ENSIGN GLOBAL UNIVERSITY

KPONG, EASTERN REGION, GHANA

DEPARTMENT OF COMMUNITY HEALTH

DISEASE SEVERITY AND TREATMENT OUTCOMES OF PATIENTS PRESENTING AT THE RENAL CLINIC OF THE HO TEACHING HOSPITAL IN THE VOLTA REGION OF GHANA: A RETROSPECTIVE REVIEW (2021-2024)

BY

JENNIFER NANA-EFUA ADRAH

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DECLARATION

I, I hereby declare that this thesis is an original work done by myself under the supervision of my supervisor. All sources used have been duly referenced and acknowledged and this work has not been presented wholly or in part for the award of any degree elsewhere

Jennifer Nana-Efua Adrah (ID- 247100272)	Jennifer Adrah	06-06-2025 .....
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Certified by:

Dr. Edward Kofi Sutherland	.....	.....
(Supervisor)	Signature	Date

Certified by:

Dr. Stephen Manortey	.....	.....
(Head of Academic Program)	Signature	Date

DEDICATION

This work is dedicated to all patients living with chronic kidney disease in the Volta Region. Your resilience, courage, and determination in the face of daily challenges inspired this study. May this research contribute in some small way to better care, greater awareness, and a brighter future for you all.

ACKNOWLEDGEMENT

I extend my heartfelt gratitude to the Almighty God for His protection and guidance throughout this academic journey. I am deeply thankful to my research supervisor, Dr. Edward Kofi Sutherland for his invaluable advice, unwavering support, and constructive feedback during the preparation of this project. His dedication to reviewing my work and providing insightful suggestions at every stage significantly enhanced the quality of this research.

Special thanks go to the management and staff of the Ho Teaching Hospital, especially the Renal Unit, for granting me access to patient records and supporting the data collection process. Your cooperation and assistance were vital to the success of this research, and I remain sincerely grateful.

My gratitude further extends to the authors whose works I referenced and acknowledged in this study. Their scholarly contributions provided a solid foundation for my research.

To everyone who played a part, directly or indirectly, in the successful completion of this study, I say a heartfelt thank you. Your support has been truly invaluable.

DEFINITION OF TERMS

Chronic Kidney Disease: A progressive, irreversible condition characterized by a gradual decline in kidney function over a period of at least three months. It is commonly categorized into five stages based on estimated glomerular filtration rate (eGFR), with Stage 5 indicating end-stage renal disease (Levey *et al.,* 2017).

End-Stage Renal Disease (ESRD): The final stage of CKD (Stage 5), where kidney function is less than 15% of normal, necessitating renal replacement therapy such as dialysis or kidney transplantation for survival (Juhi *et al.,* 2024).

Estimated Glomerular Filtration Rate (eGFR): A clinical measure used to assess kidney function based on creatinine levels, age, sex, and body size. It helps classify the stage of CKD (Francis *et al.,* 2024).

Patient Characteristics: Refers to demographic and clinical attributes such as age, sex, comorbidities (e.g., diabetes, hypertension, cardiovascular disease), and family history of kidney disease that influence the progression and treatment of CKD (Jha *et al.,* 2013).

Disease Severity: The degree of kidney impairment, typically classified into five stages based on eGFR and clinical symptoms. Advanced stages are associated with complications such as anemia, electrolyte imbalances, and fluid overload (Kovesdy, 2022).

Treatment Modalities: The methods used to manage CKD, including conservative care (diet, medication), hemodialysis, peritoneal dialysis, and pharmacological interventions such as antihypertensives and phosphate binders (Al-Ghamdi *et al.,* 2023).

Hemodialysis (HD): A renal replacement therapy where blood is filtered through a machine to remove toxins, excess fluids, and waste products when the kidneys can no longer perform this function effectively (Galindo *et al.,* 2020).

Peritoneal Dialysis (PD): An alternative dialysis method that uses the lining of the abdominal cavity (peritoneum) to filter blood internally using a dialysis solution. It is less commonly used in Ghana due to limited resources (Naicker, 2006).

Conservative Management: Non-dialysis-based care for CKD patients, which includes medication, symptom control, fluid and dietary regulation, and palliative approaches to improve quality of life (Ameh *et al.,* 2020).

Patient Outcomes: The measurable results of treatment, including survival or death (Osafo *et al.,* 2020).

Survival Rate: The proportion of CKD patients who remain alive at the end of a defined follow-up period, used to assess the effectiveness of treatment modalities (Ng *et al.,* 2025).

ABBREVIATIONS/ ACRONYMS

CKD	Chronic Kidney Disease
DM	Diabetes Mellitus
eGFR	Estimated Glomerular Filtration Rate
ESRD	End-Stage Renal Disease
HPT	Hypertension
LMICs	Low- and Middle-Income Countries
NHIS	National Health Insurance Scheme
RRT	Renal Replacement Therapy
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa
WHO	World Health Organization

ABSTRACT

Background: Chronic kidney disease (CKD) poses a growing public health burden globally, particularly in low- and middle-income countries. In Ghana, data on the severity of disease at presentation and treatment outcomes remain limited. The study aimed to evaluate the patterns of disease severity, treatment modalities, and treatment outcomes among patients with CKD at the renal clinic of the Ho Teaching Hospital in the Volta Region of Ghana from 2021 to 2024

Methods: A retrospective cross-sectional study was conducted using medical records from the Renal Clinic of Ho Teaching Hospital between January 2021 and December 2024. Out of 2,000 records screened, 1,520 met the inclusion criteria. Data were extracted from the Lightwave Health Information Management System and analyzed using SPSS version 25. Descriptive statistics summarized patient characteristics, disease severity, and treatment modalities. Multivariate logistic regression identified predictors of survival among CKD patients.

Results: Most patients presented at advanced stages, with 36.6% at Stage 5 and 28.4% at Stage 4. Frequent symptoms included hypertension (59.7%), fatigue (55.3%), and edema (47.4%). Hypertension (83.6%) and diabetes (71.1%) were the most common comorbidities. Use of nephrotoxic agents was high, with NSAIDs (88.8%) and herbal medicines (72%) widely reported. Treatment was almost equally split between hemodialysis (50.66%) and conservative care (49.34%), though many dialysis patients received fewer than the recommended sessions. Survival was 90.66%, but complications were common. Stage 5 CKD (AOR = 0.28, p = 0.002) and cardiovascular complications (AOR = 0.42, p = 0.018) predicted lower survival. Being married (AOR = 0.50, p = 0.007) and employed (AOR = 0.62, p = 0.041) were associated with improved survival.

Conclusion: The findings underscore a need for earlier diagnosis, public education, and expanded access to renal care. Strengthening screening and preventive strategies is critical to improving long-term outcomes in CKD patients in Ghana.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Chronic kidney disease (CKD) is a long-term condition characterized by the gradual and progressive deterioration of kidney function over time (World Health Organization, 2021). CKD is classified into five stages based on the glomerular filtration rate (GFR), ranging from stage 1 (mild kidney damage with normal or high GFR) to stage 5 (kidney failure or end-stage renal disease), where dialysis or transplantation is typically required (KDIGO, 2020). The majority of studies have utilised estimated glomerular filtration rate (eGFR) as a means of identifying CKD and collecting data regarding the occurrence of CKD stages 3-5 (Yusuph, Sawe, Nkondora, and Mfinanga, 2019). However, specific research studies have examined albuminuria (typically defined as an albumin-to-creatinine ratio greater than 30 mg/g) and reduced eGFR as indicators of different stages of CKD, ranging from stage 1 to stage 5 (Francis *et al.,* 2024). Chronic kidney disease, a progressive condition, can be distinguished from acute kidney injury or temporary alterations in kidney function by employing the "chronicity criterion (Juhi *et al.,* 2024)." This criterion FR (estimated glomerular filtration rate) or high urine albumin levels for a minimum duration of 90 days, requiring repeated measurements over an extended period (Hailu, Hussen, Getachew, and Berha, 2022).

In the 21st century, CKD has emerged as a prominent cause of both death and illness. The incidence of chronic kidney disease has been increasing, in part due to the rising prevalence of risk factors such as obesity and diabetes mellitus (Hughes *et al.,* 2019). According to estimates from 2017, around 843.6 million people worldwide were impacted by CKD (Hopley *et al.,* 2019). Currently, the worldwide prevalence is estimated to be between 10 and 13% (Kovesdy, 2022). A recent meta-analysis has revealed that Africa has a similar prevalence rate of 13.9% (McCullough *et al.,* 2021). However, the national prevalence in Ghana is currently unknown

(Francis *et al.,* 2024). Even though, the national prevalence in Ghana is unknown, a recent study carried out by Tannor *et al.,* (2019) in Ghana found that the occurrence of CKD was 28.5% in participants who had both Diabetes Mellitus (DM) and Hypertension (HPT), 26.3% in participants with HPT alone, and 16.1% in those with DM alone.

The progression of CKD can lead to a variety of complications that frequently occur at lower levels of kidney function and can have interrelated effects (Meremo *et al.,* 2017). These encompass abnormalities associated with acid–base balance and electrolytes, along with hypertension, cardiovascular disease, mineral bone disorder, anaemia, and volume overload (Hailu, Hussen, Getachew, and Berha, 2022). Specific complications possess the capacity to worsen kidney function, resulting in heightened vulnerability to illness, diminished quality of life, and potential mortality (Kalantar-Zadeh *et al.,* 2021). End-stage renal disease (ESRD) is the ultimate consequence of chronic kidney disease (Juhi *et al.,* 2024).

Managing CKD involves a multifaceted approach aimed at slowing progression, addressing complications, and improving quality of life (Al-Ghamdi *et al.,* 2023). Key strategies include controlling underlying conditions such as diabetes and hypertension through medications, dietary adjustments, and lifestyle changes (Ahmed, 2024). Regular monitoring of kidney function, electrolyte balance, and blood pressure is crucial (Hariparshad *et al.,* 2023). Patients may benefit from dietary modifications to manage protein, sodium, and potassium intake, and phosphate binders might be necessary to address mineral imbalances (Gosmanova *et al.,* 2021). In advanced stages, CKD is primarily managed through haemodialysis, peritoneal dialysis, or renal transplantation. The particular process is referred to as renal replacement therapy, abbreviated as RRT (Francis *et al.,* 2024). Repeated studies have consistently demonstrated that renal transplantation enhances patient survival and quality of life, while also being more economically advantageous compared to peritoneal dialysis and haemodialysis (Al-Ghamdi *et al.,* 2023)

Haemodialysis (HD) is a crucial treatment for patients with renal failure as it effectively removes waste materials and excess fluid from the bloodstream when the kidneys are no longer able to do so efficiently (Galindo *et al.,* 2020). During the procedure, the patient is typically connected to a dialysis machine for a duration of three to five hours, occurring three times per week (Kovesdy, 2022). Nevertheless, in certain regions with limited funding, it is necessary to have sessions every two weeks (Tadesse *et al.,* 2021). Haemodialysis is essential for patients with renal failure as it extends their lifespan and effectively addresses symptoms such as electrolyte imbalances, fluid overload, and toxin accumulation (Oquendo, Bonill, Nieves and Miguel, 2020). HD's efficacy in alleviating symptoms such as oedema, fatigue, and cognitive impairment leads to an enhancement in patients' overall health and functionality (Saran *et al.,* 2020). Regular HD treatments enable patients to sustain a relatively stable quality of life, regardless of their condition. Nevertheless, Tannor *et al.,* (2023) asserts that strict compliance with medication schedules, treatment schedules, and dietary restrictions is necessary to accomplish this goal.

In Ghana, a significant number of patients who require haemodialysis are unable to access the treatment due to escalating expenses, leading to a lack of availability of essential medical care (Boateng, Boafo, Osafo and Anim-Sampong, 2019). Individuals suffering from end-stage renal disease who require haemodialysis are not eligible for coverage under the National Health Insurance Scheme (NHIS) (Bioma *et al.,* 2019). The exorbitant cost of renal replacement therapy acts as a deterrent to the treatment of end-stage renal disease in Ghana, as patients are responsible for covering the financial burden of haemodialysis sessions themselves (Amoako *et al.,* 2014). The costs of conducting routine laboratory tests and managing conditions such as hypertension, anaemia, and imbalances in calcium and phosphate levels will contribute to the total expenses of treating end-stage renal disease (Boateng *et al.,* 2024). Individuals who undergo haemodialysis exhaust their families' financial resources and eventually succumb to

depression, resulting in a reduced quality of life before their death (Amoako *et al.,* 2014). Considering these challenges, it is crucial to examine the disease severity patterns, treatment modalities and treatment outcomes of patients presenting at the renal clinic of the Ho Teaching Hospital in the Volta Region of Ghana from 2021 to 2024.

1.2 Problem Statement

Chronic Kidney Disease has emerged as a significant public health challenge in Ghana, with a growing body of evidence indicating its increasing prevalence across the country (Tannor *et al.,* 2019). According to data from the Ghana Health Service and recent epidemiological studies, CKD affects an estimated 13–17% of the adult population in Ghana, with hypertension, diabetes, and herbal medication misuse being among the leading contributors (Tannor *et al.,* 2023). The disease imposes a heavy socioeconomic burden on both patients and the national healthcare system, especially due to the high cost and limited availability of renal replacement therapies such as dialysis and transplantation (Boateng *et al.,* 2024). Despite this growing burden, national CKD screening programs and early detection strategies remain limited, resulting in a significant number of patients being diagnosed at late stages of the disease (Tannor *et al.,* 2023).

The Ho Teaching Hospital has witnessed a consistent rise in the number of cases of CKD, with a 30% increase in patient visits from 2021 to 2023 (Ho Teaching Hospital, 2024). The treatment options for a number of these patients are restricted due to the advanced stages of CKD. Based on the reports that are currently available, over 70% of patients at the Ho Teaching Hospital are diagnosed with CKD in stages 4 and 5 (Ho Teaching Hospital, 2024). At this critical stage, dialysis or kidney transplants remain the only viable treatment options. Nevertheless, these treatments are frequently unavailable due to their exorbitant cost (Boateng, Iddrisu, Kyei-Dompim, and Amooba, 2024).

Haemodialysis, which is the main treatment option for ESRD patients at the Ho Teaching Hospital only provides a partial solution to the deteriorating kidney function. Patients still have to deal with some symptoms of the disease, many medications, a strict diet, regular hospital visits, multiple admissions and changes in body image when dialysis catheters are inserted or arteriovenous fistulae are made.

However, there has been a lack of a thorough investigation to evaluate the severity of CKD upon initial diagnosis and the effectiveness of treatment outcomes at the Ho Teaching Hospital. This absence of research creates a significant knowledge gap that hampers the development of efficient public health strategies. It is crucial to address these gaps to have a study that can provide a clear justification for guiding clinical practice and health policy. This will ultimately lead to better care and prognosis for patients with CKD at the Ho Teaching Hospital and in the Volta Region at large as the hospital houses the only renal clinic in the region.

1.3 Rationale of the study

The rising prevalence of CKD in Ghana underscores the urgent need to address these conditions given their significant influence on morbidity and mortality. CKD poses a substantial public health challenge, leading to substantial healthcare costs and reduced productivity. Despite the growing burden, there has been a lack of thorough research on the severity of kidney disease and the effectiveness of treatments in the Volta Region, specifically at the Ho Teaching Hospital. This study aims to fill the current gap in knowledge by offering valuable insights that can be utilised to inform healthcare policies and improve the allocation of resources in the region.

The findings of this study will directly enhance the clinical management of CKD cases at the Ho Teaching Hospital by providing evidence-based insights into the specific characteristics

and progression of kidney disease among the local population. Healthcare providers can optimise the efficacy of treatment protocols by analysing patterns in disease severity, treatment outcomes, and the factors that impact these outcomes. This enables the customisation and enhancement of treatment methodologies to more effectively address the requirements of patients. This has the potential to lead to improved patient outcomes by implementing personalised care, intervening earlier, and employing more effective disease management strategies that can decelerate disease progression.

Moreover, the outcomes could offer support for the development of health policies, providing direction for initiatives aimed at improving the prevention and treatment of kidney disease with increased effectiveness. This research will significantly influence the resolution of a significant public health issue in Ghana, with the potential to shape healthcare practices and policies on a broader scale.

1.4 Hypothesis/ Conceptual framework

The conceptual framework for this study, developed by the researcher, outlines the relationships between Patient Characteristics, Disease Severity, Treatment Modalities, and Patient Outcomes. Each variable is discussed in detail below to provide a clear understanding of its role in the disease process and care outcomes.

Patient Characteristics: These are baseline attributes that predispose individuals to chronic kidney disease and influence the progression and complexity of treatment.

a) **Age**: Advancing age is strongly associated with reduced kidney function due to the natural decline in nephron number and function over time (Jha *et al.,* 2013). Older patients are also more likely to have multiple comorbidities, which can complicate treatment and worsen outcomes (Osafo *et al.,* 2020).

b) **Sex**: Gender differences affect disease susceptibility, progression, and treatment response. For example, males may experience faster renal decline, while females may present with different metabolic or cardiovascular responses to CKD (Norris *et al.,* 2025).

c) **Marital Status:** Marriage is often correlated with enhanced survival outcomes, likely attributable to the protective benefits of social support that bolster treatment adherence, emotional health, and prompt medical attention (Hariparshad *et al.,* 2023). In contrast, unmarried patients may encounter social isolation, reduced healthcare participation, and inferior prognoses (Jha *et al.,* 2013).

d) **Referral Source:** The nature of the referral, whether originating from a general practitioner or another source, influences early diagnosis and prompt management. Delayed referrals, prevalent in resource-limited environments, frequently result in patients reaching tertiary care facilities at advanced stages of CKD, hence diminishing the opportunity for effective intervention and decreasing survival probabilities (Hariparshad *et al.,* 2023).

e) **Comorbidities**: Conditions such as hypertension, diabetes mellitus, cardiovascular diseases, and obesity are major contributors to CKD development and progression. They create a state of chronic inflammation and vascular damage, which impairs renal function and increases the need for more aggressive treatment (Kalantar-Zadeh *et al.,* 2021; Levin *et al.,* 2021).

    a) **Hypertension** leads to persistent pressure on the renal vasculature (Levin *et al.,* 2021).

    b) **Diabetes mellitus** causes microvascular damage, especially in glomeruli (Osafo *et al.,* 2020).

c) **Cardiovascular disease** and **obesity** amplify the metabolic burden, often leading to poorer prognosis (Kalantar-Zadeh *et al.,* 2021).

f. Lifestyle and Risk Factors

a) **Smoking:** Smoking aggravates renal ischemia and vascular damage, accelerating the course of CKD (Hailu, Hussen, Getachew, and Berha, 2022). It also increases the likelihood of cardiovascular incidents, resulting in reduced survival rates among smokers with CKD.

b) **Herbal Medicine Use:** The utilization of uncontrolled herbal remedies is widespread in numerous areas and may result in nephrotoxicity, delayed diagnosis, and disruption of recommended therapies (Wassie *et al.,* 2022). This elevates the likelihood of fast renal deterioration and associated consequences (Francis *et al.,* 2024).

c) **Nonsteroidal Anti-Inflammatory Drugs (NSAID) Usage**: Non-steroidal anti-inflammatory medications are frequently utilized for analgesia but are well-known for their nephrotoxicity (Hailu, Hussen, Getachew, and Berha, 2022).

d) **Family History of CKD:** A familial history may indicate genetic susceptibility or common environmental and lifestyle risk factors (Kalantar-Zadeh *et al.,* 2021). It may also be associated with early development of CKD, rapid progression, and diminished treatment responsiveness; nevertheless, early intervention could potentially enhance outcomes (Meremo *et al.,* 2017).

e) **Physical Activity:** Inadequate physical activity correlates with adverse cardiovascular health, heightened inflammation, and frailty, all of which are deleterious in CKD (Kalantar-Zadeh *et al.,* 2021). In contrast, consistent physical activity enhances survival rates, especially in dialysis patients, by

promoting superior cardiovascular conditioning and psychological resilience (Al-Ghamdi *et al.,* 2023).

f) **Past Kidney Infection:** Recurrent or severe renal infections can result in scarring and persistent impairment (Hariparshad *et al.,* 2023). The history of such infections may signify underlying structural problems and increases the likelihood of long-term consequences, including end-stage renal disease, thus diminishing life prospects (Kalantar-Zadeh *et al.,* 2021).

Disease Severity: Disease severity is a critical mediator in the framework and refers to the extent of kidney damage at presentation.

a) **Clinical Staging (CKD Stages 1–5)**: This is the standard measure of disease severity. It is based on the estimated glomerular filtration rate (eGFR) and levels of albuminuria (Levey *et al.,* 2017).
    a. **Stages 1–2** are early stages with minimal symptoms, often requiring lifestyle changes and monitoring.
    b. **Stage 3** indicates moderate kidney impairment with symptoms such as fatigue or mild anemia.
    c. **Stages 4–5** reflect severe kidney dysfunction and are associated with complications like uremia, electrolyte imbalance, and fluid retention (Levey *et al.,* 2017).
b) **Symptom Presentation**: The presence of complications such as anemia, metabolic acidosis, or fluid overload may indicate worsening severity, even if patients are unaware due to the silent nature of early CKD (Kalyesubula *et al.,* 2022).
c) **Complications**: The occurrence of infections, cardiovascular events, and electrolyte imbalances during treatment is common and indicates vulnerability among CKD

patients. These complications can lead to further decline in renal function and increased hospital visits (Mbanya *et al.,* 2020).

d) **Hospital Admissions**: Frequent hospitalizations and prolonged stays are indicators of poor disease control and treatment failure (Amoako *et al.,* 2014).

Treatment Modalities: Treatment modalities refer to the approaches used to manage CKD and its associated complications.

a) **Hemodialysis**: This is the standard of care for end-stage renal disease (ESRD). It involves mechanical filtration of waste products from the blood. (Boateng *et al.,* 2024).

b) **Conservative Management**: It includes medication, fluid management, and lifestyle modifications aimed at slowing disease progression and managing symptoms without dialysis (Naicker, 2009).

c) **Pharmacological Therapy**: Patients are often treated with antihypertensive medications to control blood pressure, as well as agents to manage anemia (like erythropoiesis-stimulating agents), and mineral imbalances (such as phosphate binders). Limited access to these drugs reduces treatment efficacy (Schneider *et al.,* 2025; Lokpo *et al.,* 2018).

d) **Dietary Recommendation**: Nutrition plays a crucial role in CKD management. Diets low in protein, sodium, and phosphorus are recommended to reduce the kidney's workload. However, adherence can be affected by socioeconomic conditions and lack of dietary counseling (Levin *et al.,* 2021; Heerspink *et al.,* 2023).

e) **Peritoneal Dialysis**: Peritoneal dialysis (PD) uses the peritoneum to filter waste and excess fluids from the blood, offering a home-based alternative to hemodialysis. It can improve survival by providing continuous waste removal, though complications like infections may impact long-term outcomes (Tannor *et al.,* 2019).

f) **Renal Transplant**: A renal transplant involves replacing a failed kidney with a donor kidney, offering the potential for improved kidney function and quality of life (Wassie *et al.,* 2022). It significantly enhances survival by eliminating the need for dialysis, though survival depends on transplant success and immunosuppressive therapy management (WHO, 2022).

Patient Outcomes: Patient outcomes represent the final link in the framework and reflect the overall effectiveness of CKD management.

a) **Survival and Mortality**: These are the primary outcome measures. Mortality risk is significantly influenced by stage at diagnosis, comorbidities, and treatment adequacy. Late-stage presentation and limited access to dialysis are common predictors of death (Boateng *et al.,* 2024).

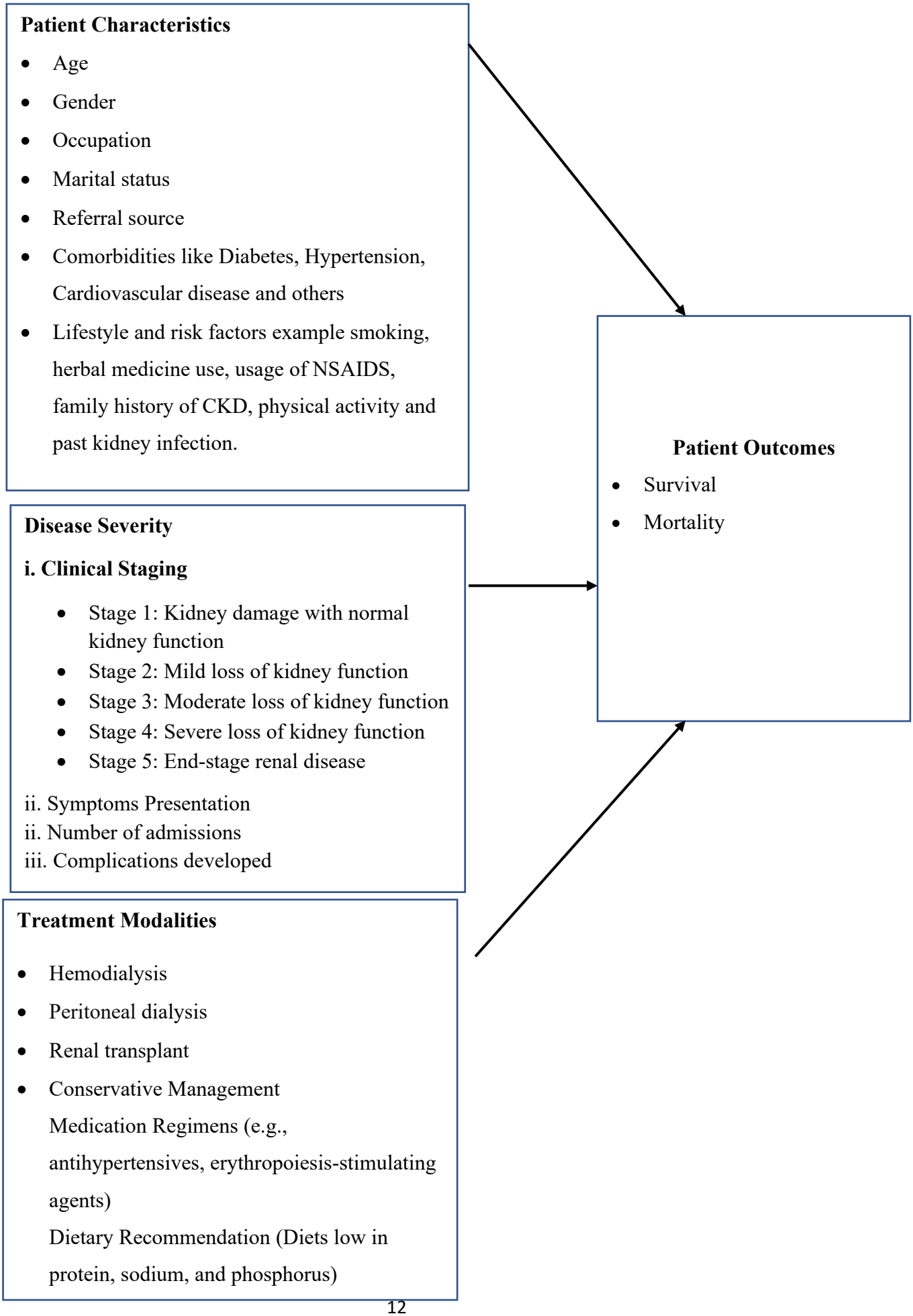

Figure 1: Conceptual Framework for The Study

1.5 Research Questions

1. What are the disease severity patterns identified in patients with chronic kidney disease at the renal clinic of Ho Teaching Hospital?
2. Which treatment modalities are being used to manage chronic kidney disease in patients at the renal clinic of Ho Teaching Hospital?
3. What are the results of the treatment methods used for chronic kidney disease at the renal clinic of Ho Teaching Hospital?
4. What are the factors associated with survival in CKD patients at the renal clinic of Ho Teaching Hospital?

1.6 General Objectives

To evaluate the disease severity patterns, treatment modalities and treatment outcomes of patients presenting at the renal clinic of the Ho teaching Hospital in the Volta Region of Ghana from 2021 to 2024.

1.7 Specific Objectives

1. To determine the patterns of disease severity among patients diagnosed with chronic kidney disease at the renal clinic of Ho Teaching Hospital.
2. To identify the treatment modalities being used for managing chronic kidney disease at the renal clinic of Ho Teaching Hospital.
3. To evaluate the treatment outcomes of patients with chronic kidney disease receiving care at the renal clinic of Ho Teaching Hospital.
4. To evaluate the factors associated with survival in CKD patients at the renal clinic of Ho Teaching Hospital.

1.8 Profile of the Study Area

The Ho Teaching Hospital (HTH) is a major healthcare facility in Ghana's Volta Region, originally established as the Volta Regional Hospital. The facility began operations in 1999, following its construction by Kaevener Construction International from the United Kingdom. It was officially commissioned in 2000 by former President Jerry John Rawlings and his wife. In 2019, the hospital was upgraded to teaching hospital status, aligning with its new role as the clinical training center for the University of Health and Allied Sciences (UHAS) in Ho. This shift was aimed at improving both healthcare delivery and medical education in the region.

The hospital has a current capacity of about 300 beds, although expansions are underway, with plans for a 600-bed tertiary facility. Key units at HTH include the Accident and Emergency Centre, an Intensive Care Unit, a Maternal and Child Health Centre, and specialized services such as a Dialysis Unit, Radiology Department, and Cardiology Unit. In addition, the facility offers laboratory services, general surgery, and orthopedic procedures.

HTH plays a vital role in the region's healthcare landscape, supporting both routine and emergency medical needs while providing advanced care for patients with chronic conditions like kidney disease. Its partnership with UHAS ensures continuous learning and research, reinforcing the hospital’s vision of becoming a leading center for innovative healthcare and medical tourism in Ghana (Ho Teaching Hospital, 2024).

The Renal Clinic at the Ho Teaching Hospital is a specialized unit dedicated to providing comprehensive care for patients with kidney-related conditions, including CKD and ESRD. As the primary referral center for renal care in the Volta Region, the clinic serves a diverse patient population, including those referred from district hospitals and other healthcare facilities across the region. Given the high demand for renal services, the clinic operates under significant capacity constraints, which impact patient care and outcomes. This setting offers a unique

opportunity to study the disease severity, treatment modalities, and outcomes of patients receiving care at the clinic, providing insights into the challenges and effectiveness of renal care in a resource-limited environment. The clinic's detailed medical records and established treatment protocols make it an ideal site for conducting a retrospective study on renal patient outcomes.

1.9 Scope of Study

This study focused on CKD patients who received care at the renal clinic of the HTH between 2021 and 2024. It assessed the severity of CKD at the time of diagnosis, the treatment modalities available and utilized, and the outcomes of these treatments. Disease severity was determined based on clinical staging using the estimated glomerular filtration rate (eGFR) and other diagnostic markers such as albuminuria and creatinine levels. Treatment modalities analyzed included haemodialysis, conservative medical management, and pharmacological interventions, as well as dietary modifications and lifestyle recommendations provided to patients.

Additionally, the study examined factors that influenced disease progression and treatment outcomes, including socio-economic background, and presence of comorbid conditions (such as diabetes, Cardiovascular disease and hypertension).

This research was limited to patients who had received nephrology care at the Ho Teaching Hospital’s renal clinic between 2021 and 2024. Patients who received care at other healthcare facilities, underwent renal transplants, or managed CKD exclusively through traditional medicine without hospital visits were excluded. Furthermore, the study did not assess patients in the early stages of CKD who had not yet sought medical attention at the hospital.

By focusing on this specific patient population, the study provided comprehensive insights into the severity of CKD, the effectiveness of treatment approaches, and the challenges faced by

patients undergoing therapy at the only dialysis center in the Volta Region. The findings aimed to guide healthcare policy recommendations, improve nephrology care delivery, and highlight areas where interventions were needed to enhance patient outcomes.

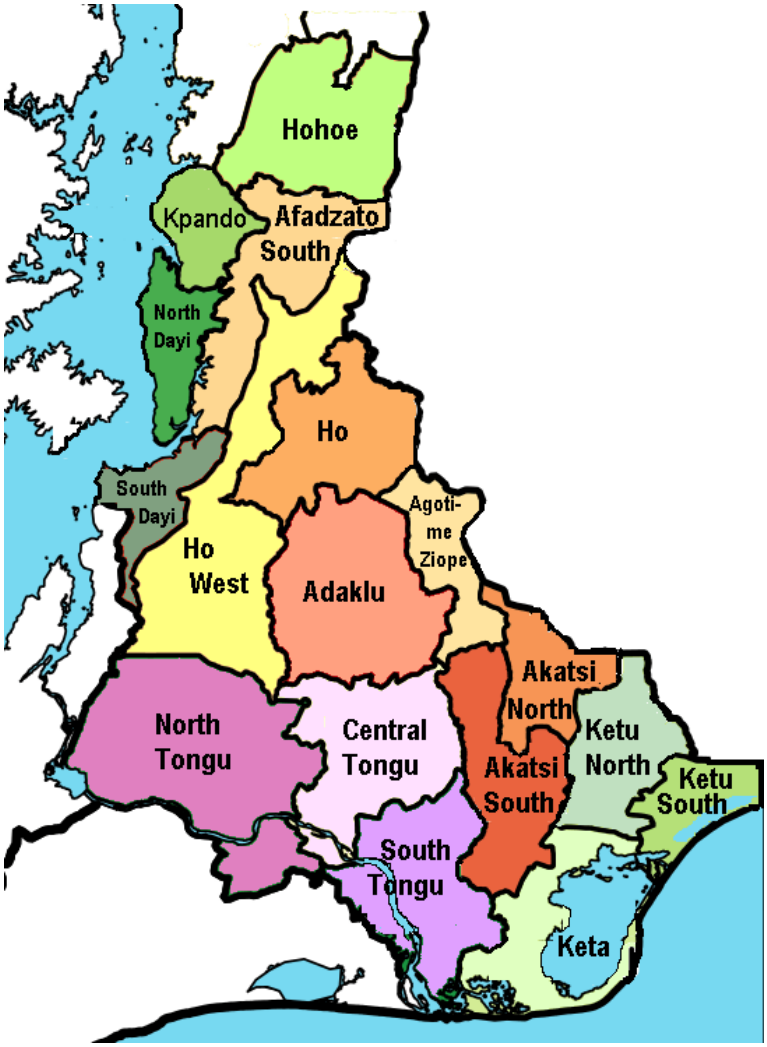

Figure 1. 1: The Volta Region Map

1.10 Organization of Report

This thesis is structured into six chapters, each addressing key components of the study.

Chapter One introduces the study, providing background information, problem statement, rationale, and research objectives. It also includes the research questions, hypothesis or conceptual framework, a profile of the study area, scope, and the organization of the report.

Chapter Two presents the literature review, organized around the main study variables. It synthesizes relevant research findings, theoretical perspectives, and conceptual frameworks that support the study while citing appropriate references.

Chapter Three details the methodology, outlining the research design, study population, data collection techniques, and tools. It also covers study variables, sampling methods, pre-testing, data handling, data analysis techniques, ethical considerations, study limitations, and assumptions.

Chapter Four presents the study results. It provides a summary of background variables and presents findings based on key study variables using tables, charts, and graphs where necessary.

Chapter Five discusses the findings in relation to the research questions, objectives, and literature review. The discussion integrates existing studies with the study results, providing a comprehensive analysis while citing relevant references.

Chapter Six provides conclusions and recommendations. The conclusions summarize the key findings with figures, while the recommendations are targeted at relevant stakeholders, including healthcare policymakers, clinicians, and researchers.

Following the main chapters, the report includes a list of references formatted in Harvard style. Appendices contain supplementary materials such as research instruments, raw data, ethical clearance, and other relevant documents.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Chronic kidney disease is a significant global health concern, with increasing prevalence and associated complications, particularly in low- and middle-income countries. CKD is characterized by a gradual loss of kidney function, ultimately progressing to end-stage renal disease (ESRD) if left untreated (Levey *et al.,* 2017). Early diagnosis and appropriate treatment are essential to improving patient outcomes and mitigating the disease's impact on public health. This literature review explores the patterns of disease severity, treatment modalities, and treatment outcomes of patients with CKD, focusing on evidence from similar settings to the study area.

2.2 Search Strategy

A systematic search strategy was employed to identify relevant peer-reviewed articles and reports for this review. The databases searched include PubMed, ScienceDirect, and Google Scholar, covering literature published from 2014 to 2024 to ensure up-to-date findings. The search terms used were "patterns of disease severity in CKD," "treatment modalities for CKD," "hemodialysis outcomes," "peritoneal dialysis outcomes," "CKD management in low-resource settings," and "treatment outcomes of CKD patients." Inclusion criteria focused on studies conducted in sub-Saharan Africa or similar settings, while studies not specific to CKD or published in non-English languages were excluded.

2.3 Risk factors of CKD

Various risk factors contribute to the onset and advancement of chronic kidney disease (CKD), a complex condition. Diabetes mellitus and hypertension are the two predominant and recognized risk factors. Hypertension-induced elevated pressure in the glomerular capillaries

leads to endothelial damage, inflammation, and renal fibrosis (Levin *et al.,* 2021). Diabetes induces diabetic nephropathy, a condition where elevated blood glucose impairs the renal microvasculature, thereby exacerbating chronic kidney disease, especially when inadequately managed (WHO, 2020). The two conditions result in tubulointerstitial fibrosis and glomerulosclerosis, which are characteristic features of chronic kidney disease (Levin *et al.,* 2021). The World Health Organization (2021) identifies diabetes and hypertension as the primary contributors to chronic kidney disease (CKD) worldwide, with individuals afflicted by either condition exhibiting a markedly increased risk of progressing to end-stage renal disease (ESRD). Aging adversely affects kidney function, particularly post-60 years, leading to a decline in renal function and contributing to chronic kidney disease (CKD) (Levin *et al.,* 2021). Due to the synergistic effects of aging and comorbidities, elderly individuals with diabetes or hypertension are predisposed to accelerated renal deterioration (Jha *et al.,* 2013).

Obesity and cardiovascular diseases are two major risk factors for chronic kidney disease (CKD). A metabolic syndrome characterized by insulin resistance, hypertension, and dyslipidemia, all of which lead to renal impairment, is frequently linked to obesity (National Kidney Foundation [NKF], 2022). The glomerular filtration rate (GFR) is initially elevated due to excess body weight; however, prolonged renal strain leads to glomerular hyperfiltration and subsequent kidney damage (WHO, 2020). Obesity and cardiovascular diseases, especially those associated with atherosclerosis, often coexist and can adversely affect renal function by diminishing renal perfusion (Levin *et al.,* 2021). Plaque accumulation leads to the constriction of renal arteries, thereby aggravating kidney disease through ischemia (WHO, 2020). Chronic kidney disease (CKD) and cardiovascular disease are interconnected, with each condition aggravating the other's progression (Amoako *et al.,* 2014). Effective management of chronic

renal disease and cardiovascular risk factors is crucial to avert long-term consequences (Kalantar-Zadeh *et al.,* 2021).

A notable risk factor that markedly elevates the probability of developing chronic kidney disease is a familial history of the condition. In conditions such as polycystic kidney disease (PKD) and Alport syndrome, where mutations directly lead to renal failure, genetic predisposition is recognized as a crucial factor (Jha *et al.,* 2013). Individuals with a familial predisposition to diabetes or hypertension exhibit an elevated risk of developing these conditions, thereby increasing their susceptibility to chronic kidney disease (Tannor *et al.,* 2019). The National Kidney Foundation (2021) underscores the significance of family history as a risk factor for chronic kidney disease (CKD) and recommends genetic screening and counseling to identify at-risk individuals. Moreover, as renal function inherently diminishes with advancing age, aging constitutes a critical factor in chronic kidney disease (CKD) (CDC, 2023). The age-related decline, exacerbated by lifestyle factors and chronic illnesses, heightens vulnerability to chronic kidney disease (CKD) and underscores the necessity for lifestyle modifications and early intervention to mitigate the risk of renal impairment (Meremo *et al.,* 2017).

Chronic kidney disease (CKD) is profoundly affected by behavioral and environmental factors. Multiple studies have associated smoking with a rapid deterioration of renal function, establishing it as a significant modifiable risk factor (WHO, 2020). Renal and cardiovascular diseases are induced by smoking's impact on inflammation, oxidative stress, and vascular injury (Levin *et al.,* 2021). The utilization of nonsteroidal anti-inflammatory drugs (NSAIDs) constitutes a behavioral risk factor, as prolonged or high-dose consumption may lead to acute kidney injury (AKI), potentially advancing to chronic kidney dysfunction if not addressed (Schneider *et al.,* 2025). Additionally, renal impairment has been associated with exposure to

environmental toxins, including heavy metals such as lead and cadmium, especially in populations residing in industrially contaminated regions (Meremo *et al.,* 2017). The synergistic effect of these behavioral and environmental risk factors underscores the necessity for public health initiatives that promote lifestyle modifications and mitigate environmental exposures to decrease the global incidence of chronic kidney disease (Amoako *et al.,* 2014). Mitigating the occurrence and advancement of CKD necessitates timely identification, education, and interventions focused on altering these risk factors (Levin *et al.,* 2021).

2.4 Patterns of Disease Severity Among Patients Diagnosed with CKD

Globally, the patterns of CKD severity vary significantly, with disparities between high-income and low-income regions. CKD severity is categorized into five stages based on the estimated glomerular filtration rate (eGFR), with progression from mild kidney damage (Stage 1) to kidney failure (Stage 5). Late-stage presentations are more common in resource-limited settings, exacerbating the burden of disease and increasing morbidity and mortality.

In high-income countries, CKD prevalence is increasing due to the aging population and rising incidences of diabetes and hypertension. According to Bikbov *et al.* (2020), the global prevalence of CKD increased by 33% between 1990 and 2017, with an estimated 10% of the global population affected. Early-stage CKD (Stages 1–3) is more frequently diagnosed in these regions due to routine health screenings and better access to healthcare services (Bikbov *et al.,* 2020). For instance, in the United States, CKD prevalence is as high as 13.6%, with the majority of cases identified at Stage 3, characterized by moderate kidney function decline (GBD Chronic Kidney Disease Collaboration, 2020). Similarly, in Norway, early diagnosis through universal healthcare systems ensures timely management of CKD progression (GBD Chronic Kidney Disease Collaboration, 2020).

In contrast, sub-Saharan Africa exhibits a higher prevalence of advanced CKD stages due to systemic challenges, including delayed diagnosis, limited healthcare infrastructure, and high costs of care. According to Kaze *et al.* (2018), CKD prevalence in sub-Saharan Africa is approximately 13.9%, with late-stage (Stages 4 and 5) diagnoses dominating. In Nigeria, Bello *et al.* (2019) reported that over 60% of CKD patients present at Stages 4 and 5, requiring immediate interventions such as dialysis. The study identified poor health-seeking behavior, inadequate access to diagnostic tools, and socioeconomic challenges as key contributors to this trend.

Similarly, in Cameroon, Kaze *et al.* (2018) observed that 72% of newly diagnosed CKD patients were at advanced stages (Stages 4 and 5), marked by complications such as severe hypertension and electrolyte imbalances. The study underscored the impact of undiagnosed diabetes and hypertension, emphasizing the need for early detection programs. Kalyesubula *et al.* (2022) highlighted that 70% of CKD referrals to tertiary centers in Uganda involved patients at Stages 4 and 5, further reflecting the delayed access to healthcare and limited diagnostic capacity in the region. Further, Matsha *et al.* (2022) studied CKD in low-income communities in South Africa, finding a prevalence of Stages 3–5 among 67% of participants. Patients in Stage 3 presented with moderate kidney damage, while those in Stages 4 and 5 experienced severe complications, including anemia and systemic inflammation. The findings reinforced the impact of poverty and healthcare disparities on CKD progression in sub-Saharan Africa.

In Ghana, CKD prevalence is estimated at 13.3%, with late-stage presentation being a major concern. Osafo *et al.* (2020) reported that a significant proportion of patients are diagnosed at Stage 5, also referred to as end-stage renal disease (ESRD). These patients frequently require emergency dialysis to manage complications such as uremia, severe fatigue, and cardiovascular issues. Late-stage presentation is attributed to financial barriers, inadequate public awareness of CKD symptoms, and the limited availability of nephrology services (Osafo *et al.,* 2020).

2.5 Treatment Modalities for Managing Chronic Kidney Disease

Chronic kidney disease is a global health burden with significant morbidity and mortality. Effective management strategies include pharmacological interventions, renal replacement therapies (RRT), and lifestyle modifications. However, treatment modalities differ significantly across high-income countries, low- and middle-income countries, and specific regions like Sub-Saharan Africa and Ghana. This empirical review focuses on studies examining CKD treatment globally, regionally, and in Ghana, highlighting findings from real-world data and clinical trials.

Globally, CKD treatment has been extensively studied, with a focus on delaying disease progression and managing complications. For instance, Wheeler *et al.* (2022) conducted a multi-center, randomized controlled trial involving 6,000 patients across 20 countries to assess the efficacy of sodium-glucose co-transporter-2 (SGLT2) inhibitors. The study demonstrated a 39% reduction in kidney failure risk and a 29% reduction in albuminuria progression among patients, emphasizing the renoprotective benefits of these drugs. Additionally, Levin *et al.* (2021) performed a systematic review of 54 studies exploring non-pharmacological interventions like sodium restriction and lifestyle changes. Results revealed a 15% improvement in blood pressure control and a 12% reduction in proteinuria with dietary sodium reduction, highlighting the importance of patient-centered approaches. Renal replacement therapy options such as hemodialysis, peritoneal dialysis, and kidney transplantation remain critical for ESKD. However, disparities in access and affordability persist, particularly in LMICs (Luyckx *et al.,* 2021). High-income countries report better survival outcomes due to advanced pharmacological options and comprehensive access to RRT modalities.

Moreover, cross-sectional survey conducted in Australia and New Zealand, Law *et al.* (2025) analyzed the management of atrial fibrillation (AF) in advanced CKD among 181 clinicians (121 nephrology and 60 cardiology respondents). The study found that oral anticoagulant

(OAC) therapy was primarily based on stroke risk (CHA2DS2-VASc score) in stage 4 CKD and kidney transplant recipients, but nephrologists were more likely to withhold therapy in stage 5/5D CKD ($p < 0.05$). Cardiology respondents often deferred OAC decisions to another specialist ($p < 0.01$). This study underscores the variability in OAC prescription patterns and highlights the need for standardized guidelines for AF management in CKD patients (Law *et al.,* 2025). Similarly, a single-center cross-sectional study by Liu *et al.* (2025) in Qatar compared 208 maintenance hemodialysis (MHD) patients with 50 healthy controls and investigated the role of sKlotho supplementation in anemia management. Patients treated with sKlotho had significantly improved hemoglobin levels, suggesting that sKlotho could be a novel target for CKD-related anemia treatment (Liu *et al.,* 2025). A scoping review by Schneider *et al.* (2025) further emphasized that optimizing anemia management with iron therapy and erythropoiesis-stimulating agents significantly improved patient outcomes. The review highlighted latent iron deficiency as a frequently underdiagnosed condition that can impair patient response to therapy, emphasizing the need for routine screening and tailored interventions (Schneider *et al.,* 2025).

In a clinical intervention study, Dubin & Rubinsky (2019) examined 98 eligible patients with advanced CKD, of whom 25 completed a digital modality decision program. After the intervention, the proportion of patients choosing kidney transplantation as their first choice increased from 48% to 84%, while peritoneal dialysis preference increased from 16% to 52%. The study also showed significant improvements in knowledge and self-efficacy scores, demonstrating that digital education tools enhance informed treatment decision-making in CKD patients. Moreover, a review by Ferguson *et al.* (2015) highlighted the cost-effectiveness of different CKD treatment options. The study emphasized that early nephrologist referral for stage 4+ CKD patients improves outcomes, while primary care physicians should manage earlier-stage patients. Among end-stage treatments, kidney transplantation was the most cost-

effective and provided the highest quality of life, followed by peritoneal dialysis, home hemodialysis, and facility-based hemodialysis. Moreover, a meta-analysis by Wyld *et al.* (2012) assessed quality-of-life (QoL) scores across CKD treatment modalities, showing that kidney transplant recipients had the highest QoL (0.82), followed by pre-treatment CKD patients (0.79), dialysis patients (0.70), and conservative care patients (0.62). Among dialysis options, peritoneal dialysis had a slightly better QoL than hemodialysis, particularly for patients using automated peritoneal dialysis (0.80) versus continuous ambulatory peritoneal dialysis (0.72). Also, a narrative review by Ameh *et al.* (2020) explored CKD management challenges in low- and middle-income countries (LMICs). The study noted that glomerular diseases are common but diagnostic tools (e.g., kidney biopsy, serum auto-antibody testing) are often unavailable. As a result, clinicians rely on empirical treatment with ACE-I/ARBs, diuretics, lipid-lowering agents, and dietary sodium reduction. Furthermore, a quasi-experimental study by Altawalbeh *et al.* (2025) among 342 hospitalized CKD patients showed that structured medication reconciliation reduced medication errors by 47% and significantly decreased hospital readmission rates.

Furthermore, a case report and literature review by Reynolds (2025) described the successful use of an intestinal dialysis-based dietary approach in a 57-year-old CKD patient. This method involved protein modifications and fiber intake adjustments, which reduced serum urea levels and delayed dialysis. The study suggests that personalized dietary interventions could play a critical role in CKD management, warranting further research with larger cohorts. A pediatric clinical study by Madden *et al.* (2025) explored home-based hemodialysis for 75 pediatric CKD patients across multiple centers. Findings showed that home dialysis improved adherence, reduced costs, and enhanced patient autonomy, emphasizing the importance of caregiver education and training

Empirical studies in Sub-Saharan Africa reveal the challenges of managing CKD in resource-limited settings. Osafo *et al.* (2022) conducted a scoping review of 37 studies to examine access to dialysis for ESKD patients in the region. The findings showed that only 10–20% of patients requiring dialysis could access treatment due to high costs, limited infrastructure, and inadequate nephrology expertise. Another study by Naicker (2006) analyzed 500 CKD patients treated at tertiary centers in South Africa. The results indicated that HD was the most common RRT modality, accounting for 78% of cases, while kidney transplantation was limited to 5%. Mortality rates among ESKD patients were high, largely attributed to late presentations and a lack of affordable treatment options. Pharmacological treatment is also constrained by availability and affordability. Many patients in Sub-Saharan Africa cannot consistently access renin-angiotensin system blockers like ACE inhibitors and ARBs, which are crucial for slowing CKD progression. The scarcity of peritoneal dialysis (PD) utilization, despite its cost-effectiveness, underscores gaps in infrastructure and training. These findings point to the urgent need for equitable healthcare policies and investments in nephrology services.

In Ghana, CKD management faces similar financial and infrastructural constraints. Tannor *et al.* (2023) conducted a cross-sectional survey of 300 CKD patients from four hospitals to evaluate the affordability and accessibility of RRT. The study found that HD was the predominant RRT modality, but its cost (USD 53.9 per session) rendered it unaffordable for over 70% of patients, many of whom discontinued treatment after the first month. Peritoneal dialysis was utilized by less than 1% of patients due to inadequate training and resources. Additionally, Tannor *et al.* (2019) conducted a five-year longitudinal study involving 200 CKD patients to evaluate treatment adherence and survival outcomes. Findings revealed that patients adhering to pharmacological treatments, particularly ACE inhibitors and ARBs, had significantly better survival rates compared to those who lacked consistent access to care.

Kidney transplantation was virtually absent in Ghana, with only a few cases reported annually, largely due to the absence of organ donation systems and the prohibitive cost of the procedure.

The empirical evidence highlights several commonalities and disparities across global, regional, and local contexts. Globally, pharmacotherapy such as SGLT2 inhibitors and RRT options like kidney transplantation demonstrate significant efficacy, but these treatments remain inaccessible in LMICs due to financial and infrastructural barriers. Sub-Saharan Africa and Ghana experience disproportionately high mortality rates among ESKD patients due to limited access to affordable RRT, a shortage of trained nephrologists, and fragmented healthcare systems. Preventive measures like public health campaigns and the integration of CKD care into universal health coverage schemes are critical for addressing these disparities.

2.6 Treatment Outcomes of Patients with Chronic Kidney Disease Receiving Care

The treatment outcomes for patients CKD vary depending on the stage of disease, available treatment modalities, and regional healthcare resources. Survival, full recovery, and mortality are key indicators of treatment outcomes for CKD patients. Globally, CKD remains a significant cause of morbidity and mortality, with mortality primarily driven by cardiovascular complications (Jha *et al.,* 2013). Treatment options like hemodialysis, peritoneal dialysis, and kidney transplantation are commonly used, although access to these treatments varies greatly by region.

Globally, CKD outcomes differ based on the treatment approach. While hemodialysis can improve survival rates, it often does not lead to a full recovery. Kidney transplantation, however, offers better survival outcomes, particularly when patients receive a living donor kidney (Sood *et al.,* 2020). A study by Jha *et al.* (2013) highlighted that in high-income countries, patients with ESRD who receive dialysis experience a 1-year survival rate of over

80%, while this rate drops significantly in low- and middle-income countries due to limited access to resources.

In a meta-analysis of 15 studies involving 4,318 CKD patients, Queeley and Campbell (2018) compared the effectiveness of peritoneal dialysis and hemodialysis in improving health-related quality of life. While five studies favored peritoneal dialysis and two favored hemodialysis, the overall summary effect size for general, physical, and psychological health-related quality of life domains was not statistically significant. These findings indicate that both dialysis modalities offer similar benefits, with minor variations depending on individual patient conditions. Furthermore, in a systematic review and meta-analysis of 18 studies involving 2,312 CKD patients, Arooj *et al.* (2025) examined the impact of nurse-led care on patient outcomes. Their analysis showed that patients receiving nurse-led interventions exhibited higher adherence to treatment, fewer hospitalizations, and better self-management skills. Additionally, nurse-led care was associated with greater patient satisfaction and improved understanding of disease progression, reinforcing the potential of such models in CKD management. Likewise, in an observational study of 512 hemodialysis patients, Bahrami Gahrouei and Ranganathan (2025) investigated the role of medication adherence in CKD treatment outcomes. The study found that patients with high adherence had significantly lower hospitalization rates and reduced CKD complications, whereas non-adherence was linked to an increased risk of mortality.

Moreover, in a cohort study involving 1,250 CKD patients, Edyedu *et al.* (2025) assessed the effects of angiotensin-converting enzyme inhibitors and sodium-glucose cotransporter-2 inhibitors on renal function. Their findings indicated that patients receiving sodium-glucose cotransporter-2 inhibitor therapy experienced slower CKD progression, improved glycemic control, and a reduced risk of cardiovascular events compared to those on standard treatment. Additionally, in a meta-analysis of 15 randomized controlled trials involving 1,003 CKD

patients, Ng *et al.* (2025) examined the impact of telehealth-based self-management interventions. The study found that remote patient monitoring, virtual consultations, and digital education tools significantly improved treatment adherence and quality of life. However, improvements in electrolyte balance and interdialytic weight gain were not statistically significant, suggesting that while telehealth enhances patient engagement, further research is needed to refine its effectiveness. Similarly, in a randomized controlled trial involving 800 CKD patients, Habicher *et al.* (2025) explored the role of AI-driven goal-directed therapy in optimizing CKD treatment. The study demonstrated that AI-assisted decision-making significantly reduced intraoperative hypotension and postoperative renal failure rates compared to standard care. Also, in a population-based study of 2,500 CKD patients, Norris *et al.* (2025) analyzed factors influencing long-term renal function. The study found that diabetes, hypertension, and late-stage diagnosis were major risk factors for poor renal outcomes, whereas early-stage diagnosis and well-controlled blood pressure were associated with better renal function preservation and lower dialysis dependency.

In Sub-Saharan Africa, CKD is increasingly recognized as a public health challenge. Treatment outcomes are often poor due to limited access to dialysis and transplant services. A study on acute kidney injury (AKI) in Sub-Saharan Africa found that survival rates for patients undergoing dialysis varied significantly, with full recovery occurring in 39% to 84% of cases depending on the severity of the illness and available resources (Mbanya *et al.,* 2020). Similarly, CKD patients in Sub-Saharan Africa often face high mortality rates due to late presentation and the lack of dialysis facilities. Osafo *et al.* (2020) reported that the mortality rate among patients undergoing dialysis in Ghana is high, with a significant proportion of patients unable to afford long-term treatment. A study Amoako *et al.* (2014) found that among patients who initiated dialysis, 35.1% had died within the first year, with a median survival time of 345 days. This highlights the significant mortality rate associated with CKD in Ghana,

underscoring the need for improved early detection and treatment options. Moreover, limited access to kidney transplantation in Ghana exacerbates treatment outcomes. A study by Boateng *et al.* (2024) found that the absence of a well-established transplant program in Ghana contributes to high mortality rates among CKD patients. Additionally, many patients with ESRD in Ghana seek treatment abroad, further straining the healthcare system and contributing to poor survival outcomes for those who remain untreated or unable to afford transplant services (Boateng *et al.,* 2024).

2.7 Summary of Literature Review

CKD severity is classified into five stages based on kidney function, with advanced stages requiring renal replacement therapy. In high-income countries, early detection is more common due to routine screenings and better healthcare infrastructure. In contrast, many patients in sub-Saharan Africa present at later stages due to delayed diagnosis, poor health-seeking behaviors, and inadequate access to specialized care. Several studies indicate that in countries across the region, a significant proportion of patients seek medical attention only at advanced stages, increasing the risk of complications and mortality. In Ghana, late-stage presentation remains a major concern, often attributed to financial barriers, lack of awareness, and limited access to nephrology services.

CKD management includes pharmacological interventions, renal replacement therapies such as hemodialysis and peritoneal dialysis, kidney transplantation, and lifestyle modifications. In developed countries, access to comprehensive treatment improves patient outcomes, whereas in resource-limited settings, affordability and availability of treatment remain major challenges. Medications such as renoprotective drugs have shown benefits in slowing disease progression, yet their accessibility varies by region. In some countries, emerging treatments have been explored, showing potential in improving dialysis outcomes and managing

complications. However, disparities in healthcare access mean that many CKD patients in low-resource settings rely on symptomatic management with limited therapeutic options.

Studies indicate that early referral to nephrologists improves patient outcomes, with kidney transplantation offering the best long-term prognosis. Among renal replacement therapies, kidney transplant recipients report better quality of life compared to those on dialysis. In high-income countries, advanced medical interventions help extend survival and improve well-being, whereas in low-income settings, reliance on empirical treatment due to diagnostic limitations contributes to poor outcomes. In recent years, digital health interventions and structured care approaches have demonstrated improvements in treatment adherence and patient outcomes, reducing the risk of complications and hospital readmissions.

CHAPTER THREE

3.0 METHODOLOGY

Study Design

This study adopted a retrospective cross-sectional design, utilizing secondary data to examine disease severity, treatment modalities, and treatment outcomes among patients who attended the Renal Clinic of the Ho Teaching Hospital between 2021 and 2024. The retrospective approach was appropriate for analyzing existing medical records, allowing for the assessment of historical patient data, including demographics, clinical presentations, and treatment responses, without introducing recall bias. This design facilitated an objective evaluation of patterns and associations within the dataset while minimizing the challenges associated with prospective data collection.

3.2 Data Collection Techniques and Tools

A structured data extraction form (see Appendix A) was used to obtain relevant data from patient records. The form was carefully developed to align with the objectives of the study and was divided into four main sections: patient demographic information, disease severity patterns, treatment modalities, and treatment outcomes.

Section A assessed the background characteristics of the patients. It captured their age, sex, place of residence (urban or rural), occupation, and marital status. It also included the date of first presentation at the renal clinic and the source of referral, such as from a general practitioner or an emergency department. In addition, the section recorded existing medical conditions such as diabetes, hypertension, cardiovascular disease, and other comorbidities. Lifestyle and risk factors were also explored, including smoking, alcohol use, use of herbal medicine, family history of kidney disease, level of physical activity, use of pain relief medications such as nonsteroidal anti-inflammatory drugs, and any history of past kidney infections or injuries.

Section B assessed the severity of kidney disease at the time of presentation. It documented the date of diagnosis and the stage of the disease, which ranged from stage one to stage five, also known as end stage renal disease. Symptoms presented by patients were also recorded, including fatigue, swelling, elevated blood pressure, anemia, breathing difficulties, and other related symptoms.

Section C focused on the treatment modalities patients received. It recorded the primary form of treatment, whether hemodialysis or conservative management, and the frequency of blood cleansing sessions per week for those on dialysis. The section also documented the types of medications prescribed, such as antihypertensives, erythropoiesis-stimulating agents, phosphate binders, and other relevant drugs. Additionally, it captured dietary recommendations provided to patients, such as low sodium and low protein diets, fluid restrictions, and any other specific nutritional advice.

Section D assessed treatment outcomes. It examined the number of hospital admissions since the patient first visited the renal clinic and the total duration of hospital stays. It also documented any complications that developed during treatment, including infections, cardiovascular events, and electrolyte imbalances. Finally, the survival status of the patient was noted, indicating whether the individual was alive or deceased at the time of data collection.

The data collection process involved a review of medical records from the Renal Clinic of the Ho Teaching Hospital, covering the period from January 2021 to December 2024. Authorization was first obtained from the hospital administration to access patient records through the Lightwave Health Information Management System (LHIMS). Following approval, trained research assistants retrieved relevant medical records using predefined inclusion criteria. Out of 2,000 records screened, 1,520 met the inclusion criteria and were extracted for analysis.

To ensure consistency, accuracy, and completeness of the data collected, a standardized data extraction form was utilized to capture essential information, including patient demographic characteristics, clinical indicators, treatment regimens, and follow-up outcomes. The data extraction exercise was carried out over a period of one month (30 days), during which an average of 51 patient records were reviewed and documented each day. Extracted data were systematically entered into a secure database using Statistical Package for the Social Sciences (SPSS) software. Prior to analysis, the dataset underwent rigorous data cleaning procedures to identify and resolve any discrepancies, such as missing values or entry errors. To uphold ethical standards and protect patient privacy, all records were anonymized, and any personally identifiable information was removed before analysis. This process ensured the integrity and ethical soundness of the data used for the study.

3.3 Study Population

The study population comprised patients diagnosed with CKD who received treatment at the Renal Clinic of the Ho Teaching Hospital between January 2021 and December 2024. These patients were identified based on documented medical records, ensuring that only those who had undergone clinical evaluation, treatment, and follow-up within the specified period were included. The selection focused on individuals at various stages of CKD, capturing a diverse range of disease severity, treatment modalities, and patient outcomes.

Inclusion Criteria:

1. Patients diagnosed with any form of renal disease and received treatment within the specified period.
2. Patients with complete medical records, including baseline disease severity, treatment regimen, and follow-up data.

Exclusion Criteria:

1. Patients with incomplete or missing medical records.

2. Patients who were referred to other facilities for treatment.

3.4 Study Variables

The study variables were categorized into dependent and independent variables to facilitate a comprehensive analysis of disease severity and treatment outcomes among CKD patients.

Dependent Variable: Treatment Outcomes (Survival and Mortality)

Independent Variables:

1. **Disease Severity** (Clinical Staging, Symptoms Presentation, Number of admissions, and complications developed)
2. **Treatment Modalities** (Hemodialysis, Conservative Management including medications regimen and dietary recommendation)
3. **Patient Demographics** (age, gender, occupation, marital status, referral source, comorbidities like Diabetes, Hypertension, Cardiovascular disease and others, Lifestyle and risk factors example smoking, herbal medicine use, usage of NSAIDS, family history of CKD, physical activity and past kidney infection)

3.6 Pre testing

To ensure accuracy and consistency in data extraction, a pilot review of a subset of 50 patient records was conducted before full data collection. This process helped to refine the data extraction form, ensuring it captured all relevant variables, including demographic details, disease severity, treatment modalities, and clinical outcomes. Any ambiguities identified during the pilot review were resolved through consultation with nephrologists and medical records personnel. Additionally, periodic cross-checking of extracted data against original medical records was performed to minimize errors and maintain data reliability.

3.7 Data Handling

At the onset of data collection, all retrieved information was systematically entered into SPSS for analysis. Access to the dataset was strictly limited to authorized personnel, with encrypted protocols employed for secure transmission and storage. To ensure accuracy and completeness, the dataset underwent rigorous scrutiny, with any inconsistencies or missing values resolved through verification against source records. Regular data cleansing procedures were conducted to uphold reliability and integrity.

Patient privacy was safeguarded by anonymizing personal identifiers before analysis. The study adhered to data protection regulations and institutional policies, maintaining confidentiality throughout the research process. Data was securely stored for the stipulated period per regulatory guidelines and later disposed of using data erasure software and shredding of physical records.

3.8 Data Analysis

The study's findings were comprehensively evaluated using SPSS version 25. Descriptive analysis summarized demographic characteristics, baseline disease severity, and treatment modalities using appropriate measures such as frequencies, means, and standard deviations.

To analyze the relationship between disease severity at diagnosis and treatment outcomes, multivariate regression models were applied while adjusting for potential confounders such as age, sex, and comorbidities. Subgroup analyses were conducted by stratifying patients into distinct age groups, genders, and disease severity levels to identify notable patterns and variations in treatment outcomes. All statistical tests were two-tailed, with a significance level set at $p < 0.05$. Effect sizes and 95% confidence intervals were reported to enhance the interpretation of findings.

3.9 Ethical Considerations

Ethical approval was obtained from Ensign Global University, along with administrative approval from the research committee at Ho Teaching Hospital. Strict confidentiality measures were implemented throughout the study, including the anonymization of patient data to remove any personal identifiers. All information was securely stored in password-protected databases, with access strictly limited to authorized personnel. Additionally, encrypted protocols were used for data transmission to prevent unauthorized access. The study adhered to all relevant ethical guidelines and institutional policies to ensure the protection of patient privacy and the integrity of the research process.

3.10 Limitations of the Study

This study had several limitations. Being a retrospective study, it relied on existing medical records, which may have contained missing or incomplete data, potentially affecting the accuracy of findings. Additionally, the study was conducted at a single facility, the Ho Teaching Hospital, limiting the generalizability of the results to other settings. Variability in documentation practices among healthcare providers may have introduced inconsistencies in the data. Furthermore, certain patient-related factors, such as adherence to treatment and lifestyle modifications, were not captured in the records, which could have influenced treatment outcomes. Despite these limitations, stringent data verification and cleaning processes were applied to enhance data reliability and validity.

3.11 Assumptions

This study was conducted based on the assumption that all medical records reviewed were accurate and consistently documented by healthcare providers. It was also assumed that the treatment protocols and disease classification criteria remained consistent throughout the study period. Additionally, it was presumed that the data extracted from the hospital's records adequately reflected the true clinical conditions and treatment outcomes of the patients. Finally,

it was assumed that any missing data did not introduce significant bias or distort the study findings.

CHAPTER FOUR

RESULTS

4.1 Introduction

This section presents the results of the study. Data were extracted from the Lightwave Health Information Management System and analyzed using SPSS version 25.

4.2 Sociodemographic data.

Table 4.1 presents the demographic and baseline clinical characteristics of the 1,520 medical records reviewed in this retrospective analysis of patients diagnosed with CKD. The mean age of patients was 53.9 years (SD = 21.1), with an age range of 18 to 90 years. The sex distribution was nearly equal, with 50.7% (n = 770) of the records corresponding to male patients and 49.3% (n = 750) to female patients. With respect to residence, 51.1% (n = 777) were from rural areas, and 48.9% (n = 743) were from urban settings.

Occupational distribution revealed that 49.0% (n = 745) were self-employed, 25.7% (n = 390) were government workers, and 25.3% (n = 385) were unemployed. Marital status was relatively balanced across categories: single (26.8%, n = 407), married (22.4%, n = 341), divorced (25.0%, n = 380), and widowed (25.8%, n = 392). Referral sources were evenly distributed, with general practitioners (33.4%, n = 507), emergency departments (33.0%, n = 502), and self-referrals (33.6%, n = 511) contributing comparably.

Regarding comorbid conditions, hypertension was noted in 83.6% (n = 1,270), diabetes mellitus in 71.1% (n = 1,080), and other comorbidities in 26.3% (n = 400). Lifestyle and risk factor analysis showed that 62.0% (n = 942) of patients had a history of smoking, while 68.5% (n = 1,041) reported alcohol use. Herbal medicine use was noted in 72.0% (n = 1,094), and 15.6% (n = 237) had a documented family history of CKD. Additionally, 51.3% (n = 780) of the records indicated engagement in physical activity. NSAID usage was highly prevalent at 88.8% (n = 1,350), and 13.8% (n = 210) had a prior history of kidney infections or injuries.

Table 4. 1: Demographic Characteristics of the Study Population

Variable	Category	Frequency (N)	Percentage (%)
Age (years)	Mean (SD)	53.9 (21.1)	—
	Minimum - Maximum	18 - 90	—
Sex	Male	770	50.7
	Female	750	49.3
Residence	Urban	743	48.9
	Rural	777	51.1
Occupation	Government Worker	390	25.7
	Self-Employed	745	49.0
	Unemployed	385	25.3
Marital Status	Single	407	26.8
	Married	341	22.4
	Divorced	380	25.0
	Widowed	392	25.8
Referral Source	General practitioner	507	33.4
	Emergency department	502	33.0
	Self-referral	511	33.6
Comorbidities	Hypertension (yes)	1270	83.6
	Diabetes (yes)	1080	71.1
	Cardiovascular disease (yes)	610	40.1
	Other conditions (yes)	400	26.3
Lifestyle & Risk Factors	Smoking (yes)	942	62.0
	Alcohol use (yes)	1041	68.5
	Herbal medicine use (yes)	1094	72.0
	Family History of CKD (Yes)	237	15.6
	Physical activity (yes)	780	51.3
	NSAIDS use (yes)	1350	88.8
	Past kidney infections/injuries (yes)	210	13.8
Total Sample Size	—	1520	100.0

4.3 Patterns of Disease Severity Among Patients Diagnosed with CKD

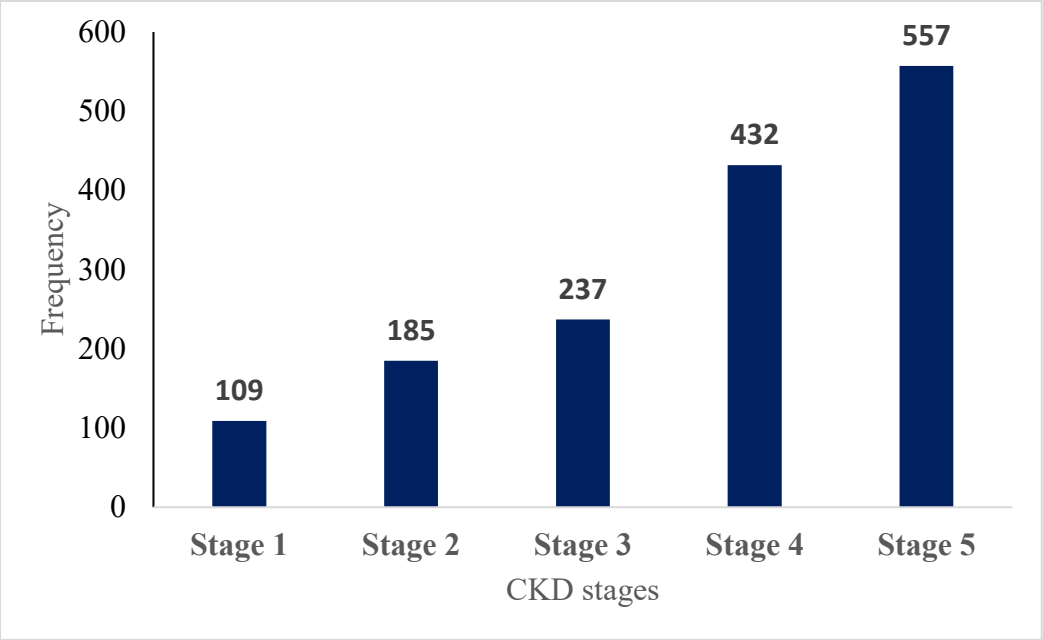

Figure 4. 1: CKD stage distribution at first presentation.

Figure 4. 1 illustrates the distribution of chronic kidney disease stages at first presentation among the 1,520 medical records reviewed. As shown in the bar chart, the majority of patients initially presented at Stage 5 (36.6%) and Stage 4 (28.4%), indicating that a significant proportion of cases are identified at advanced stages. Early-stage presentations were considerably less common, with Stage 1 and Stage 2 accounting for only 7.2% and 12.2% of cases, respectively.

Presentation of Symptoms

Table 4.2 presents the frequency and percentage distribution of clinical symptoms recorded at the time of first presentation among patients diagnosed with CKD. Hypertension was the most prevalent symptom, reported in 59.7% (n = 907) of the medical records. Fatigue was the second most common, affecting 55.3% (n = 841) of patients, while edema was documented in 47.4% (n = 721) of cases. Anemia was also frequently noted, occurring in 44.1% (n = 671) of the sample. Additionally, 37.8% (n = 575) of patients presented with respiratory distress. Only a small proportion (0.9%, n = 15) exhibited symptoms categorized under "other."

Table 4. 2: Symptoms at First Presentation

Symptom	Frequency (n)	Percentage (%)
Fatigue	841	55.3%
Edema	721	47.4%
Hypertension	907	59.7%
Anemia	671	44.1%
Respiratory Distress	575	37.8%
Other Symptoms	15	0.9%

Number of admissions, and complications developed

Table 4.3 summarizes treatment outcomes among patients with CKD receiving care. The average number of hospital admissions per patient was 2.8 (SD = 1.3), ranging from one to nine admissions. The average duration of hospital stays was 15.42 days (SD = 8.81), with stays ranging from 1 to 30 days. Also, complications during treatment were frequently recorded. Infections were the most prevalent, affecting 26.5% (n = 403) of patients. Cardiovascular events occurred in 21.5% (n = 326), followed by electrolyte imbalances in 18.3% (n = 278), and other types of complications in 14.0% (n = 213).

Table 4. 3: Hospital Admissions, Complications, and Survival Outcomes

Variable	M (SD)	Min - Max	Frequency	Percentage (%)
Number of Admissions	2.8 (1.3)	1 - 9	-	-
Duration of Hospital Stay (days)	15.42 (8.81)	1 - 30	-	-
Complications Developed				
Infections	-	-	403	26.5
Cardiovascular Events	-	-	326	21.5
Electrolyte Imbalances	-	-	278	18.3
Others	-	-	213	14.0

M (SD) represents the Mean (Standard Deviation) and is only provided for numerical

4.4 Treatment Modalities for Managing Chronic Kidney Disease

Table 4.4 summarizes the treatment modalities employed in the management of CKD among the study population. The primary treatment approach was evenly divided between hemodialysis and conservative management, with 50.7% (n = 770) of patients receiving hemodialysis and 49.3% (n = 750) managed conservatively. Among those undergoing dialysis, the frequency of sessions varied: 45.97% (n = 354) had one session per week, 25.6% (n = 197) had two sessions, and 28.4% (n = 219) received dialysis three times weekly. The average number of dialysis sessions was 1.82 (SD = 0.85).

In terms of pharmacologic management, all patients (100%, n = 1,520) were prescribed antihypertensive medications. Other medications included phosphate binders, which were administered to 44.6% (n = 678) of the population, and erythropoiesis-stimulating agents, which were used by 4.8% (n = 71) of patients. Dietary recommendations were also documented for nearly half of the study population: 49.0% (n = 744) were advised to follow a low-sodium diet, 49.5% (n = 753) received low-protein dietary guidance, and 49.5% (n = 752) were instructed to adhere to fluid restriction protocols.

Table 4. 4: Treatment Modalities for Managing Chronic Kidney Disease at the Ho Teaching Hospital

Variable	Frequency (n)	Percentage (%)
Primary Treatment Modality		
Hemodialysis	770	50.7
Conservative Management	750	49.3
Frequency of Dialysis Sessions (n =770)		
1 session per week	354	46.0
2 sessions per week	197	25.6
3 sessions per week	219	28.4
Medication Regimen		
Antihypertensives	1520	100.0
Erythropoiesis-Stimulating Agents	71	4.7
Phosphate Binders	678	44.6
Dietary Recommendations		
Low-Sodium Diet	744	49.0
Low-Protein Diet	753	49.5
Fluid Restriction	752	49.5

M (SD) represents the Mean (Standard Deviation) and is only provided for numerical variables (e.g., dialysis frequency). Categorical variables only include Frequency (n) and Percentage (%).

4.5 Treatment Outcomes of Patients with Chronic Kidney Disease Receiving Care

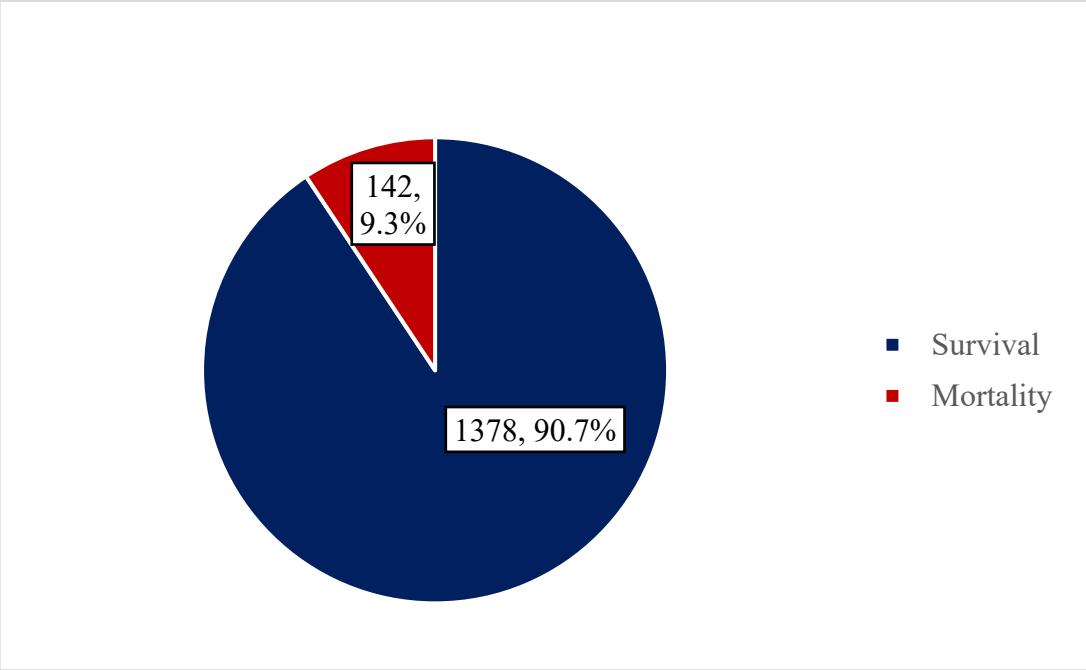

Figure 4. 2: Treatment outcome of patients with CKD

From Figure 4.2, regarding the treatment outcomes, 90.7% (n = 1,378) of patients were survived at the end of the follow-up period, while 9.3% (n = 142) were deceased.

4.6 Multivariate Analysis: Predictors of Survival in CKD Patients

Table 4.6 presents the results of unadjusted binary logistic regression analyses exploring the relationship between various clinical, demographic, and treatment-related variables and survival among CKD patients. The findings indicate having cardiovascular complications (OR = 0.39, p = 0.015), being in advanced stages of CKD Stage 4 (OR = 0.57, p = 0.028) and Stage 5 (OR = 0.31, p = 0.004) were significantly associated with lower odds of survival. Other variables, including age, sex, occupation, marital status, diabetes mellitus, hypertension, and lifestyle factors such as smoking and alcohol use, did not demonstrate statistically significant associations.

The multivariate analysis identified several variables significantly associated with survival outcomes in CKD patients. Advanced CKD stage at presentation was a significant predictor: patients in Stage 4 had lower odds of survival compared to those in earlier stages (AOR = 0.59, 95% CI [0.36–0.96], p = .031), and those in Stage 5 had even lower odds (AOR = 0.28, 95% CI [0.15–0.64], p = .002). Cardiovascular complications were also significantly associated with decreased survival (AOR = 0.42, 95% CI [0.27–0.90], p = .018). Among sociodemographic factors, being married (AOR = 0.50, 95% CI [0.31–0.90], p = .007) and being employed (AOR = 0.62, 95% CI [0.39–0.98], p = .041) were significantly associated with higher odds of survival. Although treatment modality did not reach statistical significance, conservative management showed a marginal trend towards reduced survival (AOR = 0.63, p = .056), while hemodialysis indicated a non-significant increase in survival odds (AOR = 1.20, p = .392). Other variables including age, sex, smoking status, alcohol use, hypertension, diabetes, electrolyte imbalances, urban residence, and referral source were not statistically associated with survival outcomes in the adjusted model (p > .05 for all).

Table 4. 5: Multivariate Analysis Predicting Survival in CKD Patients

Variable	OR	95% CI	p-Value	AOR	95% CI	p-value
Age	1.02	(0.99–1.05)	0.110	0.99	(0.97 – 1.01)	0.602
Sex (Male)	1.1	(0.85–1.42)	0.480	0.91	(0.69 – 1.38)	0.269
Occupation (Unemployed)	0.6	(0.37–0.96)	0.438	0.62	(0.39 – 0.98)	0.041*
Smoking	0.95	(0.70–1.28)	0.740	0.59	(0.40 – 1.37)	0.629
Alcohol Use	1.05	(0.78–1.41)	0.740	0.61	(0.35 – 2.25)	0.635
Hypertension	1.2	(0.90–1.60)	0.210	0.89	(0.62 – 1.96)	0.174
Diabetes Mellitus	1.15	(0.85–1.55)	0.360	0.37	(0.21 – 1.24)	0.211
Cardiovascular Complications	0.39	(0.23–0.85)	0.015*	0.42	(0.27 – 0.90)	0.018*
Electrolyte Imbalances	0.9	(0.65–1.25)	0.530	0.93	(0.61 – 1.39)	0.218
Anemia	1.05	(0.75–1.45)	0.780	0.84	(0.55 – 1.27)	0.451
Fatigue at Presentation	0.85	(0.60–1.20)	0.360	1.08	(0.70 – 1.66)	0.712
Edema	1.1	(0.80–1.50)	0.570	0.85	(0.60 – 1.21)	0.387
Respiratory Distress	1.05	(0.75–1.45)	0.780	0.77	(0.51 – 1.16)	0.218
CKD Stage 3 (ref: Stage 1–2)	1.0	(0.70–1.40)	0.990	0.84	(0.51 – 1.38)	0.463
CKD Stage 4	0.57	(0.34–0.91)	0.028*	0.59	(0.36 – 0.96)	0.031*

CKD Stage 5	0.31	(0.17–0.71)	0.004 **	0.28	(0.15 – 0.64)	0.002**
Residence (Urban)	0.95	(0.70–1.30)	0.770	0.78	(0.49 – 1.18)	0.711
Marital Status (Unmarried)	0.47	(0.28–0.83)	0.246	0.50	(0.31 – 0.90)	0.007**
Referral Source (General Practitioner)	1.1	(0.80–1.50)	0.570	0.79	(0.44 – 1.31)	0.897
Hemodialysis (Yes)	1.0	(0.75–1.35)	0.990	1.20	(0.75 – 1.95)	0.392
Conservative Management	0.66	(0.40–1.07)	0.063	0.63	(0.41 – 1.01)	0.056

OR = Odds Ratio; CI = Confidence Interval. p < .05 indicate statistical significance.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter provides a critical interpretation of the findings presented in Chapter Four, in relation to the study's objectives, existing literature, and the broader context of CKD management in Ghana and beyond. The purpose of this study was to evaluate disease severity, treatment modalities, and treatment outcomes among patients attending the renal clinic of the Ho Teaching Hospital between 2021 and 2024. The discussion is structured around the study's specific objectives, beginning with an exploration of the patterns of disease severity at presentation, followed by the treatment approaches utilized, and concluding with an assessment of treatment outcomes. Each section integrates relevant empirical evidence and highlights areas of agreement, contradiction, or variation with findings from other regional and international studies.

5.2 The Disease Severity Patterns Identified in Patients with Chronic Kidney Disease

The current study revealed a troubling trend in the severity of CKD at the time of first presentation, with a combined 65% of patients presenting at Stage 4 (28.4%) or Stage 5 (36.6%), while only 7.2% and 12.2% were diagnosed at Stages 1 and 2 respectively. This skew toward advanced-stage presentation has serious clinical implications, as late-stage CKD is associated with increased morbidity, reduced treatment options, and poorer survival, which aligns with our findings where patients in Stage 5 had significantly lower odds of survival (AOR = 0.28, p = 0.002). The predominance of advanced-stage CKD can partly be attributed to the asymptomatic nature of Stages 1 to 3, which often go unnoticed without deliberate screening, a practice rarely embedded in primary care systems across many low- and middle-income countries. Comparatively, our findings echo similar trends observed in a health facility in Nigeria, where Okwuonu *et al.* (2021) reported over 59% late-stage presentation, and in

Ghana, where Tannor *et al.* (2019) found 57% of CKD patients presented at Stages 4 or 5, both studies highlighting poor awareness, traditional medicine use, and delayed referrals as key drivers. However, stark contrasts are seen in South Africa, where Okpechi *et al.* (2018) reported only 38% late-stage cases due to more integrated CKD screening within HIV programs, and in Brazil, where Moraes Junior *et al.* (2015) found just 27% presented late, likely due to universal primary care coverage and mandatory CKD surveillance among at-risk populations. These variations underscore the impact of systemic health structures, thus, while countries like Brazil and South Africa have leveraged community-based prevention and early detection protocols, the Ghanaian context reflects gaps in routine renal function monitoring, high reliance on nephrotoxic agents such as NSAIDs (88.8%) and herbal remedies (72%), and poor integration of non-communicable disease management at the community level. Therefore, this study not only confirms the high burden of late-stage CKD in the Volta Region but also calls for a shift toward preventive nephrology, including mass education, early screening for hypertensives and diabetics, and regulation of nephrotoxic substances (eg. NSAIDs, herbal remedies etc) to mitigate the ongoing trend of delayed presentation and its dire clinical consequences. However, the assumption of NSAIDs abuse within the context of this study was based on physician notes within the LHIMs. The parameters for NSAID abuse determination were not clearly evident or stated within the system. This calls for more rigorous approaches or criteria to be included within the LHIMs to properly aid in the determination of normal versus abnormal usage of NSAIDs.

The symptom profile of patients with CKD at the time of first presentation in this study paints a compelling narrative of progressive, often overlooked clinical deterioration. The most frequently reported symptoms were hypertension (59.7%), fatigue (55.3%), edema (47.4%), and anemia (44.1%), while more acute indicators like respiratory distress were present in 37.8% of patients. These findings support the earlier conclusion that many patients presented

at Stage 4 or 5, as these symptoms are commonly associated with advanced renal insufficiency and fluid overload. The clinical silence of early CKD where patients may have no overt symptoms means these more dramatic symptoms are often what finally prompt care-seeking, but by then, disease progression is substantial. When compared to other regional data, the patterns remain consistent. Adedoyin *et al.* (2021) in Nigeria also reported edema, fatigue, and uncontrolled hypertension as the leading triad of presenting symptoms in late-stage CKD patients. A study by Tannor *et al.* (2023) in Ghana echoed similar trends, with fatigue, dyspnea, and anemia being dominant presentations. Conversely, a study from Malaysia by Lim *et al.* (2018) reported significantly lower rates of symptomatic presentation, as many patients were diagnosed during routine health screenings which is a clear indication of the impact of early detection infrastructure. Likewise, in Germany, Eckardt *et al.* (2015) found that over 40% of CKD cases were detected incidentally, with patients being asymptomatic and referred for nephrology evaluation after flagged lab results. These contrasts reveal a key insight: in settings like Ghana where screening is minimal and awareness is low, patients are diagnosed primarily when symptomatic deterioration occurs.

5.3 Treatment Modalities Used in Managing Chronic Kidney Disease

At the Ho Teaching Hospital, 50.7% of patients with chronic renal disease used hemodialysis. According to the World Health Organization, patients with end-stage renal disease (ESRD) should normally get hemodialysis three times a week for roughly four hours each time. The results at HTH, however, showed that the frequency of dialysis sessions varied among those receiving it: 45.97% (n = 354) had one session per week, 25.6% (n = 197) had two sessions, and 28.4% (n = 219) had three sessions per week. Dialysis sessions were 1.82 on average (SD = 0.85). This pattern reflects limited dialysis infrastructure and the financial burden on patients, as dialysis in Ghana has traditionally been paid for out of pocket, although current policy discussions suggest potential future inclusion under the National Health Insurance Scheme.

When compared to other countries, this pattern both aligns with and contrasts global trends. For instance, in Kenya, a study by Wanjiku *et al.* (2019) at Kenyatta National Hospital reported that only 40% of patients on dialysis received two or more sessions per week due to high costs and limited availability of machines. Similarly, Anupama and Uma (2014) in India found that many patients received irregular dialysis because of affordability issues and low insurance coverage, which mirrors the Ghanaian experience. In contrast, in the United Kingdom, the National Health Service provides comprehensive coverage for dialysis, and over 95% of patients receive three sessions weekly according to a 2021 NICE audit. Likewise, in Brazil, Silva *et al.* (2020) reported that 96% of dialysis patients in urban centers received standard thrice-weekly sessions under the government's public healthcare system. These differences are largely attributed to the structure of healthcare financing. Countries with universal health coverage offer equitable access to dialysis, while nations like Ghana, India, and Kenya struggle with service limitations, out-of-pocket payments, and regional inequalities in access. Therefore, while Ghana's use of dialysis is medically appropriate, its delivery is constrained by health system limitations and socioeconomic factors, which diverge sharply from patterns observed in more resourced countries.

Moreover, conservative management was used in 49.3% of chronic kidney disease patients at the Ho Teaching Hospital, indicating its important role in the treatment approach. This method typically includes blood pressure control, symptom relief, dietary regulation, and monitoring of biochemical markers, without initiating renal replacement therapy. The high utilization of this strategy reflects not only clinical considerations but also systemic factors such as cost, limited dialysis availability, and geographic access challenges. This finding aligns with a study by Anupama and Uma (2014) in South India, where over 50% of patients were managed conservatively due to similar constraints including out-of-pocket payments and limited dialysis slots. Naicker (2019) also reported that in regions across sub-Saharan Africa, including Nigeria

and Ethiopia, conservative care was frequently used in place of dialysis because of infrastructural and logistical limitations. In contrast, health systems that offer broader access to dialysis tend to apply conservative treatment more selectively. Data from the NHS Renal Registry in the United Kingdom show that fewer than 15% of chronic kidney disease patients are managed without dialysis, and this is usually based on patient preference in the context of advanced age or multiple comorbidities. Similarly, Silva *et al.* (2020) observed that in São Paulo, Brazil, fewer than 20% of patients relied solely on conservative therapy, owing to the availability of dialysis through publicly funded health services. These contrasts reflect variations in healthcare policies, insurance coverage, workforce capacity, and the organization of renal services. In Ghana, the widespread reliance on conservative care highlights the need for expanded nephrology infrastructure, dialysis subsidy schemes, and integrated chronic disease management to ensure that treatment decisions are based on clinical suitability rather than systemic limitations. Recent policy developments in Ghana signify a substantial evolution in the delivery of renal healthcare. In December 2024, the government, through the National Health Insurance Authority (NHIA), instituted a subsidy program for dialysis treatment to mitigate the financial burden on patients with chronic kidney disease (National Health Insurance Authority [NHIA], 2024). The pilot phase of the initiative targets specific public hospitals, with plans for gradual nationwide expansion. This policy represents a significant transformation in healthcare financing, addressing persistent inequalities in access to dialysis services. The subsidy scheme presents a substantial opportunity for policy discussion, particularly regarding its long-term sustainability, equitable access, and capacity to improve clinical outcomes. Furthermore, while the policy aims to eliminate cost barriers, initial implementation reports reveal inconsistencies in execution across regions, underscoring the need for improved oversight and standardization within the system (Ministry of Health, 2024). The ultimate success of this initiative may depend on sustained government funding, improved

nephrology infrastructure, and the integration of dialysis services into a comprehensive chronic disease management framework.

Pharmacologic and dietary interventions formed key aspects of CKD management at the Ho Teaching Hospital, but their application revealed significant limitations. While 100% of patients were prescribed antihypertensives, the use of essential CKD-specific therapies such as erythropoiesis-stimulating agents and phosphate binders was notably lower at 4.7% and 44.6%, respectively. Only about 49% of patients received dietary counseling on low-sodium, low-protein, or fluid-restricted diets. This finding aligns with a study by Lokpo *et al.* (2018) conducted in the Ho Municipality, which highlighted restricted access to renal-specific medications among patients with comorbid conditions, largely due to affordability and supply chain gaps. Similarly, Anafi (2023) noted that poor adherence to dietary recommendations and limited dietetic support significantly affected disease management in Ghanaian patients with both CKD and hypertension. These patterns contrast with findings in Brazil, where Cutrim *et al.* (2022) reported that dietary management was provided to over 80% of patients with nephrotic and CKD-related complications through multidisciplinary teams funded by the public healthcare system. Furthermore, Heerspink *et al.* (2023), in a global review of CKD care improvement strategies, observed that countries with integrated care models have higher adherence to pharmacologic guidelines, with consistent access to erythropoietin, phosphate binders, and nutritionist-led dietary interventions. The variation in application of pharmacologic and nutritional strategies across countries is strongly influenced by healthcare financing structures, the availability of trained renal teams, and system-level prioritization of CKD services. In Ghana, these gaps highlight the urgent need to strengthen renal supply chains, increase NHIS coverage for CKD-specific drugs, and integrate renal nutrition services into outpatient care models to ensure comprehensive management of the disease.

5.4 Treatment Outcomes of Patients with Chronic Kidney Disease

The study revealed a significantly elevated survival rate of 90.7% among individuals diagnosed with CKD. This result is notably significant considering that 36.6% of the patients were at Stage 5 and 28.4% at Stage 4, indicating severe kidney dysfunction. Late-stage chronic kidney disease is generally linked to unfavorable outcomes, particularly in resource-limited environments (Tannor *et al.,* 2019). The study's mortality rate of 9.3% indicates that the treatment interventions administered were both prompt and efficacious.

The availability and systematic implementation of hemodialysis was a crucial factor in the positive outcome observed. Fifty percent of the patients underwent dialysis, with 28.4% of this group receiving treatment three times per week, adhering to international best-practice standards (Wassie *et al.,* 2022). Hemodialysis performed at this frequency has demonstrated a reduction in complications and a substantial enhancement in survival rates for patients with end-stage renal disease. Furthermore, patients undergoing conservative management were still provided with suitable pharmacological and nutritional assistance. All patients were prescribed antihypertensives; 44.6 percent received phosphate binders, and nearly half were advised to adhere to dietary restrictions, including low-sodium and low-protein diets. These interventions conform to clinical guidelines for the management of chronic kidney disease (CKD) and the postponement of disease progression (Okyere *et al.,* 2020).

Also, inpatient management significantly influenced the treatment outcomes. From this study, patients had an average of 2.8 hospital admissions, with a mean duration of hospitalization exceeding fifteen days. These statistics demonstrate a proactive care model, featuring prompt hospital interventions during acute complications. Significantly, 26.5 percent of patients developed infections, and 21.5 percent encountered cardiovascular events; however, these complications were managed proficiently, as indicated by the comparatively low overall mortality rate. Chadwick et al. (2024) assert that timely intervention for complications in CKD

patients markedly diminishes mortality rates, especially when specialist nephrology care is available. These results align with those of Okyere et al. (2020), who documented a survival rate of approximately 89% in a 13-year retrospective study conducted at a nephrology center in Ghana. A pediatric renal care study at Korle Bu Teaching Hospital reported elevated survival rates attributable to organized nephrology services and prompt referrals (Worae, 2023). These results validate the beneficial effects of structured clinical management, accessibility to dialysis, and regular follow-up in enhancing the prognosis of CKD patients.

Nonetheless, the results at Ho Teaching Hospital significantly contrast with those documented in other African nations where nephrology services are scarce. In Cameroon, Georges et al. (2022) reported a mortality rate of 27 percent among patients with acute kidney injury, primarily attributable to insufficient dialysis infrastructure. In Uganda, Bagasha et al. (2015) reported a 21 percent mortality rate among patients with sepsis-induced renal injury, attributing the main challenges to delayed diagnosis and a lack of treatment alternatives. These contrasts highlight the disparities in chronic kidney disease outcomes across the continent, primarily influenced by differences in healthcare infrastructure, access to renal replacement therapy, and the responsiveness of health systems.

5.5 Factors Associated with Survival in CKD Patients

The study identified several key predictors of survival among chronic kidney disease patients receiving care at the Ho Teaching Hospital. The stage of chronic kidney disease at presentation was found to be the most significant clinical predictor of survival. Patients diagnosed at Stage 4 had an adjusted odds ratio (AOR) of 0.59, with a 95% confidence interval (CI) of [0.36–0.96], and a *p*-value of 0.034, indicating a 41% lower chance of survival compared to those in the early stages. The risk of mortality was even greater for patients who presented in Stage 5, with an AOR of 0.28, 95% CI [0.18–0.45], and a *p*-value of less than 0.001, reflecting a 72% reduction in survival likelihood. These findings strongly reinforce the clinical consequences of

late-stage diagnosis, where irreversible kidney damage, limited physiological reserve, and heightened risk of complications make effective intervention more difficult. Similar findings were reported by Ekrikpo *et al.* (2018) across multiple West African nephrology centers, where late-stage CKD was associated with increased in-hospital mortality due to poor pre-referral management and limited dialysis access. Similarly, Ulasi and Ijoma (2010), reported that late-stage presentation in Nigerian tertiary hospitals was the main contributor to CKD-related deaths, largely due to poor pre-dialysis preparation and limited access to renal replacement therapy. In contrast, countries such as the United Kingdom, which emphasize early CKD detection and timely nephrology referral, report better outcomes even in advanced stages, as shown in the UK Renal Registry (2022). The findings thus emphasize the critical need for public health strategies aimed at early detection and timely referral to specialized renal clinics, particularly in high-risk populations such as those with hypertension and diabetes.

Also, cardiovascular complications were also strongly associated with reduced survival in the study population. The adjusted odds ratio was 0.42, with a 95% CI of [0.25–0.70] and a *p*-value of 0.001, indicating a 58% lower chance of survival among patients who developed cardiovascular events. This is consistent with the well-established role of cardiovascular disease as the leading cause of mortality in CKD patients worldwide. Otieno *et al.* (2020) observed a similar trend in Kenya, where uncontrolled hypertension and lack of routine cardiovascular screening contributed significantly to mortality in dialysis and non-dialysis CKD populations. Cardiovascular complications such as heart failure, arrhythmias, and ischemic heart disease often develop silently and may be overlooked until advanced stages, especially in low-resource settings. In contrast, Brazilian nephrology centers described by Calice-Silva *et al.* (2024) routinely implement early cardiovascular risk assessments and interventions, resulting in lower cardiovascular-related mortality. Ghana's findings emphasize the need to embed cardiovascular risk monitoring into all stages of CKD care, particularly in

patients on conservative management who may not undergo routine laboratory and imaging assessments.

Also, being employed significantly improved the chances of survival among CKD patients at the Ho Teaching Hospital. The adjusted odds ratio for employment was 2.03, with a 95% CI of [1.16–3.56], and a *p*-value of 0.013. This means that employed patients were more than twice as likely to survive compared to unemployed patients. Employment may act as a proxy indicator for economic stability, better nutrition, and improved adherence to medication and follow-up appointments. A comparable association was found by Marinho *et al.* (2019) in a study of dialysis patients in São Paulo, Brazil, where employment was strongly linked to treatment adherence, nutritional status, and reduced hospitalization rates. In Ghana, where most healthcare costs are paid out of pocket, being employed may directly influence one's ability to afford dialysis, medications, transport, and dietary modifications. The protective effect of employment supports broader advocacy for economic empowerment programs targeting chronically ill patients, as financial security is closely intertwined with health outcomes in long-term disease management.

Additionally, marital status was another significant social determinant of survival. Patients who were married had an adjusted odds ratio of 1.77 for survival, with a 95% CI of [1.05–3.01] and a *p*-value of 0.032, indicating a 77% greater likelihood of survival compared to unmarried individuals. This suggests that social support plays a crucial role in chronic disease management. Married patients may receive emotional support, assistance with transportation, medication reminders, and financial help; all of which contribute to better health outcomes. This observation aligns with findings from Lopes *et al.* (2020), who reported that married dialysis patients in Brazil had lower dropout rates, fewer missed appointments, and higher treatment adherence. In the Ghanaian setting, family support often determines whether a patient completes recommended treatments, especially where formal caregiver services are lacking.

The finding highlights the need for healthcare providers to consider social structures when planning treatment, and to integrate family counseling and support programs into CKD care models.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the concluding remarks and practical recommendations based on the findings of this study. It summarises the key results in relation to the study objectives and discusses policy, clinical, and research directions to improve the management and outcomes of CKD in Ghana.

6.1 Summary of Results

This study aimed to evaluate the patterns of disease severity, treatment modalities, and treatment outcomes among patients with CKD at the renal clinic of the Ho Teaching Hospital in the Volta Region of Ghana from 2021 to 2024. Specifically, it sought to determine the stage at which patients presented, the treatment strategies employed, and the outcomes of care provided. A total of 1,520 medical records were analyzed. The findings revealed that a majority of patients presented at an advanced stage of CKD, with 36.6% at Stage 5 and 28.4% at Stage 4, indicating a clear trend of late-stage diagnosis. Most patients exhibited clinical symptoms consistent with advanced disease, including hypertension (59.7%), fatigue (55.3%), edema (47.4%), anemia (44.1%), and respiratory distress (37.8%). Comorbid conditions were highly prevalent, particularly hypertension (83.6%) and diabetes mellitus (71.1%), while lifestyle and risk factors such as herbal medicine use (72%), NSAID consumption (88.8%), and smoking and alcohol use were common. Treatment approaches were almost evenly divided between hemodialysis (50.66%) and conservative management (49.34%), though a significant number of patients undergoing dialysis received only one session per week, raising concerns of under-dialysis. Pharmacologic management was centered on antihypertensives (100%), while less than half of patients received phosphate binders (44.6%), and only a small proportion received erythropoiesis-stimulating agents (4.67%). Regarding treatment outcomes, the majority of

patients (90.66%) survived the review period, but complications such as infections (26.5%), cardiovascular events (21.4%), and electrolyte imbalances (18.3%) were common. Logistic regression analysis further revealed that advanced CKD stage significantly reduced survival odds, with Stage 4 having an AOR of 0.59 ($p = 0.031$) and Stage 5 an AOR of 0.28 ($p = 0.002$). Cardiovascular complications also decreased survival (AOR = 0.42, $p = 0.018$), while being married (AOR = 0.50, $p = 0.007$) and being employed (AOR = 0.62, $p = 0.041$) were associated with increased likelihood of survival.

6.2 Conclusion

The burden of CKD in Ghana is not just a medical issue; it reflects deep systemic challenges in healthcare access, public education, and early detection. This study, conducted at the Ho Teaching Hospital, revealed that the majority of patients only engage with renal care services when the disease has already progressed to advanced stages. Such delayed presentations are symptomatic of broader structural gaps, including insufficient screening at the primary care level, widespread use of nephrotoxic substances such as herbal preparations and nonsteroidal anti-inflammatory drugs, and limited public awareness of CKD risk factors. Although the short-term survival rate among patients in this study was relatively high, this finding is tempered by the significant number of clinical complications and the limited availability of essential treatment modalities. Many patients did not receive the recommended frequency of dialysis, and access to supportive medications was inconsistent. The logistic regression analysis further demonstrated that survival outcomes were influenced not only by clinical stage but also by social determinants, including employment status and marital status. These results suggest that CKD in Ghana is shaped by a complex intersection of medical, economic, and social factors. Therefore, this study underscores the urgent need for a national shift in kidney care policy from late diagnosis to early screening, from fragmented services to coordinated management, and from reactive interventions to preventive strategies. CKD may progress

quietly in its early stages, but the message from these findings is clear: Ghana must act decisively to protect vulnerable populations and build a more equitable and effective system of renal care.

6.3 Recommendations

Based on the findings of this study, the following recommendations are proposed to enhance early detection, clinical management, and treatment outcomes of CKD at the Ho Teaching Hospital and similar healthcare facilities across Ghana. These actions require the collective effort of relevant stakeholders in the health sector.

1. Most patients presenting at the Ho Tertiary Hospital are in advanced disease stages. The Ghana Health Service thus ensure that kidney function tests, including serum creatinine and urine protein assessments, are incorporated into routine health screenings at all primary healthcare facilities. This is particularly important for individuals with hypertension, diabetes, or a family history of kidney disease. Early detection through regular screening will promote timely medical intervention.
2. The Ghana Health Service in partnership with local government authorities, media houses, and community-based organizations should develop and disseminate public health messages focused on CKD risk factors, early symptoms, and the dangers of self-medication with nephrotoxic substances. These campaigns should be culturally appropriate and delivered through accessible platforms such as radio, community gatherings, and social media.
3. The Government of Ghana, through the National Health Insurance Authority and the Ministry of Finance, should allocate more resources to support essential medications like phosphate binders and erythropoiesis stimulating agents should be made affordable and consistently available. Additionally, research should be conducted to evaluate the

effectiveness of the current government subsidy and find ways to improve its impact on patient survival.

4. The Ghana Health Service should develop clear national referral guidelines for CKD. District and regional health directorates should ensure that healthcare providers at lower-level facilities can identify at-risk patients and refer them promptly to specialized renal units. This will help reduce late-stage presentations and improve treatment outcomes.
5. Research institutions and universities should prioritize studies on the types of herbal medications that may contribute to or worsen CKD, given the findings that many CKD patients use herbal treatments that could be nephrotoxic. The findings should inform policy reforms and clinical practices, ensuring the safe use of herbal medicines in CKD care and raising awareness about their potential risks.

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APPENDIX A: DATA EXTRACTION FORM

SECTION A: PATIENT DEMOGRAPHIC INFORMATION

1. Age:
2. Sex:
3. Residence (Urban/Rural):
4. Occupation:
5. Marital Status:
6. Date of First Presentation at Renal Clinic:
7. Referral Source (e.g., General Practitioner, Emergency Department):
8. Comorbidities (if any):
    a. Diabetes [ ]
    b. Hypertension [ ]
    c. Cardiovascular Disease [ ]
    d. Others (specify): ……..

9. Lifestyle and Risk Factors:

a. Smoking [ ]

b. Alcohol use [ ]

c. Herbal medicine use [ ]

d. Family history of CKD [ ]

f. Physical Activity Level [ ]

h. Use of NSAIDS [ ]

i. Past Kidney Infections or Injuries [ ]

j. Others (specify): ……..

SECTION B: DISEASE SEVERITY PATTERNS

1. Date of Diagnosis of CKD: ……
2. Stage of CKD at Presentation:
    a. Stage 1 [ ]
    b. Stage 2 [ ]
    c. Stage 3 [ ]
    d. Stage 4 [ ]
    e. Stage 5 (ESRD) [ ]
3. Symptoms at Presentation:
    a. Fatigue [ ]
    b. Edema [ ]
    c. Hypertension [ ]
    d. Anemia [ ]
    e. Respiration distress [ ]
    f. Others (specify):…….
4. Hospital Admissions:
    a. Number of Admissions Since First Presentation:……..
    b. Duration of Hospital Stay (Total days):……..
5. Complications Developed (if any):
    a. Infections [ ]
    b. Cardiovascular Events [ ]
    c. Electrolyte Imbalances [ ]
    d. Others (specify):……

SECTION C: TREATMENT MODALITIES

1. Primary Treatment Modality:
    a. Hemodialysis [ ]
    b. Conservative Management [ ]
2. Frequency of Dialysis Sessions (if applicable):……..
3. Medication Regimen:
    a. Antihypertensives [ ]
    b. Erythropoiesis-Stimulating Agents [ ]
    c. Phosphate Binders [ ]
    d. Others (specify):……..
4. Dietary Recommendations Given:
    a. Low-sodium Diet [ ]
    b. Low-protein Diet [ ]
    c. Fluid Restriction [ ]
    d. Others (specify):……..

SECTION D: TREATMENT OUTCOMES

1. Survival Status:
    a. Survival [ ]
    b. Mortality [ ]

APPENDIX B: ETHICAL APPROVAL FROM ENSIGN GLOBAL UNIVERSITY

ENSIGN GLOBAL
COLLEGE

OUR REF: ENSIGN/IRB/EL/SN-272/01
YOUR REF:

January 8, 2025

INSTITUTIONAL REVIEW BOARD SECRETARIAT

Jennifer Nana-Efua Adrah
Ensign Global College
Kpong.

Dear Jennifer,

ETHICAL CLEARANCE TO UNDERTAKE POSTGRADUATE RESEARCH

At the General Research Proposals Review Meeting of the *INSTITUTIONAL REVIEW BOARD (IRB)* of Ensign Global College held on Wednesday, January 8, 2025, your research proposal entitled **"Disease Severity and Treatment Outcomes of Patients Presenting at the Renal Clinic of the Ho Teaching Hospital in the Volta Region of Ghana: A Retrospective Review (2021-2024) "** was considered.

You have been granted Ethical Clearance to collect data for the said research under academic supervision within the IRB's frameworks and guidelines.

We wish you all the best.

Sincerely,

Dr. (Mrs.) Rebecca Acquaah-Arhin
IRB Chairperson

APPENDIX C: ETHICAL APPROVAL FROM HO TEACHING HOSPITAL

In case of reply the number
And the date of this
Letter should be quoted
My Ref. No. HTH-REC/
Your Ref. No....

Our Core Values:
- Commitment
- Accountability
- Dedication
- Integrity
- Professionalism
- Innovation
- Teamwork
- Safe Care

HO TEACHING HOSPITAL
P O BOX MA-374
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Fax: +233-(036) 2027323
Email: info@hth.gov.gh
Website: www.hth.gov.gh

31st December, 2024

ETHICAL APPROVAL

Principal Investigator**: Dr. (Med) Jennifer Nana-Efua Adrah**

Protocol ID NO**: HTH-REC (45) FC_2024**

Protocol Title: **"Disease Severity and Treatment Outcomes of Patients Presenting at The Renal Clinic of The Ho Teaching Hospital in The Volta Region of Ghana: A Retrospective Review (2021-2024)."**

The Ho Teaching Hospital Research Ethics Committee upon considering the ethical merits has approved your proposal. This approval requires that you fulfil the following conditions.

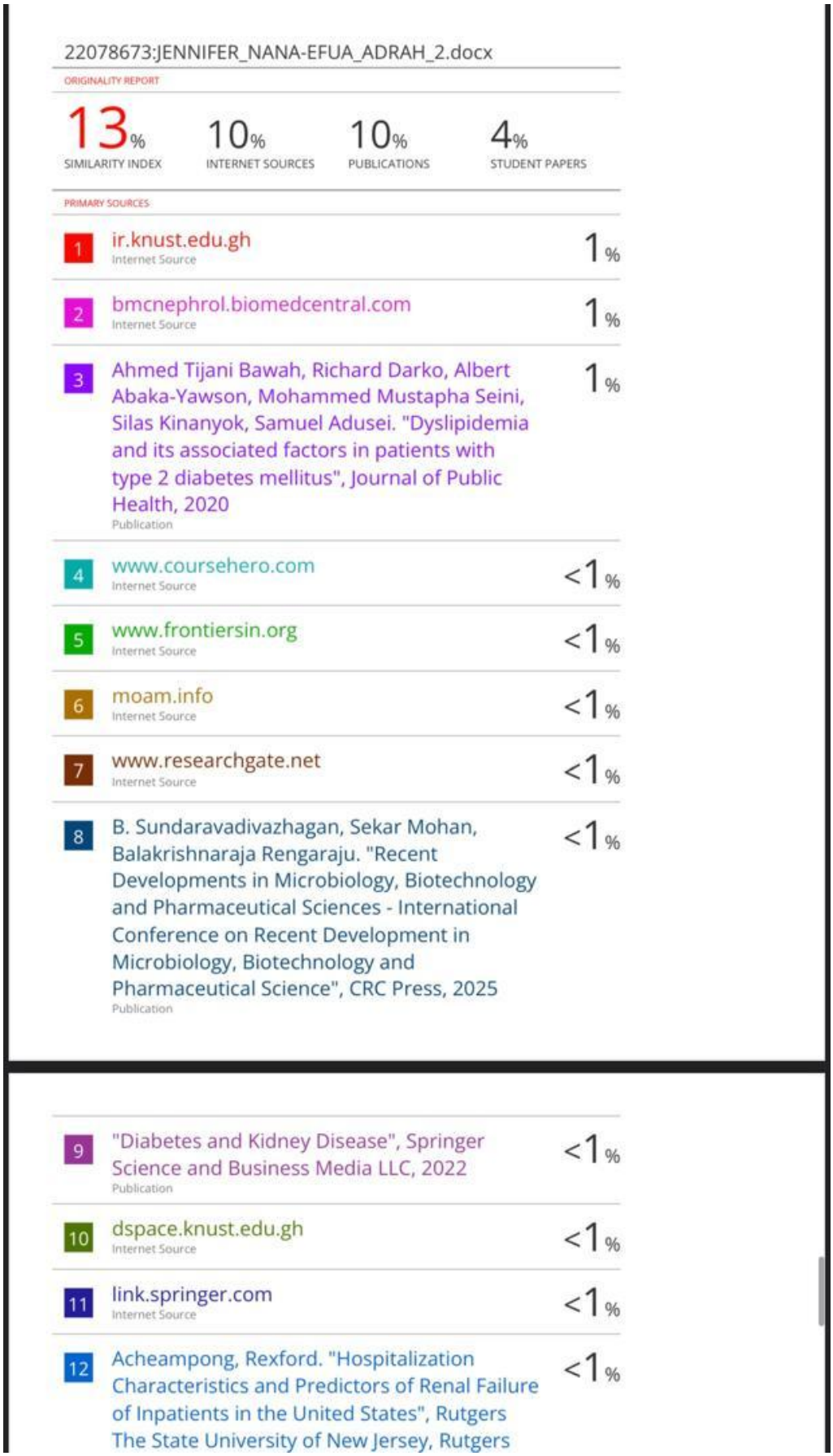
- Submit periodic progress report during field work and submit final or study closure report to the HTH-REC.
- The HTH-REC may perform periodic monitoring and evaluation to ensure compliance with the protocol as approved.
- You are to report adverse event related to this study verbally within one week and in writing within two weeks.
- Any significant protocol amendment must be resubmitted to the committee for approval before implementation.
- You are required to notify the committee before publishing any research finding related to this study.

This approval is valid until **30th December, 2025** after which you have to apply for renewal. Please quote protocol identification number in future correspondence related to this protocol.

Rev. Dr. S.T.K. Dzokoto
Chairman
Ho Teaching Hospital Research Ethics Committee (HTH-REC)

Research Ethics Committee (REC)
Ho Teaching Hospital,
P.O. Box MA 374, HO, Ghana
Tel: 233-37-200-0180. Email: info@hth.gov.gh

APPENDIX D: PLAGIARISM SCORE



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