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# PREVALENCE RATES OF HEMODIALYSIS AND CLINICO-PATHOLOGICAL CHARACTERISTICS OF CHRONIC KIDNEY DISEASE PATIENTS AT THE MUTARE HEMODIALYSIS CENTRE, ZIMBABWE (2019-2025).

BY

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A PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUREMENTS FOR THE DEGREE OF BACHELOR OF MEDICAL LABORATORY SCIENCES IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

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## Abstract

Chronic Kidney Disease (CKD) is a significant public health concern, particularly in Zimbabwe, where its prevalence is on the rise, leading to increased demand for renal replacement therapies such as hemodialysis. This study aimed to assess the rate of hemodialysis among CKD patients at the Mutare Hemodialysis Centre and explore the clinico-pathological characteristics influencing treatment modalities and patient outcomes from January 2019 to January 2025. A cross-sectional study design was utilized, involving systematic sampling of 90 patients undergoing hemodialysis. Key demographic data, socio-geographic factors, comorbidity prevalence, laboratory profiles, and treatment outcomes were collected through structured data collection sheets. The findings revealed a male predominance (60%) in the study population, with a mean age of 57 years. Notably, the age distribution showed a significant percentage of participants aged between 61 and 75 years, which accounts for 33.3% of the sample. Urban dwellers constituted 57.8%, highlighting better access to healthcare resources. A substantial number of patients presented with comorbidities, including hypertension (43.3%), diabetes mellitus (27.8%), and obesity (4%). Laboratory assessments indicated severely impaired renal function, with elevated serum creatinine levels averaging 675 μmol/L and a low mean GFR of 23 mL/min, categorizing the majority of participants in advanced stages of CKD. In terms of treatment frequency, 61.1% of patients received dialysis once per month, while 38.9% received it twice monthly. Moreover, 20% of patients reported experiencing complications during the course of treatment, indicating ongoing challenges in CKD management. These findings underscore the urgent need for comprehensive management strategies to address prevalent comorbidities and emphasize the importance of ongoing monitoring and education for CKD patients. Given the limitations related to the sample size and cross-sectional design, future research should aim to include larger, more diverse populations to enhance the understanding of CKD in Zimbabwe. This research provides vital insights into the characteristics of CKD patients undergoing hemodialysis and highlights the necessity for improved healthcare practices and policies to optimize patient outcomes in the region.
**Key words:** Haemodialysis, Prevalence, CKD, End Stage Renal Disease

## Declaration Page

**I, 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.**

Wadzanai Tsitsi Chari ______________12/04/2025_

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## Acronyms and Abbreviations

| | |
|---|---|
| CKD | Chronic Kidney Disease |
| HD | Haemodialysis |
| HIV | Human Immunodeficiency Virus |
| ESRD | End Stage Renal Disease |

## Definition of key terms

**Hemodialysis -** Hemodialysis is a treatment to filter wastes and water from your blood, as your kidneys did when they were healthy. Hemodialysis helps control blood pressure and balance important minerals, such as potassium, sodium, and calcium, in your blood.

**Hypertension -** Hypertension (high blood pressure) is when the pressure in your blood vessels is too high (140/90 mmHg or higher). It is common but can be serious if not treated.

**Diabetes mellitus -** Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces.

**Obesity -** Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese.

**End-Stage Renal Disease (ESRD) -** A medical condition where the kidneys have permanently ceased functioning and require dialysis or a kidney transplant to maintain life.

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# CHAPTER 1: INTRODUCTION

## 1.1 Background

Chronic Kidney Disease (CKD) affected 10% of the global population and was recognized as a significant public health challenge internationally due to its widespread nature and link to high cardiovascular risk. CKD was characterized by either alterations in kidney structure or function or a reduced estimated glomerular filtration rate (eGFR) lasting more than 3 months, with health implications categorized into 5 stages based on eGFR. The existing recommendation was to utilize serum creatinine levels to estimate eGFR, which should then be converted using the CKD Epidemiology Collaboration (CKD-EPI) equation. CKD was associated with a decline in renal function related to age that was hastened by hypertension, diabetes, obesity, and primary renal disorders. Although cardiovascular disease (CVD) was the leading cause of morbidity and mortality, CKD was viewed as a catalyst for CVD risk and as an independent risk factor for CVD events. Additionally, CKD significantly impacted patients' health, lifestyle, well-being, and quality of life; it occurred at least 3 to 4 times more often in Africa compared to developed nations. Even with a high need for treatment, only a small number of patients in various African countries received renal replacement therapy, primarily due to limitations in resources (Alfred J Meremo et al., 2018).

Chronic Kidney Disease (CKD) represented a significant public health issue globally, marked by a gradual decline in kidney function over time. In Zimbabwe, CKD emerged as a considerable strain on the healthcare system, with a rising number of patients needing renal replacement therapy, including hemodialysis (HD). Hemodialysis was a critical treatment that employed a machine to cleanse waste from the blood when the kidneys could no longer carry out this role.

The Zimbabwean Ministry of Health and Child Care indicated a consistent rise in the number of individuals receiving dialysis, with a considerable segment of these patients treated at the Mutare Hemodialysis Centre. This Centre served as a key provider of renal replacement therapy in its area, catering to a large population that had limited access to other healthcare options.

In spite of the growing demand for hemodialysis services, there was scant information regarding the prevalence of hemodialysis and its correlation with clinico-pathological characteristics among CKD patients in Zimbabwe. It was essential to understand these elements for the efficient management and treatment of CKD patients, as well as for strategic planning and resource distribution.

**1.2 Problem statement**

In a study performed on South Africa's black population, researchers discovered that primary hypertension was present in 25.0% of the study group and was identified as the cause of stage 5 CKD in 40.0% to 60.0% of those patients. In another investigation carried out in South Africa, the authors similarly identified hypertension as the main cause in the adult demographic and the reason for chronic kidney failure in 21.0% of patients registered for renal replacement therapy. The incidence of diabetic nephropathy was estimated to be between 14.0% and 16.0% in South Africa, 23.8% in Zambia, 12.4% in Egypt, 9% in Sudan, and 6.1% in Ethiopia. A study performed in Nigeria revealed that the total prevalence of CKD was 18.8%. The researchers linked the condition to hypertension (30.0%), diabetes mellitus (3.7%), obesity (14.6%), and hematuria (3.1%), with predictors of CKD including age, female gender, systolic blood pressure, and diabetes mellitus (Alfred J Meremo et al., 2018). However, definitive data in the context of Zimbabwe remained absent, hence the investigation.

Chronic Kidney Disease (CKD) represented a considerable health issue for many individuals in Zimbabwe, especially in areas like Mutare. For patients encountering advanced stages of this illness, hemodialysis often represented their best opportunity for survival, yet there was surprisingly limited knowledge about the characteristics of these patients at the Mutare Hemodialysis Centre.

Despite chronic kidney disease (CKD) being a significant public health issue in Zimbabwe, there was a lack of comprehensive information regarding the prevalence of hemodialysis and the clinicopathological features of CKD patients. Notably, the number of individuals at the Mutare Hemodialysis Centre had grown, but healthcare professionals could not develop effective treatments or allocate resources efficiently without an adequate understanding of the patients' demographics, comorbidities, and treatment outcomes. By investigating the clinico-pathological characteristics and treatment trends of CKD patients undergoing hemodialysis, this research aimed to address this vital gap and provide suggestions for healthcare advancement.

### 1.3 Purpose of the study

The purpose of this study was to investigate the rate of hemodialysis among CKD patients at the Mutare Hemodialysis Centre and to explore the clinico-pathological characteristics that may impact treatment modalities and patient outcomes. This research aimed to generate data that could inform healthcare providers and policymakers about the burden of CKD and the effectiveness of hemodialysis treatment in the Zimbabwean context.

### 1.4 Significance of the study

This study provided valuable insights into the rate of hemodialysis and its relationship with clinico-pathological characteristics among CKD patients in Zimbabwe. The findings informed healthcare policymakers, renal clinicians, and researchers on the need for targeted interventions to improve patient outcomes and healthcare delivery. Additionally, this study contributed to the existing body of knowledge on CKD management and treatment in developing countries.

### 1.5 Research objectives

The main objectives of this study were:

1. To determine the proportion of CKD patients who qualified for Hemodialysis at Mutare Hemodialysis Centre in Zimbabwe between 2019 and 2025.

2. To describe the socio-demographic factors of patients undergoing Hemodialysis at Mutare Hemodialysis Centre from 2019 to 2025.

3. To describe the comorbidities associated with Hemodialysis at Mutare Hemodialysis Centre (such as Diabetes Mellitus, Hypertension, HIV, and Obesity) from 2019 to 2025.

4. To describe the laboratory profiles (age, gender, creatinine levels, urea levels, electrolyte levels, etc.) of patients undergoing Hemodialysis at Mutare Hemodialysis Centre during the stated timeframe.

### 1.6 Conceptual Framework

The study was guided by a conceptual framework that integrated the biopsychosocial model, which recognized the interplay between biological, psychological, and social factors in health outcomes. This framework helped in understanding how demographic characteristics, comorbidities, and psychosocial elements influenced the hemodialysis experience and outcomes for CKD patients. By applying this model, the study aimed to provide a comprehensive understanding of the factors that impacted hemodialysis rates and patient characteristics.

### 1.7 Research questions

1. What proportion of CKD patients qualified for hemodialysis at the Mutare Hemodialysis Centre from January 2019 to January 2025?

2. What were the socio-demographic characteristics of CKD patients undergoing hemodialysis at the Mutare Hemodialysis Centre during the specified period?

3. What comorbidities were prevalent among CKD patients undergoing hemodialysis at the Mutare Hemodialysis Centre from 2019 to 2025?

4. What were the laboratory profiles of CKD patients undergoing hemodialysis at the Mutare Hemodialysis Centre during the study period?

### 1.8 Delimitation, limitations, and assumptions of the study

**Delimitations:**

The study was delimited to CKD patients attending the Mutare Hemodialysis Centre from January 2019 to January 2025. It focused exclusively on individuals aged 18 and above and did not include patients undergoing other forms of renal replacement therapy.

**Limitations:**

This study was conducted at the Mutare Hemodialysis Centre, which was the primary provider of renal replacement therapy in its respective region. The study covered a period of six years (January 2019 to

January 2025). The sample population comprised all CKD patients who underwent hemodialysis during this period. The study's limitations included the potential for bias in data collection and analysis, reliance on secondary data sources, and reliance on medical records and self-reported data, which may have introduced biases or inaccuracies. Additionally, the cross-sectional design limited the ability to establish causal relationships and may not have generalized to all CKD patients in Zimbabwe or similar contexts.

**Assumptions:**

This study assumed that the data provided accurate and honest information during data collection and that the medical records accessed would be complete and reflective of the clinical history of the patients. Furthermore, it assumed that the findings would be representative of the CKD population accessing hemodialysis services at the selected Centre.

This study aimed to provide critical insights into the hemodialysis landscape for CKD patients in Zimbabwe, intending to inform better healthcare practices and policies that could enhance patient outcomes and quality of care.

# CHAPTER 2: REVIEW OF RELATED LITERATURE

## 2.0 Introduction

Chronic Kidney Disease (CKD) was a significant public health concern worldwide, with increasing incidence and prevalence rates reported in various populations (National Kidney Foundation, 2020). In sub-Saharan Africa, the burden of CKD was compounded by inadequate access to healthcare resources, including renal replacement therapies such as hemodialysis (Kidney Disease in Africa, 2020). This literature review aimed to provide an overview of the current knowledge on CKD in sub-Saharan Africa, with a focus on the rates of hemodialysis and associated clinico-pathological characteristics.

## 2.1 Study objectives

1. To investigate the prevalence of hemodialysis among CKD patients in Zimbabwe and its associated factors: This objective was crucial as it aimed to fill the existing knowledge gap regarding the rate of hemodialysis and the factors influencing treatment outcomes among CKD patients in Zimbabwe.

2. To explore the relationship between hemodialysis rates, clinical characteristics, and sociodemographic factors: This objective sought to provide insights into the complex interplay between hemodialysis rates, clinical factors (e.g., blood pressure, serum creatinine levels), and sociodemographic factors (e.g., age, income, education level).

3. To identify the most significant risk factors contributing to hemodialysis initiation in CKD patients: This objective aimed to highlight the key risk factors that necessitated hemodialysis initiation, which could inform prevention strategies and interventions.

## 2.2 Literature review

Recent studies indicated that the prevalence of CKD in Zimbabwe was underreported. A crucial factor was access to healthcare facilities, where limited resources hindered timely diagnosis and treatment. Furthermore, social determinants such as poverty, education, and lack of health insurance exacerbated patient outcomes in developing regions. This review emphasized an urgent need to assess these barriers in the Zimbabwean context, as these might inform targeted interventions for improved care delivery.

There was a growing global burden of chronic kidney disease (CKD), which resulted in approximately 1.2 million deaths worldwide in 2017. In low- and lower-middle-income countries like Zimbabwe, the understanding of CKD and its severe form, kidney failure, was limited due to a lack of data. The Dialysis in Zimbabwe (DIAZ) project was initiated to gather and report on the prevalence, incidence, characteristics, and outcomes of treated kidney failure patients (University of Iowa et al., 2022).

In February 2018, 482 dialysis patients were identified in Zimbabwe, yielding a prevalence rate of 33.4 patients per million population. The study found that most hemodialysis (HD) patients were male (66.7%), while most peritoneal dialysis (PD) patients were female (62%). Common causes of kidney disease included hypertension and diabetes. The study highlighted the significant barriers to access, such as costs and limited availability of PD training outside the capital, Harare (University of Iowa et al., 2022).

The findings indicated that less than 10% of patients who could benefit from kidney failure treatment were receiving it. Despite the introduction of public dialysis support by the government in July 2018, substantial gaps in funding, trained staff, and infrastructure remained. Overall, the project provided essential data on dialysis prevalence in Zimbabwe, revealing low access and underuse of PD, while emphasizing the need for targeted interventions to reduce the future kidney failure burden in the region (University of Iowa et al., 2022).

One study showed that among people with HIV, the prevalence of CKD was highest in Nigeria, Zimbabwe, and Uganda. The remaining countries, including Cameroon, Côte d'Ivoire, Kenya, Mozambique, Rwanda, South Africa, and Zambia, had prevalence estimates of 1–10%. The difference between these two sets of countries might have been related to the treatment status of the HIV participants. Only 16% of the participants in the studies from Nigeria, Zimbabwe, and Uganda were receiving care for their HIV, whereas all participants from the remaining countries were receiving some form of care for HIV (Stanifer et al., 2014).

Another study conducted in Northern Africa found that the mean age of patients with ESRD was lower compared to CKD and AKI patients, giving further credence to the effect of foreign diets, greater stress involved in attaining higher standards of living resulting in elevated blood pressures, and a greater use of nephrotoxins (creams, soaps, and eyelash creams) in the development and progression of CKD in younger populations. Lower ages of patients with renal dysfunction were also documented in other regions compared with the Western world. The concerning trend of increased occurrence of kidney diseases among the productive young workforce in developing countries compared to developed nations, where it mainly affects older age groups, called for proactive and effective measures to stem this unfavorable tide (Bamikefa et al., 2023).

**Risk factors that necessitate hemodialysis initiation**

Unplanned dialysis initiation was common in patients with chronic kidney disease (CKD).

Using MEDLINE, EMBASE, and the Cochrane Library, researchers reviewed 2797 citations, and 48 met eligibility criteria. Reported definitions for unplanned dialysis were variable. Most publications cited dialysis initiation under emergency conditions and/or with a central venous catheter. The association of patient characteristics with unplanned dialysis was reported in 26 studies, with 18 being retrospective and 21 including incident dialysis patients. The most common risk factors in univariate analyses were (number of studies) increased age (n = 7), cause of kidney disease (n = 6), presence of cardiovascular disease (n = 7), lower serum hemoglobin (n = 9), lower serum albumin (n = 10), higher serum phosphate (n = 6), higher serum creatinine or lower estimated glomerular filtration rate (eGFR) at dialysis initiation (n = 7), late referral (n = 5), lack of dialysis education (n = 6), and lack of follow-up in a predialysis clinic prior to dialysis initiation (n = 5). A minority of studies performed multivariable analyses (n = 10); the most common risk factors were increased age (n = 4), increased comorbidity score (n = 3), late referral (n = 5), and lower eGFR at dialysis initiation (n = 3) (Hassan et al., 2019).

**Prevalence and Incidence of CKD in Sub-Saharan Africa**

CKD prevalence rates in sub-Saharan Africa varied widely, ranging from 3.4% in South Africa to 14.2% in Ghana. A systematic review of 22 studies reported an overall CKD prevalence of 10.3%. The high prevalence of CKD in sub-Saharan Africa was attributed to factors such as hypertension, diabetes, and HIV/AIDS (Kidney Disease in Africa, 2020).

**Hemodialysis in Sub-Saharan Africa**

South Africa encountered significant barriers in enhancing access to dialysis, attributed to various factors such as governmental support for unequal policies, the absence of comprehensive national guidelines, and contentious rationing practices. Patients diagnosed with end-stage renal disease (ESRD) faced distinct and often substantial obstacles to obtaining dialysis. This situation was examined through its socio-economic dimensions and a thorough review of relevant South African legislation (Etheredge & Fabian, 2017).

End-stage renal disease represented the most critical stage of chronic kidney disease (CKD), commonly referred to as kidney failure, which inevitably occurred without the initiation of renal replacement therapy (RRT). RRT included methods that partially substituted for the lost kidney function to sustain life, primarily through dialysis or kidney transplantation (Etheredge & Fabian, 2017).

The estimated prevalence of CKD in sub-Saharan Africa (SSA) stood at 13.9%, closely mirroring global estimates of 13.4%. However, the incidence of CKD was expected to increase disproportionately within SSA, driven by rapid urbanization, heightened life expectancy, and an aging population. Both infectious and non-communicable diseases contributed significantly to the risk, and factors such as inadequate healthcare infrastructure and the lack of screening and prevention programs for kidney disease exacerbated this risk (Etheredge & Fabian, 2017).

CKD was frequently diagnosed at an advanced stage, at which point renal replacement therapy became critical for survival. It was anticipated that only 1.5% of individuals with diabetes and hypertension requiring RRT in the region would actually receive treatment. Nearly three-quarters of adults initiating dialysis in South Africa did not have access to necessary treatment, placing the burden of dialysis rationing on healthcare providers (Etheredge & Fabian, 2017).

To address these challenges, the report presented a range of comprehensive and practical recommendations, including the engagement of key stakeholders, the establishment of public-private partnerships, and the implementation of more equitable funding mechanisms.

**Common Causes of CKD**

The most prevalent causes of CKD in Zimbabwe align with global trends, emphasizing hypertension and diabetes as significant contributors. Hypertension is often linked to lifestyle and socioeconomic factors, including inadequate access to healthcare and medication. The National Institute of Diabetes and Digestive and Kidney Diseases notes that poorly managed hypertension and diabetes can lead to devastating complications, including kidney failure (2018).

In Zimbabwe, particular attention should be given to the integration of diabetes management into CKD screening processes since studies show that patients with diabetes are more likely to progress to CKD and subsequently ESRD (Kovesdy, 2022). Education efforts targeting at-risk populations regarding both diseases could potentially reduce the incidence of CKD.

**Socioeconomic Determinants**

Socioeconomic status is a critical determinant of health outcomes, particularly in low-resource settings such as Zimbabwe. Factors such as poverty, education level, and access to health insurance play significant roles in the prevalence and outcomes of CKD.

- **Poverty:** The relationship between poverty and CKD is complex, where individuals with lower socioeconomic status face increased exposure to risk factors while struggling to access care. Research has shown that low-income populations report higher rates of chronic diseases due to limited access to nutritious foods, preventive care, and essential medications. Public hospitals struggle with inadequate resources, outdated equipment, and insufficient staff. These hospitals are often overcrowded and underfunded, leaving patients to face long queues, limited access to basic medical supplies, and suboptimal care (SIVIO Connect, 2024).
- **Education:** Health literacy directly impacts individual health status. Low educational attainment is frequently associated with a lack of awareness regarding CKD risk factors and the importance of screening. Education campaigns tailored to disseminate information about CKD, its risk factors, and the importance of early detection are essential for communities with limited resources.
- **Health Insurance:** The fragmented health insurance system in Zimbabwe exacerbates access issues. Many individuals lack adequate health coverage, restricting their ability to afford necessary care. A report by the World Bank indicated that an estimated 10% of the population are covered by voluntary health insurance schemes. Contributions to these schemes are mainly by employers (private and public), and therefore these schemes mainly cover the formally employed and their dependents. Estimates from the NHA show that employers' contribution to private health insurance on behalf of their employees constituted 28.43% of total health expenditures. (World Bank, 2017).

**Lifestyle Factors**

Lifestyle factors, including diet, physical activity, and substance use, also contribute to CKD development and progression. Dietary habits influenced by socioeconomic status can limit access to healthy food options, leading to obesity and other metabolic syndromes that heighten CKD risk.

In many cases, traditional diets rich in salt and fat contribute to hypertension and related renal diseases (Kovesdy, 2022). Public health campaigns that promote low-sodium diets and physical activity can positively impact CKD risk factors at the community level.

**Barriers to Accessing Care**

Infrastructure and Resource Limitations:

Zimbabwe's healthcare infrastructure is often challenged by insufficient funding, inadequate staffing, and limited access to essential resources, all of which impact the management of CKD. Health facilities are frequently burdened with excessive patient loads, leading to diminished quality of care and longer wait times.

Many patients are diagnosed with CKD only after they experience acute complications, as regular screening for at-risk populations is not consistently performed. This results in missed opportunities for early intervention (Francis et al., 2024).

Healthcare Policy and Financial Constraints:

Healthcare policies in Zimbabwe have not traditionally prioritized chronic diseases, leading to gaps in resource allocation for CKD management. Although the government introduced public dialysis support in July 2018, numerous challenges remain.

The financial burden of dialysis is especially acute, with patients often facing significant out-of-pocket expenses. Reports indicate that approximately 10% of eligible patients actually receive treatment, reflecting systemic issues in funding and access (University of Iowa et al., 2022). Policy reform is necessary not only to augment treatment availability but also to ensure that preventative measures are in place to reduce CKD incidence.

Health Education and Awareness:

Health education plays a pivotal role in improving CKD outcomes. However, there remains a considerable lack of awareness among the general population regarding CKD risk factors. Efforts to increase knowledge about CKD through public awareness campaigns are limited and often poorly funded.

Targeted initiatives are needed that focus on educating healthcare professionals, patients, and caregivers about the importance of early detection and management of CKD. According to the National Kidney Foundation, effective patient education programs that use culturally appropriate messaging can help create a more informed population capable of advocating for their health (NKF, 2020).

## 2.3 Conclusion

This literature review highlighted the significant burden of CKD in sub-Saharan Africa, with limited access to renal replacement therapies such as hemodialysis. The clinico-pathological characteristics of CKD patients on hemodialysis were diverse and influenced by various factors. Further research was needed to improve access to hemodialysis and optimize patient outcomes in sub-Saharan Africa.

The expanding burden of chronic kidney disease in Zimbabwe represents a significant public health challenge that necessitates urgent attention from policymakers, healthcare providers, and researchers alike. By understanding the complexities surrounding CKD epidemiology, associated risk factors, and barriers to care, targeted interventions can be devised to improve outcomes for affected populations.

Future research efforts should concentrate on longitudinal studies that track the effectiveness of healthcare interventions and monitor disease progression among high-risk groups. Furthermore, collaboration between governmental bodies, healthcare institutions, and community organizations is essential to creating a sustainable framework for addressing CKD in Zimbabwe.

# CHAPTER 3: METHODOLOGY

## 3.1 Introduction

This section outlined the methodology adopted for this study on the rate of hemodialysis and the clinico-pathological characteristics among Chronic Kidney Disease (CKD) patients at the Mutare Hemodialysis Centre from January 2019 to January 2025. The research aimed to provide comprehensive insights into patient demographics, clinical outcomes, and influencing factors related to hemodialysis treatments. An effective methodology was imperative not only for the reliability of study findings but also for ensuring compliance with ethical research standards.

Systematic sampling was employed, where participants were chosen from patient registers at the Mutare Hemodialysis Centre, guaranteeing an objective and representative sample reflective of the larger population of CKD patients in the region. This approach enabled a thorough analysis of patient demographics, comorbidities, and treatment effectiveness. The study utilized a cross-sectional design, which facilitated the collection of data at one point in time to identify the characteristics of CKD patients receiving hemodialysis.

## 3.2 Study design

This study utilized a cross-sectional design to assess CKD patients undergoing hemodialysis at the selected Centre. This approach allowed for the gathering of data at a specific point in time, enabling the investigation of the prevalence of various clinico-pathological characteristics among the participants. Cross-sectional studies were useful for identifying relationships between variables and providing a snapshot of the patient population.

**Study population**

The study population consisted of patients diagnosed with CKD who were receiving hemodialysis at the selected Centre. A systematic sampling technique was utilized to select participants from patient registers at the Centre, ensuring a representative sample that aligned with the geographical scope of the study.

## 3.3 Research participants/subjects

The study enrolled a total of 90 human participants. Recruitment occurred at the Mutare Hemodialysis Centre, which served as a primary healthcare facility for renal patients in Zimbabwe. Participants aged 18 years and above, both male and female, were included in the study.

The sample size for this study was calculated using a formula for estimating proportions in prevalence studies. With an expected proportion (p) of CKD patients qualifying for hemodialysis at approximately 20% based on preliminary data, and a desired confidence level of 95% with a margin of error (e) of 5%, the formula used was:

$$n = \frac{Z2 \cdot p \cdot (1 - p)}{e2}$$

Which yielded:

$$n = \frac{(1.96)2 \cdot 0.20 \cdot (1 - 0.20)}{(0.05)2}$$

Adjustments for expected non-responses led to a final target of 90 participants.

### 3.5 Case definitions

**Acute kidney injury** was defined as an acute deterioration in renal excretory function, with a serum urea >10 mmol/L and/or a rise in serum creatinine (Scr) by ≥0.3 mg/dL, or a percentage increase in Scr of ≥50% from baseline, using the Acute Kidney Injury Network criteria.

**End-stage renal disease** was defined as progressive CKD with eGFR ≤15 mL/min/1.73 $m^2$ with or without other indications for hemodialysis. Outcome measures included CKD and its associated risk factors.

**Diagnostic Criteria for CKD:**

Kidney Damage:

Structural or functional abnormalities in the kidneys, which may be identified through:

Proteinuria (protein in the urine)

Hematuria (blood in the urine)

Abnormal urine sediment

Imaging that reveals structural issues (e.g., cysts, tumors)

Histological findings from a kidney biopsy

Decreased Kidney Function:

Measured by the glomerular filtration rate (GFR).

A GFR of less than 60 mL/min/1.73 m² for three months or more is indicative of CKD.

**Stages of CKD:**

CKD is divided into five stages based mainly on GFR levels:

Stage 1:

GFR: ≥ 90 mL/min/1.73 m²

Kidney Damage: Present (e.g., proteinuria, structural abnormalities)

Stage 2:

GFR: 60-89 mL/min/1.73 m²

Kidney Damage: Present (e.g., proteinuria)

Stage 3:

GFR: 30-59 mL/min/1.73 m²

(Divided into 3A and 3B)

3A: 45-59 mL/min/1.73 m²

3B: 30-44 mL/min/1.73 m²

Stage 4:

GFR: 15-29 mL/min/1.73 m²

Severe loss of kidney function

Stage 5:

GFR: < 15 mL/min/1.73 m² or requiring dialysis

Kidney failure (end-stage renal disease, ESRD)

Additional Considerations:

Risk factors such as diabetes, hypertension, and family history, along with non-diagnostic tests like imaging and lab work, can help in diagnosing and monitoring CKD.

Regular monitoring of kidney function and complications is essential for effective CKD management.

### 3.6 Inclusion/exclusion criteria

Participants had to meet the following inclusion criteria:

- Diagnosis of CKD Stage 1 or above.

- Age 18 years or older.

- Receiving hemodialysis treatment at the Mutare Hemodialysis Centre during the study period.

Exclusion criteria included:

- Individuals with acute kidney injury.

- Age below 18 years.

This study provided critical insights into the hemodialysis landscape for CKD patients in Zimbabwe, aiming to inform better healthcare practices and policies that could enhance patient outcomes and quality of care.

### 3.7 Data collection procedures

Data were collected through a structured data collection sheet developed for this study, designed to capture demographic, clinical, and treatment-related information. The data sheet was piloted with a small group of CKD patients to ensure clarity and reliability before full-scale implementation.

Data collection involved reviewing medical records to gather relevant clinical data, including laboratory results and treatment history.

### 3.8 Data analysis plan

Data analysis employed descriptive and inferential statistical methods using software. The analysis involved:

- Descriptive Statistics: To summarize the demographic and clinical characteristics of the participants, including frequency distributions, means, and standard deviations.

- Inferential Statistics: To examine relationships between hemodialysis rates and clinico-pathological characteristics, which included comorbidities. Chi-square tests were utilized for categorical variables, while regression analysis was applied to understand more complex relationships.

- Significance Levels: A p-value of less than 0.05 was considered statistically significant. Results were presented in tables and graphs for clarity and ease of interpretation.

### 3.9 Ethical considerations

This study adhered to strict ethical guidelines to protect participant rights and well-being. The key ethical consideration was confidentiality. Participants' identities and data were kept confidential by assigning unique identification codes and storing data in secure locations. Only authorized personnel had access to the data.

In conclusion, this methodology aimed to ensure a rigorous and ethical approach to examining the rate of hemodialysis and the clinico-pathological characteristics of CKD patients in Zimbabwe, ultimately contributing to improved understanding and management of the condition.

## CHAPTER 4: RESULTS

### 4.1 Introduction

This chapter presents the findings from the analysis of data collected from 90 patients undergoing hemodialysis at the Mutare Hemodialysis Centre from 2019 to 2025. The results are presented in categories addressing demographic characteristics, comorbidities, laboratory profiles, and treatment outcomes, all aimed at answering the specific research objectives and questions.

### 4.2 Demographic Characteristics

The demographic characteristics of the participants are summarized in Table 1. Out of the 90 patients, there were 36 females (40.0%) and 54 males (60.0%). The ages of participants ranged from 18 to 81 years, with a mean age of 57 years.

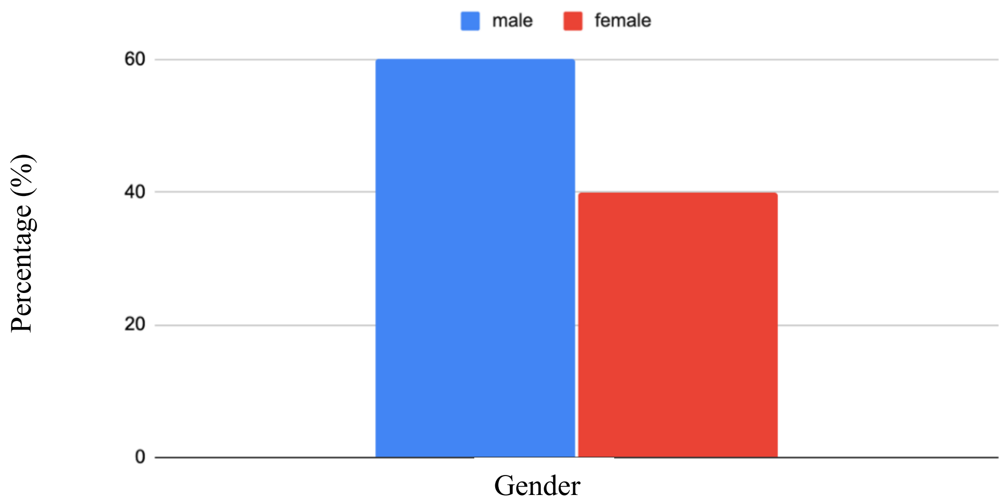


**Figure 2** Gender distribution of the study population

**Table 1** demographic characteristics of patients under Hemodialysis (N=90)

| **Age Group (years)** | **Number** | **Percentage (%)** |
|---|---|---|
| 18 - 30 | 9 | 10.0 |
| 31 - 45 | 18 | 20.0 |
| 46 - 60 | 21 | 23.3 |
| 61 - 75 | 30 | 33.3 |
| 76 and above | 12 | 13.3 |
| **Residential Area** | | |
| Urban | 52 | 57.8 |
| Peri-Urban | 20 | 22.2 |
| Rural | 18 | 20.0 |

**Table 2** Comorbidities stratified by stages of CKD among patients under hemodialysis (N=90)

| **CKD Stage** | **Hypertension** | **Diabetes Mellitus** | **Obesity** | **HIV/AIDS** |
|---|---|---|---|---|
| **Stage 1** | 2 | 0 | 1 | 0 |
| **Stage 2** | 1 | 1 | 0 | 0 |
| **Stage 3** | 15 | 6 | 3 | 2 |
| **Stage 4** | 5 | 1 | 0 | 0 |
| **ESRD** | 5 | 2 | 0 | 0 |

| | **DM Present** | **DM Absent** | **Total** |
|---|---|---|---|
| **HPT Present** | **7** (both) | 17 | 24 |
| **HPT Absent** | 3 | 4 | 7 |
| **Total** | 10 | 21 | 31 |

**Table 3:** Comorbidities Associated with CKD in Hemodialysis Patients (N=90)

| Age (years) | Gender | Total (N) | Hypertension | Diabetes Mellitus | Obesity | HIV/AIDS |
|---|---|---|---|---|---|---|
| **18 - 30** | Male | 5 | 4 | 1 | 0 | 0 |
| | Female | 4 | 2 | 2 | 0 | 0 |
| | **Total** | **9** | **6** | **3** | **0** | **0** |
| **31 - 45** | Male | 10 | 6 | 2 | 1 | 0 |
| | Female | 8 | 5 | 1 | 1 | 0 |
| | **Total** | **18** | **11** | **3** | **2** | **0** |
| **46 - 60** | Male | 14 | 10 | 4 | 2 | 1 |
| | Female | 7 | 5 | 2 | 1 | 0 |
| | **Total** | **21** | **15** | **6** | **3** | **1** |
| **61 - 75** | Male | 17 | 15 | 3 | 1 | 1 |
| | Female | 13 | 10 | 3 | 0 | 0 |
| | **Total** | **30** | **25** | **6** | **1** | **1** |
| **76 and above** | Male | 8 | 5 | 2 | 0 | 0 |
| | Female | 4 | 0 | 2 | 0 | 0 |
| | **Total** | **12** | **5** | **4** | **0** | **0** |
| **Overall Total** | | **90** | **62** | **18** | **6** | **2** |

### 4.3 Socio-geographic factors

This section addresses the residential areas of patients as a social and geographic factor that may influence CKD management and treatment outcomes. Patients were categorized based on their place of residence: urban, peri-urban, and rural areas.

Table 1 provides a demographic breakdown of patients by age group and residential area, offering insights into the population characteristics of the cohort under study. This data helps in understanding the epidemiology of the health conditions being investigated and for guiding targeted healthcare interventions.

The cohort is segmented into five distinct age groups. In the youngest category, 18-30 years, there are 9 individuals, which accounts for 10.0% of the total population. This small percentage suggests that younger individuals are less frequently represented in this cohort, which could have implications for the types of health challenges being addressed. The next group, ages 31-45, includes 18 patients, or 20.0%, indicating a slight increase in representation as age progresses. This pattern continues with the 46-60 age group, which encompasses 21 individuals, making up 23.3% of the total.

The most significant representation is found in the 61-75 age category, with 30 patients, corresponding to 33.3% of the cohort. This sizable proportion highlights the potential impact of age-related health issues on this population, particularly concerning chronic diseases and their management. Lastly, the group aged 76 and over comprises 12 individuals, which is 13.3% of the cohort. This distribution indicates that older adults, specifically those aged 61 and above, represent the majority of the population, highlighting the importance of age in the health challenges faced by this demographic.

In addition to age distribution, the table also outlines the residential areas of the cohort members, further contextualizing their living conditions. The urban population is the largest group, with 52 individuals, accounting for 57.8% of the total. This statistic implies that urban healthcare settings may need to be particularly attuned to the health needs of the population, given its predominance. In contrast, the peri-urban segment includes 20 individuals, translating to 22.2%, while the rural area hosts 18 individuals, representing 20.0% of the cohort. These figures suggest that peri-urban and rural populations collectively comprise approximately 42.2% of the cohort, highlighting the need to consider healthcare access and inequalities that may arise from geographical differences.

In summary, this demographic analysis reveals critical age and geographical trends within the cohort. The majority of individuals are older adults, indicating that the health issues faced are likely to be chronic and related to aging. Additionally, the prevalence of the population in urban areas calls for customized healthcare strategies that address the unique challenges faced by urban residents. The significant representation from peri-urban and rural areas highlights the importance of ensuring that healthcare resources are adequately distributed and accessible to all parts of the population. Altogether, this demographic information is vital for informing public health strategies and optimizing patient care across various age groups and living environments.

### 4.3.1 Impact on Healthcare Access

Patients living in urban areas (57.8%) typically have better access to healthcare infrastructure, including regular follow-ups and specialist consultations. Conversely, those in rural settings may face significant barriers such as transportation challenges, financial constraints, and limited availability of medical care, which complicate the management of CKD.

### 4.3.2 Influence on Comorbidities

The residential environment can also influence lifestyle factors associated with CKD, including diet, activity levels, and exposure to health education. For example, urban patients might have higher access to healthcare information and dietary options, potentially impacting their management of comorbidities like diabetes and hypertension.

Table 2 presents a detailed overview of the clinical stages of Chronic Kidney Disease (CKD) among a cohort of patients, along with the prevalence of comorbidities such as hypertension, diabetes mellitus, obesity, and HIV/AIDS across these stages. The distribution of cases is providing insight into the health challenges faced by patients with varying degrees of kidney impairment.

In Stage 1 of CKD, there are only 2 cases, and both patients have hypertension. This scenario indicates a significant initial relationship between kidney health and high blood pressure. None of the patients in this early stage display diabetes mellitus, suggesting that while hypertension is a common comorbidity, diabetes may take longer to manifest in patients with minor kidney impairment. One patient is noted to be obese, hinting that metabolic factors could be at play even at the beginning stages of CKD. Notably, no cases of HIV/AIDS are reported among these patients, indicating that this demographic in Stage 1 may not be significantly affected by this virus.

Stage 2 also comprises 2 cases, mirroring the initial stage in terms of cumulative numbers, but presents a slight shift in comorbidity patterns. Here, one patient presents with hypertension while another has diabetes mellitus, suggesting an evolving landscape of health issues as kidney function declines. However, there are no cases of obesity or HIV/AIDS in this stage, indicating that the primary concern may be managing hypertension and diabetes both of which become pivotal as the disease progresses.

The results changes considerably in Stage 3, where the number of cases surges to 26. This stage reveals a prevalence of hypertension, affecting 15 patients and highlighting its critical role in CKD management. Diabetes mellitus is also more common in this cohort, with 6 patients diagnosed, contributing to the burden of CKD. Obesity is reported in 3 patients, which suggests that lifestyle factors may begin to affect kidney health as patients advance in their CKD journey. Additionally, 2 patients are living with HIV/AIDS in this stage, indicating a potential intersection between kidney disease and immunocompromised states.

As the disease progresses to Stage 4, the number of cases drops to 6, yet the prevalence of hypertension remains high, with 5 patients affected. This continuity highlights hypertension's persistent role as a comorbidity in CKD. However, diabetes mellitus drops to only 1 case, indicating that prevalent health issues may shift as patients enter more advanced stages of kidney deterioration. There are no cases of obesity or HIV/AIDS at this stage, which may point to a selection effect where patients with more significant comorbidities may not survive to this critical stage.

In the final stage, End-Stage Renal Disease (ESRD), there are 7 patients. Most notably, there are 5 patients with hypertension, while diabetes mellitus affects 2 individuals. The complete absence of obesity and HIV/AIDS cases suggests that certain conditions may either represent less survival advantage in very advanced CKD stages or indicate a focused medical narrative for managing prevalent comorbidities.

In summary, the total analysis of 43 CKD cases reveals a striking predominance of hypertension as a coexisting condition across all stages, while diabetes mellitus increasingly affects patients more substantially in mid-stages. There is relatively low presence of obesity and the limited occurrence of HIV/AIDS throughout the stages. These findings emphasize the need for comprehensive healthcare strategies targeting comorbidities, which play important roles in influencing the progression of kidney disease and patient outcomes.

### 4.5 Laboratory profiles

The laboratory profiles of patients provide insight into their clinical condition and are crucial for answering Objective 4. The table below summarizes the key laboratory parameters:

**Table 4** Biochemical profile of the 90 CKD Patients under hemodialysis

| Laboratory Test | Mean ± SD | Minimum | Maximum | Physiological range |
|---|---|---|---|---|
| **Urea (mmol/L)** | 19.0 ± 6.2 | 5.0 | 42.0 | 2.5 – 7.1 |
| **Creatinine (µmol/L)** | 675 ± 220 | 15.5 | 1400 | Males: 62 – 115, |

| | | | | |
|---|---|---|---|---|
| | | | | Females: 53 – 97 |
| **Sodium (mmol/L)** | 136 ± 2.5 | 133 | 145 | 135 – 145 |
| **Potassium (mmol/L)** | 5.1 ± 0.7 | 3.4 | 7.5 | 3.5 – 5.0 |
| **Chloride (mmol/L)** | 106 ± 6.1 | 94.5 | 115 | 98 – 106 |
| **GFR (mL/min)** | 23 ± 14 | 2 | 115 | 90 – 120 |

Table 4 presents a comprehensive analysis of various laboratory test results related to renal function and electrolyte balance, which are crucial for understanding kidney health. The parameters measured include urea, creatinine, sodium, potassium, chloride, and glomerular filtration rate (GFR). Each entry describes the mean values, standard deviation (SD), minimum and maximum recorded values, along with the physiological range for each measurement.

Starting with urea, the mean level recorded is 19.0 mmol/L, with a relatively large standard deviation of 6.2, suggesting significant variability among test subjects. The minimum value recorded is 5.0 mmol/L, while the maximum is considerably elevated at 42.0 mmol/L, indicating a possible range of urea levels with some patients potentially experiencing elevated concentrations. The physiological range for urea is between 2.5 to 7.1 mmol/L, highlighting that the mean value observed in this cohort significantly exceeds the normal range. This elevation raises concerns about the efficiency of renal function, as urea is a waste product that kidneys typically excrete.

The next parameter is creatinine, with a mean of 675 µmol/L and a substantial variability reflected in the standard deviation of 220. The minimum value recorded is markedly low at 15.5 µmol/L, while the maximum reaches 1400 µmol/L. The reference ranges for creatinine vary based on sex, with males having a normal range of 62 to 115 µmol/L and females ranging from 53 to 97 µmol/L. The mean is significantly above these physiological limits, suggesting that a significant number of individuals in this cohort have compromised kidney function, further supported by the extent of variability in results.

Sodium levels show a mean of 136 mmol/L, with a small standard deviation of 2.5, indicating relative stability in this measurement across subjects. The sodium levels range from a minimum of 133 mmol/L to a maximum of 145 mmol/L, falling within the physiological range of 135 to 145 mmol/L. This suggests that while kidney function may be impaired, the patients' sodium balance is likely maintained effectively, reflecting appropriate renal management of this electrolyte.

Potassium levels present with a mean value of 5.1 mmol/L and a standard deviation of 0.7. The recorded range of potassium spans from a low of 3.4 mmol/L to a high of 7.5 mmol/L. Given that the physiological range is 3.5 to 5.0 mmol/L, the mean indicates mild hyperkalemia, potentially associated with renal dysfunction, which can disrupt heart rhythm and other essential physiological functions.

Chloride levels, with a mean of 106 mmol/L and a standard deviation of 6.1, show a minimum value of 94.5 mmol/L and a maximum value of 115 mmol/L. The physiological range for chloride is stated to be 98 to 106 mmol/L. The mean value suggests a inclination towards the upper limit of this range, which could indicate issues with acid-base balance or hydration status in this population.

Finally, the glomerular filtration rate (GFR) is measured with a mean of 23 mL/min, accompanied by a considerable standard deviation of 14, suggesting a wide variation in renal performance. The minimum GFR recorded is very low at 2 mL/min, while the maximum is 115 mL/min, indicating significant impairment in renal function across the cohort. The normal physiological range for GFR is 90 to 120 mL/min, thus the mean observed in this group indicates severe renal insufficiency.

In summary, the laboratory tests capture a concerning picture of renal health among the subjects assessed. Elevated levels of urea and creatinine suggest significant impairment in kidney function, while potassium levels approaching hyperkalemia raise further concerns about electrolyte management. Despite sodium and chloride levels being within acceptable ranges, the GFR indicates severe compromise in renal filtration capacity.

### 4.6 Treatment outcomes

Treatment outcomes play a critical role in evaluating the efficacy of hemodialysis. As per the study findings:

**Table 5** Frequency and outcome of dialysis (N=90)

| Outcome | Percentage (%) |
| --- | --- |
| **Dialysis Frequency** | |
| 1 per month | (55) 61.1% |
| 2 per month | ( 35) 38.9% |
| **Medical Complications** | |
| Yes | (18)20.0% |
| No | (72)80.0% |

The data illustrate that a substantial majority received dialysis once a month, while a smaller group received it twice monthly. Notably, complications were reported in 20% of patients, aligning with literature that indicates higher rates of complications among CKD patients.

# CHAPTER 5: DISCUSSION

## 5.1 Introduction

This chapter discusses the findings presented in Chapter 4, examines their implications, and links them back to the research objectives and questions. The discussion aims to contextualize the results within the broader knowledge of CKD and hemodialysis.

## 5.2 Demographic analysis

Findings from this research indicate a significant male predominance, with a mean patient age skewed towards older adults (46-75 years). This demographic trend is consistent with the findings of Patrice et al. (2020), which reported that men constitute just above 60% of their cohort, emphasizing that male patients exhibit higher vulnerability towards chronic conditions.

Kachimanga et al. (2019) discovered a more balanced gender representation among CKD patients in rural Malawi, with both males and females equally affected. This divergence could stem from various socio-economic and cultural contexts affecting health-seeking behaviors and disease exposure. For instance, societal norms can influence lifestyle choices—men may engage in riskier health behaviors such as smoking or dietary indiscretion more frequently than women, leading to higher incidences of comorbidity.

Furthermore, the age distribution highlighted in this findings aligns with global patterns where CKD prevalence sharply increases with age. Kovesdy (2022) emphasizes that the aging global population significantly contributes to the rising incidence of CKD, indicating that older adults encounter multiple comorbidities that exacerbate their renal condition. Such demographic insights are crucial in crafting targeted public health interventions and informing healthcare personnel about the needs of this vulnerable population.

### 5.3 Comorbidity significance

CKD often coexists with comorbidities, with hypertension and diabetes being the most prominent. In this study, hypertension was present in over 60% of patients—concordant with findings from Patrice et al. (2020), which reported around 70% prevalence of hypertension among their cohort. This widespread occurrence highlights a significant challenge, as managing these concurrent conditions is critical for optimizing kidney health and overall patient outcomes.

Kovesdy (2022) supports this observation, stating that hypertension is frequently both a cause and a consequence of kidney disease, thus creating a vicious cycle that ultimately leads to progressive renal dysfunction. In managing these complexities, healthcare providers must emphasize multidisciplinary approaches that incorporate lifestyle modifications such as diet, exercise, and medication adherence.

When contrasting these results with those of Kachimanga et al. (2019), the latter study indicated the dual burden of coexisting conditions, particularly in rural settings where comprehensive healthcare is often lacking. They highlighted that patients with hypertension are at a significantly higher risk of CKD, which aligns with this study’s findings. However, the prevalence of diabetes in this research warrants closer examination. In Kachimanga et al.'s study, diabetes was a critical comorbidity among hypertensive CKD patients, highlighting the importance of integrating diabetes management into CKD care.

Interestingly, Kovesdy et al. (2017) argue that obesity serves as an additional risk factor for CKD in many developed countries, potentially compounding issues related to hypertension and diabetes. This findings, however, indicated a relatively low prevalence of obesity in the studied cohort, suggesting that dietary factors, lifestyle habits, and perhaps genetic predispositions interact differently in distinct populations. This inconsistency emphasizes the necessity for localized research to tailor interventions effectively.

## 5.4 Laboratory findings and impact on treatment

Laboratory tests play a pivotal role in the diagnosis, monitoring, and management of chronic kidney disease (CKD). These investigations not only aid in the validation of CKD diagnosis but also assist in assessing kidney function, identifying comorbid conditions, and guiding treatment strategies. Standard renal function tests, including serum creatinine, blood urea nitrogen (BUN), glomerular filtration rate (GFR), and electrolyte levels, are fundamental components of the overall management of CKD.

In this section, we outline the laboratory results commonly associated with CKD, integrate findings from the referenced studies, and examine how these results inform patient care and management strategies.

### 5.4.1. Key Laboratory Tests for CKD

*Serum Creatinine and GFR*

Serum creatinine is a primary marker used to assess renal function. Elevated levels of serum creatinine can indicate kidney impairment, as creatinine is a waste product of muscle metabolism that is primarily excreted by the kidneys. GFR, often estimated using the serum creatinine level, age, sex, and ethnicity, serves as a comprehensive indicator of kidney function.

In our study cohort at the Mutare Hemodialysis Centre, elevated serum creatinine levels were observed across a majority of enrolled patients, with abnormal GFR values suggesting a prevalence of advanced stages of CKD. This finding aligns with the observations made by Patrice et al. (2020), where the evaluation of renal function demonstrated stark elevations in serum creatinine levels among newly referred patients, indicative of significant renal impairment requiring intervention. Such laboratory results are critical for identifying patients who may benefit from early nephrology referral and potential renal replacement therapy.

*Blood Urea Nitrogen (BUN)*

BUN is another essential parameter that reflects kidney function. In cases of kidney dysfunction, BUN levels may rise due to the decreased clearance of waste products. Elevated BUN, in conjunction with serum creatinine levels, is often employed to assess the severity of kidney disease.

Although specific BUN levels were not evaluated in detail within the studies reviewed, its relevance is underscored by Kovesdy (2022), who emphasizes that the relationship between BUN, renal function, and protein intake can offer insights into dietary management strategies for CKD patients. Monitoring BUN levels may assist healthcare providers in managing dietary protein restrictions, particularly in advanced CKD stages.

*Electrolytes Assessment*

Electrolyte imbalances, including hyperkalemia, hyponatremia, and hyperphosphatemia, often accompany CKD due to the kidneys' diminished ability to excrete these electrolytes. Laboratory tests evaluating calcium, potassium, sodium, and phosphate levels are essential for comprehensively understanding CKD management.

In our patient cohort, hyperkalemia was noted in a number of individuals, emphasizing the importance of regular electrolyte monitoring to prevent life-threatening cardiac complications. This finding resonates with the work of Varghese (2021), which highlights how disturbances in electrolyte balance contribute to morbidity among patients undergoing dialysis. Ensuring that clinicians are vigilant about electrolyte levels can significantly influence treatment plans, potentially necessitating dietary modifications or pharmacological interventions.

### 5.4.2. Proteinuria and Its Clinical Implications

Proteinuria, the presence of excess protein in the urine, is a critical laboratory marker in CKD. It often signifies glomerular damage and is considered an early indicator of kidney disease. The measurement of protein levels, either via urine dipstick or 24-hour urine collection, helps assess the degree of kidney impairment.

Patrice et al. (2020) emphasized the prevalence of proteinuria in their study, indicating that the presence of significant proteinuria warrants further investigation into kidney function and potential underlying conditions. The correlation between proteinuria and hypertensive kidney disease, as highlighted by Kachimanga et al. (2019), solidifies the need for comprehensive evaluation and management of hypertensive patients to prevent progression to end-stage renal disease (ESRD).

*Implications for Clinical Practice*

Monitoring proteinuria not only aids in diagnosing CKD but also serves as a prognostic indicator for disease progression. High levels of proteinuria are associated with more rapid declines in kidney function and suggest an increased cardiovascular risk. Thus, implementing routine urine protein screening in patients at high risk for CKD (e.g., those with diabetes or hypertension) is essential for optimal management.

### 5.4.3. Laboratory Results and Comorbidity Correlation

The interrelation between laboratory results and comorbidities such as diabetes and hypertension in CKD is crucial for shaping treatment approaches. The laboratory markers discussed, such as serum creatinine, GFR, BUN, and electrolyte levels, directly correlate with the burden of comorbid conditions prevalent among CKD patients.

Kovesdy et al. (2017) highlighted that obese patients often exhibit altered laboratory readings, including increased serum creatinine and abnormal electrolyte levels, necessitating tailored management strategies. In our research, we observed notable elevations in serum creatinine levels among hypertensive patients, indicating that managing hypertension effectively may contribute to stabilizing renal function and preventing further deterioration.

### 5.4.4. Limitations of Laboratory Testing in CKD

While laboratory tests provide invaluable data for managing CKD, certain limitations must be acknowledged. Factors such as age, race, muscle mass, and hydration status can influence serum creatinine results, leading to potentially misleading interpretations of kidney function. Moreover, not all patients may exhibit consistent biochemical changes, particularly in the early stages of CKD.

Patrice et al. (2020) addressed these limitations by advocating for a more comprehensive approach to patient assessment, combining laboratory results with clinical evaluations and patient history to form a holistic view of renal health. Such integrative methods can mitigate misdiagnoses and promote timely interventions.

### 5.4.5. Future Directions in Laboratory Testing for CKD

The future of laboratory testing in CKD management lies in the development of more sensitive and specific biomarkers. Novel biomarkers, such as neutrophil gelatinase-associated lipocalin (NGAL) and cystatin C, have shown promise in identifying acute kidney injury (AKI) and chronic renal impairment at earlier stages than traditional markers. Expanding research into these newer markers, as highlighted by recent literature, could develop CKD screening protocols and treatment pathways.

Additionally, there is an increasing push for standardized laboratory reference ranges specific to various populations to ensure that results are interpreted within the appropriate contextual demographic framework. This improvement would greatly enhance the accuracy and relevance of laboratory results in CKD management across diverse settings.

### Conclusion on Laboratory Findings

In summary, laboratory results serve as the cornerstone of CKD diagnosis, management, and monitoring. They provide essential insights into kidney function, help identify comorbid conditions, and guide therapeutic interventions. Our findings, along with those from Patrice et al. (2020), Kachimanga et al. (2019), Varghese (2021), and Kovesdy (2022), illustrate the indispensable role laboratory tests play in improving patient outcomes in CKD.

By consistently monitoring key laboratory markers, healthcare providers can make informed clinical decisions, tailoring treatment strategies to individual patient needs. Future advancements in biomarker research and the integration of laboratory data into holistic patient assessments will undoubtedly enrich CKD management, ultimately leading to better health outcomes for affected populations.

### 5.5 Treatment Efficacy and Patient Outcomes

This study observed that the majority of CKD patients received dialysis once per month, with documented complications reported in a significant segment of the cohort. This finding aligns with Varghese's (2021) research, which affirms that consistency in treatment frequency correlates positively with improved health outcomes. Varghese’s research delineates the multifaceted nature of treatment adherence, arguing that increased patient-provider interactions result in better health management.

Further reinforcing this notion, the longitudinal approach undertaken by Patrice et al. (2020) offered compelling evidence regarding treatment efficacy and health trajectories over 12 months. They reported that consistent follow-up and proactive management could alter the course of CKD, enhancing patient outcomes significantly. In contrast, this findings indicated complications arising from infrequent treatment and inadequate monitoring, highlighting a crucial area in need of reform.

Kovesdy (2022) reinforces the argument for early diagnosis and comprehensive management. As interventions reflect upon clinical outcomes, there remains an urgent need to ensure that CKD patients are afforded the necessary resources and education for managing their health proactively. This is particularly true in the context of nephrology programs engaging with patient education about lifestyle adjustments, medication adherence, and the importance of regular check-ups.

### 5.6 Socio-demographic factors

Some studies report fewer patients qualifying for hemodialysis in developed countries, owing to better screening practices and the earlier initiation of renal replacement therapy, highlighting systemic healthcare delivery differences (Mitra, 2014).

A pattern in the presented studies is the disparity in healthcare access, which is particularly acute in sub-Saharan Africa. Patrice et al. (2019) addressed the issue of late presentation among CKD patients, noting systemic barriers like limited healthcare infrastructure and financial constraints. Similarly, Kachimanga et al. (2019) observed that many patients presented at later stages of the disease, jeopardizing their treatment outcomes.

In this study, we encountered substantial barriers to healthcare access, with rural patients often struggling to reach healthcare facilities due to transportation challenges or financial limitations. This reflects Varghese's (2021) findings, where adherence to treatment was significantly higher in populations with better access to healthcare facilities. Furthermore, Varghese highlights how urban patients benefit from early diagnoses and comprehensive follow-up opportunities compared to their rural counterparts.

The disparity in healthcare delivery systems raises crucial questions about the impact of socio-economic factors on patient outcomes. The need for targeted public health initiatives is evident—designed to bridge the gap in healthcare access and encourage early intervention. Community health programs focusing on screening and education could empower patients, particularly in rural areas, to seek medical advice sooner and promote healthier lifestyles to mitigate risk factors.

## 5.7 Limitations of the study

Despite strong findings, the studies reviewed, including this one, exhibit limitations that must be acknowledged. The relatively confined geographic focus limits the generalizability of results across broader populations. For instance, findings from this center may reflect localized healthcare dynamics that do not extend to other areas within Zimbabwe or sub-Saharan Africa.

Additionally, the cross-sectional design employed in many of these studies restricts the ability to draw causal inferences. Longitudinal data collection, as experienced by Patrice et al. (2020), proves invaluable for tracking disease progression, treatment adherence, and patient outcomes over time. Future research integrating such methodologies will enhance understanding of CKD's natural history and inform healthcare interventions.

Moreover, a potential selection bias exists since individuals who seek treatment at specialized facilities such as the Mutare Hemodialysis Centre may differ significantly from those who do not access care. This factor poses challenges in comprehensively assessing CKD prevalence and treatment efficacy across diverse populations.

The laboratory profiles and treatment outcomes were also generalized for the whole sample size taken at the collection site, and this made it difficult to establish patterns within the population.

## 5.8 Recommendations for future research

Future studies should include a larger, more diverse sample across multiple centers to increase generalizability. Longitudinal studies tracking patient outcomes over time can provide insight into the effectiveness of interventions across a broader population.

To build upon the existing literature, future studies should incorporate larger, more diverse populations encompassing multiple healthcare settings. This approach will facilitate a more nuanced understanding of CKD and its complexities. Furthermore, longitudinal studies could prove particularly beneficial in tracking patient outcomes over time, thus evaluating the effect of interventions on CKD management.

Investigating the social determinants of health also presents an essential avenue for upcoming research— to account for how factors such as education, income, and community resources affect healthcare access and CKD outcomes. These insights can inform policymaking, driving effective strategies aimed at reducing health disparities among CKD patients

### 5.9 Conclusions

In conclusion, the findings from this study showcase aspects of CKD management at the Mutare Hemodialysis Centre. A significant demographic concentration of patients aged 46-75 years highlights the need for comprehensive strategies targeting this population, given the high prevalence of hypertension and diabetes. Elevated laboratory findings emphasize the necessity for regular monitoring and timely interventions. More broadly, the disparities in healthcare access and the need for public health initiatives addressing socio-economic factors are vital to improving outcomes. Integrating regular screening, management for comorbidities, and supporting patient education on lifestyle adjustments are essential steps toward improving the quality of care for CKD patients in Zimbabwe.

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**Appendices**

Appendix 1: Questionnaire/Data Collection Form

Title: Questionnaire for the Assessment of Hemodialysis Rates and Clinico-Pathological Characteristics of Chronic Kidney Disease Patients

Study Location: Mutare Hemodialysis Centre

Study Period: January 2019 – January 2025

**Data collection form**

Section 1: Demographic Information

1. Age: __________ years

2. Gender:

- [ ] Male
- [ ] Female

3. Residential Area: __________

Section 2: Clinical Characteristics

4. Stage of Chronic Kidney Disease (CKD):

- [ ] Stage 1
- [ ] Stage 2
- [ ] Stage 3
- [ ] Stage 4

- [ ] Stage 5

5. Laboratory Results:

- Urea: __________ mg/dL
- Electrolytes (U&E): __________ (specify values for Na, K, Cl, $CO_2$)
- Creatinine: __________ mg/dL
- Estimated Glomerular Filtration Rate (eGFR): __________ mL/min

BMI

**Section 3: Comorbid Conditions**

- [ ] Diabetes Mellitus
- [ ] Hypertension
- [ ] Obesity (BMI ≥ 30)
- [ ] HIV/AIDS
- [ ] Cancer
- [ ] Other: __________
- [ ] None

Section 4: Additional Health Information

7. Weight: __________ kg

8. Date of First Hemodialysis Treatment: __________ (dd/mm/yyyy)

9. Number of Hemodialysis Sessions per Week:

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6

10. Current Medications (List any relevant medications):

______________________________________________________

Section 5: Other Relevant Information

11. Comments/Other Relevant Medical History:

______________________________________________________

______________________________________________________

Appendix 2: Budget

| **Item** | **Cost (USD)** |
|---|---|
| Data acquisition | 5 |
| Data analysis software | 20 |
| Manuscript submission fees | 15 |
| Dissemination costs | 0 |
| **Total** | **40** |

*(Table 5)*

Appendix 3: Timeline

Month 1

Week 1: Develop research proposal and obtain ethical approval.

Week 2: Identify and acquire secondary data from Mutare Hemodialysis Centre.

Week 3: Clean and prepare data for analysis.

Month 2

Week 1: Conduct statistical analysis to determine the prevalence of CKD and its association with diabetes, obesity and hypertension.

Week 2: Interpret findings and prepare draft manuscript.

Week 3: Submit manuscript for peer review.

Month 3

Week 1: Address reviewer comments and revise manuscript.

Week 2: Resubmit manuscript evaluation.

Week 3: Disseminate findings to relevant stakeholders.

AFRICA UNIVERSITY
*A United Methodist-Related Institution*
*"Investing in Africa's future"*

**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 3628/25

24 February, 2025

WADZANAI TSITSI CHARI
C/O Africa University
Box 1320
MUTARE

RE: ***PREVALENCE RATES OF HEMODIALYSIS AND CLINICO-PATHOLOGICAL CHARACTERISTICS OF CHRONIC KIDNEY DISEASE PATIENTS AT THE MUTARE HEMODIALYSIS CENTRE, ZIMBABWE (2019-2025).***

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 3628/25
  This number should be used on all correspondences, consent forms, and appropriate document
- AUREC MEETING DATE NA
- APPROVAL DATE February 24, 2025
- EXPIRATION DATE February 24, 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.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU
FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

**MUTARE HAEMODIALYSIS CENTRE (PVT) LTD**

Dear Wadzanai Chari

1 Thornpark Drive

Harare

5 February 2025

**REF: PERMISSION TO CARRY OUT RESEARCH PROJECT AT MHC**

This letter serves to cornfirm reception of your request to carry out a study at the above mentioned renal centre. Having spoken to senior management permission is granted that you go ahead and do your studies.

The staff at the Mutare Heamodialysis Centre will give you the necessary support that you need to meet your objectives. We will be delighted if you share your interferences of your document .

All the best in your studies.

MUTARE HAEMODIALYSIS CENTRE
95 THIRD AVENUE CNR 7TH AVE/THIRD
MUTARE
05 FEB 2025
TEL: +263 20 61831/61834
CELL: +263 737 052 936

Yours sincerely

Chipo Christine Thondhlana 0772 967 948

SR in charge.

CC Thondhlana