ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH

ASSESSMENT OF RENAL FUNCTION IMPAIRMENT AMONG HIV PATIENTS ON HIGHLY ACTIVE ANTIRETROVIRAL THERAPY IN SELECTED PUBLIC HOSPITALS IN ADIS ABEBA, ETHIOPIA 2018

BY HABIBA HUSSEN (BSC)

A thesis submitted to AddisAbaba University, college of health science, School of Public Health for partial fulfillment for the requirements of the degree of master's in public health.

Jun, 2018

Addis Ababa, Ethiopia

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APPROVED BY THE BOARD OF EXAMINERS
This thesis by Habiba hussen (BSc) is accepted in its present form by the board of examiners as a very good thesis requirement for the Degree of Masters in Public Health.

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ACRONYMS

AAU	Addis Ababa University
AIDS	Acquired Immunodeficiency Syndrome
AKI	Acute kidney injury
ART	Antiretroviral therapy
BMI	Body Mass Index
CD4	Cluster of differentiation 4
CKD	Chronic Kidney Disease
CKD –epi	chronic kidney disease epidemiology collaboration
CrCl	Creatinine clearance
DART	Development of Antiretroviral Therapy in Africa Trial
EB	Ethiopian birr
EFV	Efavirenz
eGFR	estimated Glomerular filtration rate
ESRD	End Stage Renal Disease
GFR	Glomerular filtration rate
HAART	Highly Active Antiretroviral Therapy
HIV	Human immunodeficiency virus
HIVAN	Human immunodeficiency virus associated nephropathy

KDOQI	Kidney disease outcome quality initiative
SPHMMC	Saint Paul's Hospital Millennium Medical College
TDF	Tenofovir

Abstract

Background: Human immunodeficiency virus (HIV) infection and its treatment cause renal diseases. Renal disease is associated with an increasing cause of morbidity and mortality in HIV positive individuals than in the general population. It has been also associated with adverse outcomes, such as complications of decreased renal functions and progression to renal failure. The aim of this studyistodetermine the prevalence and factors associated with renal function impairment among adult HIV patients taking highly active antiretroviral therapy inZewditu memorial hospital and saint poul's Hospital millennium medical college in 2018 GC.

Methods: A facility based cross-sectional study was conducted on a total of 698 HIV positive study participants in selected government hospitals located in Addis Ababa from 1st February 2018 to 1st April 2018. HIV positive patients on ARTduring the study period where included in the study by using systematic random sampling method. The outcome variable was measured by applying ckd-epi estimation equation and renal impairment was defined as eGFR<60ml\min\1.73m^2.Socio-demographic characters, clinical and laboratory records were collected using a structured questionnaire. Data wasentered using epi data after cleaned and coded. Data was analyzedbyusing SPSS statistical package. Bivariate and multivariable logistic regression where done and variables with p-value<0.05 were considered statistically significant.

Result: the overall prevalence of renal impairment in this study was 3% (95%CI 1.7%-4.3%) with response rate of 98.9%. After adjustment; being cannot read and write (AOR = 4.18; 95% CI1.65,10.58) ,Bing hypertensive(AOR=1.86;95%CI1.045,3.305),being underweight(AOR =3.14 ;95% CI 1.07,9.2),being HBsAg positive (AOR= 0.376; 95%CI 0.168,0.84) and having proteinuria (AOR=3.55;95%CI 2.17,5.81) were found statistically significant predictors of renal impairment.

Conclusion: the prevalence of renal impairment among HIV patients on HAART in this study was relatively low clinically significant. Therefore early detection of kidney disease by working on modifiable risk factors and implementation of sensitive screening techniques of renal function in persons with HIV on HAART will have an impact on the burden of disease, prevention of renal disease among this population

Keywords: Renal impairment, HIV Positive, HAART, Addis Ababa

1. INTRODUCATION

1.1 Background

HIV continues to be a major global public health issue. In 2016, an estimated 36.7 million people were living with HIV (including 1.8 million children) – with a global HIV prevalence of 0.8% among adults[(1),(2)]. Around 30% of these same people do not know that they have the virus(3).

Since the start of the pandemic, an estimated 78 million people have become infected with HIV and 35 million people have died of acquired immune deficiency syndrome (AIDS)-related illnesses. In 2016, 1 million people died of AIDS-related illnesses(4).The vast majority of people living with HIV are located in low- and middle- income countries (LMICS), with an estimated 25.5 million living in sub-SaharanAfrica1.2 million in Ethiopia .Among this group 19.4 million are living in East and Southern Africa which saw 44% of new HIV infections globally in 2016(5).

In 2016, there were roughly 1.8 million new HIV infections - a decline from 2.1 million new infections in 2015(6).There has previously been concern that the annual number of new infections among adults would remain static, as incidence rates failed to shift between 2010 and 2015. However, a slightly more positive trend is emerging as new infections among adults are now estimated to have declined by 11% - and 16% for the general population - between 2010 and 2016, whereas there was only an 8% decline between 2010 and 2015(7).

Despite challenges, new global efforts have meant that the number of people receiving HIV treatment has increased dramatically in recent years, particularly in resource-poor countries. major milestone was achieved in 2016 where, for the first time, it was found that more than half of all people living with HIV (53%) now have access to life-saving treatment which is (HAART) Highly active antiretroviral therapy (5).In 2016, 19.5 million people living with HIV were receiving antiretroviral treatment (ART) - up from 7.5 million in 2010 to17million in June 2016. If this level of treatment scale up continues, it is estimated that the world will meet its global target of 30 million people on treatment by 2020(4).

Treatment coverage in Latin American and the Caribbean reached 55% [47–64%] in 2015. In the Asia and Pacific region, coverage more than doubled, from 19% [17–22%] in 2010 to 41% [35–47%] in 2015(4). Western and central Africa and the Middle East and North Africa also made important gains but achieved lower levels of coverage in 2015, 28% [23–34%] and 17% [12–24%], respectively.

In eastern Europe and central Asia, coverage increased by just a few percentage points in recent years to 21% [20–23%]about one in five people living with HIV in the region. The gains in treatment are largely responsible for a 26% decline in AIDS-related deaths globally, from an estimated 1.5 million [1.3 million–1.7 million] in2010 to 1.1 million [940, 000 –1.3 million] in 2015. The reduction in deaths since 2010 has been greater among adult women (33% decrease) compared with adult men (15% decrease), reflecting higher treatment coverage among women than men, 52% [48–57%] and 41% [33–49%], respectively. The gender gap for treatment among adults highlights the impact of gender norms that delay initiation of treatment among men, reduce treatment adherence, blunt the preventive effects of treatment, and lead to men accounting for 58% of adult AIDS related deaths. The Fast-Track approach to HIV treatment is working. Global consensus and leadership have driven greater investment of financial and human capital, and mounting clinical experience and research, improved treatment regimens and diagnostics and reductions in the price of medicines have created gains in efficiency and effectiveness.

Scale-up of antiretroviral therapy is on a Fast-Track trajectory that has surpassed expectations. Global coverage of antiretroviral therapy reached 46% [43–50%] at the end of 2015(1). Gains were greatest in the world's most affected region, eastern and southern Africa. Coverage increased from 24% [22–26%] in 2010 to 54% [50–58%] in 2015(2).. South Africa alone had nearly 3.4 million people on treatment, more than any other country in the world. After South Africa, Kenya has the largest treatment program in Africa, with nearly 900 000 people on treatment at the end of 2015. Botswana, Eritrea, Kenya, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe all increased treatment coverage by more than 25 percentage points between 2010 and 2015(3).

The continuing momentum reinforces the determination to achieve the 90–90–90 treatment target by 2020, whereby 90% of people living with HIV know their HIV status, 90% of people who know their HIV-positive status are accessing treatment and 90% of people on treatment have suppressed viral loads(5).

The introduction of HAART also known as combination antiretroviral therapy (cART) in 1996 has revolutionized the management of HIV infection. In patients for whom HAART is available, this therapy has been shown not only to reduce mortality and morbidity rates, but also to improve the quality of life and to delay or even prevent the progression to AIDS in many cases. However, with increased life expectancy of the affected individuals due to drug therapy, kidney diseases have emerged as the possible cause of morbidity and mortality(7)Infection with HIV has been associated with many types of renal diseases including acute renal failure, chronic kidney disease acute tubular necrosis which ultimately may progress to end stage renal disease (ESRD)[(8),(9)].Within few months if left untreated. Neurologic, respiratory, and gastrointestinal complications have all been extensively described in the medical literature; however renal manifestations and in particular their imaging characteristics are less described.

Some antiretroviral agents (e.g. nucleotide reverse-transcriptase inhibitors such as tenofovir, protease inhibitors such as indinavir) can cause serious side effects that affect multiple systems, including the kidneys (10). Tenofovir (tenofovirdisoproxilfumarate) has been associated with development of acute renal failure (ARF) and dysfunction of proximal and distal tubules(11). A patient who was treated with tenofovir at first time developed reversible Fanconisyndrome,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. Tenofovir is taken up into renal epithelial cells by basolateral membrane human organic anion transporters, and then secreted into the urine across the apical membrane by transporters called multidrug-resistance-associated proteins(12). Other transporters may also be involved.

1.2 Statement of the Problem

In Ethiopia there are 1.0% Estimated HIV prevalence among adults 15–49 Years, 15,338 Estimated AIDS-related deaths and 386,123 estimated numbers of adults living with HIV receiving antiretroviral treatment (ART)(3). The risk of kidney disease remains higher in HIV infected persons than in the general population, associated with poor outcomes, including increased mortality and morbidity. Problems with kidney function in HIV infected people due to medications, HIV itself in addition to old risk factors. There is15% increased prevalence of CKD per year of additional exposure to ARVs(13).

Chronic kidney disease that may progress to end-stage renal disease requiring dialysis and renal transplant can be diagnosed in its earlier stage through routine screening and careful attention to changes in renal functions (14). In developing countries like Ethiopia where renal transplant and dialysis not be accessibleearly detection of renal disease have some clinical and financial implications for people living with HIV/AIDS. The guide line recommend basic chemistry test every 3-6 months (15). But due to scarcity of resource this is not practicable.Creatininwill not be raised above the normal range until 60% Of total kidney function is lost (16).Is insensitive measurement of eGFR for all patients and other estimation formulas should be used. HIV infection can cause a broad spectrum of clinical manifestations, ranging from an asymptomatic carrier state to severe immunodeficiency. Kidney disease is an often unrecognized problem as kidney function maybe abnormal in up to 30% in HIV Population (17).

1.3 Significance of the study

More than 718,000 people living with HIV in Ethiopia, but very few studies have been done to find the prevalence of renal impairment in patients on HAART. In those few studies done, the prevalence is variable, as well as variability in access to care and different estimates of GFR used during the studies.

The present study was undertaken because of the growing demands for HAART, increase life expectancy of HIV patients they are prone to chronic diseases such as renal disease than the general population. Identification of asymptomatic patients will aid in early management of patients. So this study will be conducted with the aim to assess the magnitude of renal function impairment among patients taking HAART in selected public Hospitals, Addis Ababa, Ethiopia.

After its completion, this study is expected to show the prevalence of renal function impairment among patients on ART and it will benefit:-

Patients by early detection and treatment

Health care service provider (Nurses and Doctors), who work ART clinic to strengthen in their clinical practice to give more attention for the factors that affect renal impairment.

For Health care managers to make available necessary in puts for the prevention.

As a baseline data for those who are interested to carry out further research with this regard.

2. **LITERATURE REVIEW**

2.1 Over view of HIV

There was a research done in Sub-Sahara Africa with the titleofHIV Infection and AIDS in Sub-Saharan Africa; Current Status, Challenges and Opportunities by Ayesha B.M. Kharsany and Quarraisha A. Karim. They showed that in 2013 an estimated 35.0 [33.2-37.2, (range around estimate)] million people were living with HIV worldwide. Sub-Saharan Africa is home to only 12% of the global population, yet accounts for 71% of the global burden of HIV infection. Ten countries, mostly in southern and eastern Africa, South Africa (25%), Nigeria (13%), Mozambique (6%), Uganda (6%), Tanzania (6%), Zambia (4%), Zimbabwe (6%), Kenya (6%), Malawi (4%) and Ethiopia (3%), account for almost 80% of all people living with HIV(18).

Available surveys on HIV/AIDS knowledge, attitudes and practices conducted in Ethiopia, show that unlike a high level of awareness about HIV/AIDS, many people lack adequate know-how about HIV preventions and transmission as well as have misconceptions. Besides, the studies make it clear that the disparity between knowledge and practice is also considerable. If we try to look at the situation at a national level, the recent Ethiopian Demographic Health Survey (EDHS 2016) report discloses a high level of awareness among both sexes aged 15-49 (90% for women and 97% for men). However, relatively lower percentages of both sexes believe that there is a way to avoid HIV/AIDS (81% for women and 93% for men), and only 37% of women and 57% of men are aware that using condoms and limiting sexual intercourse to one uninfected partner can reduce the risk of getting the AIDS virus. Whereas, only 49 % of women and 69 % of men know that using a condom during sexual intercourse can reduce the risk of HIV infection (Central Statistics Authority (CSA), 2005).

2.2 Renal Disease among HIV Infected Patients on HAART

Cross sectional study was done at Washington University Outpatient Infectious Disease Clinic 845 patients were recruited (63, 7% males, 36, 3% females) 4%of patients who were HIV infected had mild to moderate renal dysfunction defined as eGFR< 90mL/min and proteinuria, 5.3% of participants had CKD defined as eGFR<60ml/min. In this study Overton and colleagues found that tenofovir and stavudine were significantly associated with declining in renal function. HAART generally consisted of three or more antiretroviral drug combinations and cumulative exposure to ART drugs might have caused the decline in renal function (19).However, TDF was not a significant predictor of lower GFR in multivariate analysis.

The Manhattan HIV Brain Bank established in America was a prospective cohort of antiretroviral experienced patients and looked at histology specimens from those individuals who had consented to post mortem organ donation(20). Of the 89 kidney tissue donors, 27 had chronic renal disease based on the presence of proteinuria and an eGFR less than 60ml/min/1,73m2 for at least3 months. Most common diagnoses were arterionephrosclerosis, HIVAN and glomerulonephritis. The prevalence of chronic renal disease was common among black female population(20). However, there was no association between chronic renal diseases or renal pathology and HIV related factors such as HIV viral load and CD4 counts.

During the pre –ART era, renal failure was associated with younger age, advanced immune suppression, volume depleting conditions and septicemia(10).A hospital based study, done in New York, United States of America by Wyatt et al compared the incidence of Acute renal failure (ARF) in HIV positive individuals in 1995 (pre ART era) and 2003 (post HAART era). The results showed that HIV infected patients had an increased incidence of acute kidney injury in the pre HAART era compared to post HAART era(21).It was an observational study retrieving information from a database and the diagnosis of acute kidney injury was based on clinical judgment and documentation by the treating physician.

In a cross sectional study done in Brazil the prevalence of chronic renal disease diagnosed on the basis of proteinuria and eGFR less than or equal to 60ml/min/1.73m2 was 8.4% (13). The risk factors were hypertension, time on HAART and tenofovir exposure. They postulated that prolonged use of HAART could be associated with greater long term renal toxicity as there was a 15% increase in the prevalence of chronic kidney disease per year of additional exposure to HAART. However, this was a cross sectional study hence it might have included patients with reversible causes of renal dysfunction contributing to the high prevalence that was found.

The DART (Development of antiretroviral therapy for Africa) trial conducted in Uganda and Zimbabwe, had an observational analysis within a randomized trial of ART management strategies (22).The trial included 3316 participants with CD4 count less than 200cells/ml and creatinine levels less than 360umol/l at baseline. Renal function was monitored for up to 96 weeks while patients were on different ART regimens. Mild renal impairment was seen in 45% of patientseGFR 60-90ml/min/1.73m^2,7% had moderateeGFR>30but<60ml/min/1.73m^2 at baseline. Patients with more severe decrease in GFR at baseline showed a greater increase over 96 weeks of follow up. Severe reductions in GFR were seen in 52 patients during the period with no relation to ART agents. The conclusion was that renal impairment was highly prevalent among patients with a low CD4 count and this tended to improve with ART(22). However, the results cannot be generalized as patients with high creatinine (>360 micromoles) were excluded from the study.

Comparative cross sectional study was done in Nigeria showed that there is no significant difference in serum total protein and albumin among patienton HAART and HIV- negative controls. There is a statistically significant difference in renal creatinine between PLWHA on HAART, those not on HAART and HIV-negative controls. This study indicates that HAART of stavudine, lamivudine and nevirapine can potentially reverse the HIV/AIDS-related impairment in renal functions(23).

Another comparative cross sectional study was done in Ethiopia by Kahsu and colleagues in Felegehiwot referral hospital(24).They recruited 307 HIV positive patients, 153 HAART naïve and 154 on HAART. The prevalence of renal impairment based on GFR calculated using the Cockcroft-Gault method in HAART naïve was 30, 1% and the prevalence of renal impairment in those on HAART was12, 9%. Overall proteinuria in the study was 17.9% .The prevalence of renal impairment was lower in those on HAART and this might be due to improved immune status and also improvement in weight as this was incorporated in calculating eGFR. For the patients not yet on HAART it was shown that proteinuria and low CD4 counts had significant association with the prevalence of renal impairment.

2.3 Impact of Renal disease Among HIV Patients

In Zambia, Mulenga et al found a prevalence of 33.4% renal insufficiency at initiation of HAART with increased mortality among those patients with more severe renal insufficiency within 90days and also two year survival analysis after initiating HAART(25).Renal dysfunction was characterized using the Cockcroft-Gault method with about 3.1% having severe renal dysfunction defined by a creatinine clearance of less than 30mL/min(25) In this study they did not do routine urinalysis; this might have missed some patients who present with proteinuria but with preserved creatinine clearance.

Emem et al in a cross sectional study from Nigeria, found a prevalence of 38% renal dysfunction determined by at least 1+ dipstick albuminuria and/or raised serum creatinine concentration (greater than 132micromoles/ml) in 400 HIV-AIDS patients (26).They attributed the high prevalence to late presentation as evidenced by low CD4 counts in the affected patients.

2.4. Conceptual frame work of the study

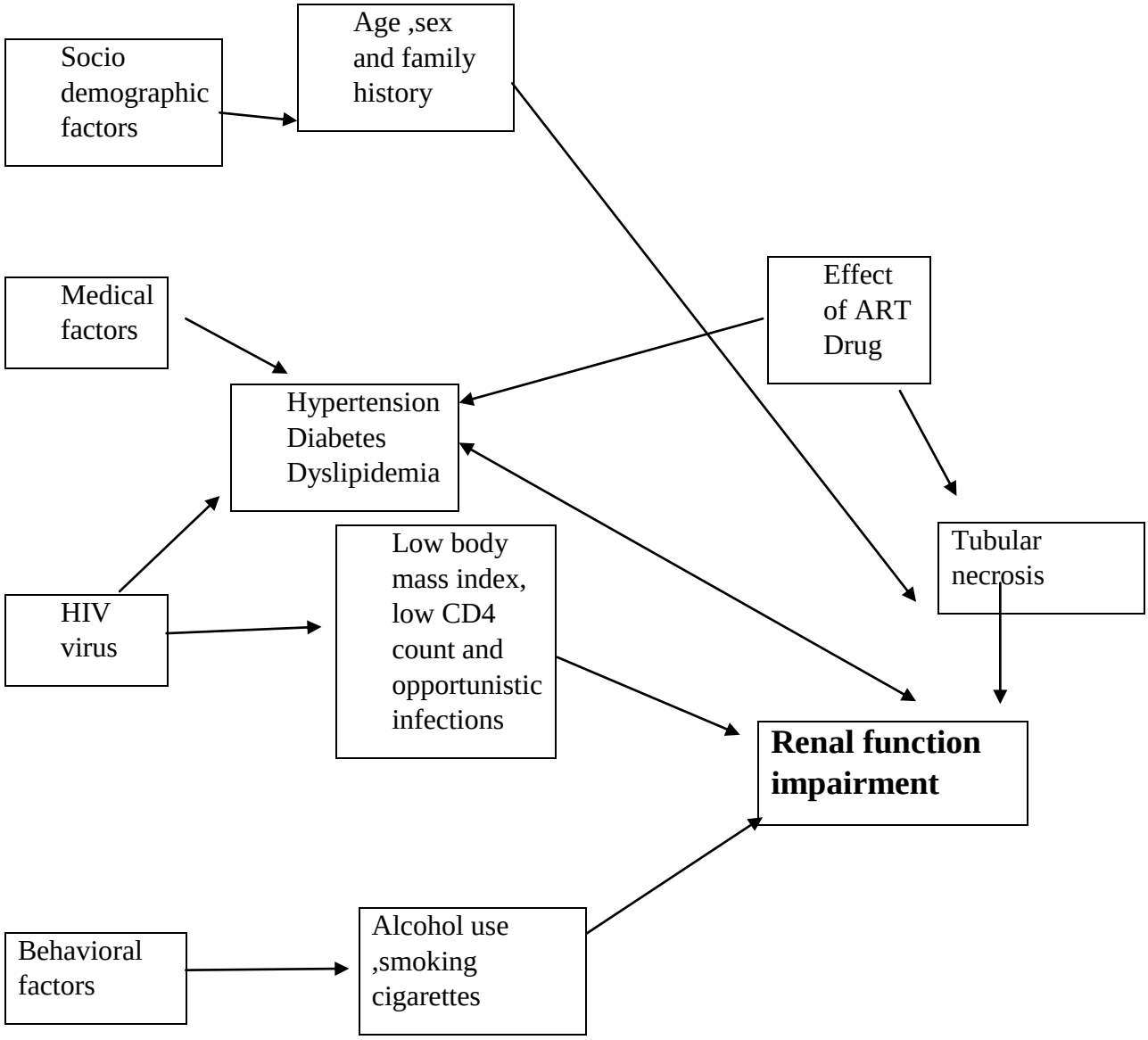

Figure 1: Conceptual framework of renal impairment among patients taking HAART developed based on those references 2018.

3. OBJECTIVES

3.1. General Objective

To assess the magnitude of renal impairment and its associated factors among HIV patients on HAART at ART clinic in Zewditu memorial hospital and Saint Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia, 2018GC**.**

3.2 Specific Objectives

1. To assess the magnitude of renal function impairment among HIV patients on HAART.

2. To assess factors associated with renal function impairment among HIVpatients on HAART.

4. METHODS AND MATERIALS

4.1 Study Setting and Period

This study was conducted in Saint Paul's Hospital Millennium Medical College and Zewditu memorial hospital from Jan to Mar 2018.

Zewditu memorial hospital:which is found inAddisAbaba,Kirkos sub city .is leading hospital in the treatment of ART patients. CDC Ethiopia helped launch Ethiopian's first ART program at Zewditu Hospital in July 2003 and in March 2005 it received technical support from Johns Hopkins University.it Is one of referral hospital under regional health bureau. There are around 6700 HIV infected patients currently on HAART and have follow up at ART clinic.

Saint Paul's Hospital Millennium Medical College

Found in Addis Ababa, Gullele sub-city in 2017\18. It is one of Teaching hospitals under federal Minister of health, referral center for different health facilities, providing health service for over 300,000 people per a year in different catchment areas. The hospital has medical, surgical and orthopedics, gynecology / obstetrics, pediatrics, Endoscopy, psychiatry and rehabilitation department, ART departments. There are 4,528 HIV infected patients on HAART who had follow up in ART clinic.

4.2 Study Design

An institution based cross-sectional study was conducted among HIVpatients taking HAART and follow up in Saint Paul's Hospital Millennium Medical College and Zewditu memorial hospital.

4.3. Population

4.3.1. Source population

All HIV infected patients on HAART in public hospitals in Addis Ababa.

4.3.2. Study population

Those HIV infected patients on HAART, age above 18 who had a follow up in public hospital in Addis Ababa.

4.3.3. Study unit

Those HIV infected patients on HAART, age above 18 and who have a follow up in SPHMMC and Zewditu memorial hospital ART clinic.

4.4. Data Collection Tool and Techniques

Interviewer administered structured data collecting sheet where adapted from previous study and comments of advisors are incorporated by the investigator that can be filled by data collectors from face to face interview and medical record review blood was sent for creatinen for those having old result.

Two medical doctors and twoBSc nurses currently working in ART clinic where involved during the data collection process , training was given to the data collectors by the principal investigator for two days on the objective of the study, how to approach participants , how to fill and collect the relevant data using the data collection sheet. The Principal Investigator was continuously supervising the data collectors and 10% of the records were cross checked against the selected medical records.

The questioners have the following data:

- ✓ **Socio-Demographics**; Age, Sex, Address, Educational level, Occupation, Marital status, income.
- ✓ **Clinical history**; Family history of renal disease, History of opportunistic infections, history of hypertension diabetes dyslipidemia Current and previous medications used, ART history.
- ✓ **Clinical measurements**; Weight *(*Kg*)*, Height *(*m*)*, Body mass index (*Kg/*m2), Blood pressure *(*mm/Hg).

- ✓ **Laboratory measurements**; Current Serum creatinine (mg/dl),Estimated GFR *(*ml/min/1.73m2*)*, Urine dipstick *(*protein /hematuria / leucocytes*)*, Random blood glucose *(*mg/dl*)*, CurrentCD4 counts *(*cells/mm^3*)*andviral load.

Renal function impairment was measured using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula(27).

4.5 Sample size calculation and Sampling Procedure

The sample size required for this study was calculated by using single population proportion formula theproportion considered in sample size determination is prevalence of renal function impairment among HIV infected patients on HAART conducted in Southwest part of Ethiopia, which was 18.2%(28).

With margin of error 3% and 95% certainty level.

Among all public Hospitals in Addis AbabaZewditumemorial hospital and saint Paulo's hospital where selected based on patient flow with a total of 11,228 individuals.

The formula used to calculate the sample size was

$$\mathbf{n = (Z\alpha/2)^2 p\ (1\text{-}p)/\ d^2}$$

Where,

Z=is the reliability coefficient associated with 95% confidence level which is 1.96.

P= is the proportion of renal impairment among patients taking HAART that taken from previous Published studies(28)

d = margin of error 3 %.

n = initial sample size.

Then, $n= (1.96)^2(0.182)\ (0.818)/\ 0.03^2 = 635$

Adding a 10 % non-response rate gave the required sample size = **698**

And also calculated for the second objective the results are as follow:-

Table 1: Sample size calculated for the second objective, 2018

Associated Factors	Result
Age	106
Sex	632
CD4 count	38
Diabetics	3410
Hypertension	3049
BMI	524
WHO stage	175

Due to feasibility the third largest sample size was taken which is calculated by using single population proportion and distributed for each hospital based on their proportion.so that **411** for Zewditu and **281** for Saint Paulo's. HIV infected patients on HAART where selected during ART clinic visit using systematic random sampling technique.

K = patient flow with in two month/sample size

K=3000\282

=10, so every 10^{th} patient was selected in saint Paulo's hospital ART follow up clinic

K=5000\416 =12

So every 12^{th} patient was selected in zewditu ART follow up clinic. The first patient was selected by lottery method.

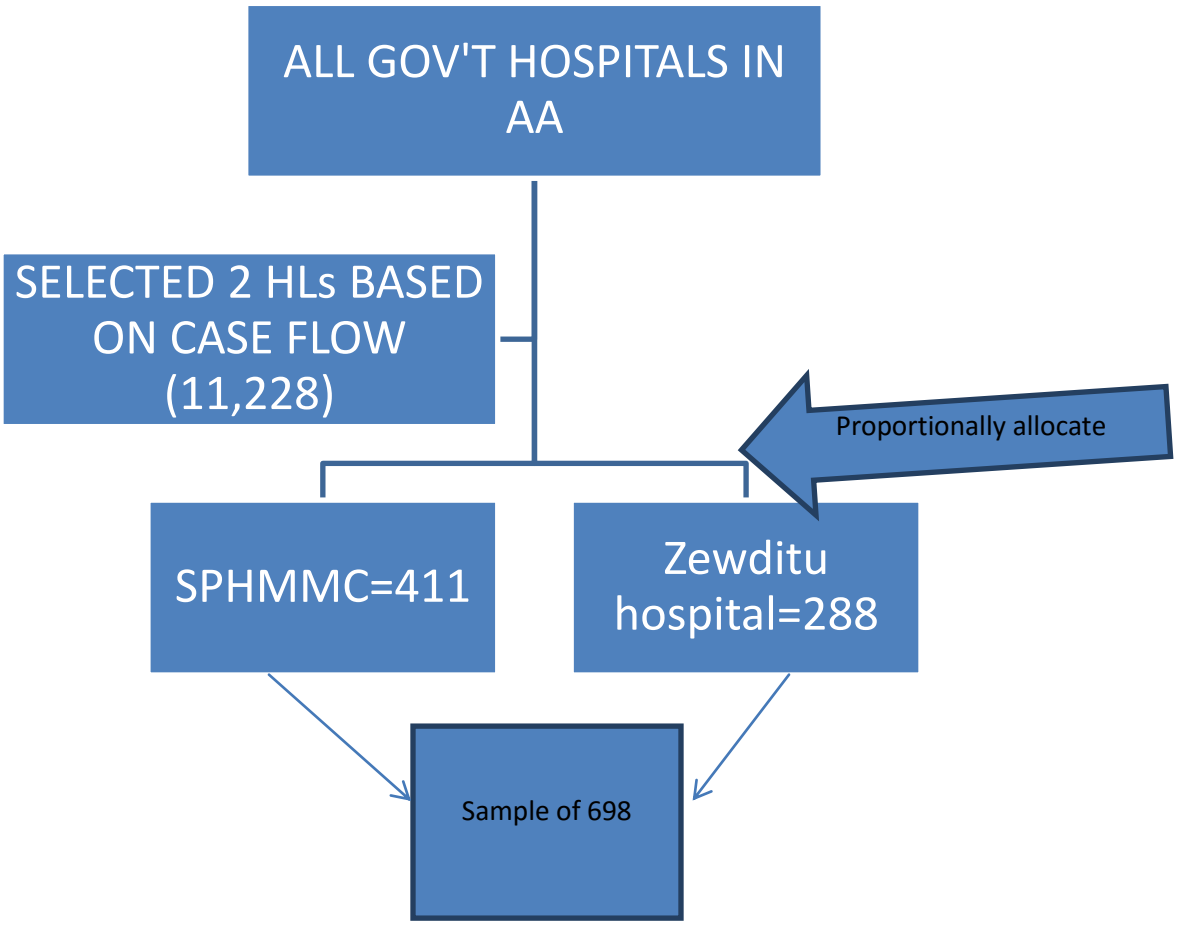

Figure 2: Schematic presentation of sampling technique, 2018

4.6 Eligibility criteria

4.6.1. Inclusion criteria

- All HIV positive patients on HAART for greater than or equal to 3 years who come to ART clinic during the study period.
- Age equal or greater than 18 years

4.6.2. Exclusion Criteria

- Pregnant patients
- Patients with known renal disease
- Amputated patients

4.7. Study Variables

4.7.1 Dependent variable

Renal function impairment

4.7.2. Independent variables

- Socio- demographic variables
- Behavioral factors
- History of opportunistic infections
- Hypertension
- Diabetes
- Clinical and laboratory measurements
- Family history of renal disease
- Medication use

4.8. Data Quality control

The data collecting sheet was adopted from previous researchers checked for internal consistency capable of yielding the required data for the study and some modifications was done according to comment of advisors. . Training was given for data collectors the principal investigator was supervised the data collection process. Pretest was done in 5% of the questionnaire in yekatit 12 medical collage by the principal investigator. The collected data was checked for completeness consistency and clarity.

4.9. Data Entry and Analysis

Datawas checked for its completeness entry by using Epidata version 3.2exported ,cleaned and analyzed by SPSS version 20. The generated data was compiled by proportion, frequency tables, charts, and graphs. Bivariate ordinal logistic regression analyses was done to evaluate the association of renal impairment with each independent variables and p-value<0.25 was includes into the multivariable ordinal logistic regression in two separated model for socio- demographic variables and for clinical variables. Final model was taken from the two with value <0.1. P-value <0.05 was taken as statistically significant.

Multivariable logistic regression analysis was used to control for identified possible potential confounding variables.

In order to evaluate the strength of association, both crude and adjusted odds ratios with 95% confidence interval where calculated. Renal impairment was classified based on national kidney foundation guide line based on eGFR determined by ckd-epi estimation equation. Accordingly eGFR>90ml\min\1.73m^2 normal 60-89ml/min/1.73m^2 mild,59-30ml/min/1.73m^2 moderate 29-15ml/min/1.73m^2 sever and<15 kidney failure.

4.10. Operational definition

Renal impairmentdefined as eGFR less than 60ml/min/1.73m^2 calculated by the Ckd-epi formula.

Acute kidney injury previously called acute renal failure (ARF) is rapidly progressive loss of renal function , generally characterized by oliguria (decreased urine production, quantified as less than 400ml per 24 hrs. in adults , less than 0.5 ml/kg/hr. in children or less than 1 ml/kg/hr., In infants and fluid and electrolyte imbalance. AKI result from a variety of causes, generally classified as pre-renal, intrinsic, and post-renal.

Risk of renal dysfunction is defined as 1.5 fold increase in serum creatinine or GFR decrease >25% or urine output less than 0.5ml/kg/hr. for 6 hours.

Injury to the kidney is defined as two fold increase in serum creatinine or GFR decreases by >50% or urine output <0.5ml/kg/h for 12 hours.

Failure of kidney function is defined as threefold increase in serum creatinine or GFR decreases by >75% or serum creatinine greater than or equal to 4mg/ld. or acute rise in serum creatinine greater or equal to 0.5mg/dl or urine output <0.3ml/kg/h for 24hours or anuria for 12hours.

Chronic kidney disease (CKD) can also develop slowly and initially show few symptoms. CKD can be the long term consequence of irreversible acute disease or part of disease progression. According to the National Kidney Foundation, CKD is evidence of kidney damage that persists for greater than three month .A useful indicator of kidney damage is elevated urinary protein excretion measured qualitatively with a urine dipstick or quantitatively with a spot urine protein to creatinine ratio. Micro albuminuria refers to elevated excretion of albumin above normal ranges but below the level of detection by dipstick test for protein. Persistent proteinuria is the principal marker of kidney damage (29).

Severity of kidney damage is graded according to renal function on the basis of GFR or creatinine clearance into five stages.

CKD stage 1 is normal or increased GFR above 90ml/min/1.73m2.

CKD stage 2 is mild or reduced GFR ranging 60-89ml/min/1.73m2.

CKD stage 3 is moderate GFR ranging 30-59ml/min/1.73m2.

CKD stage 4 is severe GFR ranging 15-29ml/min/1.73m2.

CKD stage 5 is ESKD with GFR below 15ml/min/1.73m2 and in need of permanent renal replacement therapy in form of dialysis.

Recent result: is a result that was done with in the last three months.

4.11. Ethical consideration

Ethical clearance and approval letter where obtained from Addis Ababa University (AAU), college of health science, school of public health Ethical Review Committees to conduct the research. An official letter of approval was written to both Zewditu memorial Hospital and Saint Paulo's Hospital millennium medical collage research office from AAU school of public health ethical review committee. Approval letter was taken from SphmmcIRB and recommendation letter from Zewditu memorial hospital for respective department. Informed verbal consent was taken from each participant after describing the benefits and risks of the study. Anonymity was kept; during specimen collection privacy was kept. Any information concerning the participants was kept confidential and the specimens collected from the participants were analyzed only for the intended purposes. Abnormal results where communicated to internal medicine unit in the hospital for appropriate management.

4.12. Dissemination of the result

The finding of the study will be presented and submitted to AAU collage of health science school of public health for partial fulfillment of the degree of masters in General public Health. And efforts will be made to present it on scientific conferences. The paper will also be given to peer review journals for publication.

5. RESULTS

The results of this research were based on 691 participants of the study who successfully completed the interview with response rate of 98.9 %.

5.1 Socio-demographic Characteristics

Mean age of participants was 41.8 ± 9.1SD .Most of the participants are Females 448(64.8%) the reaming 243(35.2%) are males. Most of the respondents 612(88.6) live in urban the rest79 (11.4) live in rural part of Ethiopia. Majority of the respondents 237 (34.3%) completed secondary education followed by 217(31.4%) Primary Education, 125(18.1%) Collage and above 86(12.4%) cannot read and write and 26(3.8%) can read and write. The majority of participants 326(47%) are married followed by widowed 130(18%), single 115(16.6), divorced 115(16.6%) and cohabitation 5(0.7%) (**Table 2**)

Table 2: Socio-demographic characteristics of HIV patients on HAART attending ART clinics at Zewditu memorial hospital and Saint Paulo's Hospital millennium medical college, Addis Ababa, Ethiopia, 2018

Variables	frequency	Percentage (%)
Age		
<30	75	10.9
31-40	274	39.7
41-50	242	35
51-60	84	12.2
>60	16	2.3
Sex		
Male	243	35.2
Female	448	64.8
Marital status		
Single	115	16.6
Married	326	47.2
Divorced	115	16.6
Widowed	130	18.8
Cohabitation	5	0.7
Educational status		
Cannot read and write	86	12.4
Can read and write	26	3.8
Primary education	217	31.4

Secondary education	237	34.3
Collage and above	125	18.1
Main Occupation		
Governmental	142	20.5
private	294	`42.5
Non-governmental	38	5.5
Unemployment	217	31.4
Monthly income (in ETB)		
≤ 200 ETB	210	30.4
201-850	68	9.8
851-1668	137	19.8
1669-4000	156	22.6
≥4001 ETB	120	17.4

5.2 Behavioral Factors of participants

Among 691 Participants 93(13.5%) have history of smoking cigarette .12(1.7%) are current smokers among this 6(50%) smoke every day .the rest 6(50%) smokes someday.266 (38.5%) have previous history of alcohol drink. 94(13.6%) are current drinkers (**Table 3**).

Table 3: Behavioral Factors of HIV patients on HAART attending ART clinics at Zewditu memorial hospital and Saint Paulo's Hospital millennium medical college, Addis Ababa, Ethiopia, 2018

Variables	**frequency**	**Percentage (%)**
Ever smoke cigarette		
Yes	93	13.5
No	598	86.5
Current smoking		
Yes	12	1.7
No	679	98.3
Frequency of smoking		
Every day	6	50
Some day	6	50
Number of cigarette per day		
1-4cigarrate	4	33.3
>5 cigarette	8	66.6
Ever drink alcohol		
Yes	266	38.5

No	425	61.5
Current alcohol drinking		
Yes	94	13.6
No	597	86.4

5.3 Laboratory and clinical information of the study participants

About 24(6.5%) participants are positive for Tuberculosis the rest 667(96.5%) are negative.35 (5.1) of participants have confirmed Diabetes mellitus on medication.75 (10.9%) of respondents are confirmed Hypertensive on medication. 33(4.8%) of participants have family history of renal disease.618 (89.4%) of individuals where receiving first line regimen. The most common ART regimen used where TDF +3TC+EFV 302(48.9%). 233(33.7%) of participants are on sulfametoxazole prophylaxis. Most of the participants 623(90.2%) are world health organization treatment stage one. The mean CD4 count was 541 ±267.2sd cells\$mm^3$. 179 (25%) of participants CD4 count was <350 cell\$mm^3$. mean hemoglobin concentration was 14.22±3.77SD.Mean blood glucose level was 104.9 ±40.9sd.Above half of participants 389(56.3%) have normal BMI followed by overweight 198(28.7%), underweight 53(7.7%) and 51(7.4%) obese. 110(15.9%) of participants have proteinuria +1 and above.81 (11.7%) have Hematuria.59 (8.5%) have leukocyte in the urine. Mean creatinin was 0.797 ±0.297sd. 571(82.6%) have eGFR> 90ml/min/1.73m^2, 99(14.3%) have mild impairment, 19 (2.7%) have moderate impairment and 2 (0.3) have sever impairment. About 86(12.4%) of participants are positive for HBV.28 (4.1%) are positive for HCV (**Table 4**).

Table 4: laboratory and clinical information of HIV Patients on HAART attending ART clinics at Zewditu memorial hospital and Saint Paulo's Hospital millennium medical college, Addis Ababa, Ethiopia, 2018

Variable		Frequency	Percent (%)
Tuberculosis			
Yes		24	3.5
No		667	96.5
Hypertension			
Yes		75	10.9
No		616	89.1
Diabetes			
Yes		35	5.1
No		656	94.9
Dyslipidemia			
Yes		32	4.6
No		659	95.4
Fungal infections			
Yes		140	20.3
No		551	79.7
Urinary tract infection			
Yes		191	27.6
No		500	72.4
Family history of renal Disease			
Yes		33	4.8
No		658	95.2
WHO	Stage 1	623	90.2
stage	Stage 2	41	5.9
	Stage 3	24	3.5
	Stage 4	3	0.4
HAART	First line	618	89.4

regimen	Second line	73	10.6
Proteinuria	Yes	110	15.9
	No	581	84.1
CD4	<350	179	25.9
COUNT	>350	512	74.1
NSAID use	Yes	128	18.5
	No	563	81.5
HBV	Yes	28	4.1
	No	663	95.9
HBV	Yes	86	12.4
	No	605	87.6
BMI	Under weight	53	7.7
	Normal	389	56.3
	Over weight	198	28.7
	Obese	51	7.4
Viral load	<150	500	81.8
	150-1000	23	3.8
	>1000	88	14.4

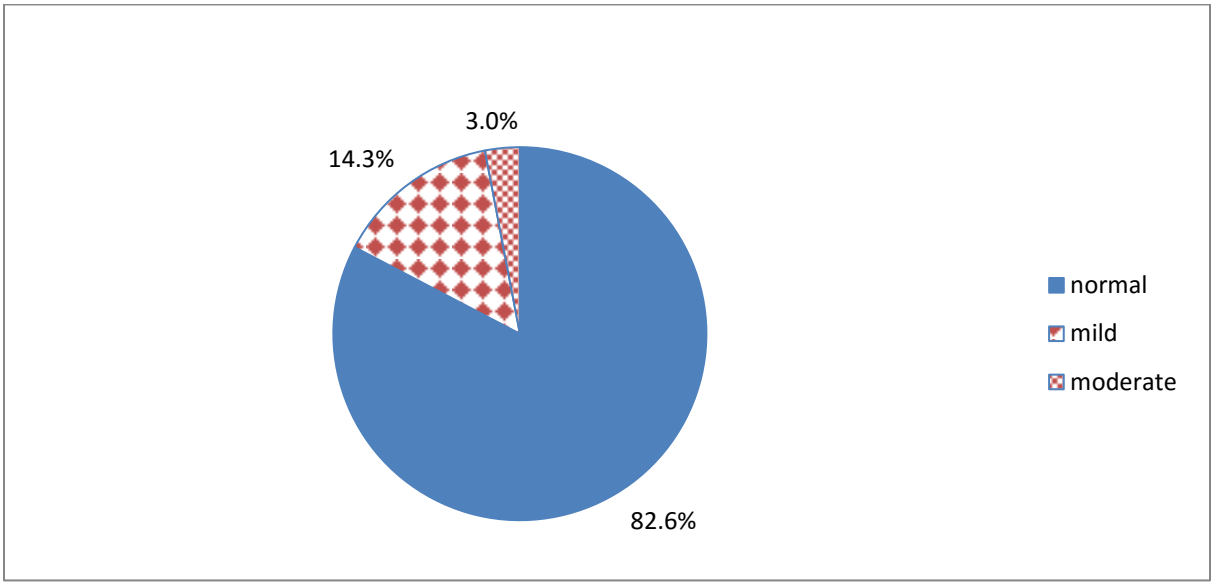

Figure 3 :**Magnitudeof renal function impairment among HIV patients on HAART in government hospitals in adis abeba 2018.**

5.4 Bivariate and multivariable ordinal logistic regression for factors of renal function impairment among HIV patients on HAART

Bivariate logistic regression was done to identify factors for the multiple based on their significance p-value<0.25. In the analysis age, educational status, marital status, residency, income, job, current alcohol drink, diabetic, hypertension, HBV, first line HAART regimen, month on art, CD4count ,non- steroidal anti -inflammatory drug use, body mass index and proteinuria are selected for multi variable logistic regression. And the bivariate analysis showed that age group 41-50 are less likely to develop renal impairment (COR=0.37;95%CI 0.122,1.15)than age group 51-60 (COR=0.88;95%CI0.274,2.83).Those marital status divorced are more likely to develop renal impairment (COR=1.68;95%CI0.9,3.41) than married ones (COR=0.94;95%CI0.54.1.64).Participants completed primary education are more likely to develop renal impairment (COR=1.55;95%CI 0.82,2.95,) than those completed secondary education. Those who live in urban are less likely to develop renal impairment (COR=0.61; 95%0.352, 1.05) than live in rural .Those who work in non -governmental institutions are less likely (COR=0.481;95%CI0.162,1.43) than those who work in governmental institutions (COR=0.823;95%CI 0.48,1.4).Participants having average monthly income 1669-4000 EB are less likely to develop renal impairment (COR= 0.61;95%CI 0.314,1.19) than having monthly income 851-1668EB.

Participants having diabetic are more likely to develop renal impairment (COR=2.8;95%CI1.373,5.85),Binghypertensive(COR=2.99;95%CI1.78,5.022,).thoseon HAART for 36-72 months are less likely to develop renal impairment (COR=0.47;95%CI 0.23, 0.954) than that of 73-108 month (COR= 0.72; 95%CI 0.386, 1.35).NSAID use (COR= 1.85;95%CI 1.174,2.91).Having CD4 Count <350 (COR=1.65;95%CI 1.08,2.52) (**Table 5**).

Table 5: Risk factors associated with renal function impairment from binary ordinal logistic regression analysis, among HIV on HAART attending ART clinic at Zewditu hospital and saint Paulo's hospital millennium medical college, 2018.

Predictor variables	eGFR ml\min\1.73m^2			COR (95%CI)	P value
	>90 N (%)	89-60 N (%)	<60 N (%)		
Age category					
<30	65(11.4)	7(7.1)	3(14.3)	**0.284(0.8,1.006)**	**0.051**
31-40	238(41.7)	33(33.3)	3(14.3)	**0.27(.087,0.837)**	**0.023**
41-50	200(35.0)	37(37.4)	5(23.8)	**0.376(0.122,1.157)**	**0.088**
51-60	57(10.0)	20(20.2)	7(33.3)	0.881(0.274,2.83)	0.831
>61	11(1.9)	2(2.0)	3(14.3)	1.00	
Marital status					
Single	95(16.6)	19(19.2	1(4.8)	1.05(0.538,2.054)	0.883
Married	276(48.3)	38(38.4)	12(57.1)	0.94(0.54,1.64)	0.828
Divorced	86(15.1)	26(26.3)	3(14.3)	**1.68(0.9,3.14)**	**0.1404**
Widowed	109(19.1)	16(16.2)	5(23.8)	1.00	
Educational status					
Cannot read and write	59(10)	21(21.2	6(28.6)	**3.374(1.67,6.8)**	**0.001**
Can read and write	22(3.9)	4(4)	0(0)	1.29(0.39,4.232)	0.677
Primary education	79(31.3)	31(31.3)	7(33.3	**1.55(0.82,2.95)**	**0.179**
Secondary	201(35.2)	31(31.3)	5(23.8)	1.3 (0.682-2.478)	0.425

education					
Collage and above	110(19.3)	12(12.1)	3(14.3)	1.00	
Residency					
Urban	512(89.7)	80(80.8)	20(95.2)	**0.606(0.352,1.046)**	**0.072**
Rural	59(10.3)	19(19.2)	1(4.8)	1.00	
Occupation					
Non - governmental	34(6)	2(2)	2(9.5)	**0.481(0.162,1.43)**	**0.188**
Governmental	117(20.5)	23(23.2)	2(9.5)	0.823(0.48,1.41)	0.481
private	247(43.3)	38(38.4)	9(42.9)	**0.751(0.477,1.181)**	**0.215**
Unemployment	173(30.3)	36(36.4)	8(38.1)	1.00	
Income					
<200	168(29.4)	34(34.3)	8(38.1)	1.104(0.623,1.96)	0.734
201-850	57(10)	10(10.1)	1(4.8)	0.837(0.38,1.85)	0.659
851-1668	111(19.4)	22(22.1)	4(19)	1.026(0.548,1.92)	0.936
1669-4000	137(24)	16(16.2)	3(4.3)	**0.610(0.314,1.19)**	**0.145**
4001+	98(17.2)	17(17.2)	5(23.8)	1.00	
Current drink alcohol					
Yes	88(15.4)	6(6.1)	0(0)	**0.418(0.266,0.658)**	**0.001**
No	483(84.6)	93(93.9)	21(100)	1.00	
Diabetes					
Yes	23(4)	8(8.1)	4(19)	**2.834(1.373,5.853)**	**0.005**

No	548(96)	91(91.9)	17(81)	1.00	
Hypertension					
Yes	49(8.6)	20(20.2)	6(28.6)	**2.99(1.78,5.022)**	**0.001**
No	522(91.4)	79(79.8)	15(71.4)	1.00	
First line drugs					
AZT_3TC_NVP	94(18)	17(21.2)	3(2.6)	**0.076(0.003,1.85)**	**0.076**
AZT3TC_EFV	49(9.4)	9(11.2)	0	**0.064(0.002,1.621)**	**0.064**
TDF 3TC EFV	266(50.9)	28(35)	8(2.6)	**0.049(0.002,1.17)**	**0.049**
TDF3TC EFV	114(21.8)	25(31.2)	3(2.1)	**0.86(0.004,2.09)**	**0.086**
ABC3TCEFV	0	1(1.2)	0	**1.00**	
Month on ART					
36-72	109(19.1	13(13.1	1(4.8)	**0.47(0.231,0.954)**	**0.037**
73-108	114(20)	3(23.2)	0(0)	0.72(0.386,1.35)	0.307
109-144	250(43.8)	46(46.5)	11(52)	0.847(0.501,1.432)	0.536
145+	97(17)	16(16.2)	9(42.9)	1.00	
NSAID use					
Yes	95(16.6)	29(29.3)	4(19)	**1.85(1.174,2.91)**	**0.008**
No	476(83.4)	70(7.07)	17(81)	1.00	
CD4 count					
<350	138(24.2)	32(32.2)	9(42.9)	**1.65(1.08,2.52)**	**0.02**
>350	433(75.8)	67(67.7)	12(57.1)	1.00	

BMI					
Under weight	36(6.3)	14(14.1)	3(14.3)	**0.47(0.231,0.954)**	**0.037**
Normal	334(58.5)	47(47.5)	8(38.1)	0.722(0.39,1.35)	0.307
Over weight	157(27.5)	33(33.3)	8(38.1)	**0.85(0.501,1.432)**	**0.536**
Obese	44(7.7)	5(5.1)	2(9.5)	1.00	
Proteinuria					
Yes	70(12.3)	26(26.3)	14(66.7)	**11.96(4.71,30.34)**	**0.001**
No	501(87.7)	73(73.7)	7(33.3)	1.00	
HBV					
Yes	78(13.7)	6(6.1)	2(9.5)	**0.456(0.214,0.971)**	**0.001**
No	493(86.3)	93(93.9)	19(90.5)	1.00	

5. 5.Model 1, Model 2 and final model for multivariable analysis

Significantly associated variables were entered into multivariable analysis. Model 1 for socio-demographic factors; model 2 for clinical and laboratory measurements .those variables with p-value<0.1where taken in to final model. Those cannot read and write AOR (4.18; 95% CI1.65,10.58;p-value 0.003) , Bing hypertensive AOR(1.86 ;95%CI1.045,3.305) p-value0.035) ,Hepatitis B virus positive AOR(0.376; 95%CI0.168,0.84 ,p-value0.017),under- weight AOR (3.14 ;95% CI 1.07,9.2,P-value0.038) and having proteinuria AOR3.55;95%CI 2.17,5.81p-value0.001) where significantly associated with renal function impairment(**Table 6**).

Table 6: Risk factors associated with renal function impairment from multivariable ordinal logistic regression analysis, among HIV patients on HAART attending ART clinic at Zewditu hospital and saint Paulo's hospital millennium medical college, 2018

Variables	category	eGFR(ml\min\1.73m^2			AOR(95%CI)	P-value
		>90	89-60	<60		
Model 1						
Age	<30	65(11.4)	7(7.1)	3(14.3)	0.37(0.102,1.34)	0.131
	31-40	238(41.7)	33(33.3)	3(14.3)	0.3(0.094,0.957)	0.042
	41-50	200(35)	37(37.4)	5(23.8)	0.425(0.134,1.35)	0.148
	51-60	57(10)	20(20.2)	7(33.3)	0.9(0.271,2.987)	0.863
	>60	11(1.9)	2(2)	3(14.3)	1	
Educational status	Cannot read and write	59(10)	21(21.2	6(28.6)	3.9(1.574,9.681)	0.003
	Can read and write	22(3.9)	4(4)	0(0)	1.66(0.46,6.01)	0.438
	Primary education	79(31.3)	31(31.3)	7(33.3	2.04(0.949,4.38)	0.068
	Secondary	201(35.2)	31(31.3)	5(23.8)	1.73(0.844,3.55)	0.134

	education					
	Collage and above	110(19.3)	12(12.1)	3(14.3)	1	
Income	<200	168(29.4)	34(34.3)	8(38.1)	0.508(0.141,1.83)	0.301
	201-850	57(10)	10(10.1)	1(4.8)	0.52(0.21,1.284)	0.155
	851-1668	111(19.4)	22(22.1)	4(19)	0.82(0.4,1.681)	0.587
	1669-4000	137(24)	16(16.2)	3(4.3)	0.45(0.218,0.931)	0.031
	4000^{+}	98(17.2)	17(17.2)	5(23.8)	1	
Model 2 for clinical and laboratory measurements						
Variable	category	eGFR(ml\min\1.73m^2			AOR(95%CI)	P-value
		>90	89-60	<60		
Hypertension	Yes	49(8.6)	20(20.2)	6(28.6)	2.5(1.298,4.829)	0.006
	no	522(91.4)	79(79.8)	15(71.4)	1	
BMI	Under weight	36(6.3)	14(14.1)	3(14.3)	5.42(1.478,19.9)	0.011
	Normal	334(58.5)	47(47.5)	8(38.1)	1.68(0.537,5.22)	0.374
	Over weight	157(27.5)	33(33.3)	8(38.1)	3.27(1.036,10.3)	0.043
	obese	44(7.7)	5(5.1)	2(9.5)	1	
CD4	<350	138(24.2)	32(32.2)	9(42.9)	1.6(0.92,2.68)	0.095
	>350	433(75.8)	67(67.7)	12(57.1)	1	
Protein urea	Yes	70(12.3)	26(26.3)	14(66.7)	3.27(1.8,5.92)	0.001
	no	501(87.7)	73(73.7)	7(33.3)	1	
HBV	Positive	78(13.7)	6(6.1)	2(9.5)	0.257(0.089,0.747)	0.013
	Negative	493(86.3)	93(93.9)	19(90.5)	1	

Final model for multivariable analysis of associated factors

Variable	Category	eGFR(ml\min\1.73m^2			AOR(95%CI)	P-value
		>90	89-60	<60		
Educational status	Cannot read and write	59(10)	21(21.2	6(28.6)	4.18(1.65,10.58)	0.003
	Can read and write	22(3.9)	4(4)	0(0)	2.3(0.623,8.49)	0.212
	Primary education	79(31.3)	31(31.3)	7(33.3	1.976(0.913,4.27)	0.084
	Secondary education	201(35.2)	31(31.3)	5(23.8)	1.84(0.88,3.85)	0.104
	Collage and above	110(19.3)	12(12.1)	3(14.3)	1	
Hypertension	Yes	49(8.6)	20(20.2)	6(28.6)	1.86(1.045,3.305)	0.035
	no	522(91.4)	79(79.8)	15(71.4)	1	
BMI	Under weight	36(6.3)	14(14.1)	3(14.3)	3.14(1.07,9.21)	0.038
	Normal	334(58.5)	47(47.5)	8(38.1)	1.11(0.44,2.77)	0.827
	Over weight	157(27.5)	33(33.3)	8(38.1)	1.82(0.71,4.65)	0.209
	Obese	44(7.7)	5(5.1)	2(9.5)	1	
Proteinuria	Yes	70(12.3)	26(26.3)	14(66.7)	3.55(2.17,5.81)	0.001
	no	501(87.7)	73(73.7)	7(33.3)	1	
HBV	Positive	78(13.7)	6(6.1)	2(9.5)	0.376(0.168,0.84)	0.017
	Negative	493(86.3)	93(93.9)	19(90.5)	1	

6. Discussions

This study assessPrevalence of renal function impairment and associatedfactors in HIV patients on highly active anti retro viral therapybased on glomerularfiltration rate using ckd -epi estimation equation method and the prevalence was 3% (95%CI1.7%, 4.3%). This result was in parallel with a study done in Ghana 3.7%(30)cohort study in middle income countries 3.8%(31). Naval Medical -enter San Diego 3%(32)but higher than Tanzania 1.2 %(33) But lower as compared to a report from southwest part of Ethiopia 7.6%(34) . 8.4% study in Brazil(35) Zambia 5.5%(36). Population variation, study design, sample size, different in inclusioncriteria, and use of different estimating formulas may contribute to the differences observed.

The prevalence of proteinuria in this study was 15.9% which is similar with a study done in Gondar(24). But lower from study done in Nigeria and high compared to south Africa(37).as it is early sign of renal damage(38).

The prevalence of hypertension in this study was 10.9% which is concordant with a study done in Barcelona 13.1 %(39). lower from study done in Limbe general hospital, Cameron 38 % (40).and study done in Malaysia 45.6%(41).

In this study old age (>50) is not significantly associated with renal function impairment this finding is discordant with study done in Jimma(34),south Africa(37),Nigeria(42),cohort study in middle income countries(31),Myanmar,Korea(43) and Spain (44) .those studies found out that old age is independent predictor for renal function impairment. This variation may be due to the population variation, mean age of participantsin this study is 41.8 and different age classification methods used.

This study finds out that those cannot read and write are4times more likely to develop renal impairment than collage and above. Low educational status was significantly associated with renal impairment which is supported by the study from Sweden(45)This may associate with those cannot read and write in this study where relatively older than others. Renal function is known to decline with age. Older age is an established risk factor for decline in creatinine clearance in the general population(46).

This study foundout that gender is not statisticallysignificant associated with renal impairment. This finding is not in lined with the studied conducted in Gondar(47),Jimma(34), and sndiago(32)sanfransisco(48) those revealed being female is the main predictor of renal impairment. The discrepancy could be explained by differences in sociocultural variability, different in samplesize, and population variation.

This study revealed that Binghypertensive is86% more likely to develop renal impairment than non-hypertensive .Hypertension was significantly associated with renal function impairment. This finding is in line with a study done in brazil(35),Washington (49), London(50)study in turkey(51). And the fact that incidence of serumcreatinine increase 5 times greater in hypertensivepatients as compared to patients with normal blood pressure(52).This is because kidney is one of the principal target organsof hypertension and most disease of kidney associated with blood pressure elevation.

In this study diabetes is not independent predictor for renal function impairment this is discordant with study done in middle income countries(31)Sandi ago(32).and southern Ethiopia (53) those studies showed that diabetes is significantly associated with renal impairment. This variation may be due to population variation and most of our participants are in age group 31-40.

This study shows that low CD4 count is not statistically significant association with renal function impairment .This finding is discordant with those studies conducted in Gondar(24),Jimma(34),in middle income countries(31)Tanzaniya(33),Sandi ago (32).Those studies showed that low CD4 count is one of independent predictor for renal function impairment in HIV patients on HAART.This variation may be due to differentCD4 classification method, different in inclusion criteria and most ofourparticipants have CD4 count greater than 350 cells\mm^3.

This study showsthat renal function impairment among underweight is 3 times morelikely than those who have normal body mass index. Underweight is significantly associated with renal impairment .This finding is in agreement with the finding of those studies conducted in Japane(54), a study done in Zimbabwe, Nigeria (42)Taiwan(55),United States veterans(56)and Gondar(24).But discordant with the study done in university of Alabama (57),study in Israel which shows high BMI associated with renal impairment(58)and a study inEngland(50).

This study shows that co- infection with hepatitis B virus and HIV among HAART is67% less likely to develop renal impairment than negatives and is statisticallysignificant. This finding is discordant with Meta-analysis which showed that no relationship occurred between HBV positive status and prevalent chronic renal disease(59) and study from china shows that no significant association between HBV status and renal impairment(60) but a study in Paris shows high prevalence of CKD in patients Chronic hepatitis B infection, thisvariation is may be due to HBsAg was detected not ELISA this include false positives.

Conclusions and recommendations

Conclusions

- The prevalence of renal impairment among HIV patients on HAART in selected public hospitals in AddisAbaba was relatively low but clinically significant. Multivariable logistic regression sowed that Low educational status, hypertension, low body mass index, hepatitis B co- infection are associated with renal impairment.
- Renal function in HIV on HAART have an impact on the burden of disease, prevention of renal disease among HIV infected individuals is a community as well as an individual concern, healthcare workers, health care managers and planners should strength focus on the prevention of this disease.

Recommendations

Together with increase life expectancy in persons with HIV receiving HAART, this study recommends that:

For patients

- To check their blood pressure every time

For health care service providers

- Early detection of kidney disease by implementation of sensitive screeningtechniques
- Encourage patients to check their blood pressure status each time they arrive at the hospital.
- Should strengthen working on modifiable risk factors like low body mass index.
- Should send urinalysis based on the guideline.

For Health care managers

- Shouldstrengthen working on availability of laboratory equipment

Policy makers

- Emphasis should be given to education, as it is the key tool to have healthy and productive society.

Strength and limitation of the study

Strength

Large sample size, assessment of associated factors urine analysis was done to evaluateforproteinuria which shows early sign of renal damage.

Limitations

Cross sectional nature of the study, systematic sampling procedure,bothcreatiene and proteinuria was measured at single point in time that may include reversible cause of renal impairment and the underlying causes of renal impairment where unknown.

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ANNEXES

Annex I: Information sheet

Addis Ababa University College of Health SciencesSchool of Public Health

Assessment of Renal Function Impairment among Patients taking HAART in Selected public hospitals in Addis Ababa

Greeting, My Name is ----------; I am working in ----------. I am a research team member of Addis Ababa University College of Health Sciences School of public Health. I would like to inform you that I would have a short interview concerning a study which is conducted for the partial fulfillmentof master's in public health. Before we go to our discussion, I will ask you to listen carefully to what I am going to tell you about the purpose and general condition of the study and tell me whether you agree or disagree to participate in this study.

The objective of this study is to assess the magnitude of Renal Impairment among patients taking HAART. You are invited to be one of the participants we will stay together for 10-15 minutes. The study will be conducted through interview, medical record review and 4ml of blood will be taken from your venous blood by laboratory technician there will be little pain us usual and urine specimen will be collected, i will inform you the result. The information you give us is confidential and will be used only for the study purpose. A code number will identify every participant. The result will be disseminated only summarized information of the total participant. The interview is voluntarily and you have the right to participate. Your refusal will not have any effect on services that you get from the Hospital. However, your participation is important to fulfill the study.

Are you willing to participate in the study? 1. Yes 2. No

Thank you! (If the participant agrees to participate start interviewing if not say good bye).

Annex II: Informed consent form

I understand all the information provided to me by the data collector, the research conducted in our follow up hospital requires my participation. I am willing to participate in the interview, provided that no information regarding me is transferred to the third parity. I also understand that the nature of the study is maintaining confidentiality and privacy and my willingness is considered and my right I can stop at any point if there is any inconvenience. Therefor I am willing to participate in the study.

Signature ---------- Date ----------

Data collector name_____ signature_____

Annex III: English Version Questionnaire

	Study number			
	Demographic data			
101	*Age*			
102	*Sex*	*Male*	*Female*	
103	*Marital status*	*Single……1* *Married …….2* *Divorced…….3* *Cohabited……4* *Widowed……5*		
104	*Educational status*	*Illiterate……..1* *Can read and write….2* *Primary……3* *Secondary……4* *Collage and above….5*		
105	*Residency*	*Urban …….1* *Rural……..2*		
106	*Job*	*Non- governmental…….1* *Governmental……..2* *Private……3* *Unemployed…….4*		
107	*Income in Ethiopian Birr*	*Monthly*	*Annually*	
	1. ***Behavioral factors***			
201 *202*	*Have you ever smoke cigarette?* *How was the frequency*	*Yes……1* *Every day……1someday….2*	*No……2* *No at all……..2*	
202	*Do you currently smoke cigarette?*	*Yes…….1*	*No……2*	
204	*If the answer is yes for question 202*	*Every day……1* *Some days……..2* *Not at all……..3*		
205	*On average how many cigarettes do you currently smoke each day? _____*			
206	*Have you ever taken a drink that contains alcohol (tela,tej,areke,wayn…etc.*	*Yes …1*	*No ….2*	
207	*Do you Currently take a drink that contains alcohol?*	*Yes……1*	*No……..2*	

208	*During the last 30 days, how many days did you have a drink that contains alcohol?*	
209	*During the last 1 year how often did you take a drink that containsalcohol?* *almost every day . . . . . 1* *at least once a week . . . . . 2* *less than once a week. . . . . 3* *none in the last 13 months……..4*	
	3. ***medical history***	
301	*Tuberculosis*	*Yes……..1 No……..2*
302	*Cryptococalmeningitis*	*Yes……..1 no……..2*
303	*PCP*	*Yes……..1 No……..2*
304	*Kaposi sarcoma*	*Yes……..1 No……..2*
305	*Diabetes*	*Yes……..1 No……..2*
306	*Hypertension*	*Yes……..1 No……..2*
307	*Dyslipidemia*	*Yes……..1 no……..2*
308	*Fungal infections*	*Yes ……1 no……..2*
309	*UTI*	*Yes……..1 no……..2*
310	*Renal stone*	*Yes ……1 no……..2*
311	*Cardiac disease*	*Yes……..1 no……..2*
312	*family history of renal disease*	*Yes……1 no……..2*
	Any other underling conditions	
312	*WHO stage*	_____
	*4.****Drug History***	
401	*Month and year of ART initiation*	
402	*HAART Regimen*	*First line:_____1* *Second line:_____2*
403	*Sulfamethoxazole/ trimethoprim(cotimoxazole)*	*Yes……..1 no……..2*
404	*INH*	*Yes……..1 no……..2*
405	*antihypertensive*	*Yes……..1 no……..2*

406	*Hypoglycemic drug*	*Yes ……1 no……2*		
407	*lipid-lowering agent*	*Yes……..1 no……2*		
408	*NSAID'S*	*Yes……..1 no……2*		
	5 .Clinical measurements			
501	*Blood pressure*	_____		
502	*mass (kg)*	___.__ *kg*		
503	*height(cm)*	___.__ *cm*		
504	*BMI(kg/m2)*	_____		
	6. Laboratory result			
601	*urine dips tick*	*proteinuria*	*+……1*	*-……2*
		hematuria	*+……..1*	*-……..2*
		leukocytes	*+……..1*	*-……..2*
602	*serum creatinine*			
603	*eGFR*			
604	*CD4 count*			
605	*Viral load*			
606	*Random blood glucose*			
607	*hemoglobin*			
607	*HBV*	*+……..1 -……2*		
608	*HCV*	*+……..1 -……..2*		

Amharic version of information sheet

ስለጥናቱመረጃመስጫቅፅ

ስሜ----------

ይባላልየመጣሁትከአ.አዩኒቨርስቲየጥናትቡድንነው::ስለጥናቱትንሽመግለጫሰለማደርግበጥሞናያዳምጡኝዘንድበትህትናእጠይቃለሁ::ይህጥናትበአ.አዩህክምናናጤናሳይንስኮሌጅየማስተርስፕሮግራምመመረቂያፅሁፍነው::

የዚህጥናትዓላማየኩላሊትህመምንናተያያዥችግሮችንየኤችአይቪመድኃኒትበሚወስዱላይየሚያስስነው::ጥናቱየሚካሄደውበቃለምልልስ፣
ከካርድላይበምንወስደውመረጃእናከርሶበምንወስደውየደምናየሽንትናሙናለይተመስርቶነውለቃለምልልሱእሪሶተጋብዘዋልበአጠቃላይከ10-15ደቂቃአብረውይቆያሉ
4ሚሊሊትርደምከክንድትላይበባለሞያይወሰዳልእንደተለመደውትንሽህመምይኖረዋልእናየሽንትናሙናይሰጣሉውጤቱእንደደረሰእንነግርዎታለን፡፡
ሌላበመሳተፍዎየሚደርስብዎትጉዳትየለምነገርግንየእርሶመርጃለሌላታካሚዎችተገቢውንእንክብካቤእድናደረግይረዳናል፡፡

የሚሰጡንመረጃሚስጥሩየሚጠበቅሲሆንስምንአያካትትምውጤቱምሲቀሪብከሌሎችጋርተጠቃሎነውያለመሳተፍመብትዎየተጠበቀነውበዚህምክኒያትየሚያገኝትአገልግሎትላይየሚደርስብዎትምንምጉዳትየለምነገርግንመሳተፍዎይህጥናትግቡንእዲመታትልቅድርሻአለው፡፡

ፍቃደኛነወት? 1/ **አዎ** 2/**አይደለሁም**

Amharic vertion of informed consent

የስምምነትማረጋገጫቅጽ

በባለሞያውየተሰጠኝንመረጃየተረዳሁሲሆንየኔተሳትፎወሳኝነውሰለዚህተስማምቻለሁ፡፡
ግንምንምአይነትመረጃለሶስተኛወገንአሳልፎመስጠትአይቻልም፡፡
ጥናቱየኔንምስጥርእናመብትየሚጠብቅልኝሲሆንከጀመርኩበኃላማቋረጥእደምችልተረድቻለሁ፡፡

ፊርማ---------- **ቀን----------**

ቃለምልልሱንየሚያደርገው

ስም_____ፊርማ _____

Annex IV: Amharic Version Questionnaire

መጠይቁበአማርኛ

	መለያቁጥረ					
101	ዕድሜ					
1022	ፆታ	ሴት		ወንድ		
103	የጋብቻሁኔታ	ያገባ	ያላገባ	የተፋታ	አብረውየሚኖሩ	የሞተበት
104	ገቢ	ወርሃዊ		አመታዊ		
105	የትምህርትደረጃ	ምንምያልተማር	አንደኛደረጃ	ሁለተደረጃ	ከፊተተምእናከዚያበላይ	
106	መኖርያአከባቢ	ከተማ		ገጠር		
107	የስራሁኔታ	የግል	የመንግስት	መንግስታዊያልሆነ	ስራየለለው	
	2የባህሪጥያቄወች					
201	ሲጋራአጭስውያውቃሉ	አዎ……1 አላውቅም……2				
202	አሁንላይያጨሳሉ	አዎ……1		አላጨስም……..2		
203	አሁንላይያጨሳሉ	በየቀኑ……1 አልፎአልፎ……2 ምንም……..3				
204	በአማካይበቀንስንትሲጋራያጨሳሉ	_____				
205	አልኮልያለውመጠጥወስደውያውቃሉ	አዎ……1		አላውቅም……..2		
206	አሁንላይይጠጣሉ	አዎ……..1		አልጠጣም……..2		
207	ላለፈው 1 ወርስንትቀናትጠጡ	የቀኑብዛት				

208	ላለፈው 1 ዓመትስንትጊዜጠጡ	በየቀኑ……..1 በሳምንት 1 ጊዜ……2 በሳምንትከአንድጊዜበታች……..3 ምንም……..4	
	3የጤናሁኔታ		
301	የሳንባህመም	አለ……..1	የለም……..2
302	የማጅራትገትር	አለ……1	የለም……..2
303	ካፖሰስሳርኮማ	አለ……..1	የለም……2
304	ስኳር	አለ……1	የለም……..2
305	ደምግፊት	አለ……1	የለም……2
306	ፒ.ሲ .ፒ	አለ……..1	የለም……2
307	የፈንገስ	አለ……1	የለም……2
308	የኩላሊትጠጠር	አለ……1	የለም……..2
309	የሽንትባንባእንፈክሽን	አለ……1	የለም……2
310	በቤተሰብየኩላሊትህመም	አለ……1	የለም……..2
311	በሀኪምየተለረጋገጠየልብህመም	አለ……1	የለም……2
	ሌላየምያምምትህመምካለ		
312	ደብሊውኤችኦደረጃ	_____	
	4 የሚወስዱትመድኃኒት		
401	የኤችአይቪመድኃኒትመችነውየጀመሩት?		
402	የኤች.አይ.ቪመድኃኒት	የመጀመሪያደረጃ _____	

		ሁለተኛደረጃ _____		
403	ባክቴሪየም			
404	አይኤንኤች			
405	የስብማቅለጫ			
406	የደምግፍት			
407	የስካር			
408	የህመምማስታገሻ			
	5የልኬትውጤት			
501	ክብደት			
502	ርዝመት			
503	ቦዲማስኢንዴክስ			
	6የላቦራቶሪውጤት			
601	የሽንት	ደም	+	-
		ፕሮቲን	+	-
		ሊኮሳይት	+	-
602	ክራቲኒን			
603	ክራቲኒንክሊራንስ			
604	ሲዲፎር			
605	በደምውስጥየስኳርመጠን			
606	ህሞግሎቢን			
607	ሄፓታይተስቢ		+	-
608	ሄፓታይተስሲ		+	-

Curriculum Vite

1. **PERSONAL DATA**

1.1 Name	HabibaHussen Mohammed
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1.8 Tel.	+251912040357

2. **EDUCATIONAL BACKGROUND**

   2.1 From grade 1-6 Werjimaysa Primary School.

   2.2 From grade 7_10 Laska Secondary School.

   2.3 From grade 11-12 Sawla Secondary and preparatory School.

   2.4 Higher Education in Harommaya University Health Science College Harar campus.

3. **QUALIFICATIONS**

   - BCS Degree in Public Health Officer from Harommaya University 2002 EC.

4. **WORK EXPERIENCE**

   * From 2002 Ec -2003 EcBasketo Health Center

   * From 2003 Ec on ward _ is working at St Paulo's Hospital Millennium Medical College as Senior Public Health Officer

5. **LANGUAGE SKILL**

   - Excellent Speaking ,Reading , Writing and Listing In Amharic and good in English
   - Fluent Speaker of local language of Basketo.

6. **OTHER SKILLS**

   - Basic ADULT And Pediatric ART Care Training

- PMTCT and New born care Training

7. REFERENCE

- Available Up on request

DECLARATION

I the undersigned, declare that this thesis is my original work, has never been presented in this or any other university, and that all the resources and materials used for the thesis development are recognized and cited, and people who involved in are acknowledged.

Name: HabibaHussen

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This thesis work has been submitted for examination with my approval as University primary advisor.

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