

AFRICA UNIVERSITY
(A United Methodist- Related Institution)

ASSESSMENT OF RENAL FUNCTION AMONG DIABETIC PATIENTS ATTENDING
GWERU PROVINCIAL HOSPITAL FROM 2023 TO 2024.

BY

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A RESEARCH PROJECT SUBMITTED IN PARTIAL
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Abstract

This study investigated the renal function of diabetic patients attending Gweru Provincial Hospital in Zimbabwe from 2023 to 2024. The research aimed to assess renal function within this population, identify socio-demographic characteristics associated with abnormal renal results, analyze renal function tests, and determine the prevalence of abnormal renal function tests. A retrospective cross-sectional study design was employed, utilizing data from the hospital's laboratory records. The study population consisted of 200 adult patients with type 1 and type 2 diabetes mellitus. The inclusion criteria had patients from 18 years and above who had been diagnosed with type 1 and type 2 diabetes mellitus, excluding those with pre-existing kidney disease or other conditions affecting kidney function. Key findings revealed a high prevalence of abnormal renal function among the participants. The mean age of the participants was 46.4 years, with a notable predominance of males (68%). The duration of diabetes varied among the patients, with 40% having been diagnosed between 5 to 10 years. Most participants demonstrated good glycemic control; however, gender differences were observed, with a higher proportion of females showing effective blood glucose control. Analysis of serum creatinine levels indicated that a significant percentage of both males(33.8%) and females(23.4%) exhibited abnormal levels, suggesting impaired renal function. Furthermore, estimated glomerular filtration rate (eGFR) results corroborated these findings, revealing a substantial proportion of participants with abnormal renal function. Overall, the prevalence of renal dysfunction in the study population was approximately 40.25%. These results underscore the importance of routine renal function monitoring and early intervention strategies for diabetic patients. The study's findings highlight the need for improved screening practices, enhanced public health initiatives focused on diabetes management, and the development of sex-specific management strategies to address the specific needs of different patient groups.

Keywords: Diabetic patients, Renal function , Serum creatinine levels , Estimated glomerular filtration rate (eGFR), Glycemic control, Renal dysfunction.

Declaration

I, Chikondi Charmaine Nkwenze Student Id 210591 do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a Bachelor of Science degree.

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List of Acronyms

AGES	Advanced Glycation End-Products.
eGFR	estimated glomerular filtration rate.
GFR	Glomerular Filtration Rate.
DKD	Diabetic kidney disease.
CKD	Chronic kidney disease.
ESRD	End-stage renal disease.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

The evaluation of renal function in diabetic patients will be the main topic of discussion. First off, hyperglycemia is a hallmark of diabetes mellitus, a chronic illness caused by deficiencies in either insulin action or secretion, or both. Addressing the complications that come with diabetes, especially renal dysfunction, is crucial as its prevalence keeps rising. In order to improve patient care and outcomes for this expanding population, this research proposal aims to offer insightful information about the evaluation of renal functions in diabetic patients. In diabetic patients, evaluation of renal function is essential because it helps detect certain conditions early, such as diabetic nephropathy. Given the rising incidence of diabetes worldwide, it is now critical to comprehend how it affects renal function in order to effectively manage patients. In the end, this research aims to lessen the burden of renal complications in this susceptible population by bringing attention to these important factors and helping to develop better screening and management strategies for diabetic patients. The importance of evaluating renal function in diabetic patients will be demonstrated in this chapter. Early detection of renal impairment can enable prompt interventions, potentially slowing the progression of the disease and improving quality of life.

1.2 Background of the study

1.2.1 Overview of renal function among diabetic mellitus patients

To Begin with ,long-term hyperglycemia (high blood sugar levels) causes renal impairment in diabetic individuals, also known as diabetic nephropathy, a serious consequence. Diabetes has a complex etiology of renal failure, comprising both hemodynamic and metabolic alterations that gradually harm the kidneys over time. When too much glucose binds to proteins and lipids, advanced glycation end-products (AGEs) build up as a result of chronic hyperglycemia. AGEs

can accumulate in the kidneys and other tissues, causing endothelial dysfunction, fibrosis, and inflammation. In the glomerular mesangium, the core region of the glomerulus, hyperglycemia also encourages the accumulation of extracellular matrix proteins. The glomerular basement membrane thickens as a result of mesangial growth, which hinders glomerular filtration. One of the main characteristics of diabetic nephropathy is glomerulosclerosis, or scarring, which is brought on by these structural alterations in the glomeruli. The kidney's filtering units are harmed as a result, which lessens their capacity to remove waste from the blood. This gap in the literature emphasizes the necessity of a targeted study of diabetic patients' renal function that takes into account different causes of renal dysfunction. In diabetic patients, renal function evaluation is essential for the early identification of renal impairment, which can happen without diabetic nephropathy. Renal dysfunction can also result from other factors like hypertension, medication side effects, and cardiovascular diseases, even though diabetic Nephropathy is a well-known consequence of diabetes. Therefore, for thorough patient care, it is crucial to comprehend renal function in diabetic patients outside of the context of nephropathy. The purpose of this study is to evaluate renal function in diabetic patients at a provincial hospital. The study aims to offer important insights into the general renal health of this population by assessing variables like serum creatinine levels, estimated glomerular filtration rate (eGFR), and the existence of comorbid conditions. By enabling prompt interventions for renal impairment unrelated to diabetic nephropathy, the findings may improve screening procedures, guide clinical practices, and ultimately improve patient outcomes. The findings of this study will highlight the significance of thorough renal evaluations in clinical settings and advance knowledge of the multifactorial nature of renal dysfunction in diabetic patients.

1.2.2 Worldwide burden of diabetes mellitus

This condition is caused by high glucose levels damaging the kidneys' blood arteries and filters making it more difficult for the body to eliminate waste and extra fluid. Diabetes mellitus represents a significant global health challenge, with its prevalence increasing dramatically across the world. The burden of this chronic disease is characterized by its rising incidence, associated complications, and economic impact. There are mainly 2 types of Diabetes Mellitus which are Type 1 and Type 2 Diabetes Mellitus. The body's immune system targets the insulin-producing islet cells in the pancreas, which results in diabetes type 1 where the pancreas is unable to produce insulin. When you have diabetes type 2, your body becomes resistant to insulin and your pancreas produces less insulin than it used to. There are certain risk factors that are associated with diabetes which may include Obesity, which is a major risk factor for Type 2 diabetes, sedentary lifestyle which includes lack of physical activity is linked to higher rates of diabetes. As the life expectancy increases more people are living into the age ranges where diabetes is more common.

1.2.3 Effects of diabetes mellitus on renal function

Diabetic kidney disease (DKD), the main consequence of diabetes mellitus, has a substantial impact on renal function. This disorder increases illness and death and is a common and dangerous complication of diabetes. The key effects of Diabetes on renal function include; high blood pressure which most likely leads to arterial damage in the kidneys therefore compounding the effects of diabetes. Diabetes often coexists with hypertension which further exacerbates kidney damage. To add on, chronic hyperglycemia leads to metabolic and hemodynamic changes in the kidney which may include Glomerular filtration, increased blood flow and pressure in the kidneys can elevate the glomerular filtration rate and with time this can cause damages to the glomeruli leading to the thickening of the basement membrane and mesangial expansion.

Diabetic nephropathy progresses through the following stages: microalbuminuria, macroalbuminuria and declining GFR which then leads to chronic kidney disease. Diabetes can also lead to imbalances in electrolytes especially in advanced kidney disease , impacting overall health. Acidosis can also be a result of renal impairment which then affects bone health and muscle function. Impact on Quality of Life, Patients may experience fatigue, swelling and frequent urination as kidney function declines. The burden of chronic kidney disease can lead to anxiety and depression, affecting the patient's quality of life. Moreover ,prolonged elevated blood glucose levels that cause direct damage to renal tissues. Excess glucose leads to glycation of proteins which contribute to inflammation and fibrosis in kidney tissues. Chronic inflammation can result in fibrosis which permanently damages kidney structures and function.

To sum up, diabetes mellitus has a substantial impact on renal function and can result in complications that can drastically affect a patient's health and quality of life. For this reason, managing diabetes and its complications aggressively and early is crucial to maintaining renal function and lowering the risk of end-stage renal disease. Therefore, consistent kidney function monitoring, lifestyle changes, and medication can help lessen these negative effects.

1.2.4 Assessment of renal function among Diabetes Mellitus patients

Assessing renal function in patients with Diabetes Mellitus is important because Diabetes is a leading cause of chronic kidney disease and end-stage renal disease. When assessing the renal function of diabetic patients it is crucial to consider the following:

- The clinical history and physical examination of the patient: The duration of diabetes as well as the glycemic control,HbA1c levels provide insight into long term glucose management. The normal ranges for HbA1C are <6.5% and anything that is above 6.5%

is considered to be abnormal and a clear indication of poor diabetes management. Hypertension is common in diabetes and it contributes to kidney damage. Symptoms of kidney disease such as fatigue, edema and changes in urination are very crucial in the assessment of renal function in diabetic patients.

- There are various methods that can be used when assessing the renal functions in diabetic patients so as to detect early kidney damage and prevent progression to diabetic nephropathy and these include; Serum Creatinine levels: they are used to estimate Glomerular Filtration Rate(waste product clearance) and elevated levels may suggest impaired kidney function. The normal ranges for serum creatinine for males is 0.6mg/dL and in females it is considered to be 0.5mg/dL anything above or below these ranges is considered to be abnormal, for eGFR the normal is >90mL/min and anything that is less than 90mL/min is considered to be abnormal. To add on, Urinary Albumin excretion, Microalbuminuria and Macroalbuminuria are indicators of kidney damage, which are early signs of nephropathy. More so, monitoring potassium and phosphate levels is very important as imbalances can occur with kidney dysfunction.
- Assessing the kidney size, structure and any obstructions using ultrasound can also be used for diabetic patients. Kidney Biopsy may be performed to determine the specific cause of kidney damage.
- Patients who are diabetic should have regular screenings for kidney function so as to catch any decline early, especially those that have >5 years of hypertension, family history of kidney disease , micro-albuminuria and proteinuria.

- Strict control of blood glucose levels can slow the progression of diabetic nephropathy as well as hypertension management can also be a form of monitoring renal function in diabetic patients. To add on, lifestyle modifications such as exercise and dieting are essential components.

Regular assessment of renal function in diabetic patients is vital for early detection and interventions to prevent progression to more severe kidney disease .Multidisciplinary care can optimize management strategies.

1.3 Statement of the Problem

The majority of the results, particularly for urea and creatinine, were abnormal during my attachment at the Gweru Provincial Hospital Laboratory, where we processed several u&e samples from various wards. As a result, I had to initiate an inquiry to analyze and determine the cause of the issue.

1.4 Research Objectives

1.4.1 Broad Objective

The main objective of the study was to examine the renal function of diabetic patients attending Gweru Provincial Hospital from 2023 to 2024.

1.4.2 Specific Objectives

1. To identify socio demographic characteristics associated with abnormal renal results among diabetic patients attending Gweru Provincial Hospital from 2023 to 2024.
2. To analyze renal function tests of diabetic mellitus patients attending Gweru Provincial Hospital from 2023 to 2024.

3. To determine the prevalence of abnormal renal function tests among diabetes mellitus patients attending Gweru Provincial Hospital from 2023 to 2024.

1.4 .3 Research Questions

1. What are the socio demographic characteristics associated with abnormal renal results among diabetic patients attending Gweru Provincial Hospital from 2023 to 2024?
2. How is the distribution of renal function tests of diabetic mellitus patients attending Gweru Provincial Hospital from 2023 to 2024?
3. What is the prevalence of abnormal renal function tests among diabetes mellitus patients attending Gweru Provincial Hospital from 2023 to 2024.

1.5 Justification of Study

Diabetes mellitus is a serious public health issue that is becoming more extremely common worldwide. People with diabetes have a higher chance of getting chronic kidney disease (CKD), which can cause serious problems like end-stage renal disease (ESRD). Early detection and intervention in this population depend on an understanding of renal function. Timely interventions can slow the progression of kidney disease when renal function is assessed early. Better clinical outcomes, decreased morbidity, and lower healthcare costs can all be achieved by early detection of renal impairment. The purpose of this study was to demonstrate the value of routine screening in enhancing patient care. The Gweru Provincial hospital has limited resources and might not have access to specialized clinical services. By shedding light on existing procedures and pointing out opportunities for development, this study made sure that the few resources available are used efficiently to meet the needs of diabetic patients. According to earlier studies, medical professionals might not always give renal function evaluation of diabetic patients top priority. This study determined educational needs and guide training programs by

assessing their attitudes and knowledge, which will ultimately improve patient care. In order to promote improved self-management and compliance with monitoring recommendations, this study assisted in assessing patient awareness. The ultimate objective of this research was to enhance renal function screening and management in diabetic patients in order to improve their health outcomes. Patients and the healthcare system will both gain from a decrease in the prevalence of CKD and its complications. In conclusion, the urgent need to improve patient outcomes in the provincial hospital setting, optimize healthcare procedures, and address renal health in the expanding population of diabetic patients justifies this study.

1.6 Study Limitations

The Gweru Provincial Hospital's lack of sponsors and lack of funding resulted in the unavailability of reagents. Results may not be generalizable if only specific demographics are included, and a small sample may not fairly represent the larger diabetic community. Results may be inconsistent due to inconsistent testing and variations in the way renal function is monitored, such as serum creatinine. The time of day or level of hydration can affect renal function. Other conditions, such as hypertension, can make it more difficult to evaluate renal function, and certain drugs may have an adverse effect on renal function, which could produce false results. In addition to overfitting the data, complex statistical models can distort the link between renal function and diabetes by failing to account for confounders.

1.7 Delimitations of the study

Specific focus on the targeted population, focusing on diabetic patients allowed for a detailed analysis of renal function in a high risk group, providing insights that may not be applicable to the general population. To add on, The use of multiple methods to assess renal function e.g serum creatinine can provide a more holistic view of renal health collecting data

over time helped identify trends and changes in renal function, offering important insights into disease progression. The implementation of standardized testing and measurement protocols minimized variability and enhanced reliability of results, including control groups that can also strengthen the study design by allowing for comparisons and better understanding of renal function differences. Conducting the study within the Gweru Provincial Hospital y reflected real-world conditions and challenges faced by diabetic patients, improving the applicability of findings. And lastly , This study contributed valuable data to the existing literature helping to inform future research and clinical practices regarding diabetes and renal health.

1.8 Summary

In order to better understand the connection between diabetes and renal health, this study examined the renal function of diabetic patients attending Gweru provincial hospital. This research was essential for enhancing patient outcomes because diabetes is becoming more common and has a substantial impact on kidney function. By highlighting the necessity of continuous monitoring and intervention techniques, this study offered important new insights into the evaluation of renal function in diabetic patients. The results are intended to enhance the management of renal health in this susceptible group and to guide clinical practice. To improve the results' applicability, future studies should take into account more extensive demographic and geographic factors.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

This literature review serves the purpose of exploring the knowledge on Diabetes Mellitus. Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels, which can lead to a range of complications, including renal impairment. This literature review aims to shed more light on the renal function in diabetic patients, focusing on identifying early markers of kidney damage and understanding the relationship between glycemic control and renal health. The literature that will be reviewed will be obtained from articles that have been published on the internet.

2.2 Conceptual Framework For Diabetic Kidney Disease

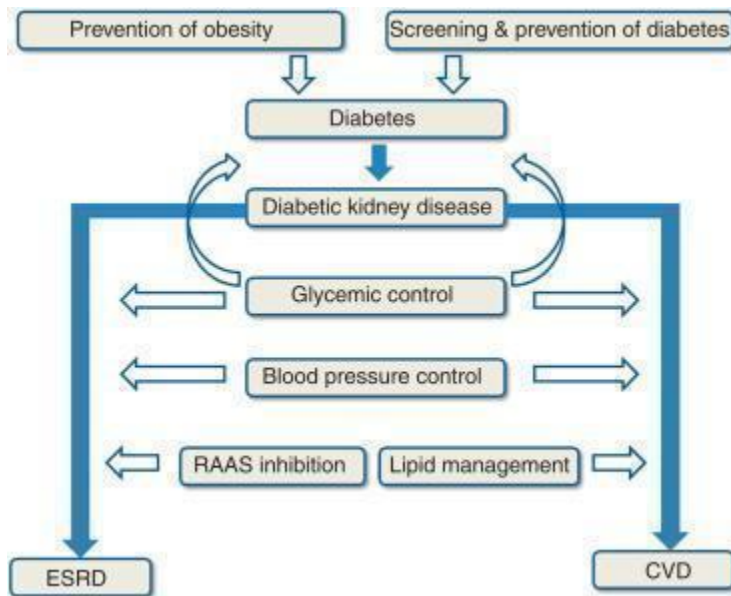


Figure 1: Conceptual Framework For Diabetic Kidney Disease

This conceptual framework demonstrates how obesity, diabetes, and diabetic kidney disease (DKD) are interrelated and how these linkages affect cardiovascular disease and end-stage renal disease (ESRD). It has also shown how important it is to prevent obesity because it is a major risk factor for diabetes. Diabetes and its complications can be prevented by adopting lifestyle changes

that support a healthy weight. The framework also depicts how important it is to prevent obesity because it is a major risk factor for diabetes. To conclude the framework is also illustrating and giving ways that help with the management strategies that help control diabetes.

2.3 Review of related literature

2.3.1 Socio demographic characteristics associated with abnormal renal function.

To begin with, A serious consequence of diabetes mellitus, diabetic kidney disease (DKD) is characterized by increasing kidney deterioration that eventually results in end-stage renal disease (ESRD). In order to implement effective preventative and management measures, it is essential to comprehend the sociodemographic characteristics linked to aberrant renal outcomes in diabetic patients. Numerous sociodemographic traits that affect the occurrence and course of DKD in diabetic individuals have been brought to light by recent studies. According to the study by Tesfe, D., Adugna, M., & Nigussie, Z. M. (2021). The proportion of chronic kidney disease and its associated factors among adult diabetic patients at Tibebe Ghion Specialized Hospital, Bahir Dar, Ethiopia. *Frontiers in Epidemiology*, 4, the results indicated that 16.7% of patients had chronic kidney disease. Older age, pre-existing hypertension, increased systolic blood pressure (≥ 140 mmHg), and albuminuria were important factors linked to chronic kidney disease (CKD). Interestingly, 60.5% of participants were men, and the median age was 39. In other studies, It is shown that the risk of having DKD is influenced by sociodemographic characteristics, including age, gender, ethnicity, and socioeconomic level. For example, a study conducted in Singapore by Tan, J. L., et al. (2024), on Prevalence of diabetic kidney disease and the associated factors among patients with type 2 diabetes mellitus in Singapore. *Scientific Reports*, 14(1), 12345 , discovered that a higher risk of diabetic kidney disease was linked to male sex, growing age, and Malay race. Furthermore, a study conducted in Ethiopia found that poor physical component summary (PCS) scores in individuals with chronic kidney disease (CKD) were substantially

correlated with lower educational attainment, increased serum creatinine, and a history of smoking. Additionally, poor mental component summary (MCS) scores were substantially correlated with a lower hemoglobin level, CKD-related problems, and the presence of three or more comorbidities. Moreso, according to Sule, S. S., et al. (2022). Socio-demographic factors associated with chronic kidney disease in patients with diabetes mellitus. *Journal of Clinical Nephrology*, 6(1), 1104 , it indicates that socio-demographic factors such as age, gender, and socioeconomic status influence the risk of developing DKD. For instance, a study in Ghana and Nigeria found that age over 50 years was independently associated with CKD. In Nigeria, Akinmoladun et al. (2021) identified that urban residence and higher levels of education were linked to increased awareness of diabetes and its complications, which could result in earlier diagnosis and management of abnormal renal function. However, rural-dwelling patients were found to have lower rates of early diagnosis and were more likely to present with advanced renal disease at the time of diagnosis. Furthermore, Nearly 40% of patients with chronic kidney disease (CKD) were not aware of their condition until they experienced severe symptoms, according to Nkosi et al. (2022), highlighting the role of socio-demographic characteristics, especially socio-economic status, in the late presentation of kidney disease. In South Africa, a high burden of abnormal renal function has been documented among Black populations, especially those residing in lower socio-economic areas.

2.3.2 Prevalence of abnormal renal failure

With differing prevalence rates around the continent, diabetic kidney disease (DKD) is a serious health concern in Africa. According to a study by Tesfe et al. (2024), chronic kidney disease (CKD) was present in 26.5% of adult diabetes patients in Ethiopia. Significant risk factors included having a family history of kidney problems, having diabetes for more than ten years,

and having hypertension. To add on, Nephropathy was found to be 28.2% of diabetic patients in Africa, according to a systematic review and meta-analysis by Wagnew et al. (2023). Southern and Western Africa had higher rates of nephropathy (40.4% and 40.2%, respectively) than Eastern and Central Africa (29.7% and 35.3%, respectively). This diversity highlights the necessity of addressing DKD with region-specific solutions. Similarly, 10% of diabetic patients in Eastern Ethiopia developed chronic kidney disease (CKD) after ten years of receiving a diabetes diagnosis, according to a study conducted by Kedir et al. (2023). An increased risk of developing chronic kidney disease (CKD) was linked to proteinuria, lower baseline HDL-C levels, advanced age, and longer duration of diabetes. According to a study conducted in Nigeria by Akinmoladun et al. (2021), the prevalence of chronic kidney disease (CKD) in diabetic individuals was 22.1%. Obesity and hypertension were found to be contributing factors to the development of renal dysfunction. Additionally, the study found a substantial correlation between poor blood pressure control and a lower glomerular filtration rate (GFR), highlighting the importance of lifestyle changes in preventing aberrant renal outcomes in diabetic patients. Comparing these results reveals regional differences in the frequency of chronic kidney disease (CKD) among African diabetes individuals. The Ethiopian findings show that whereas prevalence rates are higher in Southern and Western Africa, Eastern Africa also faces major obstacles. These discrepancies could be explained by variations in public health campaigns, screening accessibility, and hospital facilities.

2.4 Conclusion

This review of the literature emphasizes how important it is to do additional research to close these gaps, especially in the context of diverse populations and varied healthcare

environments. The prevalence of abnormal renal failure in Africa and the socio-demographic traits linked to abnormal renal function are complex and interconnected. Important variables including age, gender, wealth, and education have a big impact on when renal dysfunction first appears and how quickly it progresses to renal failure. When these two features are compared, it is evident that socioeconomic considerations have an impact. While rural populations are more at risk from delayed diagnosis and treatment, metropolitan populations often enjoy better access to healthcare. In order to develop more focused public health interventions that address the prevention and early detection of kidney illness in Africa, future research should carry out a more thorough investigation of these socio-demographic variables, especially in rural populations that have received less attention. The proposed study intended to add to this body of knowledge by using both established biomarkers and newly developed diagnostic techniques to evaluate renal function comprehensively. In the end, this study may influence therapeutic procedures and enhance the results that diabetic patients receive.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter went over the methods for the study that looked at renal function in diabetic patients. Diabetes mellitus (DM) and chronic kidney disease (CKD) were two important complications that could raise healthcare expenses, morbidity, and mortality. Since early discovery of renal impairment might have resulted in timely therapy and potentially slowed down the progression of the condition, patients with diabetes were to have their renal function examined. Despite the fact that diabetes was known to have risk factors and implications for renal health, it remained unclear which diabetic populations exhibited specific patterns of renal impairment. The purpose of the planned study was to evaluate renal function in diabetics using imaging, biochemical, and clinical methods.

3.2 Research Design

A Retrospective cross sectional study was used for this investigation. The project aimed to recruit a representative sample across diverse age groups, genders, and diabetes types (Type 1 and Type 2). The population consisted of diabetic patients attending a tertiary care center. This method enabled the evaluation of multiple clinical indices and renal function in diabetic patients simultaneously at one time. This approach was helpful for examining the frequency and relationship between renal impairment and diabetes-related variables.

3.3 Study Site

The study was carried out at the Gweru Provincial Hospital Laboratory, which is located in the city of Gweru. The hospital is also a referral for patients in the Midlands Province, Zimbabwe thus being ideal due to the diverse population that visits the hospital for treatment. The research

study was carried out on participants who had agreed to help with this investigation and to give their input.

3.4 Study Population

The study focused on adult patients (aged 18 years and above) with both type 1 and type 2 diabetes mellitus who attended at the Gweru Provincial Hospital. Individuals with known pre-existing kidney disease or conditions that may affect kidney function, such as glomerulonephritis or polycystic kidney disease, were excluded.

3.5 Sampling

Laboratory data for patients with both type 1 and type 2 Diabetes was collected and used. A non-probability purposive sampling technique was used as the sampling strategy for this investigation. With this method, participants were chosen according to certain attributes pertinent to the study's goals, such as having been diagnosed with diabetes mellitus and meeting eligibility requirements. By doing this, the sample's representativeness of the target population is increased.

3.5.1 Sampling Size

The participants for the study were selected based on the inclusion and the exclusion criteria that has been set for the study.

$$n = (Z^2 \cdot p(1-p)) / E^2$$

n=required sample size

Z is the value of the number of standard deviations from the mean, corresponding to the desired confidence level

P= estimated proportion of the population

E= margin of error (the maximum acceptable difference between the sample estimate and the population parameter)

For example $z=1.41$; $p=0.5$; $E=0.005$

$$\text{Therefore } n = \frac{1.41^2 * 0.5 * (1-0.5)}{0.05}$$

$$= 198.4$$

Therefore the sampling size was 200 patients.

3.5.2 Sampling Procedure

The researcher used the random sampling technique during the research based on the exclusion and inclusion criteria. The researcher statistically studied patients' laboratory records. I wrote laboratory numbers for the patients, then placed them in a box, the box was shaken and then numbers were picked randomly until the estimated size was reached.

3.6 Pilot study test

A pilot study was conducted at Masvingo Provincial Hospital, where I used a small sample size that was drawn from the hospital records at Masvingo Provincial hospital laboratory. A simple random sampling method was used and the data was then analyzed to check if the study is feasible enough to carry out. The aim of the Pilot study was to check the reliability of the data collection tool.

3.7 Data Analysis

Data was collected from the Biochemistry Department of the Gweru Provincial Hospital, compiled using Microsoft Excel. Patient age and gender are the main variables which are important. The data analysis is aligned with the research questions as well as the data collected.

3.8 Ethical Considerations

Prior ethical approval from the relevant institutional review boards (Gweru Provincial Hospital Ethics Review Board and AUREC) was obtained before initiating the study. Patients were thoroughly informed about the study's objectives, methods, any risks and benefits, and their freedom to discontinue participation at any moment without facing any consequences. When

getting consent from vulnerable groups, including elderly people or people with cognitive disabilities, caution was exercised to make sure that comprehension is evaluated. Sensitive health information may be revealed by renal function assessment, thus it was critical to make sure that any results were appropriately reported and shared with only authorized persons suitably. Strict procedures were followed to safeguard patient data and guarantee the confidentiality of personal information. When feasible, data anonymization is part of this.

3.9 Summary

This chapter provides an overview of the techniques the researcher used to conduct their investigation. The researcher examined the population that was to be involved in the study as well as the appropriate designs to use in its execution. Additionally, the researcher examined the appropriate tool that will be most useful for the investigation.

Chapter 4: Data Presentation, Analysis, and Interpretation.

4.1 Introduction

This chapter presents the findings from the study on renal function among diabetic patients attending Gweru Provincial Hospital. The data collected was analyzed to identify trends, correlations, and significant factors affecting renal health in this population.

4.2 Socio demographic characteristics of study participants

Table 1: Socio demographic Characteristics frequency

Demographic Variable		Frequency N (%)
Sex	Males	136(68)
	Females	64(32)
Age [Mean(yrs)]	46.4 years	
Duration of the DM in the study participants	< 5 years	48(24)
	5-10 years	80(40)
	>10 years	72(36)

The table summarizes the study participants' primary demographic data, with particular attention to the distribution of sexes, mean age, and length of diabetes mellitus. There are 200 participants in all, 136 of whom are men (68%) and 64 of whom are women (32%). This suggests that the sample has a notable male greater number. The participants' average age is 46.4 years. This middle-aged group is especially pertinent because diabetes risk tends to rise with age. Three groups have been created based on the individuals' length of diabetes. Less than 5 years: 48 participants (24%) fit into this group, indicating that a sizable percentage of the sample is made up of people with diabetes in its early stages. With 80 participants (40%), the largest group is those aged 5 to 10 years. This suggests that many people have been managing their diabetes for a moderate amount of time, which may have an impact on their approaches to managing their

health. 72 patients (36%) have had diabetes for more than ten years, indicating the necessity of continuous and maybe more rigorous therapy to address long-term problems.

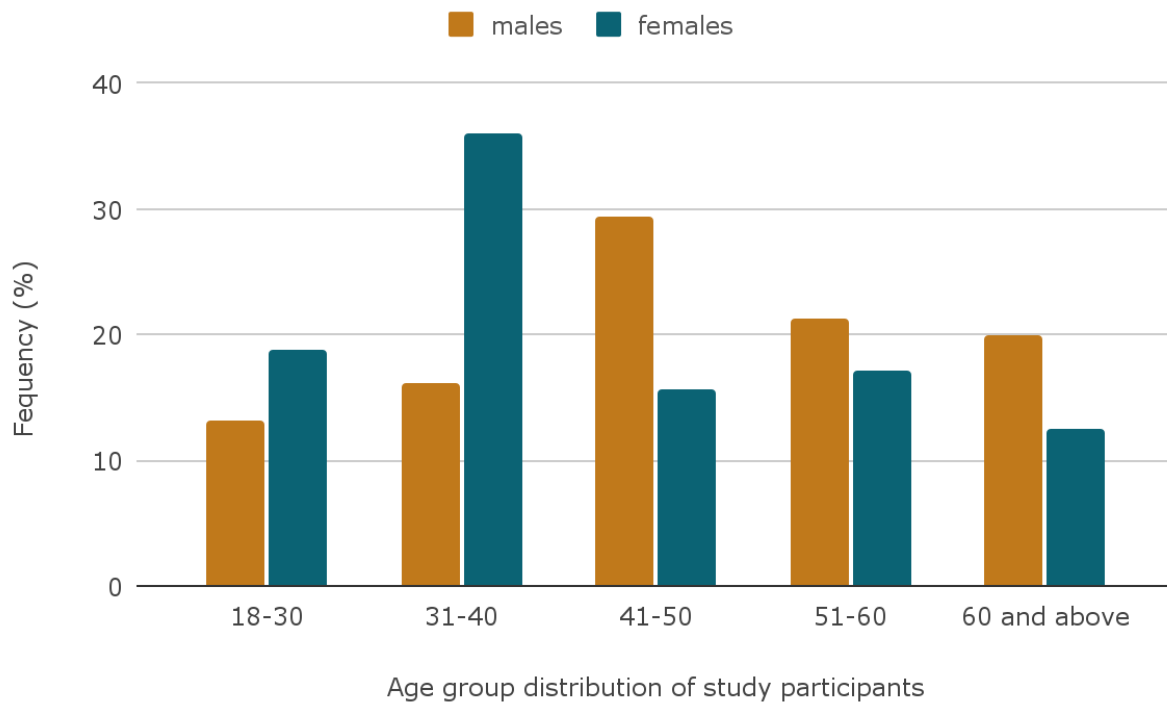


Figure 2: Age group distribution of study participants

Figure 1 is showing the number of males and females in various age categories , from 18-30 ,31-40,41-50,51-60 and participants who are above 60.Most of the participants were in the 41-50 age group, most of the females were between 31-40 years whilst males were between 41-50 years. The least number of females was found in the participants that were aged 60 years and above whilst the least number of males was found between the 18-30 age group.

4.3 HbA1C and Renal Function Tests results of study participants

4.3.1 Glycemic control status of study participants

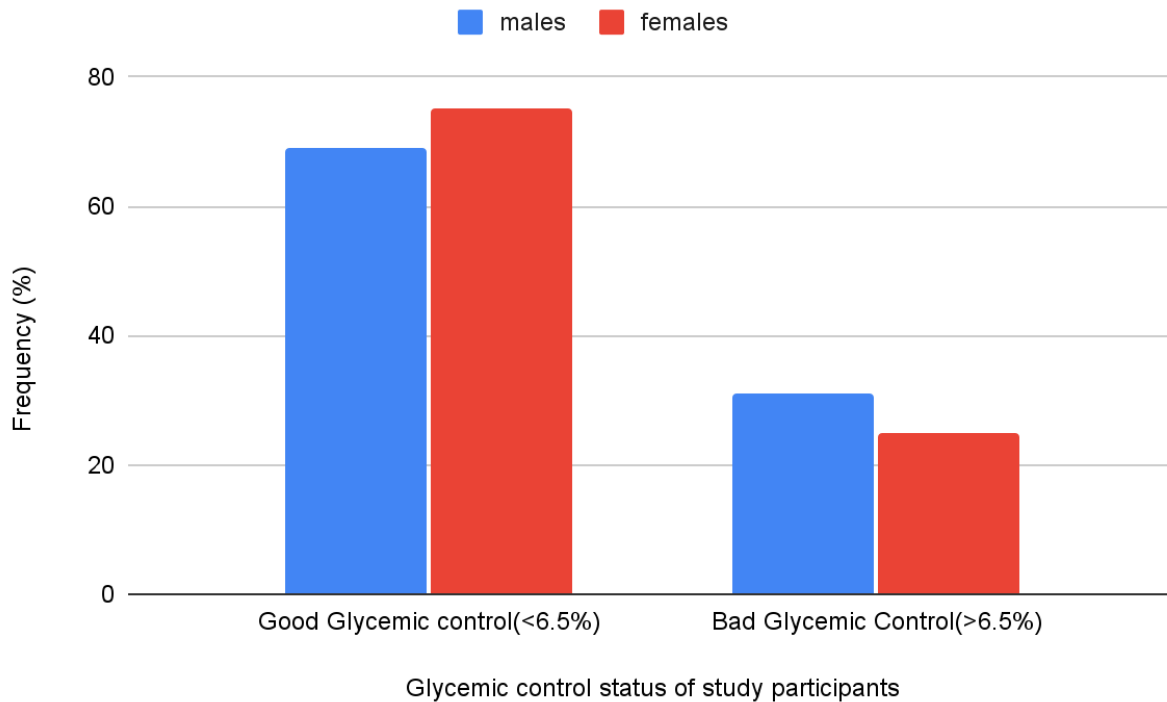


Figure 3: Glycemic control status of study participants

Good Glycemic control for HbA1c is considered to be below 6.5% and anything above 6.5% is considered as bad glycemic control. The data is separated into males and females, and the graph shows the frequency of both normal and abnormal HbA1c levels within both groups. The classifications for HbA1C are good glycemic control(<6.5%) and bad glycemic control(>6.5%). In figure 2 it shows that a higher percentage of the females were able to effectively control their blood glucose as compared to the men. Effective blood glucose control was indicated by a glycated hemoglobin of (<6.5%) which is where most of the study participants were within, both males and females. A lower percentage of people in both sexes, according to the graph, fall into the bad glycemic control (over 6.5%), which could suggest diabetes or inadequate glycemic control.

4.3.2 Serum creatinine results of study participants

Table 2: Serum creatinine results of study participants

	Male / N (%)	Female / N (%)
Below Normal Range (<70µmol/L)males (<50µmol/L)females	22(16.2)	10(15.6)
Within Normal Range (70 to 115 µmol/L)males (50 to 100 µmol/L)females	68(50)	39(61)
Abnormal (> 115 µmol/L)male (>100 µmol/L)females	46(33.8)	15(23.4)

Serum creatinine levels below the normal range are found in a relatively small percentage of both males (16.2%) and females (15.6%), according to the data in this table. Serum creatinine levels in the normal range are found in a moderate proportion of males (50%) and a higher proportion of females(61%). Serum creatinine levels are abnormal in a considerable percentage of both sexes, with a larger frequency in males than in females.

4.3.3 eGFR results of study participants

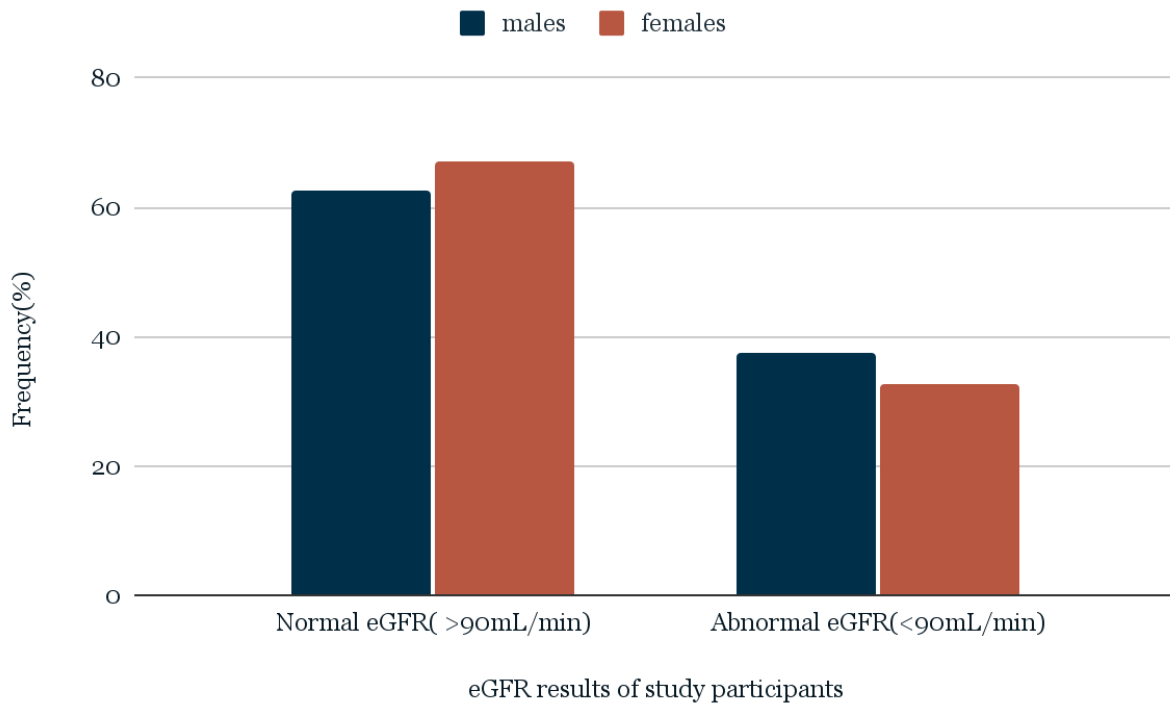


Figure 4: eGFR results of study participants

Two groups are shown on the graph: abnormal (eGFR < 90 mL/min) and normal (eGFR > 90 mL/min). In order to compare the eGFR values of the two groups, data is shown for both males and females. Most of the patients have normal eGFR with males (While a sizable portion of both men and women have eGFR levels that are within the normal range, the bar graph indicates that a sizable portion of both sexes have aberrant eGFR levels, raising the possibility of renal health issues, with one sex possibly having a higher prevalence.

4.4 Prevalence of renal dysfunction among study participants

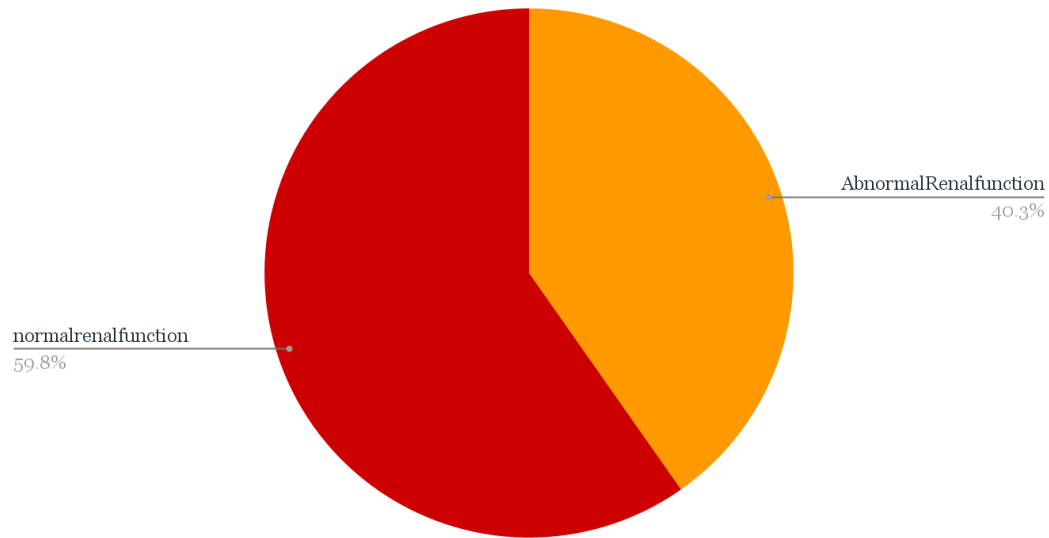


Figure 5: Prevalence of renal dysfunction among study participants

The prevalence was calculated by averaging the serum creatinine and eGFR results. The figure shows that most patients had normal renal function with a calculated prevalence of about 59.75% and very few participants had abnormal renal function with a calculated average prevalence of 40.25%. This suggests that, according to the eGFR and serum creatinine measurement, a significant percentage of the population has some degree of renal impairment.

Chapter 5 Discussion , Conclusion and Recommendation

5.1 Introduction

This chapter provides a summary of the study findings on the assessment of renal function among diabetic patients attending Gweru Provincial Hospital from 2023 to 2024. It will discuss the key findings in relation to the research objectives , outline the study limitations and explore the implications of the results. Lastly it will offer conclusions drawn from the research and provide further practice and research recommendations.

5.2 Discussion

5.2.1 Socio-demographic Characteristics of study participants

The study identified a predominance of male participants (68%) with an average age of 46.4 years. This aligns with findings from Adeyamo et al.(2023), which indicated that socio demographic factors such as age and gender significantly influence renal function outcomes in diabetic patients. Diabetes lasted for a variety of lengths of time and 40% of patients had the disease for 5-10 years. This group emphasizes the necessity of focused therapies , especially for middle aged men who are more likely to experience renal problems, as also noted in studies that emphasize the correlation between longer diabetes duration and increased risk of chronic kidney disease (Wang et al.,2021). With 24% having diabetes for <5 years , 40% for 5-10 years and 36% for more than 10 years , participants' durations of diabetes mellitus varied.

5.2.2 Glycemic control and renal function tests of study participants

Most of the study patients exhibited good glycemic control(<6.5%). This finding is consistent with Rojas et al,(2023), who emphasized that maintaining HbA1c levels below 6.5% significantly reduces the incidence of diabetic nephropathy. The gender differences in diabetes care are highlighted by this important finding .A greater proportion of females than males demonstrated good glycemic control, according to the study of HbA1c values. To add on , the

serum creatinine results revealed that a small percentage of participants showed serum creatinine levels below the normal range (16.2% of males and 15.6% of females) and also that 33.8% of males and 23.4% of females had abnormal levels, indicating impaired renal function. The eGFR results further corroborated these findings , showing that a notable portion of both sexes exhibited abnormal renal function, emphasizing the prevalence of diabetic kidney disease within this population. Lee et al,(2022) further support the necessity of blood pressure management , as hypertension coexists in many diabetic patients, exacerbating kidney damage.

5.2.3 Prevalence of Renal Dysfunction among study participants

Given the link between diabetes and kidney health , the total prevalence of renal impairment among the individuals was alarming at about 40.25%.This prevalence is consistent with findings from recent studies, suggesting a significant burden of renal dysfunction among diabetic patients, for example the International Diabetes Federation(2023) reported that the rising global prevalence correlates directly with an increase in diabetic kidney disease. These findings support earlier research showing that diabetic individuals have significant rates of renal damage, underscoring the critical necessity for routine monitoring and early intervention techniques.

5.3 Implications of study findings

The high prevalence of renal dysfunction (40.25%) among diabetic patients at Gweru Provincial Hospital indicates the need for improved screening , monitoring practices ,and the need for enhanced public health initiatives aimed at diabetes management and education, particularly in vulnerable populations. Lastly, understanding the socio-demographic factors associated with renal dysfunction can inform tailored management strategies that address the specific needs of different patient groups.

5.4 Limitations of study

The study acknowledged several limitations, including lack of sponsors and funding, leading to unavailability of reagents. The study was conducted at a single hospital which may lead to a potential lack of generalizability due to specific demographics and small size of population. As a cross sectional study it captures data at a single point in time which may not reflect changes in renal function over time, whilst inconsistencies in testing and monitoring of renal function may be difficult. Factors such as comorbid conditions , medication adherence and lifestyle choices were not extensively controlled, which could influence renal outcomes. Limited time for the research was also a factor. Lastly, limitations in access to comprehensive patient records may have affected the breadth of the analysis.

5.5 Conclusion

The renal function of diabetes patients at Gweru Provincial Hospital is better understood because of this study. The results highlight the significance of routine monitoring and early intervention by showing a large prevalence of renal failure in this population. The study also emphasizes how socio-demographic characteristics—specifically, sex—affect renal health and glycemic control metrics. Despite its shortcomings, the study advances our knowledge of renal function in diabetic individuals and serves as a foundation for further research and advancements in clinical practice.

5.6 Recommendations

Based on the findings and implications of this study , the following recommendations are proposed: Implementation of routine renal function assessments for diabetic patients attending the Gweru Provincial Hospital ,not all diabetic patients are routinely checked, and looking at the affected age group (41-50), it is important to frequently screen them because their renal function will be decreasing, to avoid any additional risk factors. Develop and implement sex-specific

strategies for the management of diabetes and the prevention of renal complications ,whilst strengthening patient education programs to promote awareness of the importance of glycemic control and renal health. For further research, longitudinal studies to explore the progression of renal dysfunction in diabetic patients and assess the efficacy of various management strategies to add on, explore the impact of specific interventions such as lifestyle modifications and pharmacological therapies on renal function in diabetic patients. Healthcare systems can improve patient outcomes and lessen the burden of chronic kidney disease by implementing these recommendations and managing diabetes patients' renal health

5.7 Dissemination of study findings

The obtained results will be shared with the management of the Gweru Provincial Hospital so that the information will be cascaded to the Ministry of Health and Child Welfare of Zimbabwe for further study and implementation.

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Appendices

Appendix 1 Data Abstraction Form

Patient Number	Patient Age	Patient sex	HbA1c	Serum creatinine level	Serum Urea levels

Appendix 2 Gantt Chart

Table 2 Gantt Chart For October 2024 to April 2025

Activity	October	November December		January	February	March	April
Approval of research proposal topic							
Proposal writing							
Submission and approval of project							
Data collection							
Compilatio n of final dissertation							
Submission							

Appendix 3: Research study budget

Table 3 Research study budget

Activity	Amount in USD
Stationery	20
Transport fees	50
Internet charges	80
Accommodation	30
Food	40
Communication	20
Total	240

Appendix 4 Site Approval Letter

Telephone: (054)2221301-7)
All correspondences to be
addressed to the
Medical Superintendent



REF: 13032025/056
Ministry of Health and Child Care
Gweru Provincial Hospital
135 Shurugwi Road
P.O.Box 135
GWERU

13th of March 2025

Chikondi Charmaine Nkwenze
AFRICA UNIVERSITY

RE: APPLICATION TO CONDUCT AT GWERU PROVINCIAL HOSPITAL

Thank you for your application to conduct research at Gweru Provincial Hospital. I am glad to advise you that your application for the research study titled, "Assessment of renal function among diabetic patients attending Gweru Provincial Hospital from 2023 to 2024" has been approved by the Gweru Provincial Hospital Research Ethics Committee.

This approval is premised on the study proposal that was submitted, should you vary your study in any way you should provide the new material for approval.

You are advised to avail the results of your study to the hospital through the Medical Superintendent.

A handwritten signature in blue ink, appearing to be 'F. J. Mashingaidze'.

Dr. F. J. Mashingaidze
MEDICAL SUPERINTENDENT



Appendix 5 Aurec Approval



AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU 3776/25

17 March, 2025

CHIKONDI CHARMAINE NKWENZE
C/O Africa University
Box 1320
MUTARE

RE: **ASSESSMENT OF RENAL FUNCTION AMONG DIABETIC PATIENTS ATTENDING GWERU PROVINCIAL HOSPITAL FROM 2023 TO 2024.**

Thank you for the above-titled proposal you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

- a) Research proposal
 - **APPROVAL NUMBER** AUREC 3776/25
This number should be used on all correspondences, consent forms, and appropriate document
 - **AUREC MEETING DATE** NA
 - **APPROVAL DATE** March 17, 2025
 - **EXPIRATION DATE** March 17, 2026
 - **TYPE OF MEETING:** Expedited
After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
 - **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
 - **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
 - **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.



Yours Faithfully

MARY CHINZOU
FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE