KIBOGORA POLYTECHNIC

FACULTY OF HEALTH SCIENCE

DEPARTMENT OF BIOMEDICAL LABORATRORY SCIENCES

PREVALENCE OF RENAL FAILURE AND ASSOCIATED RISK FACTORS AMONG HIV PATIENTS ATTENDING KIBOGORA DISTRICT HOSPITAL

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Undergraduate thesis presented in partial fulfillment of the requirements for the Bachelor's degree with honor in biomedical laboratory sciences.

PAPER PREPARED BY:

IRIBAGIZA MARIE CHRISTINE

REG N^{O}: 1800006

MUTESI MARIE JEANNE

REG N$^{o:}$ 1800045

SUPERVISOR:

Mr. HITAYEZU ELYSEE (MSc, MBC)

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DECLARATION

Declaration by the Candidate

We, IRIBAGIZA MARIE CHRISTINE and MUTESI MARIE JEANNE hereby declare that this is our own original work and not a duplication of any similar academic work. It has therefore not been previously or concurrently submitted for any other degree, diploma or other qualification to Kibogora Polytechnic or any other institution. All materials cited in this paper which are not my own have been duly acknowledged.

IRIBAGIZA MARIE CHRISTINE

Signed……..

Date…….

MUTESI MARIE JEANNE

Signed…….

Date…….

Declaration by the Supervisor

I declare that this work has been submitted for examination with my approval as KP Supervisor

Supervisor's name: …….

Signed……..

Date……..

ABSTRACT

This study is entitled “Prevalence of renal failure and associated risk factors among HIV-infected patients that attended Kibogora District Hospital”. HIV is a virus that affects the many organs of the human body with inclusion of the kidney as part the organs system that gets affected. Kidney being an essential organ in performing different functions like electrolyte and volume regulation, excretion of nitrogenous waste and elimination of exogenous molecules . Renal failure among HIV-infected patients is greater in these individuals than the uninfected individuals as their immune system is weakened by this viral infection through treatment-related toxicity due to use HAART regimens. The aim of our study was to assess the prevalence of renal failure, associated risk factors and the major group of individuals affected in KDH.This retrospective cross-sectional study was conducted at Kibogora District Hospital with a quantitative and qualitative research approach being applied using systematic sampling method that was used to assign the study participants from a target population of 315 participants under HAART based on the inclusion and exclusion criteria on the data collection sheet were entered and analyzed into the SPSS version 16. Variables were analyzed using Generalized Linear Model and Chi-square tests for descriptive statistics with the P-value ≤ 0.05.Among 315 of the total population, 176 of the participants were our sample size.Within 176 participants who were on HAART, 75% (51.70% were female and 23.30% were male) had renal failure. Variables such as age, gender considered as social-demographic factors and HAART regimen given to them show statistical association to renal failure with P-value of 0.000 while others like diabetes mellitus p value(X^2=.298), hypertension p value(X^2=.501) and Hepatitis B p value (X^2=.677) & C co infection p value(X^2=.736) whose p values are > than 0.05 showed no association with renal failure among the participants under the study. We conclude that renal failure among HIV-infected patients is not uncommon and its prevalence is high. Risk factors of age, gender and HAART drug regimen showed association with renal failure while hypertension, diabetes mellitus and HBV and HCV didn’t show association thus recommending of broadening of the knowledge regarding the disease and close monitoring of these HAART regimens due to their related toxicity to kidneys.

DEDICATION

Our dedication goes to the Almighty God for blessing us with the knowledge to learn and acquire the skills we needed for our studies.

We are thankfully dedicating this to our parents who always gave us their love and support through our entire learning as well as friends and relatives.

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ABBREVIATIONS AND ACRONYMS

HIV: Human Immuno Deficiency Virus

PLHIV: People Live with HIV

ESRD: End Stage Renal Disease

AIDS: Acquired Immune Deficiency Syndrome

GFR: Glomerular Filtrate Rate

MDRD: Modification of Diet in Renal Disease

CKD: ChronicKidney Disease

CKD_EPI: Chronic Kidney Disease Epidemiology Collaboration

HCV: Hepatitis C Virus

HBV: Hepatitis B virus

AKI: Acute Kidney Injury

ARF: Acute Renal Failure

eGFR: Estimated Glomerular Filtrate Rate

TDF: Tenofovir Disoproxil Fumarate

ESKD: End Stage Kidney Disease

KDH: Kibogora District Hospital

ART: Antiretroviral Therapy

ARV: Antiretroviral

HIVAN: HIV-Associated Nephropathy

KDIGO: Kidney Diseases Improvement Global Outcomes

SPSS: Statistical Package for the Social Sciences

DM: Diabetes Mellitus

CrCl: Creatinine Clearance

HAART: Highly Active Antiretroviral Therapy

SSA: Sub-Saharan Africa

SCr: Serum creatinine

ABC: Abacavir

AZT: Zidovudine

CHAPTER ONE: GENERAL INTRODUCTION

1.0. INTRODUCTION

This chapter contains background of the study, problem statement, objectives of the study including general and specific objectives, the significance of the study and scope of the study.

1.1. BACKGROUND OF THE STUDY

Human Immunodeficiency virus (HIV) is aretrovirus that weakens the immune system of the body thus making the host susceptible to many infections if not treated though it can't be cured, due to this reason it has become a major public health problem worldwide that needs the close monitoring of the epidemic and newly periodic interventions to fight against it (WHO, 2021).

People living with HIV globally were estimated to be about 37.9 million by 2018, of which 20.6 million were in eastern and South Africa. In Tanzania, around 1.4 million people were infected with HIV by 2019. In Rwanda 2020, people living with HIV (PLHIV) were estimated to be 227,904. An interrelation between HIV and renal diseases was first discovered and reported in 1984 with individuals that are HIV-infected and presented nephrotic range proteinuria and progressing to End-Stage Renal Diseases within 8 to 16 weeks.(June, 2009)PLHIV are at risk of developing renal dysfunction, this may be due to HIV infection especially poor viral suppression, antiretroviral toxicity and other risk factors including old age, female sex, diabetes, hypertension, injection drugs, smoking and previous renal insults such as acute kidney injury. The burden renal dysfunction among HIV patient differs across the globe; various studies conducted in Sub-Saharan Africa using different methods to define kidney disorders have reported a wide spectrum of prevalence rates ranging from 6% to 76%(Mwemezi, 2020).

Renal diseases is becoming an increasingly prevalent entity in human immunodeficiency virus(HIV)-infected patients, it occurs in variety of clinical settings and is associated with histopathological changes. HIV - related renal impairment can present as acute or chronic kidney disease; it can be caused directly or indirectly by HIV and /or by drug - related effects that are directly nephrotoxic or lead to changes in renal function by inducing metabolic vaculopathy and renal damage(Schmid, 2006).

Among HIV-infected population it is a well-known fact that the risk of kidney diseases is greater than in the general population. It is associated with poor outcomes which includes; increased morbidities and risk of death therefore this why it is necessary for early diagnosis and regular monitoring for renal impairment or failure in HIV- positive patients for better prognosis, effective medication dosing and treatment(Bilisumamulifina, 2021).

Proteinuria and elevated creatinine level has been found in 7.2% to 32% of HIV-seropositive patients and were associated with an increased rate of death in a study of 2038 female HIV-infected patients. Proteinuria still remains a nonspecific finding in HIV-infected patients. Autopsy studies yield up to 43% of pathological changes on histological examination(Schmid, 2006).

Also, a higher baseline HIV viral load (>4000copies/ml)and low baseline CD4+T-cell count (<200cells/uL) have been associated with decreased renal function in HIV-positive subjects. Kidney disease as a common complication of HIV infection moreover has been associated with a faster progression to AIDS and death(De Rosa, 2017).

For most part a personal history of kidney disease, female gender, longer period on ART, dehydration, opportunistic disease, aging non-communicable diseases such as hypertension and diabetes are factors which increase the risk for renal function impairment in HIV- positive patients and by recognizing these common risk factors for renal failure in PLWHIV is important to guide efforts that are aimed its prevention and early diagnosis(Bilisumamulifina, 2021).

In the study done in Rwanda,through the available data taken among 891 non-pregnant women,they found a decreased eGFR<60mL/min/1.73m^2 of 2.4% using MDRD formula and 8.7% of proteinuria of >1+. This proved that HIV infection was associated with decreased MDRD eGFR then(Christina, 2011).

Thus, our study aims to know the prevalence of renal failure and identify risk factors associated in HIV-infected patients of Kibogora District Hospital.

1.2 PROBLEM STATEMENT

Renal failure related to HIV infections is a fatal cause of reduced survival rates in the infected individuals thus raises concerns for the patients and people worldwide whether infected or not. A global prevalence of 6.4% and 4.8% of CKD (Chronic Kidney Disease) using Modification of Diet in Renal Disease (MDRD) and Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formulas respectively, has been reported in a systemic review of studies in 60 countries worldwide; however, Africa had shown the highest prevalence of CKD indicated by a 7.9% according to MDRD formula(Heron, 2020).

Some of the European countries such as Argentina and Israel, prevalence of CKD was 4.7% using MDRD formula to estimate GFR, from Hong Kong the prevalence was 18%with inclusion of proteinuria for 3 months as element of CKD. In sub-Saharan Africa, screening studies performed had a wide prevalence report that ranged between 6% and 45% of kidney disease in HIV patients. Kidney disease in these studies was defined as presence of albuminuria and low estimated GFR (based on serum creatinine measurements).Precisely kidney diseases in HIV-infected patients has spread wide and far that even in East Africa had prevalence report that needs careful considerations. Some of the reports made showed Uganda with 20-48%, Tanzania with 28%, Kenya with 25% and Burundi with45.7%(June, 2009).

A well characterized cohort study in Rwandan women showed prevalence of decreased eGFR among HIV-infected women was lower than that previously reported in African-Americans and in other Central and East African HIV populations with substantial variability depending on the equation used to estimate GFR. Using MDRD formula, 2.4% had an eGFR<60ml/min/1.73m^{2}and 8.7% had proteinuria > 1+ among 891non-pregnant women with available data. The study helped to know that HIV infection was associated with higher odds of decreased MDRD eGFR but not proteinuria(Christina, 2011).

Referring to the previous studies,it encourages us to study the prevalence of renal failure and its associated risk factors in HIV- infected patients attending Kibogora District Hospital.

1.3 OBJECTIVES OF THE STUDY

1.3.1 GENERAL OBJECTIVE

The general objective of this study was to determine the prevalence of renal failureand risk factors associated among HIV patients attending Kibogora District Hospital.

1.3.2 SPECIFIC OBJECTIVES

I. To determine the prevalenceof renal failure among HIV patients attending Kibogora District Hospital.
II. To identify the risk factors associated with renal failure among HIV patients attending Kibogora District Hospital.

1.4 RESEARCH QUESTIONS

i. What is the rate of renal failure among HIV patients attending Kibogora Hospital?
ii. What are the risk factors associated with renal failure among HIV patients attending Kibogora District Hospital?

1.5 SIGNIFICANCE OF THE STUDY

On a personal level,this study has been helpful in acquiring more knowledge of this fatal disease and understanding better while getting skills in conducting research.

At a scientific level, this study will help in increasing awareness of renal failure condition among HIV patients and more information about the condition can be generated hence possible preventable measures as well as careful precautions can be taken against it.Inaddition, this study will help in developing strategies in monitoring the HIV infected patients with this condition.

1.6 LIMITATION OF THE STUDY

Some of the difficulties we encountered during the research study include insufficient computer skills, highcost of travelling to the site of data collection due to the COVID-19 pandemic and few cases information about renal failure among HIV within the country.

1.7 SCOPE OF THE STUDY

This study has identified content, time and geographical scope.

1.7.1 Time Scope

This study has been carried out in focus to the prevalence of renal failure and associated risk factors among HIV patients at Kibogora District Hospital in a timeframe of four months.

1.7.2 Content Scope

This study has been conducted in Kibogora District Hospital in Nyamasheke district. The research seeks to know the prevalence of renal failure among HIV patients attending Kibogora District Hospital.

1.7.3 Geographical Scope

The study has been carried out in the ARV service in Kibogora District Hospital, found in Western province, in Nyamasheke District of Kanjongo Sector, Kibogora cell.

CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

This section deals with the analysis of existing literature related to the prevalence and risk factors of the renal failure in HIV positive individuals, pathophysiology, epidemiology, geographical distribution, effects of ART regimens on kidneys and the ramifications found in these patients.

2.1. Definition of key concepts/terms

Prevalence: The proportion of individuals in population having a disease or characteristic .prevalence is a statistical concept referring to the number of cases of a disease that are present in a particular population at given time ,whereas incidence refers to the number of new cases that develop in a given period of time (Melissa, 2021).

Risk Factor: Occurrence or characteristic that has been associated with the increased rate of subsequently occurring disease or an attribute, characteristics or exposures that increase the likelihood of a person developing a disease or health disorder (AIHW, 2017).

HIV: stands for Human Immunodeficiency Virus,HIV is a lentivirus (literally meaning "slow virus"; a member of the retrovirus family) that slowly attacks and destroys the immune system, the body's defense against infection, leaving an individual vulnerable to a variety of other infections and certain malignancies that eventually cause death. AIDS is the final stage of HIV infection, during which time fatal infections and cancers frequently arise (Rogers, 2012).

eGFR: Estimated Glomerular Filtration rate is a test that provides glomerular filtration rate which reflects how well the kidneys are filtering the blood and is represented in milliliters per minute.(ml/min) the result is often listed as milliliters per minute per 1.73 square meters of body surface area (ml/min/1.73m^2) (Niddk, 2020).

AKI/ARF: Acute Kidney Injury (AKI) previously called acute renal failure (ARF), denotes a sudden and often reversible reduction in kidney function as measured by glomerular filtration rate (GFR).It is denoted by an increase in serum creatinine of 0.5 mg/dl or greater(Mehta, 2003).

CKD/CRF: Chronic Kidney Disease (CKD) or Chronic Renal Failure is defined as persistentimpairment of kidney function, in other words abnormally elevated serum creatinine

for more than 3 months or calculated glomerular filtrate (GFR) less than 60 ml/min/1.73 m^2(Bindoroo, 2018) .

Vascularitis: it is the inflammation of blood vessels. Mostly is any infection related injury ranging from a minor problem that affects the skin to a more serious diseases that causes problems with organs such as liver or kidneys (NHS, 2019).

Glomerulosclerosis: refers to the scarring that occurs in the tiny blood vessels in the kidneys known as glomeruli with the most known characteristic of proteinuria and sometimes severe proteinuria could lead to end stage renal disease (ESRD)(Hopkins, 2021).

ESRD/ESKD: End-Stage Renal Disease (ESRD) also known as End-Stage Kidney Disease (ESKD) is defined as irreversible decline in a person's own kidney function, which is severe enough to be fatal in the absence of dialysis or transplantation. It is included under 5 of the National Kidney Foundation Disease outcomes Quality Initiative classification of CKD where it refers to individuals with estimated glomerular filtrate rate less than 15ml/1.73m^2or those requiring dialysis irrespective of glomerular filtration rate(Maaz, 2009).

TDF: Tenofovir Disoproxil Fumarate is a widely used antiretroviral drug agent given to HIV-infected patients generally safe and well tolerated but has important potential for cumulative nephrotoxicity(Cheung, 2018).

Arterionephrosclerosis: it is defined as the sclerosis of the renal arterioles and small arteries, particularly the afferent arterioles due to hypertension(Sangle, 2021).

2.2.OVERVIEW OF RENAL FAILURE

2.2.1. Introduction

The term renal failure denotes the inability of the kidney to perform excretory function leading to retention of nitrogenous waste products from the blood.Acute and chronic renal failures are two kinds of kidney failure.

Acute Renal Failure is the syndrome in which glomerular filtration declines abruptly (hours to days) and is usually reversible .according to KDIGO criteria in 2012, AKI can be diagnosed with any of the following :(1) creatinine increase in of 0.3 mg/dl in 48 hours, (2) creatinine increase to 1.5 times baseline within last 7 days, or (3) urine volume less than 0.5 ml/kg per hour for 6 hours. Recently the term acute kidney injury (AKI) has replaced ARF because AKI denotes the entire clinical spectrum from mild increase in serum creatinine to overt renal failure(Bindoroo, 2018).

Chronic Renal Failure (CRF) or Chronic kidney diseases is defined as persistent impairment of kidney function, in other words abnormally elevated serum creatinine for more than 3 months or calculated glomerular filtrate (GFR) less than 60 ml per min/1.73m^2. It often involves a progressive loss of kidney function necessitating renal replacement therapy (dialysis or transplantation). When a patient needs renal replacement therapy, the condition is called end-stage renal disease(Bindoroo, 2018).

2.2.2. Etiology

With the focus mainly on chronic renal failure, the etiology of AKI account for some factors such as (1)prerenal: hypotension, volume contaction (sepsis),severe organ failure e.g. liver failure (2) intrarenal: acute tubule necrosis(nephrotoxic substances) connective tissue disorders(vascularitis)fat emboli, (3)postrenal: extrinsic compression (carcinoma), intrinsic obstruction (tumor, clot) and decreased function like nerogenic bladder.For Chronic Renal Failure, there are; Diabetes mellitus, especially type 2 DM, is the most frequent cause of ESRD. Hypertension is the second most frequent cause. Others are Glomerulonephritis, Polycystic kidney diseases, Renal vascular diseases, Pyelonephritis and unknown etiology(Bindoroo, 2018).

2.2.3. Pathophysiology

An estimated rate of blood flow of 400ml/100g of tissue per minute is much greater than other well perfused vascular beds such as heart, liver and brain thus leads renal tissue exposed to significant quantity of potentially harmful circulating agents or substances as a consequences. Brenner and coworkers identified glomerular hypertension and hyperfiltration as major contributors to progression of chronic renal failure since glomerular capillaries are rendered vulnerable to hemodynamic injury due to high intra-transglomerular pressure. Also glomerular filtration membrane is with negatively charged molecules hence serving as barrier to anionic

macromolecules, any disruption to the barrier seen in glomerular injury cases causes plasma proteins to gain access to glomerular filtrate. Even the sequential organization of nephron's microvasculature (glomerular convoluture and pertubular capillary network) and the down position of tubuli with respect to glomeruli not only maintains glomerular tubular balance but also facilitates the spreading of glomerular injury to tubulointerstial compartment in disease, exposing the tubular epithelial cells to abnormal filtrate. Thus, nephron as a function of unit not only applies to renal physiology but also to pathophysiology of renal diseases. By regarding glomerulus itself as functional unit with each of its individual constituents; visceral, endothelial, parietal epithelial cells- podocytes and their extracellular matrix as integral part of normal function whereby damage to one part affect the other through different mechanism, direct cell-cell connections(e.g. gap junctions)(Mirjana, 2009).

The main cause of renal injury are based on immunologic reactions (initiated by immune complexes or immune cells), tissue hypoxia and ischemia, exogenic agents like drugs, endogenous substances like glucose or paraproteins and others and also genetic defects. Irrespective of the underlying cause glomerulosclerosis and tubulointerstitial fibrosis are common to CKD(Mirjana, 2009).

2.3. LITERATURE RELATED TO THE FIRST OBJECTIVE

In the first objective, the problem being studied is the prevalence of renal failure among HIV patients. Globally, different studies have been conducted with different criteria and different rates of prevalence were reported like in North-America it was found to be 6.5%, South-America had 6.2% and in Europe it was 2.7%. In SSA, the prevalence of renal failure in PLWHIV was reported to be from 25%-77%. From the study done in Cameroon,the prevalence of Chronic Kidney disease was reported to range from 10.8% to 13.5% in HIV patients(Halle, 2019).

Some prospective studies that were conducted and reported prevalence ranging from 4% to 17.0% of renal failure in HIV- infected patients from the analysis of done by Phillipe. (Philippe, 2011)It is reported that 7.2 to 13.2% of the study on 2038 female infected patients had proteinuria and increased creatinine levels. Other single-center screening studies with small number of participants used persistent proteinuria as marker for CKD reported prevalence of 1.1-5.5% in Brazil, 18% in Switzerland, 27% in India and 20% in Iran(Jotwani, 2017).

According to a cross –sectional study investigated among 4337 adult patients infected with HIV-1 taking antiretroviral treatment with at least two creatinine measurements,the rate of prevalence of mild reduced renal function was reported to be 25%.(Cristelli, 2018)Even in African, from six centers of four African countries with 8000 participants, the overall prevalence of CKD was 10.7% from the age of 40-60 years (Tandi, 2019).

2.5. LITERATURE RELATED TO THE SECOND OBJECTIVE

From the study done to investigate the severe renal function in previously untreated HIV-infected patients with CD4 cell count of <200cells/mm^3 who were on antiretroviral therapy in Africa and the results of the study found that 65% were female participants, the baseline for age was 37.there was mild to moderate renal impairment with association of the ART regimen given to them, those given zidovudine-lamivudine plus Tenofovir Disoproxil Fumarate yielded 74% from the patients,nevirapine 16% and Abacavir 9% which were given as the ART regimen in the first line(Andrew, 2008).

Another study of 352 HIV-infected participants from South-West Ethiopia discovered that the prevalence of renal function impairment was 20.7% within 73 patients with associated risk factors such as cigarette smoking, hypertension, diabetes mellitus and low CD4 count. Also the study had 56.2% of the participants were female and the mean age of the study participants was 43.42 years. Among the participants 333 (89.4%) who were on ART were receiving first line regimen that includes a combination of Tenofovir (TDF)(Bilisumamulifina, 2021).

From the studies done above, it is a common factor that risk factors such as age, female gender, hypertension, diabetes mellitus and ART regimens given to the patients were associated with renal dysfunction among HIV –infected patients.

The majority group of individuals affected by renal failure with HIV- infection based on sex is female43.1% with median age of 40 years with the patients above or equal to 40 years old having higher prevalence rate of 53.5% than the patients participants of less than 40 years old that had rate of 43.3% from the study of 5604 patients with 41.8% having renal disease(Sabi, 2019).

In a study that was conducted in Northern Uganda that enrolled 361 participants, 63.7% were female while the rest were men with mean ± Standard deviation age of 31.4± 9.5years whereby 14.4% had impaired renal function, 71.2% had moderate renal impairment while 28.8% had

severe renal impairment by determined using eGFR by CKD-EPI formula in the whole study. This study shows that the participation of women are high than men and most participants within the fourth decade and more of aging likely are diagnosed with renal failure(Odongo, 2015).

2.7. BIOLOGICAL MEASUREMENT USED IN RENAL FAILURE

Renal failure is diagnosed with different parameters but the most common used measurement is evaluation of serum creatinine levels. Mostly HIV- uninfected patients of renal failure are asymptomatic and are discovered incidentally while studying their creatinine levels that in most cases are elevated, urine studies that have proteinuria and hematuria and radiological imaging of the kidneys(Hassan, 2021).

Laboratory tests required for screening of renal failure include;

2.7.1. Serum Creatinine Test.

Creatinine is a chemical waste molecule that is generated from muscle metabolism from creatine transported through the blood stream to the kidneys. A rise of creatinine is an indicator of kidney impairment. The normal range of serum creatinine for adult men is 0.7- 1.3 mg/dl while the normal range of serum creatinine for adult women is 0.6 – 1.1 mg/dl(Metropolis , 2021).

2.7.2. Creatinine clearance.

Is the volume of blood plasma cleared of creatinine per unit time and it is a rapid and cost-effective method for the measurement of renal function. Both CrCl (creatinine clearance) and GFR (Glomerular Filtration Rate) can be measured using values of blood or urine creatinine. The calculation of GFR can be approximately rate through the CrCl since the glomerulus freely filters creatinine but also it is secreted by peritubular capillaries, causing CrClto overestimate the GFR by approximately 10% to 20% but despite this margin error it is still an accepted method for estimating GFR(Hassan, 2021).

Impaired renal function is most common with TDF regimen thus when prescribing it one needs to calculate the Creatinine Clearance, the formula used is Cockcroft-Gault one which is stated as follows;

$$\boldsymbol{CrCl = \frac{(140 - age)X\ weight(kg)}{72Xcreatinine(\frac{mg}{dl})} X0.85\ for\ a\ woman}$$

For male, there is no multiplication of 0.85. The normal creatinine clearance should ≥90ml per minute. Interpretation is as follows;Normal= ≥ 90 ml/ min, Mild renal insufficiency= 60-89 ml/min, Moderate renal insufficiency= 30-59 ml/min and severe renal insufficiency=≤ 29 ml/min (MOH, 2011).

2.8. EPIDEMIOLOGY

According to the Third National Health and Nutrition Examination Survey (NHANES III) there is almost 2 million people in the US having a serum creatinine level of 2mg/dl or greater for the incidence and prevalence of CRF are uncertain. CRF is known to be of high prevalence among men than in women. An estimation of 209 patients per million populations per year has been surveyed as incidence with 36% of patients requiring renal therapy(Pedro, 2016).

Longitudinal studies reported incidence of the kidney function decline among HIV patients ranges from 3.3 to 11.2 per 1000 person- years and cross- sectional studies had the prevalence of declining kidney function ranges from 4%to 17% in different populations and recently the EuroSIDA study reported that only 0.64% of 9044 patients developed advanced CKD/ESR/renal death during a median follow-up of 5.0years with an incidence rate of 1.32 per 1000 person-years follow-up, also as per the Spanish EPIRCE study, the prevalence of CKD in the general population has been reported to be close to 10%(Pedro, 2016).

2.9. RENAL FAILURE CO-EXISTENCE IN HIV PATIENTS

Worldwide an estimated 37 million people are living with HIV infection and more than 2 million new infections are diagnosed annually.HIV- positive individuals are at increased risk for variety of renal disorders including acute kidney injury (AKI), HIV-associated nephropathy (HIVAN), comorbid Chronic Kidney disease (CKD) and treatment – related kidney toxicity(Jotwani, 2017).

Due to use antiretroviral therapy (ARV) HIVAN, classical kidney disease of HIV infection has become less common however prevalence of other kidney disease has increased even if combined ART is effective its long-term use has been linked to increased risk for focal segmental glomerulosclerosis, arterionephrosclerosis and diabetic nephropathy(Schmid, 2006).

In December 2018, it was reported that in 1024 patients on ARV of which 88.2% used TDF containing regimen and 98%of new patients received ARV with TDF+3TC+EFV regimen, however TDF induced nephrotoxicity. Caseshave reported approximately 41% of patients with 10 years of TDF based regimen with acute kidney injury and chronic kidney injury diseases occurring during treatment(Cuong, 2020).

2.10. EFFECTS OF ART DRUG REGIMEN ON HIV- INFECTED PATIENTS

Antiretroviral Therapy or treatments are combinations of drugs given to HIV-infected patients and TDF being in the first line regimen of HIV infection that is currently used worldwide and approximately in half of all ART regimens as well as a part of post-exposure prophylaxis. High risk of tenofovir- induced toxicity has been linked with factors such as older age, less CD4 count and comorbidities. This is evident in the retrospective study done in 1647 ARV-naïve patients that found a steeper decrease in eGFR in patients on tenofovir-containing in comparison with tenofovir-sparing. It is known that the first case published of acute tubular toxicity due to TDF consisted of both proximal tubular injury with ARF and distal tubular injury. This is seen in the study of 324 ARV naïve-patients that found a greater incidence of proximal tubular dysfunction and greater decline in eGFR over 2 years in tenofovir- treated patients (Scherzer, 2013).

Despite the fact that TDF is a safe drug in HIV-infected patients with a post- marketing survey of 10343 patients that showed renal side effects in only 0.05% of the patients cases reporting proximal tubular dysfunction and ARF surfaced. It was also observed in multiple observational cohorts' studies that showed association of TDF usage with decreased eGFR and development of Chronic Kidney Disease. This pathology occurs may be due to apoptosis of tubular cells and inhibition of mitochondrial DNA replication in proximal tubular cells hence the pathogenesis of TDF-induced nephropathy (Waheed, 2015).

It was studied in a meta-analysis that the risk for ARF was 0.7% higher in TDF-treated patients than in patients receiving combined antiretroviral treatment excluding TDF from 7496 patients in eight studies that were done while also a Brazilian transversal study showed that the prevalence of CKD was 8% in TDF-treated patients who had 2.25 times higher risk of developing CKD than non-TDF treated patients which was conducted with 213 patients that were consecutively recruited in over a 6 month period(Scherzer, 2013).

Some reports have been made that Zidovudine or Efavirenzassociated with kidney stones showing that it could be a rare side effect of drug on the kidneys. A case study done on a 23 year old black male that had *pneumocystis canii*with blood urea nitrogen of 38mg/dl and creatinine was 3.8 mg/dl. With a renal ultrasound that revealed hyperechogenic kidneys and HIV-associated nephropathy that was diagnosed. He was started on zidovudine and after five months his serum creatinine level was 1.9mg/dl later due to clinical course he had renal biopsy whereby it showed focal segmental glomerulosclerosis as well as secondary pancytopenia due to zidovudine, the dose give was reduced. Its effects are still less known (Cook, 2001).

2.11.GEOGRAPHICAL DISTRIBUTION

The global burden of CKD in HIV population remains difficult to estimate due to differences in the studied populations, historic periods, settings and also the estimated glomerular filtration rate equations used.The reported difference of CKD (GFR<60ml/min/1.73m^2) among HIV – infected persons in North America and Europe ranges from 4.7 to 9.7% but was high as 33% when defined by either reduced GFR or pathological proteinuria(Schmid, 2006).

A single center cross sectional study determined the prevalence and factors associated with chronic kidney disease (CKD) and end- stage renal disease (ESRD) in HIV-1 infected Asian patients at the largest HIV clinic in Japan. The prevalence of CKD WAS 18.6% for age 50-59, 28.5% for age 60-69 and 47% for over 70 of age(Takeshi, 2017).

A Study in Brazil have reported CKD prevalence rates from 3.8% to 8.4% while a prospective Portuguese study had the prevalence of 5.9% in a cohort of 1281 patients using creatinine (Scr) based Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation to estimate GFR(Pedro, 2016).

In HIV- infected African populations the reported prevalence of CKD ranges between 3.5% and 48.5%. Also the sub-group analysis identified difference in prevalence by WHO regions with Africa having the highest MDRD-based prevalence at 7.9% and the highest was in West Africa 14.6% and the lowest in Southern Africa at 3.2% (PMC5901989).

2.12. RAMIFICATIONS OF RENAL FAILURE IN HIV PATIENTS

CKD is a non-communicable disease that goes along with the aging process and with inclusion of HIV –positive individuals. Among HIV- positive individuals in NORTH America CKD

incidences increases by 11 fold among those ages 60-69 years compared to those ages <40 years. CKD incidences are disproportionately high in blacks versus non-blacks and this disparity extends to ESR incidence trends. A good example is North America still, having declined ESRD incidence but the HIV- positive nonblack present lower ESRD incidence compared to theHIV-positive blacks. Comorbid conditions such as diabetes as well as nephrotoxicity from ART has been associated with several forms of kidney disorders as well as increased CKD risk which may extend to kidney transplantation therapy or dialysis therapy which are also costly(Jotwani, 2017).

In the setting of HIV infection both the HIV –related and traditional risk factors influence CKD development and progression, particularly hypertension and diabetes are of increasing concern worldwide. Co-infections associated like HBV and HCV pertake 2to 3 fold increased risk to progressive CKD while severe AKI gets 3.8 to 20 fold increased risk to ESKD(Cheung, 2018).

2.13. RESEARCH GAP

This is topic or area whereby missing pieces or insufficient information limits found in the existing literature and those areas are still underexplored. This includes;

i. Littleinformation regarding some the hereditary and acquired disorders regarding renal failure.
ii. Histopathological examination cases of HIV- infected patients with kidney disease or failure were inadequate.

2.14. CONCEPTUAL FRAMEWORK

Among HIV patientsrenal failure as a dependent variable is in relationship with diabetes, hypertension, age and ART drug usage as causing factors that contribute to its etiological spreading in these patients. Other determinants which can influence this fatal disease are social economic status, traditional herbal medicine usage and Hepatitis B and C co- infections(Cheung, 2018)

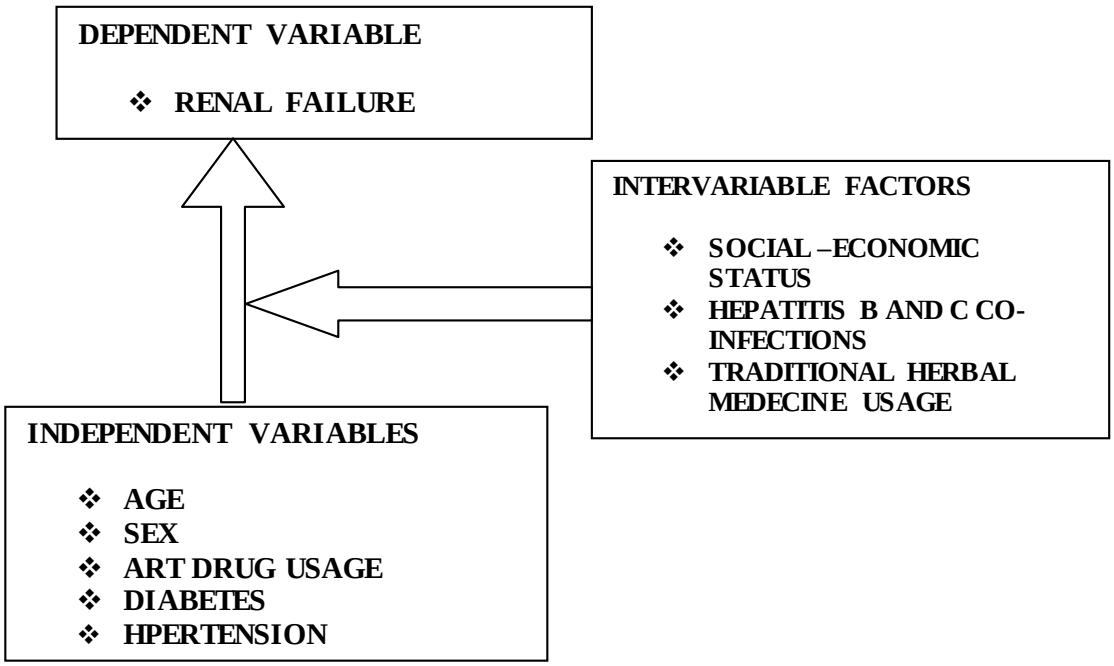

Figure 1 Conceptual framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 INTRODUCTION

This chapter included the research methods which have been used, research approach ,study design, population, sample procedures, research tools and data collection, data collection procedures,data analysis, reliability and validity measurements.

3.1. STUDY AREA

The study has been carried out in laboratory department of Kibogora District Hospital, section ARV. The hospital is localized in Nyamasheke district, Kanjongo sector and Kibogora cell.

3.2. RESEARCH APPROACH AND STUDY DESIGN

In this study we used a quantitative approach. A quantitative approach is a research strategy that focuses on quantifying the collected and analysis of data. We are interested by this approach because we want to quantify the data collected during this research and presenting it in frequencies and percentages. An institutional study has been conducted at Kibogora District Hospital.

A retrospective cross - sectional study has been employed to determine the prevalence of renal failure among HIV patients and was done in a period of 4 months from May to September, 2021.

3.3. TARGET POPULATION

The study has targeted on HIV patients and also tested for creatinine biochemical test who have been enrolled in Kibogora District Hospital, females and males, in-patients or out-patients under antiretroviral therapy. The target population was 315 participants.

3.4. SAMPLE SIZE

The sample size has been calculated using this Slovin's formula;

$$\boldsymbol{n = \frac{N}{1 + (Ne^2)}}$$

Where **n** is sample size; **N** is target population; **e** is margin error 0.05

So the sample size will be;

$$\boldsymbol{n = \frac{315}{1 + (315 * 0.05^2)}}$$

$$n = \frac{315}{1 + (315 * 0.0025)}$$

$$n = \frac{315}{1.7875}$$

$$n = 176$$

3.4.1. Sampling strategy

It has been done by collecting data of all HIV patients attending Kibogora District Hospital in February 2020 to March 2021using systematic sampling technique.

3.4.1.1 Sampling procedure

In order to choose the sample in our study we used systematic sampling method from a 315 target population that we had.Systematic sampling method is a statistical technique that applies probability sampling method whereby the researcher chooses elements from a target population by selecting a random starting point and selects sample members after a fixed sample interval. In our case study, the sample we got was 176 samples when we applied sampling interval of 2 participants from target population we used.

3.4.2. Inclusion criteria

Inclusion criteria used is based on everyone who suffer from Human Immunodeficiency Virus (HIV) that took creatinine testand who attended Kibogora District Hospital.

3.4.3. Exclusion criteria

The exclusion criteria is based on everyone either HIV-uninfected or infected and did not take creatinine test from Kibogora District Hospital.

3.5. DATA COLLECTION TOOLS

After obtaining the permission to conduct the study in Kibogora District Hospital, we explained the aim of the study and the tools we used for data collection. They included;

a. Pens and pencils
b. Laptop
c. Data collection sheet
d. Papers

e. Medical results log books

3.5.1. Data collection procedure

We used documentation technique whereby we did the reading of the data from results record registrar books of Kibogora District Hospital, wrote them on the data collection sheet and recorded them into the laptop.

3.6. RELIABILITY AND VALIDITY MEASURES

The department of ARV in the hospital of our choice was informed of the purpose of the study, with their approval; data collection was collected with confidentiality of the participants being studied to be validated was done through the double- check of the data collected whereby reliability was checked by the through inter-rater technique whereby the study was evaluated bythe assistance of our supervisor.

3.7. DATA ANALYSIS

Post the collection of the data, they were organized and analyzed. All the statistical evaluations were automatically given by the Statistical Package for Social Sciences (SPSS) version 16 for descriptive statistics and frequency tables were drawn.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 INTRODUCTION

In this chapter there is presentation of the results of the study highlighted by the key findings in section 4.1.In the other section of 4.2 the results are discussed in relation their normal findings.

4.1 DATA PRESENTATION AND ANALYSIS

In this study we conducted on 176 patients and in the table below we show the participation of participants according to their gender.

Table 1 distribution of participants according to gender

		Frequency	Percent
Valid	Male	50	28.4
	Female	126	71.6
	Total	176	100.0

Source; secondary data, 2020-2021

In the table above the participation of the patients under study shows that females were 126 that equals to 71.6 % and males' participation were 50 that equals to 28.4%.

The criteria used in the results findings were as follows;

Table 2 reference ranges used for creatinine test

Reference ranges status	**Reference values**
Hypocreatinine level	Male;< 0.7 mg/dl Female;<0.6 mg/dl
Normal level	Male; 0.7-1.3 mg/dl Female; 0.6-1.1 mg/dl
Hypercreatinine level	Male;>1.3 mg/dl Female;1.1mg/dl

Source; secondary data, 2020-2021

Patients with creatinine levels less than 0.7mg/dl for males and o.6 mg/dl for females were hypocreateninemic; males with 0.7-1.3 mg/dl and females' 0.6-1.1 mg/dl were within normal

ranges while males with creatinine levels greater than 1.3 mg/dl and females with creatinine levels greater than 1.1 mg/dl were hypercreatininemic.

Table 3 distribution of renal failure according to the creatinine level

Creatinine status	Male frequency	Female frequency	Totals
Hypocreatinine level	9	12	21
Normal creatinine level	38	105	143
Hypercreatinine level	3	9	12
Totals	50	126	176

Source; secondary data, 2020-2021

In our study, 21 participants were in the hypocreatinine level, 143 participants had normal creatinine level while 12 participants had hypercreatinine level.

Table 4 distribution of renal failure according to the creatinine clearance status

	Gender		Total percentages
	Male	Female	
	Count	Count	
Normal	9	35	25%
mild renal insufficiency	23	47	39.8%
moderate renal insufficiency	18	42	34.1%
severe renal insufficiency	0	2	1.1%
Total	50	126	100%

Source; secondary data, 2020- 2021

The table above shows distribution of renal failure according to their creatinine clearance status among both male and female in the participants. The patients that had normal creatinine clearance status were 44 which is 25%, those with mild renal sufficiency were 70 that is 39.8%, Those with moderate renal sufficiency were 60 which is 34.1% and ones with severe renal sufficiency 2 which is 1.1%.

Table 5 statistical age presentation

N	Valid	176
	Missing	0
Mean		52.97
Median		53.00
Mode		52
Range		59
Minimum		20
Maximum		79
Sum		9323

Source; secondary data, 2020-2021

Among the 176 participants in the study, the minimum age is 20 while the participant with maximum age is 79. The mean age of all the participants is 52.97 as presented in the table above.

Table 6 distribution of renal failure according to the class range of the age participants

Serial number	Ages	Does the patient have normal, mild, moderate or severe creatinine clearance status?			
		Normal(≥90ml/min	mild renal insufficiency (60-89ml/min)	moderate renal insufficiency(30-59ml/min)	severe renal insufficiency(≤29ml/min)
		Count	Count	Count	Count
1	20-27	2	0	0	0
2	27-34	2	1	0	0
3	34-41	1	2	1	0
4	41-48	16	18	6	1
5	48-55	14	30	19	0
6	55-62	8	17	17	1
7	62-69	1	2	12	0
8	69-76	0	0	4	0
9	76-83	0	0	1	0
		44	70	60	2

Source; secondary data, 2020-2021

The table above shows the distribution of renal failure according to their class range of age. According to this table, the class range with high number of renal failure among the participants is of the patients with 48 years to 55 years whereby they are 49 of the patients.

Table7:Distributionof renal failure according to the Antiretroviral Therapy drug regimens

	Does the patient use TDF,ABC or AZT drug regimen?							
	Abacavir(ABC)		Zidovudine(AZT)		Tenofovir Disoproxil Fumarate(TDF)		Total	
	Gender		Gender		Gender		Gender	
	Male	female	Male	Female	Male	Female	Male	female
	Count	Count	Count	Count	Count	Count	Count	Count
Normal	2	7	0	0	7	28	9	35
Mild renal insufficiency	6	21	0	1	17	25	23	47
moderate renal insufficiency	7	19	1	1	10	22	18	42
Severe renal insufficiency	0	1	0	1	0	0	0	2

Source; secondary data, 2020-2021

Antiretroviral drugs given to HIV patients in this study we conducted are of 3 categories; Abacavir (ABC), Tenofovir (TDF) and Zidovudine (AZT). The first two types of drug are in the first line of drug regimen while the later is given even in the second line regimen. Through these drug regimen given to the patients there is different levels of kidney damage by each as seen above. The participants with renal failure that used Abacavir are 54; those who used Zidovudine were 4 participants while those that used Tenofovir were 74 participants.

The prevalence of renal failure among the 176 participants was attained based on creatinine clearance status and serum creatinine level which was used as the parameter to assess kidney function.

Table 8 prevalence of renal failure according to creatinine level status and creatinine clearance status

Creatinine level status		Renal Failure		Total
		Negative	Positive	
Normal range 0.6-1.1 mg/dl	Female	105	21	126
	% within female	83.33%	16.66%	100%
	% within the participants	59.66%	11.93%	71.59%
Normal range 0.7-1.3 mg/dl	Male	38	12	50
	% within male	76%	24%	100%
	% within the participants	21.59%	6.82%	28.41%
Creatinine clearance status	Female	35	91	126
Both female and male, normal range is ≥ 90 ml/dl	% within female	27.78%	72.22%	100%
	% within the participants	19.89%	51.70%	71.59%
	Male	9	41	50
	% within male	18%	82%	100%
	% within the participants	5.11%	23.30%	28.41%

Source; secondary data, 2020-2021

The prevalence of renal failure according to creatinine level for female is 16.66% from 126 femaleand for male is 24% in the 50 male participantswhile according to creatinine clearance

status were 72.22% from female and 82% from the male participants therefore the rate of renal failure according to the creatinine level is 18.75% while according to the creatinine clearance level is 75% (51.70% were female and 23.30% were male) from the total participants.

4.1.0. ASSOCIATION OF RENAL FAILURE AND RISK FACTORS DETERMINED

Table 9 frequencies of the risk factors against renal failure within the participants

RISK FACTORS		**renal failure(creatinine clearance status)**		**Totals**
		Negative	**Positive**	
Antiretroviral therapy (ARTs) drugs	Abacavir	9	54	63
	Zidovudine	0	4	4
	Tenofovir Disoproxil Fumarate	35	74	109
Diabetes	diabetic	1	3	4
	Non-diabetic	43	129	172
Hypertension	yes	0	5	5
	no	44	127	171
Hepatitis B infection	positive	0	1	1
	negative	44	131	175
Hepatitis C infection	positive	1	1	2
	negative	43	131	174

Source; Secondary data, 2020-2021

Among risk factors that we had there are 132 patients were on Antiretroviral therapy drugs that were positive for renal failure, 3 patients were diabetic and positive for renal failure, 5 patients were hypertensive and had renal failure, 1 patient had Hepatitis B and 1 patient had Hepatitis C infection with positivity for renal failure.

4.1.1 RELATIONSHIP BETWEEN ART DRUG REGIMEN AND RENAL FAILURE

Table 10: relationship between antiretroviral drug regimen and renal failure

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.872[a]	6	.000
Likelihood Ratio	16.644	6	.011
Fisher's Exact Test	16.351		
N of Valid Cases	176		

Source; secondary data, 2020-2021.

The table above shows significance between renal failure and antiretroviral (ART) drugs regimen given to the patients which are AZT, ABC and TDF with measure of significance level 0f 0.05. In the output of the results investigated in our study ARTs drug regimen given to the patient show a level of significance 0.000that is below the 0.05 level of significance thus it shows there is association between renal failure and ART drugs regimen given.

4.1.2. GENERALIZED LINEAL MODEL OF RELATIONSHIP BETWEEN AGE,GENDER AND CREATININE CLEARANCE STATUS

Table 11the relationship between with gender and creatinine clearance status

Tests of Model Effects

Source	Type III		
	Wald Chi-Square	Df	Sig.
(Intercept)	1621696.659	1	.000
Gender			

Dependent Variable: creatinine clearance

Source; secondary data, 2020-2021

The table above shows that the gender of the patient is associated with creatinine clearance obtained as the significance level is .000 is less than 0.05 hence the relationship is statistical significant**.**

Table 12the relationship between age and creatinine clearance

Tests of Model Effects

Source	Type III		
	Wald Chi-Square	Df	Sig.
(Intercept) Age	1488.988	1	.000

Dependent Variable: creatinineclearance

Source; secondary data, 2020-2021

In the table above, the creatinine clearance of the patient is associated with their age as the significance value is .000 which is less than 0.05 significance level used as the standard thus the relation is statistical significant as well.

Table 13 summarized table of factors age and gender

SOCIAL-DEMOGRAPHIC FACTORS DETERMINED	**Chi –square tests**	
	Chi-square	***p-value***
GENDER	1621696.659	.000
AGE	1488.988	.000

Source; secondary data, 2020-2021

The tables above shows the relationship between gender and creatinine clearance, that there is association since the p- value is .000which is less than 0.05 that was applied as the significance level also for age and creatinine clearance, it is significantly important as the p-value is.000 which is less than 0.05 used as significance level, thus there is association between age and creatinine clearance.

4.1.3. RELATIONSHIP BETWEEN DIABETES,HYPERTENSION AND CREATININE CLEARANCE STATUS

Table 14: the relationship between diabetes and creatinine clearance status

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.684[a]	3	.298
Likelihood Ratio	4.815	3	.186
Fisher's Exact Test	4.748		
N of Valid Cases	176		

Source; secondary data 2020-2021

There is no association between diabetes and creatinine clearance status as the significance value is .298 which is greater than 0.05 used as the significance level.

Table 15: the association between hypertension and creatinine clearance status

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.358[a]	3	.501
Likelihood Ratio	3.482	3	.323
Fisher's Exact Test	3.161		
N of Valid Cases	176		

Source; secondary data, 2021

Hypertension status and creatinine clearance status show no relationship or association as the significance value .501 is greater than 0.05 used as the significance level.

Table 16 Summarized table of diabetes and hypertension

RISK FACTORS DETERMINED	**Chi-square tests**	
	Chi – square	**p-value**
DIABETES STATUS	3.684[a]	.298
HYPERTENSION STATUS	2.358[a]	.501

Source; secondary data, 2020-2021

The tables above shows the relationship between diabetes mellitus (diabetic status) and creatinine clearance status which is no association between the two variables since the p-value .298 is greater than 0.05 as the significance level. Hypertension also shows no association with creatinine clearance status (renal failure) as p-value .501 also greater than 0.05.

4.1.4. RELATIONSHIP BETWEEN HEPATITIS B, HEPATITIS C AND CREATININE CLEARANCE STATUS

Table 17therelationship between HBV creatinine clearance status

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.523[a]	3	.677
Likelihood Ratio	1.853	3	.604
Fisher's Exact Test	4.209		
N of Valid Cases	176		

Source; secondary data, 2020-2021

The table above shows that HBV and creatinine clearance status are not associated as the significance value .677 is greater than 0.05 which is used as the significance value hence the relationship is not statistical significant.

Table 18 the relationship between HCV and creatinine clearance status

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.272[a]	3	.736
Likelihood Ratio	1.858	3	.602
Fisher's Exact Test	3.522		
N of Valid Cases	176		

Source; secondary data, 2020-2021

The table above shows that HCV and creatinine clearance status are not associated because the significance value was .736 which is greater than 0.05 that is used as the significance level which shows that the relationship is not statistical significant.

Table 19 summarized table of HBV and HCV

RISK FACTORS DETERMINED	Chi-square tests	
	Chi –square	p-value
HEPATITIS B INFECTION	1.523[a]	.677
HEPATITIS C INFECTION	1.272[a]	.736

Source; secondary data, 2020-2021

The tables above shows two variables, Hepatitis B and Hepatitis C are significantly independent of creatinine clearance status (renal failure) as their p-values are .677 and .736which are greater than 0.05 used as significance level, hence no association between the these factors and renal failure.

4.2. DISCUSSION OF THE FINDINGS

Renal failure among HIV patients is a serious comorbid disease that accounts at least for ten percent within these patients. From the previous study done in Rwanda 2011 reported 2.4% in 891 HIV- infected non-pregnant women that had a decreased eGFR less than 60ml/min/1.73m^{2}and in our study carried out at Kibogora District Hospital on 176 participants, 132 of them who are equal to the rate of75% (female were 51.70% and male were 23.30%) had renal failure which show that the prevalence was higher in our study than one carried out in 2011 as per (Christina, 2011).Also from the reports of a study done on Renal function preservation following TDF initiationamong Rwandan's living with HIV whereby out of 476 patients they were 264 (55.5%) were women there was association on their functionality to kidneys thus proving also the statistical association shown in between ART drug regimen given to HIV patients and its effects on the kidneys. there was with more participation of females 71.6% than males having participation equivalent to 28.4% in our study.Prevalence of HIV is higher among females than males and this could be the reason (Avert, 2020).

In the study, there were marked elevated creatinine levels taking 6.8% and decreased creatinine levels taking 11.9% within the patients. These elevated creatinine levels among HIV patients is due kidneys excreting variety of waste products such creatinine from muscle creatine, uric acid

from nucleic acid metabolism in urine and this leads to more damage of kidney in HIV patients who are naïve to the ARTs.The HIV does replicate like any other infection and because of this there is kidney damage leading to increased serum creatinine levels seen. As mentioned by KDIGO there is a hyper-immune reaction against HIV that involves kidney in approximately 10% cases and an inflammatory disorder that is associated with worsening of preexisting infectious processes after ART initiation, rarely involving kidney(Cheung, 2018).

The impact of ARTs has been assessed to be clinically important and have some positive effects on all HIV-positive individuals. However, these ARTs have negative consequences such as Acute Kidney Injury (AKI) and HIV-related kidney diseases. In the study we conducted, three categories of ARTs have been used which Tenofovir, Abacavir and Zidovudine are presented as TDF,ABC and AZT respectively. The rate at which they caused renal failure in our study is as follows;

(42)23.9% had mild renal insufficiency, (32)18.2% had moderate renal insufficiency, 0.0% severe renal insufficiency and (35)19.9% had normal as per TDF regimen. For those who use Abacavir regimen had (27)15.3% mild renal insufficiency, (26)14.8% moderate renal insufficiency, (1)0.6% severe renal insufficiency and (9)5.1% normal. Those taking AZT regimen had (1)0.6% mild renal insufficiency,(2)1.1% had moderate renal insufficiency and(1) 0.6% severe renal insufficiency.Among these drug regimen given, Tenofovir and Abacavir are in the first line regimen and seems to show effects on kidney than Zidovudine as seen in our study frequency table. Tenofovir effects are associated nephrotoxicity whereby 1% and 2% of the recipient cases seemed to show treatment –limiting tubulopathy(Cheung, 2018).

Estimated glomerular filtration rate decreases with aging process from the study done by National Kidney Foundation, 2009, and in the study we did creatinine clearance against age by using Generalized Linear Model shows statistical significance of 0.000 that shows association between the two variables since it was less than 0.05 level of significance (report, 2009).

Also gender showed significant association with the creatinine clearance in the study we did with the level of significance is 0.00 which is below 0.05. Specifically female gender was found to be a risk factor for renal failure which agrees with the study done in San Diego, California that reported reduced GFR in females (Mpondo, 2014).

From the study done on 168 patients who reported incidence of diabetes 14% among patients receiving ART and four-fold risk of developing diabetes in HIV infected group while another

recent study showed 7.3% of hypertension incidence in seropositive patients that increased after 2 years of antiretroviral therapy. These factors show their effects through renal biopsy specimens of seropositive patients that showed clinical evidence of 6.1% of diabetic gromerulopathy and 4.1% hypertensive nephrosceloris evaluated in 98 patients(Schmid, 2006) .As per our study hypertension, Diabetes Mellitus and even Hepatitis B &C infection are not statistical significant since their significance level are greater than 0.05 thus shows no association with renal failure.

4.3. SUMMARY OF FINDINGS

In this study the results on prevalence of renal failure and associated risk factors in HIV patients shows the rate of prevalence of renal failure is 75% (female were 51.70% and male were 23.30%) among 176of total participants.

As seen in different studies HAART showed high increased risk with renal failure. From the analysis done Tenofovir and Abacavir showed similar relationship between renal failure and these regimen though Abacavir is known to be associated with cardiovascular event risk in case of renal failure. Zidovudine also has low risk with renal failure.

Through use of generalized linear model, the analyzed data of different variables like age, gender, and creatinine clearance were associated with a significance level less than 0.05 as shown above. However using Chi-square tests HAART drug regimen given to patients showed association with creatinine clearance of these patients and with other risk factors such as hypertension, Diabetes Mellitus, HCV and HBV showed with no association with creatinine clearance status (renal failure).

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.0 INTRODUCTION

Within this chapter, there are highlights of the conclusion of the study, recommendation to who interact with the problem.

5.1 CONCLUSION

Human Immunodeficiency Virus is an increasingly prevalent entity among people but also with complication of renal failure found with other complications of AIDS such opportunistic infection, neurological complications, cancers and others.Renal dysfunction or failure seemed to be having high rate 75% among these patients especially due to the use of HAART.With different drugs used for these patients and complications that could arise, there is need of close monitoring encompassing full check –up especially of how well the kidney is functioning. Therefore, factors such as age, whereby the mean age is 52.97, gender (71.6%. for female and 28.4% for male)and HAART drugs used needs to be considered since they are affected by renal failure. And we determined that the majority group of affected individuals isof female genderwith 16.66% and 72.22% according to their creatinine status and creatinine clearance status respectivelyamong 126 female participants that had renal failure. In conclusion, renal failure is a disease that needs up-close follow-up due to the important functions performed by the kidneys especially among the HIV-infected patients that are on ART due to their effects such as nephrotoxicity and some of the tips to ensure that the kidneys are working well include drinking water, eating a healthy diet, avoiding alcohols and cigarettes, increasing physical exercises to avoid obesity, hypertension and diabetes.

5.2. RECOMMENDATION

This study has provided information regarding the prevalence of renal failure and associated risk factors in HIV patients attending Kibogora District Hospital, hence following recommendation are mentioned;

Recommendation to Kibogora District Hospital

To improve in the filling of the client information and laboratory results records and archiving.

Recommendation to Kibogora Polytechnic

To increase time period of research project in order to easily achieve our goals and to avail an assistant supervisor just in case the supervisor is not around.

Recommendation to other future researchers

To do a study regarding of inherited and acquired disorders associated with renal failure among HIV patients.

Recommendation to the government

To educate public health education among people regarding the renal failure among HIV infected and even the uninfected population. To access screening centers and health care providers with knowledge of renal function and associated to the rural areas within the country.

Recommendation to pharmaceutical industry

For them to make HAART drugs with low side effects to minimize their action on the kidneys that leads to their impairment.

5.3 SUGGESTION FOR FUTHER STUDY

In order to expand on the knowledge, other similar studies can be conducted with different aims that target the understanding of the functionality of the kidney and all types the diseases that affects it in order to take control and preventive measures against them especially within the immunocompromised patients.

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APPENDICES

Appendix 1: student project letter collection letter

KIBOGORA POLYTECHNIC

STUDENT PROJECT'S LETTER

KIBOGORA DISTRICT HOSPITAL
RECEPTION / MAIL RECEIVED
Date: 22 SEP 2021
Names.....
Signature.....

DATE: 20th September, 2021

To whom it may concern;

We write this letter to humbly request you to allow **Mrs MUTESI Marie Jeanne and Mrs IRIBAGIZA Marie Christine** to conduct project work at **Kibogora District Hospital**

The above mentioned are bonafide students of Kibogora Polytechnic pursuing Bachelor's degree in Biomedical Laboratory Sciences.

This candidate is currently conducting a project entitled **"Prevalence of Renal failure and Associated Risk factors among HIV patient attending Kibogora District Hospital "**. We are convinced that your institution will constitute a valuable source of information pertaining to their work. The purpose of this letter is to humbly request you to avail them with the pertinent information they may need. We pledge to ensure that all provided information will be used in the strict academic purpose.

Any assistance rendered to the candidate will be highly appreciated.

Approved by:

MUNYANDAMUTSA Fulgence

Head of department/Biomedical Laboratory Sciences

Kibogora Polytechnic

KIBOGORA POLYTECHNIC
HEAD OF DEPARTMENT
BIOMEDICAL LABORATORY SCIENCE

Appendix 2: Data collection sheet

Patient Number	age	gender	Creatinine Result	Creatinine Clearance Status

Appendix 3 checklist for risk factors

PATIENT ID	GENDER	AGE	DIABETES MELLITUS		HYPERTENSION		HEPATITIS INFECTION			
			YES	NO	YES	NO	HBV		HCV	
							YES	NO	YES	NO
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

YES: POSITIVE

NO: NEGATIVE