

a) Kushiriki kwa hiari katika utafiti;

b) Kujiondoa kutoka kwa utafiti wakati wowote bila wajibu wa kutoa maelezo;

c) Upatikanaji wa huduma ambazo unastahili.

Nakala ya fomu hii itakupatiwa kwa rekodi zako. **Je, niendelee? NDIO/HAPANA**

Utafiti huu umeidhinishwa na Kamati ya Maadili ya Utafiti ya Chuo Kikuu cha Kabarak (KUREC).

Madhumuni ya Utafiti ni Nini?

Tunafanya utafiti kuona jinsi wagonjwa wa kisukari wanavyokuwa tayari kutumia insulini na kuchunguza unyogovu na wasiwasi.

Nani Anaweza Kushiriki katika Utafiti?

- Mtu aliyepatikana na kisukari cha aina ya pili kwa zaidi ya miezi sita.
- Mgonjwa anayetumia chakula cha mlo, dawa za mdomo, au tiba ya insulini.
- Mwenye umri kati ya miaka 18–80.
- Anayeweza kusoma na kuelewa Kiingereza au Kiswahili.

Vigezo vya Kuwatenga:

- Wagonjwa wenye upungufu wa utambuzi na magonjwa mengine yanayohatarisha maisha.
- Wagonjwa waliolazwa hospitalini ndani ya wiki mbili zilizopita, kwa sababu zana za GAD7 na PHQ zinachunguza wiki mbili zilizopita, na hii inaweza kuwa changamoto.

Ukubwa wa Sampuli:

Washiriki 123 wanahitajika ili kufanikisha utafiti huu.

Nini Kitatokea Ukikubali Kushiriki?

Hiki ndicho kitakachotokea ukikubali kushiriki:

- Zoezi hili litachukua takriban dakika 15 kukamilika.

a) Mhojiwa aliyehitimu na kufunzwa vizuri atakukuuliza maswali mahali pa faragha ambapo utahisi raha. Ikiwa kuna swali lolote unalohisi usistarehe kulijibu, hautalazimishwa kujibu. Maswali yatakuwa katika maeneo yafuatayo:

i) Umri, jinsia, hali ya ndoa, kiwango cha elimu, aina ya dawa zinazotumika.

ii) Maoni kuhusu tiba ya insulini. Ikiwa haujatumia insulini, unaweza kujibu kulingana na mawazo na ujuzi wako kuhusu tiba ya insulini.

iii) Jinsi ulivyohisi katika wiki mbili zilizopita ili kuchunguza wasiwasi au unyogovu.

b) Mwisho, utaombwa kutoa maelezo yako ya mawasiliano. Hii itasaidia kukupata iwapo taarifa mpya kuhusu utafiti itaibuka. Maelezo ya mawasiliano utakayotoa yatabaki ya siri kwa mtafiti wa msingi (PI).

Hatari Zitakazoweza Kutokea kwa Kushiriki katika Utafiti Huu

Utafiti wowote unaohusisha wanadamu unaweza kusababisha hatari au usumbufu, ikiwa ni pamoja na kisaikolojia, kimwili, kihisia, mazingira, au kitamaduni. Unaweza kuhisi usumbufu kutoa baadhi ya maelezo kuhusu wewe mwenyewe.

Faragha na Usiri

Faragha ni haki ya mtu binafsi kuwa na udhibiti fulani juu ya jinsi taarifa zake za kibinafsi zinavyokusanywa, kutumiwa, na/au kufichuliwa. Usiri ni wajibu wa kuhakikisha taarifa zinahifadhiwa kwa siri kwa kiwango kinachowezekana. Utambulisho wako utahifadhiwa kwa usiri. Majibu utakayotoa hayatatangazwa kwa mtu yeyote. Yatatumika kwa madhumuni ya utafiti huu pekee. Hata hivyo, ikiwa utapata alama za wastani hadi kali katika mizani ya unyogovu na wasiwasi, taarifa hii inaweza kushirikiwa na daktari wako wa huduma ya msingi kwa idhini yako kwa ajili ya huduma ya kina.

Ikiwa hautastarehe kujibu maswali yoyote wakati wa mahojiano kwa sababu ya aibu au usumbufu, itakuwa ndani ya haki yako kukataa. Vinginevyo, kila hatua imechukuliwa kuhakikisha mahojiano yanafanyika katika eneo la faragha bila usumbufu wowote ili uhisi raha. Ikiwa utapata jeraha lolote, ugonjwa, au matatizo kwa kushiriki katika utafiti huu, tafadhali wasiliana nasi mara moja kwa kutumia maelezo ya mawasiliano yaliyotolewa chini ya fomu hii. Utashughulikiwa na daktari wa utafiti, na ikiwa kuna haja ya tathmini au matibabu zaidi, utapelekwa ipasavyo.

Faida Zitakazoweza Kupatikana kwa Kushiriki katika Utafiti

Hakuna faida ya moja kwa moja kutokana na kushiriki katika utafiti huu. Data itakayopatikana itasaidia kuboresha matibabu ya kisukari kwa ujumla kwa kusaidia kuelewa vyema jinsi watu wanavyohisi kuhusu tiba ya insulini.

Je, Kushiriki katika Utafiti Kutakugharimu Nini?

Zoezi hili litachukua takriban dakika 15 kukamilika.

Je, Gharama Zozote Utakazoingia kwa Kushiriki Zitarudishwa?

Hakuna fidia ya pesa kwa kushiriki katika utafiti huu.

Nipate Maswali au Wasiwasi zaidi baadaye, ni Nani Nitaowasiliana Naye?

Ikiwa unahitaji ufafanuzi zaidi au maswali kuhusu kuendelea kwako kushiriki katika utafiti, jisikie huru kuwasiliana na PI {Lilian Kamita 0719338802}. Ikiwa una wasiwasi kuhusu haki na/au wajibu wako kama mshiriki wa utafiti, usisite kuwasiliana na katibu, KUREC kwa {Dr Muga 0710 360700}.

Tunakualika kuuliza maswali yoyote ambayo hayajajibiwa kuhusu utafiti. Katika siku zijazo, unakaribishwa kuwasiliana nasi na maswali yoyote.

Chaguzi Zilizopo za Kubadilisha

Uamuzi wa kushiriki au kutoshiriki ni wa hiari kabisa. Utakuwa huru kujiondoa kutoka kwa utafiti wakati wowote bila kutoa maelezo yoyote. Ukiamua kuondoka, huduma yako katika kituo hiki haitavurugika kwa njia yoyote.

Je, Matokeo ya Utafiti Huu Yatatangazwa au Kushirikiwaje?

Baada ya mahojiano, uko huru kuuliza taarifa kuhusu jinsi ulivyofanya kwenye zana tofauti. Taarifa kutoka kwa utafiti huu zitachapishwa katika majarida yaliyopitiwa na wenzao.

Tunakualika kuuliza maswali yoyote ambayo hayajajibiwa kuhusu utafiti. Katika siku zijazo, unakaribishwa kuwasiliana nasi na maswali yoyote.

Mtafiti:

Dkt. Lilian Kamita Maithya

Barua pepe: liliankamita@gmail.com Simu: 0719338802

Wachunguzi:

Dkt. Jamila Nambafu

Barua pepe: njamilaw@gmail.com Simu: 0798363515

Dkt. Mathew Loftus

Barua pepe: loftus.matthew@gmail.com Simu: 0742255853

Taarifa ya Ridhaa

Nimesoma fomu ya ridhaa kwa undani au taarifa zimesomwa kwangu kwa undani na mtafiti. Nimeelewa utafiti huu unahusu nini na maswali na wasiwasi wangu wote wamejibiwa kwa uwazi na kwa ufupi. Faida za utafiti na hatari zinazoweza kutabirika zimenielezewa. Nimeelewa kabisa kwamba uamuzi wangu wa kushiriki katika utafiti huu ni wa hiari na nina haki ya kujiondoa wakati wowote wakati wa utafiti.

Ninakubali kwa hiari kushiriki katika utafiti huu.

Kusaini fomu hii hakumaanishi kwa njia yoyote kwamba nimeachilia haki ambazo ninastahili kama mshiriki.

Nakubali kushiriki katika utafiti huu: NDIO / HAPANA

Nakubali kutoa maelezo yangu ya mawasiliano kwa ajili ya ufuatiliaji: NDIO / HAPANA

Jina la Mshiriki (Herufi za Mwanzo)

Saini ya Mshiriki/Alama ya Kidole

Tarehe

Appendix III: Research Tools

Data sheet

Data Sheet	
Age In Years /Umri	18- 25 ☐ 25-35 ☐ 35- 45 ☐ 45 – 55 ☐ >55 ☐
Sex/ Jinsia	Male ☐ Female ☐
Medication Type/ Aina Ya Dawa	Diet ☐ Orals ☐ Orals +Insulin ☐ Insulin Only ☐
Payment Of Medicine/ Malipo Ya Dawa	Out Of Pocket ☐ NHIF ☐ Other Insurance ☐
Duration Of Diabetes In Years	
Recent Hba1c	
Mental Health Treatment	Yes ☐ NO ☐

Patient health questionnaire and General Anxiety Disorder (PHQ-9 and GAD-7)

Over the last 2 weeks, how often have you been bothered by any of the following problems? Please circle your answers. Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na matatizo yoyote yafuatayo? Tafadhali zungusha majibu yako.

PHQ-9	**Not at all/haijatok-elezea kabisa**	**Sseveral days/siku kadhaa**	**More than half the days/zaidi ya nusu ya siku hizo**	**Nearly every day/takriban kila siku**
1. Little interest or pleasure in doing things./ kutokuwa na hamu au raha ya kufanya mambo	0	1	2	3
2. Feeling down, depressed, or hopeless./kuvunjika moyo , kuhuzunika au kukosa matumaini	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much./ shida ya kupata usingizi au kulala sana	0	1	2	3
4. Feeling tired or having little energy./kujisikia kuchoka au kutokuwa na nguvu	0	1	2	3
5. Poor appetite or overeating./ kutokuwa na hamu ya kula au kula sana	0	1	2	3
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down./kujihisi vibaya, kujiona umeshindwa kutimiza malengo yako ya maisha au kuhisi umejidunisha au umedunisha familia yako	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television./ shida ya kumakinikakatika mambo Fulani kwa mfano unaposoma gazeti au kuangalia runinga au kufanya kazi zingine	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual./ kutembea au kuongea pole pole sana mpaka watu wanaona tofauti (au kinyume chake) kwamba hutulii na unahangaika sna kuliko ilivyo kawaida.	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself in some way./ kuwaza kuwa ni afadhali zaidi ungekuwa umekufa au ujidhuru kwa namna Fulani	0	1	2	3
Add the score for each column				

PHQ-9 *form*

GAD-7	**Not at all sure/ halijatokele za kabisa**	**Several days/ siku kadhaa**	**Over half the days/ zaidi ya nusu ya siku hizo**	**Nearly every day/ takriban kila siku**
1. Feeling nervous, anxious, or on edge./ Je umejihisi kuwa na wasi wasi ama hofu	0	1	2	3
2. Not being able to stop or control worrying./ kushindwa kujizuia au kudhibiti wasiwasi	0	1	2	3
3. Worrying too much about different things./kuwa na wasiwasi mwingi kuhusu mambo tofauti	0	1	2	3
4. Trouble relaxing./ kuwa na wakati mgumu kupumzika	0	1	2	3
5. Being so restless that it's hard to sit still./ kuwa na hali ya kutotulia	0	1	2	3
6. Becoming easily annoyed or irritable./umekasirika au kuudhika haraka	0	1	2	3
7. Feeling afraid as if something awful might happen./ kuwa na hofu jambo mbaya litatendeka	0	1	2	3
Add the score for each column				

GAD-7 *form*

Total Score (add your column scores): _Developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke

ITAS –Insulin Treatment and Appraisal Scale

The following questions are about your perception of insulin use.If you haven't started using insulin, please ask your current education and ideas about how the use of insulin treatment will be. Please indicate to what extent you agree or disagree with each of the following words. Mark the correct one box for each word that best describes your views.

Maswaliyafuatayo ni kuhusu mtazamo wako wa utumiaji wa dawa ya insulin Kwa ugonjwa wako wa kisukari.Kama bado hujaanza utumiaji wa dawa ya insulin,tafadhali jibu kila swali kutumia elimu na mawazo yako ya sasa hivi kuhusu vipi utumiaji wa matibabu ya insulin utakuwa. Tafadhali onyesha/weka ishara ni kwa kiwango gani unakubaliana au hukubaliani na kila maneno yafuatayo.

Weka alama ya sahihi kwa kisanduku kimoja kwa kila neno ambayo inaelezea vizuri zaidi oni lako.

ITAS *tool*

Maswali	Strongly agree/ Kubaliana zaidi	Agree/ kubali	Agree nor disagree/ kubali Wala kukataa	Kukataa/ disagree	Strongly disagree/ kukataa zaidi
Taking insulin means I have failed to manage my diabetes with diet and tablets /Kuchukua insulin inamaanisha sijafaulu kuchunga ugonjwa wangu wa kisukari kwa chakula na tembe.					
Taking insulin means my diabetes has become much worse/Kuchukua insulin inamaaninisha ugonjwa wangu wa kisukari umekuwa mbaya zaidi					
Taking insulin helps to prevent complications of diabetes./ Kuchukuwa insulin inasaidia kukinga maafa ya ugonjwa wa kisukari.					
Taking insulin means other people see me as a sicker person ./Kuchukua insulin inamaanisha watu wengine wananiona mimi kama mtu mgonjwa zaidi.					
Taking insulin makes life less flexible/ Kuchukua insulin inafanya					

maisha kuwa magumu zaidi.					
I am afraid of injecting myself with a needle /Naogopa kujidunga mwenyewe na sindano.					
Taking insulin increases the risk of of low blood sugar (hypoglycemia) /Kuchukua insulin inaongeza hatari ya kushuka kwa kiwango cha sukari mwilini.					
Taking insulin helps improve my health /Kuchukua insulin inasaidia kuboresha afya yangu.					
Insulin causes weight gain /Insulin inasababisha kuongezeka kwa kilo.					
Managing insulin injections takes a lot of time and energy / Kumudu sindano ya insulin inachukua wakati na nguvu nyingi.					
Taking insulin means I have to give up activities I enjoy /Kuchukua insulin inamaanisha lazima niwache shughuli ninazozifurahia.					
Taking insulin means my health will deteriorate/ Kuchukua insulin inamaanisha afya yangu itazorota.					
Injecting insulin will be embarrassing /Kudunga insulin ni jambo la kuaibisha.					
Injecting insulin is painful/Kudunga insulin ni uchungu.					
It is difficult to inject the right amount of insulin correctly at the right time of the day / Ni vigumu kudunga kiwango kinacho takikana cha insulin kisawasawa kwa wakati unaofaa kila					

siku					
Taking insulin makes it more difficult to fulfill my responsibilities (at work, home)/Kuchukua insulin inafanya kuwa vigumu zaidi kutekeleza wajibu wangu (kazini, nyumbani).					
Taking insulin helps to maintain good control of blood glucose /Kuchukua insulin inasaidia kusawazisha kiwango cha sukari vizuri.					
Being on insulin causes falily and friends to be more concerned about me./Kuwa kwa insulin inasababisha familia na marafiki kuwa na wasiwasi zaidi unihusu mimi					
Taking insulin helps to improve my energy level/Kuchukua insulin inasaidia kuimarisha kiwango changu cha nguvu					
Taking insulin makes me more dependent on my doctor /Kuchukua insulin inanifanya mimi kutegemea zaidi daktari wangu					

Appendix IV: KUREC Clearance Letter

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE

Private Bag - 20157
KABARAK, KENYA
Email: kurec@kabarak.ac.ke

Tel: 254-51-343234/5
Fax: 254-051-343529
www.kabarak.ac.ke

OUR REF: KABU01/KUREC/001/05/08/24 **Date: 8th August, 2024**

Lilian Kamita Maithya
Reg No.: GMMF/3132/09/2019
Kabarak University,

Dear Lilian,

RE: PSYCHOLOGICAL INSULIN RESISTANCE PREVALENCE AMONG TYPE II DIABETES PATIENTS AND ITS ASSOCIATION WITH DEPRESSION AND ANXIETY IN CHOGORIA HOSPITAL

This is to inform you that ***KUREC*** has reviewed and approved your above research proposal. Your application approval number is ***KUREC-050824.*** The approval period is 8***/08/2024 – 8/08/ 2025.***

This approval is subject to compliance with the following requirements:

i. All researchers shall obtain an introduction letter to NACOSTI from the relevant head of institutions (Institute of postgraduate, School dean or Directorate of research)
ii. The researcher shall further obtain a RESEARCH PERMIT from NACOSTI before commencement of data collection & submit a copy of the permit to **KUREC.**
iii. Only approved documents including (informed consents, study instruments, MTA Material Transfer Agreement) will be used
iv. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KUREC***:
v. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KUREC*** within 72 hours of notification;
vi. Any changes, anticipated or otherwise that may increase the risk(s) or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KUREC*** within 72 hours;
vii. Clearance for export of biological specimens must be obtained from relevant institutions and submit a copy of the permit to KUREC;
viii. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal and;
ix. Submission of an executive summary report within 90 days upon completion of the study to ***KUREC***

Sincerely,

Prof. Jackson Kitetu PhD.
KUREC-Chairman
Cc Vice Chancellor
DVC-Academic & Research
Registrar-Academic & Research
Director-Research Innovation & Outreach
Institute of Post Graduate Studies

KABARAK UNIVERSITY
INSTITUTIONAL RESEARCH ETHICS COMMITTEE
08 AUG 2024
APPROVED
P. O. PRIVATE BAG - 20157, KABARAK

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

Appendix V: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **468137**

Date of Issue: **16/December/2024**

RESEARCH LICENSE

This is to Certify that Dr.. lilian kamita kamita of Kabarak University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Tharaka-Nithi on the topic: PSYCHOLOGICAL INSULIN RESISTANCE PREVALENCE AMONG TYPE II DIABETES PATIENTS AND ITS ASSOCIATION WITH DEPRESSION AND ANXIETY IN CHOGORIA HOSPITAL for the period ending : 16/December/2025.

License No: **NACOSTI/P/24/414487**

468137

Applicant Identification Number

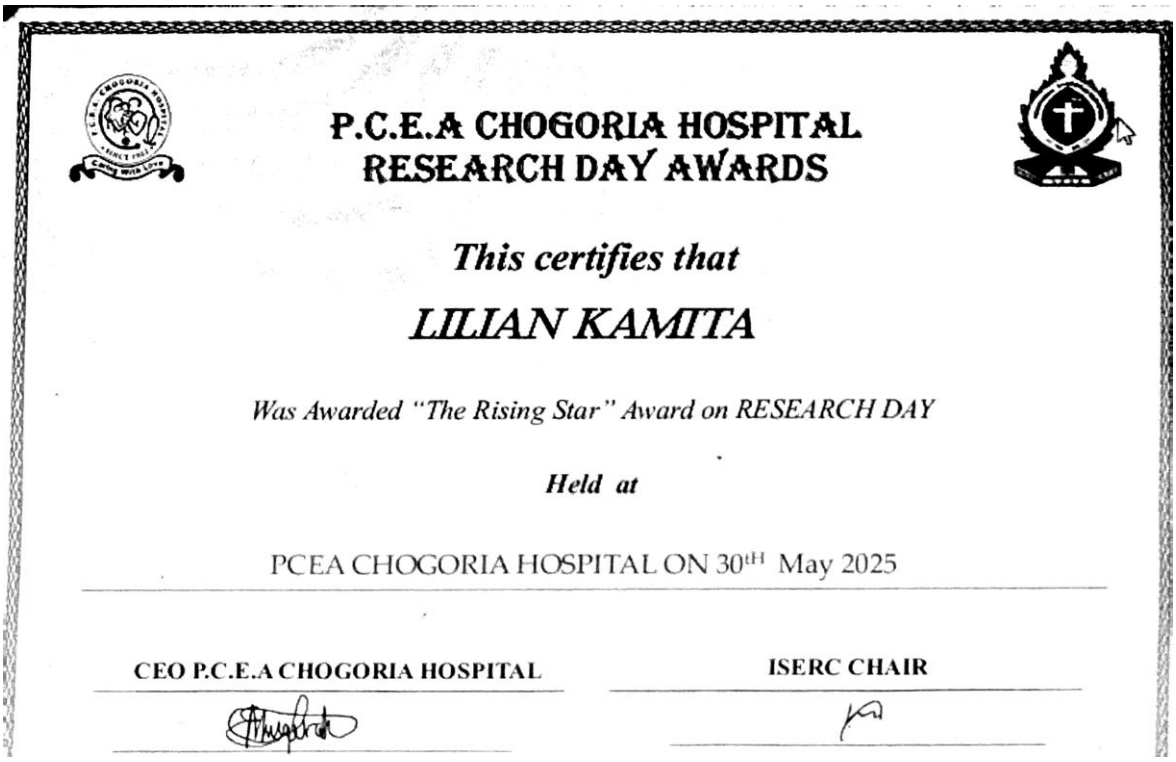
Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix VI: Evidence of Conference Participation



P.C.E.A CHOGORIA HOSPITAL
RESEARCH DAY AWARDS

This certifies that

LILIAN KAMITA

Was Awarded "The Rising Star" Award on RESEARCH DAY

Held at

PCEA CHOGORIA HOSPITAL ON 30TH May 2025

CEO P.C.E.A CHOGORIA HOSPITAL | **ISERC CHAIR**

Appendix VII: List of Publication

Contact: +254784986532
Email 1: editor@editononline.com
Email 2: editonltd@gmail.com
Journal url: http://journals.editononline.com

Editon Consortium Publishing
Transforming Scholarly Publishing

An international Publisher for Peer Reviewed Scholarly Journals

Manuscript Acceptance Letter

Date: 06/11/2025

Dear Lilian Kamita Maithya,

We are pleased to inform you that your manuscript titled **"Prevalence of Psychological Insulin Resistance among Adults with Type 2 Diabetes Mellitus at PCEA Chogoria Hospital"** has been accepted, after meeting the irreducible minimum requirements, to be published in the Journal of Medical and Health Sciences (ISSN: 2958-1079) (Online) **(volume 04, issue 01, November 2025).**

Editor's Check List for Your Article

Section/Item	Remark	Section/Item	Remark
Title	✓	Literature review	✓
Author(s) details	✓ X	Methodology	✓
Abstract	✓	Results Discussion	✓
Introduction	✓	References	✓
Word count	7989	Formatting	✓ X

1. **Final Decision: Acceptable (with corrections).**
2. **Initial plagiarism report 1% (To be removed by our admin.).**
3. **The Plagiarism report is attached separately.**
4. **Language scores out of 100 =87%; To be improved to 90% or above.**

Note that this checklist is not a peer review, but a check for inclusion of relevant article sections. Your paper will proceed for peer review after the payment of the article-processing fee is made.

Journal URL: http://journals.editononline.com
Submission: editor@editononline.com and send a copy to **editonltd@gmail.com.**

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Dr Michael Ndonye, PhD
Managing Editor—Editon Consortium Publishing

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We pride in our moral code that, "Whatever we do as and at Editon Consortium, we do to the Glory of Almighty God. (1 Cor. 10:31).