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Received: May 30, 2020

Accepted: November 2, 2020

Published: January 16, 2021

**Citation:** Fulgence M, Joseph M, Callixte Y,  
William N . Renal dysfunction among HIV patients  
under highly active antiretroviral therapy attending  
Kibagabaga district. 2021 Jan 16;4:bs202102

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author and source are credited.

**Data Availability Statement:** All relevant data are  
within the paper and supplementary materials.

**Funding:** The authors have no support or  
funding to report.

**Competing interests:** The authors declare  
that they have no competing interests.

## Renal dysfunction among HIV patients under highly active antiretroviral therapy attending Kibagabaga district

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### Abstract

Antiretroviral therapy is used for the suppression of the HIV virus and stops its progression to cause disease. Despite its role, it has the pathophysiologic effect to kidney function for users. The study was conducted to evaluate the renal function for HIV patients under highly active antiretroviral therapy at Kibagabaga District Hospital. Venous blood samples (4mL) were collected by vein puncture in phlebotomy services by means of the dry tubes from 170 patients under antiretroviral therapy. Blood samples were transported to clinical biochemistry department for analysis. Rotor centrifuge was used to separate the serum and other blood components; creatinine level was analysed for renal function analysis. The total of 170 HIV patients were considered in the study. Of the 170, 50 HIV patients were used for primary data collection, while 120 HIV patients who previously received antiretroviral therapy were considered as secondary data collection source. The patients between 25-45 years old have experienced the highest level of abnormal concentration of renal tests 25%, patients with above 45 years old was ranked the second to have the abnormal level (14.2%). Females were 59% and have experienced the high risk of renal dysfunction than males, the level of glomerular filtration rate was 67 (39.4%), and was higher than creatinine 42 (24.7%). Antiretroviral therapy has a negative effect on kidneys. Abnormalities of the kidney parameters were prevalently high among both male and female. The serious follow is needed for this vulnerable population.

**Keywords:** Renal function, HIV, HAART, Estimated glomerular filtration rate

### Introduction

Human immunodeficiency virus (HIV) infection mostly provoke acute or chronic renal proximal renal tubule resulting in functional disturbance with mitochondrial injury being one of the most important targets [1]. It results to the failure of excretory functions of kidney, which is disease and people are living longer. HIV infection negative side effects might lead to the heart, lungs, and renal diseases, which could cause high mortality among HIV patients. Africa endures greater than 60% of the global burden of HIV, however, characterized by decrease in glomerular filtration rate [2]. The advances in development of Highly active antiretroviral therapy (HAART) is a high risk to the development of the serious renal disease in developed world with very few studies done in developing world [3]. Kidney function has been estimated to be abnormal up to 30% of all HIV patients. Few outpatient renal screening studies from Africa describe varying prevalence from as low 6% to a high of 50% [4]. The dysfunction of the kidney is medical kidney abnormality where this important organ gets impairment for the filtration of wastes from blood [5]. Nephropathy is one of the complications characterizing the kidney dysfunction for HIV patients [6]. Kidney disease was clinically diagnosed considering the presence of albuminuria but also low estimated glomerular filtration rate [7]. Some antiretroviral agents can cause serious side effects that affect multiple systems; including the kidneys Tenofovir (tenofovir disoproxil fumarate) and this could be associated with development of the acute renal failure (ARF) and the dysfunction of proximal and distal tubules [8].

The first described patient who was treated with tenofovir and developed reversible Fanconi syndrome, nephrogenic diabetes insipidus and ARF, Renal biopsy demonstrated cytoplasmic vacuolization, apical localization of nuclei and reduction of the brush border on proximal tubule epithelial cells [9].

## Materials and Methods

### Study area description

The study was conducted at Kibagabaga district hospital. Kibagabaga district hospital is located in Kigali city, Nyarugenge district; the hospital receives the referred patients from 16 health centers of Nyarugenge from neighbouring health centers in Gasabo and kicukiro.

### Study design

Both cross-sectional and retrospective study design were used. The study was carried out from October to December 2019.

### Study population and sample size

All HIV patients under highly active antiretroviral therapy attending Kibagabaga District hospital during the period will be targeted by the study. However, only patients who were not HIV positive did not participate. The population size was 170; the sample size was determined by the number of eligible patients who attended the Hospital and accepted to participate in the study during the period of the study.

### Collection of stool sample

Blood samples were collected with phlebotomy and biochemistry SOPs support. The patients were placed in a comfortable seat and requested to remove sleeves from the part of the arm. Phlebotomist finds the arm with visible fuller vein. A stretched band tourniquet was placed around the upper arm to help the vein bloat. The place for injection was then whipped with cotton after being soaked in the antiseptic solution. The needle was slightly inserted into the swollen vein and around 4ml of blood were collected by the help of a seal dry test tube. Specimen containers or collection devices was labelled with the patient record number was recorded along with the date of birth to avoid bias and errors in laboratory results.

### Sample processing

The sample collection and processing were done according to Kibagabaga District Hospital laboratory SOPs, the tubes containing blood was taken to clinical biochemistry department. The collected blood specimen was clotted for 15 min before centrifugation at 3000 rpm for 5 minutes using a rotor centrifuge for separation of serum and other blood components. Creatinine level was analysed for renal function by using automated biochemistry machines (Architecture machine or Cobasc311), the Cobas C311.

### Data analysis

After data collection, the SPSS version 23.0 program and excel 2016 was used for data analysis. To compare variables and association between renal function in HIV patients under HAART and its clinical manifestation induced by this medication, and prevalence

### Ethical considerations

This study was conducted after obtaining an ethical approval from Kibogora Polytechnic research committee. In addition, the authorization was requested from Kibagabaga District hospital, Clinical research and office of education before conducting this research. The purpose of research project, sample collection procedures, as well as confidentiality of research results was explained to participants. Participation was voluntarily after understanding the aim and expected outcome of research. There was no expected risks that can threaten the lives of participants.

## Results

### Social demographic characteristics of study population

In this study the social demographic characteristics of the study population were established to characterize the population, **Table 1** indicates the analysis which was done on 170 HIV patients under highly active antiretroviral therapy from Kibagabaga district Hospital in a period of 3 months. **Table 1** reveals the different parameters with renal function tests such as age group, gender, period, clinical manifestation and weight. The high frequency was observed in the age group between 25–45 years old. The number of females stood at 62%, mouth ulcers predominated the clinical manifestations with percentage of 29.4% followed by memory loss at 25%. Over weight patients stood at 6.5% while 38.8% was in normal ranges. **Table 2** shows the range of creatinine and Glomerular filtration rate level according sex.

### Clinical analyses

In this study the creatinine level and glomerular filtration rate showed the high prevalence of abnormal results in males with 14.5% and 39.4 respectively. Cross sectional and retrospective studies were assessed and shown in **Table 3**; the majority of patients were females with 28 (56%) and 22 (44%) were males. Moreover, in retrospective 29 (58%) were females and 22 (18.3%) were males. **Table 4** shows diagnosed patients based on clinical symptoms associated to renal dysfunction in HIV patients; the majority of patients was those with mouth ulcers 50 (28.6%) followed by memory loss with 43 (24.6%).

## Discussion

This study analysed biochemical parameters of HIV patients under highly active antiretroviral therapy, this medication leads to the serious side effects including kidney failure for patients under those medications. This study considered the level of creatinine and estimation of glomerular filtration rate as tests to confirm the renal function of HIV patients under highly active antiretroviral therapy.

**Table 1.** Number of patients participated in the study and their corresponding gender, age, clinical manifestation, weight and period.

Parameter	Variables	Frequency	Percentages %
Age groups	[5-25] Years	13	9.6
	[25-45] Years	93	54.7
	Above 45 Years	64	37.6
Sex	Males	64	38
	Females	106	62
Period	2018 retrospective	70	41.2
	2019 prospective	50	29.4
	2019 retrospective	50	29.4
Clinical manifestation	Night sweats	18	10.6
	Weight loss	19	11.2
	Depression	40	23.5
	Mouth ulcers	50	29.4
	memory loss	43	25.3
Weight	40-60 kg	38	22.4
	60-80 kg	66	38.8
	80-100 kg	55	32.4
	Above 100 kg	11	6.5
Total		170	100

**Table 2.** Number of patients participate the study and their corresponding results according to gender.

State	Creatinine level (Mg/dl)			eGFR (ml/min)		
	Females	Males	Total	Females	Males	Total
Normal	92 (54.1)	36 (21.2)	128 (75.3)	72 (38.4)	31 (22.2)	103 (60.6)
Abnormal	17 (10.2)	25 (14.5)	42 (24.7)	32 (16.1)	35 (23.3)	67 (39.4)

**Table 3.** Prevalence of abnormal Creatinine and EGFR according to age and gender in suspected patients at KDH, where the creatinine (kg/dl) (A), EGFR (ml/min)(B), and Prevalence (%) (C) are shown.

Groups	Variables	Cross sectional study N (50)			Retrospective study N (120)		
		(A)	(B)	(C)	(A)	(B)	(C)
Age groups	5-25	1 (2)	1 (2)	8%	0 (0)	2 (1.6)	13%
	25-45	6 (12)	11 (22)	68%	15 (12.5)	22 (18.3)	25%
	Above 45	2 (4)	3 (6)	2%	17 (14.1)	28 (23.3)	14.20%
Gender	Females	20 (40)	28 (56)	48%	16 (13.3)	29 (58)	59%
	Males	22 (44)	14 (28)	36%	17 (14.1)	22 (18.3)	27%

**Table 4.** Clinical Manifestation and their associated abnormal level of renal test.

The frequency (%) of occurrence of symptoms		The frequency (%) of renal dysfunction	
Clinical manifestation	Frequency (%)	Abnormal creatinine	Abnormal EGFR
Night sweats	18 (10.3%)	6 (3.5%)	7 (4.1%)
Weight loss	19 (10.9%)	9 (5.2%)	9 (5.2%)
Depression	40 (22.9)	5 (2.9%)	13 (7.6%)
Mouth ulcers	50 (28.6)	14 (8.2%)	25 (14.7%)
Memory loss	43 (24.6%)	9 (5.2%)	13 (6.6%)

Among 170 suspected patients, 64(38%) were males and 106 (62%) females. The mean age of the population was 56.6, and

the standard deviation of age was 40.5. 54.7% of patients were in the age range of [25-45] Years, and were the majority in the study participants. this age is at high risk because of the habit of doing unprotected sex than elderly age. After testing creatinine level and Egfr the results showed the normal females 38.4% and 23.3% males with abnormal eGFR level and abnormal creatinine respectively. The study conducted on active antiretroviral therapy among HIV patients shows no difference with the current study since it revealed the high Glomerular filtration rate (EGFR) and creatinine in females than males under highly active antiretroviral therapy [12] The patients who had positive test results with creatinine and eGFR for cross-section study, the findings show that the majority of patients were females with 28(56%) and 22(44%) were males. Moreover, in the retrospective 29(58%) were females and 22 (18.3%) were males. In addition, the prevalence of renal dysfunction was high in old age in females. these results were comparable to the findings of Willems and his colleagues [13], we estimated the prevalence of eGFR and mortality risks in a population-based study of persons aged 85 years and older, based on these results.

The patients were diagnosed based on clinical symptoms associated with renal function of HIV patients. The majority of patients induced the mouth ulcers 50 (28.6) than other clinical manifestation. The results showed that there is significant relationship between the most of clinical manifestation and renal function of HIV patients under highly active antiretroviral therapy. The similar findings were reported where self-reported strategies used by persons living with HIV/AIDS and their clinical manifestation induced by ART such as mouth ulcers, weight loss and other opportunist infections were described [14].

## Conclusions

The study confirmed the effect of antiretroviral therapy on kidneys where the abnormalities of creatinine and eGFR were more prevalent 59% and 27% in both females and males respectively. It is a paramount action of treating patients to enhance the longevity even if renal dysfunction may occur. All HIV patients under retroviral therapy should be followed up to maintain the normal function of the kidneys.

## Acknowledgement

We are with pleasure to thank Kibagabaga district hospital's authorities to allow the study to be conducted in the hospital facilities and their abundant generosity. In addition, we once again address our thanks to Kibogora Polytechnic for its vision of promoting research not only in the region but also all over the world.

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