

**PREDICTORS OF ADHERENCE TO HIGHLY ACTIVE
ANTIRETROVIRAL THERAPY (HAART) AMONG HIV
PATIENTS ATTENDING COMPREHENSIVE CARE
CENTRES (CCC) IN SELECTED HOSPITALS IN
KERICHO COUNTY**

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**Predictors of adherence to Highly Active Antiretroviral Therapy
(HAART) among HIV patients attending Comprehensive Care Centres
(CCC) in selected Hospitals in Kericho County**

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**A Thesis Submitted in Partial Fulfilment of the Requirements for the
Degree Master of Science in Public Health of the Jomo Kenyatta
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2022

DECLARATION

This is my original work and has not been presented for a degree in any other University

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DEDICATION

To my parents Mr. Joseph and Mrs. Esther Sang, this is yours! This journey was not an easy one, but through your prayers and the unending support, all was made possible. I am greatly indebted to you for all that you did for me.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
BMI	Body Mass Index
CCC	Comprehensive Care Centre
CDC	Centers for Disease Control and Prevention
CD4	Cluster of Differentiation 4
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
HTS	HIV Testing Services
IDD	Individual Dietary Diversity
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KAIS	Kenya AIDS Indicator Survey
LTFU	Lost to Follow Up
MoH	Ministry of Health
MSM	Men who have Sex with Men
NACC	National AIDS Control Council
NASCOP	National AIDS and STI control Program
NNRTI	Non-Nucleoside Reverse Transcription Inhibitor
NRT	Nucleoside Reverse Transcriptase Inhibitor
PI	Protease Inhibitor
PMTC	Prevention of Mother-to- Child Transmission

PWID	People who Inject Drugs
QALYs	Quality Adjusted Life Years
RNA	Ribonucleic Acid
SSA	Sub Saharan Africa
SPSS	Statistical Package for Social Sciences
TB	Tuberculosis
UNAIDS	Joint United Nations Program on HIV/AIDS
VL	Viral Load
VMMC	Voluntary Medical Male Circumcision
WHO	World Health Organization

DEFINITION OF TERMS

Adherence	Is the practice of patients correctly following the medication prescriptions and it encompasses observing the recommended dietary restrictions, lifestyle changes and the dosing frequency as directed by the healthcare providers.
Optimal adherence to HAART	Achieving viral suppression (<50 HIV-1 RNA copies/ml) within 3-6 months of HAART initiation.
Sub-optimal adherence to HAART	having a viral load of between 50-1000 HIV-1 RNA copies/ml after 3-6 months of HAART initiation. This can be characterized by discontinuity or cessation of part or all of the treatment for instance missing doses, underdosing or drug holidays, not taking the medications at the right time and/or not observing dietary requirements provided by health care providers.

Comprehensive Care Centre

A clinic where people living with HIV go for holistic care and management.

Highly active antiretroviral therapy (HAART)

Is a triple combination of HIV treatment drugs which work to suppress viral load, restore CD4 cell count and reduce the risk of HIV transmission to others. Current combination involves two Nucleoside reverse transcriptase inhibitors (NRTIs) with either non-nucleoside reverse transcriptase inhibitors (NNRTIs) or Protease inhibitors (PIs) as a first line regimen. This triple combination was introduced after the single drug treatments being ineffective in slowing down the progression of the virus.

HIV care continuum

A framework that models the dynamic stage of HIV care. The continuum is made

up of five stages; Diagnosis,
Linkage to care, Retention in
care, Adherence to ART and
Viral suppression

Viral load

Is the quantitative measure of HIV-
RNA copies (copies/ml) in a
patient's blood.

ABSTRACT

Adherence is a complex and dynamic process. Just like other chronic diseases, HIV presents significance challenges in achieving and maintaining adherence. HAART is undoubtedly the only proven remedy known to improve the health outcomes and reduce AIDS-related mortality. However, the effectiveness of HAART solely depends on adherence. An optimal adherence levels of >95% is required so as to achieve viral suppression. Data from different studies indicate that few, if any, patients have achieved optimal adherence. Adherence to HAART is still unsatisfactory and it ranges between 27 and 80% across diverse populations and sub-populations in different studies, as compared with the stipulated optimal adherence level of 95%. The overall objective of this study was to determine the predictors of adherence to Highly Active Antiretroviral Therapy among HIV patients attending comprehensive care centres in selected hospitals in Kericho County. The study adopted a descriptive cross-sectional. It involved 261 HIV patients (≥ 15 years) on HAART attending Comprehensive Care Centres in the selected hospitals. The three hospitals were purposively selected. Data was collected from the patient's using interviewer administered questionnaires while Key informant interviews were held with healthcare providers involved in HIV care at the selected hospitals. Viral load was used as a measure of adherence. This was done by looking retrospectively into the patient file. Individuals who achieved viral suppression (<50 HIV-1 RNA copies/ml) within 3-6 months of HAART initiation were considered to have optimal adherence while individuals who had viral load of between 50-1000 HIV-1 RNA copies/ml after 3-6 months of HAART initiation were considered to have sub-optimal adherence. Attitudes towards HAART were measured using the Likert scale. Data was analyzed using SPSS version 25. A chi square test was used as an initial screening tool for any association between dependent and independent variables. Logistic regression analysis was used to determine the association between adherence to HAART and various independent variables with significance level of $p < 0.05$ set for all statistics. Findings from this study indicate that the level of adherence to HAART in Kericho county is 76%. Having a tool/someone to remind of when to take HIV medication, ($P=0.034$) and food security, ($P=0.042$) were found to be promoters of optimal adherence. On contrary, Age category (20-24 years) ($P=0.02$) and use of HAART alternatives ($P=0.01$) were found to be risk factors of sub-optimal adherence high sub-optimal adherence levels. From the Key informant interviews, young adulthood (18-28years) was found to be a risk factor for sub-optimal adherence. This study recommends routine adherence monitoring for patients in the age category 18-28. Additionally, this study recommends more research into aspects of attitude and practices towards HAART.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Kenya has the fifth-largest number of people living with HIV (PLHIV) in the world and HIV has continued to be a leading cause of adult morbidity and mortality (NAS COP, 2020). Despite this, Kenya is widely regarded as one of sub-Saharan Africa's HIV prevention success stories. There has been a steady decline in the annual new HIV infections from the country's peak of over 200,000 in 1993, 100,000 new infections in 2013, 62,000 in 2016 and 46,000 in 2018 (UNAIDS, 2019). The decline is attributed to the scale up and the success of the Highly Active Antiretroviral Therapy (HAART) programme. HAART has been made available throughout the country in many health facilities ranging from large referral hospitals to small dispensaries.

HAART is undoubtedly the only proven remedy known to enable PLHIV to achieve and maintain utmost viral suppression, reduce the risk of drug resistance development, prevent the transmission of HIV and reduce AIDS-related mortalities. Through HAART, HIV/AIDS has been transformed into a chronic manageable disease for a substantial proportion of PLHIV who have access to treatment. Studies have shown that most people achieve viral suppression within 3-6 months of uninterrupted HAART treatment. For HAART to be effective, maximum level of adherence is required; an optimal adherence level of 95% is required so as to achieve viral suppression. The success of the HAART programme highly depends on constant high adherence. Scaling up of HAART without addressing adherence inconsistencies further complicates the problem by limiting future treatment options (Hine *et al.*, 2018). With the UNAIDS HIV and AIDS programme setting the 95-95-95 goal to end the epidemic by the year 2030, many countries including Kenya are working towards achieving this goal. The targets projected that by the year 2020, 95% of PLHIV will have known their status, 95% of the diagnosed individuals would be enrolled to uninterrupted antiretroviral therapy and out of these individuals 95% of them would have undetectable viral load. The rapid scale-up of HAART has resulted in a large proportion of PLHIV being enrolled on treatment.

This has made AIDS to be managed easily by a bigger percentage of PLHIV. However, sub-optimal adherence to HAART has been cited as the most common reason for treatment failure (Kharsany & Karim, 2016).

Adherence is the extent to which patients correctly follow the medication prescriptions and it encompasses observing the recommended dietary restrictions, the dosing frequency and lifestyle changes as directed by the healthcare providers (WHO, 2001). Adherence to HAART is an important concept in the treatment of HIV. Its significance has been emphasized by its incorporation in the “HIV care continuum” a framework that models the dynamic stages of HIV care. The continuum is made up of five stages; Diagnosis, Linkage to care, Retention in care, Adherence to ART and Viral suppression (Kay *et al.*, 2016). Adherence to HAART is still unsatisfactory and it ranges between 27% and 80% across diverse populations and sub-populations in different studies as compared with the stipulated optimal adherence level of 95%. Suboptimal adherence to antiretroviral therapy is a multi-factorial and dynamic process hence it causes significant challenges for long-term follow-up. The available solutions to this problem are intricate (Iacob *et al.*, 2017). Sub-optimal adherence to HAART is one of the impediments in achieving the 95-95-95 target (UNAIDS, 2019).

As at the end of 2015, 40% of PLHIV globally were not aware that they were HIV positive while an estimated 20 million PLHIV were not on therapy (WHO, 2016). The global expansion of antiretroviral therapy coverage has greatly contributed to the 48% decline in AIDS-related deaths from a peak of 1.9 million in 2005 to 1.0 million in 2016 (UNAIDS, 2017). The number of PLHIV accessing HAART has increased over time, in the year 2005, 2.1 million were on treatment while by the end of 2017, the number had risen to 21.7 million. Global statistics estimate that approximately 36.7 million people are presently living with HIV and SSA contributes 52% of this burden. SSA has had a remarkable increase in the number of PLHIV on antiretroviral therapy from 758, 000 people in 2005 to 15.4 million in 2017(WHO, 2018).

HAART has been regarded as the most effective approach in the management of HIV. Its effectiveness solely relies on the extent to which an individual adheres to medication. With high adherence rate as 95%, there is a resultant viral suppression rate of approximately 78%. However, a reduction in adherence rate to 80% results in an intense drop in the rate of viral suppression and it can drop as low as 20% (Yang *et al.*, 2018). Optimal adherence to HAART results to viral suppression to a point where the virus can no longer be detected in the blood of infected individuals (Dieckhaus & Odesina 2007). As a result, the quality of life of PLHIV improves and such patients will have an increased life expectancy. HIV patients who adhere correctly to treatment regimens are reported have approximately similar survival rates as compared to uninfected patients (Bhaskaran *et al.*, 2008; Wing, 2016).

However, HAART is a complex regimen and it requires a patient to stick strictly to the prescribed dosing schedules and the numerous medications (Muhammed *et al.*, 2010). Sub-optimal adherence to HAART has proved to be a major barrier in the treatment and management of HIV/AIDS. Sub-optimal adherence is multifactorial and the causes may be related to treatment regimens, patient or the health system. Majority of patients do not achieve maximum medication benefits as a result of sub-optimal adherence. HIV treatment outcomes are critically dependent on optimal adherence to HAART. Findings from studies have shown that HAART is effective in reducing HIV viral load, minimizing the emergence of drug resistance, improving immune function, improving health outcomes and delaying the advancement of HIV to AIDS. Optimal adherence can be defined based on the virologic (measured by HIV RNA viral load), immunologic (measured by CD4 count) and clinical outcomes of PLHIV (Eggleton *et al.*, 2020).

There are extremely high rates of significant drug resistance in Kenya (Orrell *et al.*, 2013).). The primary reason for such high resistance rates were majorly attributed to long periods of sub-optimal adherence to HAART by HIV patients. Monitoring tests for drug resistance are not routinely performed in Kenya and this poses difficulty in ascertaining the levels of drug resistance in the country. Findings from recent studies

have indicated that HIV transmitted resistance were recorded in 9.2% of cases. Patients who get infected with the resistant strains always have limited treatment options. Subsequent initiation of second-line regimen results in increased healthcare costs and also poorer patient health outcomes in most cases (AVERT, 2017).

According to literature review of studies which have been published on correlates of adherence, lack of social support structures, adverse drug effects, psychological distress and the complexity of HAART regimens were consistently associated with sub-optimal adherence. However, substance abuse, depression, socio-demographic factors, patient-provider relationships and CD4 cell count were found to be inconsistently associated with sub-optimal adherence (Mukui *et al.*, 2017). Findings from systematic review of adherence to HAART in SSA from January 2002 to October 2014 found that sociodemographic, psychosocial, health status, treatment-related and intervention-related determinants contribute to optimal adherence (Tessa *et al.*, 2016).

In Kenya, findings from the Second Kenya AIDS Indicator Survey conducted in 2012 found that adolescents are 50 times less likely to be adherent as compared to adults. It was reported that they face numerous challenges ranging from social, economic, cultural, individual level and treatment related challenges that may contribute to the higher rates of sub-optimal adherence observed. These include but are not limited to stigma, challenges with disclosure, mental health problems, poverty and medication-related barriers such as pill burden and side effects (KAIS,2012). Understanding the predictors of adherence is of great significance in achieving viral suppression, reduction of AIDS related mortalities and reduction in the risk of transmission to the population at risk. This can be achieved by delivering HIV health service in a patient-tailored manner that will address the barriers to achieving optimal adherence among the various sub-populations.

1.2 Statement of the problem

Despite HAART being made freely available in many public health facilities across the globe, adherence to treatment is still a challenge. Adherence to HAART among HIV patients remains a public health concern with sub-optimal adherence resulting in treatment failure being common. It is estimated that around 33% to 38% of PLHIV globally are non-adherent to HAART (Sandeep *et al.*, 2013).

Patients in developing countries are able to achieve adherence levels similar to or higher than those of patients in developed countries. According to a systematic review by Vreeman (2018), most of the studies in developing countries report adherence levels of more than 75% (45–100%) while developed countries mainly report adherence less than 75% (20–100%). According to another systematic review by Mills *et al.* (2003), sub-Saharan Africa has a pooled adherence estimate of 77% whereas North American adherence has a pooled adherence of 55%. Kenya is among the four countries with high HIV burden in Africa with an estimated prevalence of 4.9% (NACC, 2018). According to Kenya AIDS Indicator Survey (KAIS, 2012) an estimated 16.3% of PLHIV between 15–64 years were non-adherent to antiretroviral therapy. The HIV epidemic directly or indirectly affects a big percentage of Kenya's population.

With high rate of medication adherence ($\geq 95\%$), the viral suppression rate approaches 78%. However, when the rate of adherence is reduced to 80%, there is a dramatic reduction in the viral suppression rate, which can be as low as 20% (Yang *et al.*, 2018). Sub-optimal adherence has adverse effects on health system, household economies and individuals' quality of life (Giliauskas, 2021). On an individual level, sub-optimal adherence results to rising viral loads and decline in CD4 cell counts. This will in turn lead to development of drug resistance, increased risk of transmission of drug resistant strains, disease progression to AIDS and episodes of opportunistic infections. The end result is reduced quality of life by 6,351 QALYs (Quality Adjusted Life Years) and increased AIDS-related mortality (Giliauskas, 2021). HIV patients not adhering to HAART are 3.87 times more likely to die than adherent patients on the same medication (Win *et al.*, 2017). On the healthcare system, sub-optimal adherence results in increased

utilization; PLHIV who are less than 80% adherent to HAART are 34% more likely to visit emergency department and 25% are more likely to have prolonged hospital admissions (Giliauskas, 2021). Additionally, switching from first-line of treatment to second-line results to increased healthcare costs. On household economies, sub-optimal adherence drains individuals/families of their savings since large share is channeled to treatment cost.

1.3 Justification of the study

The success of HAART programmes solely depends on consistently highly adherence levels among PLHIV. Scaling up HAART without addressing adherence inconsistencies will further worsen than solve the HIV problem. Findings from different studies indicate that a large proportion of PLHIV do not reach high levels of adherence and its prevalence is increasing as the number of PLHIV on treatment increases (Dibaba & Hussein, 2016). With the UNAIDS global goal seeking to ensure that 95% of the patients on HAART treatment achieving viral suppression, more studies into predictors of adherence are warranted. The underlying reasons for sub-optimal adherence to HAART are complex and vary from one geographic setting to another (Petse, 2018).

Adherence changes over time and the Predictors of non-adherence also differ considerably and hence no single factor has constantly been associated with non-adherence across all contexts (Semvua *et al.*, 2017). This indicates the need to develop context-specific adherence profiles. In Kenya, most of the studies on HAART adherence have been done in Nairobi. In Kericho County, such studies have remained largely unexplored hence the available information is scanty. An understanding of these predictors will allow for targeted interventions to increase adherence and improve the health outcomes of PLHIV. Through this, healthcare providers will be able to develop educational programmes and materials that target HIV patients at risk of sub-optimal adherence.

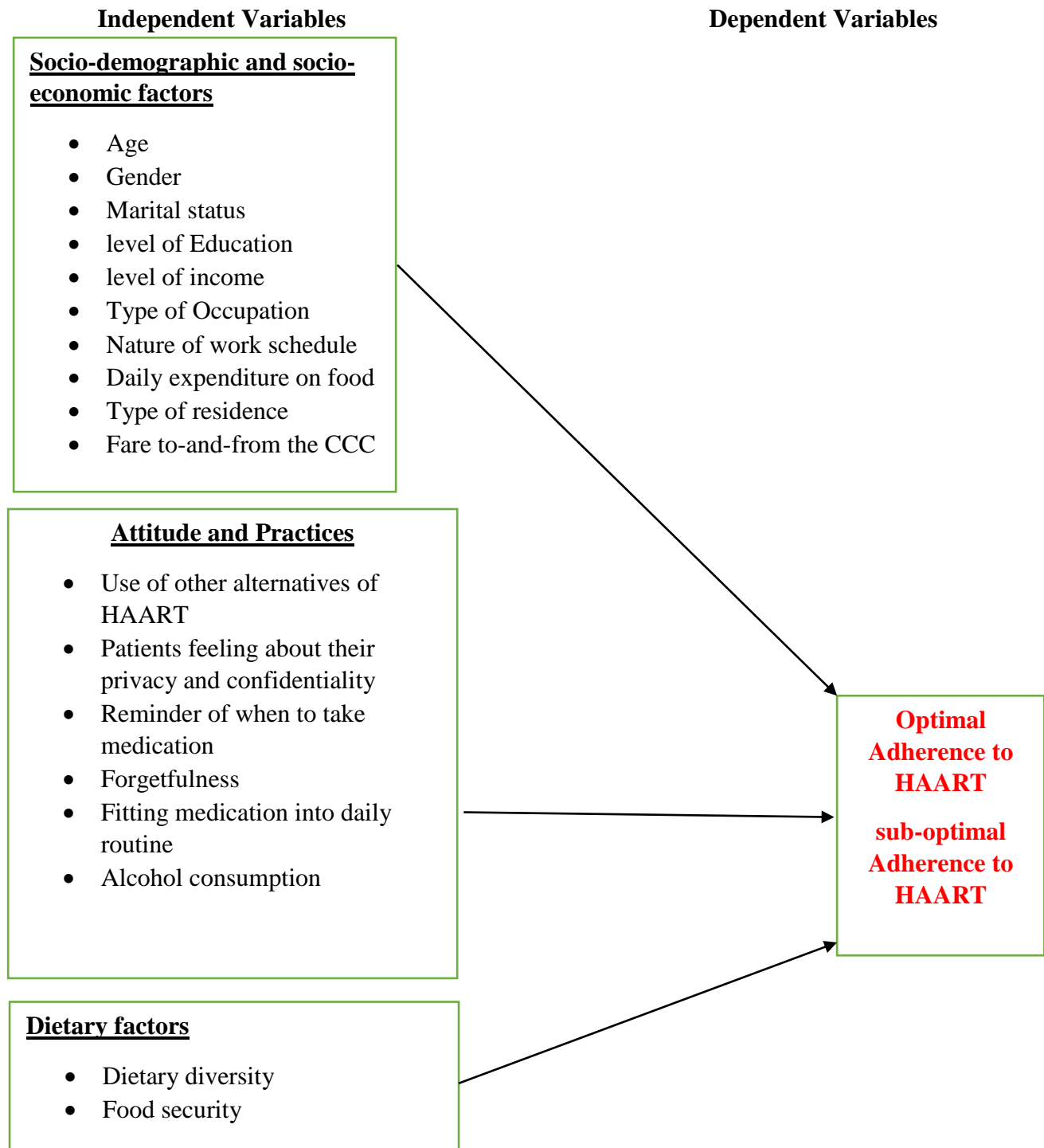


Figure 1.1: Conceptual framework

Modified from Joubert & Ehrlich (2007)

1.5 Objectives

1.5.1 Broad objective

To determine the Predictors of adherence to Highly Active Antiretroviral Therapy among HIV patients attending comprehensive care centres in selected hospitals in Kericho County.

1.5.2 Specific Objectives

- i. To determine the level of adherence to HAART among HIV patients attending comprehensive care centres in selected hospitals in Kericho County.
- ii. To determine the socio-demographic and socio-economic factors associated with adherence to HAART among HIV patients attending comprehensive care centres in selected hospitals in Kericho County.
- iii. To assess the attitude and practices towards HAART and their influences on adherence among HIV patients attending comprehensive care centres in selected hospitals in Kericho County.
- iv. To determine dietary factors associated with adherence to HAART among HIV patients attending comprehensive care centres in selected hospitals in Kericho County.

1.6 Research questions

- i. What is the level of adherence to HAART among HIV patients attending comprehensive care centres in selected hospitals in Kericho County?
- ii. What are the socio-demographic and socio-economic factors that are associated with adherence to HAART among HIV patients attending comprehensive care centres in selected hospitals in Kericho County?
- iii. What are the attitudes and practices towards HAART and their influence on adherence among HIV patients attending comprehensive care centres in selected hospitals in Kericho County?
- iv. What are the dietary factors associated with adherence to HAART among HIV patients attending comprehensive care centres in selected hospitals in Kericho County?

CHAPTER TWO

LITERATURE REVIEW

2.1 Global trends in HIV/AIDS

Since the discovery of HIV, it is estimated that approximately 70 million cases have been reported and nearly 35 million have lost their lives as a result. The WHO African region bears the largest burden of the epidemic and it contributes almost two-thirds of PLHIV globally (WHO, 2018).

It is estimated that there were 1.8 million new infections in 2016, this gives an average of 5000 new infections per day. Approximately 70% of PLHIV globally were aware that they were infected. There has been a gradual rise in the number of PLHIV accessing antiretroviral therapy globally. In the year 2000 less than 1 million people were on treatment, in 2010 the number rose to 7.5 million, in 2015 there was a further rise to 15.8 million and as at 2017 the numbers had reached 20.9 million. Majority of PLHIV are in low- and middle-income countries. In 2016, Eastern and Southern Africa had 19.4 million PLHIV which is equivalent to 53% of the total population, Western and Central Africa had 6.1 million (17%), Asia and the Pacific had 5.1 million (14%) while Western and Central Europe and North America had 2.1 million (6%) (UNAIDS, 2017).

2.2 HIV/AIDS overview in Kenya

In 2017, it was estimated that Kenya had approximately 1.5 million PLHIV of whom 105,200 were children <15 years and 1,388,200 adults >15 years. The National adult HIV prevalence rate was estimated at 4.9% with prevalence higher among women (5.2%) than men (4.5%). The HIV epidemic in Kenya is driven by sexual transmission and it affects most of the general population even though some groups are more vulnerable to infection than others and they include; sex workers, men who have sex with men (MSM) and people who inject drugs (PWID). It is reported that 51% of all new infections that occurred in the year 2015 was among the adolescents and young people (15-24 years). Young women were reported to be twice more likely to acquire HIV infection as compared to males (NACC, 2018).

It is estimated that 53% of the 1.6 million PLHIV in Kenya are not aware of their HIV status and it is reported that they contribute significantly to new HIV infections. In the recent past, Kenya adopted newer approaches to increase HIV testing and they included; introduction of self-testing kits, targeted community-based HIV testing and door-to-door testing campaigns. As at 2016, 64% of PLHIV were on treatment and 51% of them had achieved viral suppression.

AIDS related deaths in Kenya have significantly declined since 2005. There were 53,900 deaths in 2010 while 2017 reported approximately 28,200 deaths. This decline is due to the expanded countrywide HAART coverage and the voluntary medical male circumcision (VMMC) programmes. VMMC is a cost-effective strategy and is reported to reduce the risk of HIV transmission from female to male by 60%. The national prevalence trend indicates that prevalence peaked at 10-11% in the mid-1990s, declined to about 6% by 2006 and further declined to 4.9% in 2017.

Geographic location has been identified as a factor affecting HIV infections; it was reported that 9 out of the 47 counties—mainly on the Nyanza and western regions of the country—contributed 65% of all new infections. The countrywide HIV prevalence ranges from 0.1% in Wajir County to 21% in Siaya County. Kericho County, where this study will be done, has an HIV prevalence of 2.9% with prevalence higher among women (4.1%) than men (2.4%). The County has a total of 17,515 PLHIV (NACC, 2018).

2.3 HAART Combination therapy

The HIV combination drug treatment was introduced in the year 1995. This was after the single drug treatments being ineffective in slowing down the progression of the virus. The combination therapy works to suppress viral load, restore CD4 cell count and reduce the risk of HIV transmission to others. Kenya adopted the WHO recommended triple combination of two Nucleoside reverse transcriptase inhibitors (NRTIs) with either non-nucleoside reverse transcriptase inhibitors (NNRTIs) or Protease inhibitors (PIs) as a first line regimen. Jacob *et al.*, (2017) noted that despite HAART having been shown to be effective in reducing AIDS-related mortality and the risk of HIV

transmission, its efficacy and its optimized principles cannot replace the high adherence required. An adherence level above 95% is needed in order for HIV patients to achieve undetectable viral loads (Chesney, 2003).

2.4 HAART coverage in Kenya

The adult HAART coverage is estimated at 75% while the coverage for children is 82%. In 2010, there were 627,900 adults in need of HAART while in 2017 the number was estimated at 1,338,200. It is estimated that the scale up of ART since 2004 has saved over 635,500 lives in the country by the end of 2017 by averting deaths due to AIDS-related causes (NACC, 2018).

Kenya adopted the ‘test and treat’ strategy in 2015 according to the WHO recommendations. This resulted in an increase in the number of people on treatment in 2016 with an estimated 940,000 adults and 60,000 children enrolled. Current statistics show that HAART coverage is higher in women as compared to men, while key populations; men who have sex with men having 6% and female sex workers having 34% coverage. There was an improvement in the number of PLHIV on treatment from 70% in 2013 to 81% in 2015. 64% of those people on treatment in 2015 had achieved viral suppression (AVERT, 2017). The adolescents and young people are reported to be problematic in the initiation and retention in HIV treatment; it is reported that in the year 2014, out of the 141, 000 adolescents aged 10-19 years who tested HIV positive, only 34,800 were on treatment and 22,600 had achieved viral suppression (AVERT, 2017).

2.5 ART treatment guidelines

The national ART eligibility criteria for treatment have evolved over a period of time with the WHO giving new guidelines after a given period. In the year 2006, individuals whose CD4 counts were less than 200 cells/ μ l qualified for ART initiation. From 2007-2009, the eligibility criteria was adjusted to CD4 count less than 250 cells/ μ l, between 2010-2014, the eligibility threshold for treatment initiation was improved to 350 cells/ μ l. In 2014-2016 period, individuals with CD4 count of less than 500 cells/ μ l were eligible.

As from the year 2016 onwards, the “treat all” guideline was adopted. Individuals who test HIV positive are initiated on HAART irrespective of CD4 count.

2.6 The HIV care continuum

This is a sequence of stages that an individual once diagnosed with HIV takes so as to achieve maximum benefits from HIV treatments. These steps are; HIV testing and diagnosis, linkage to care, retention in care, adherence to HAART and viral suppression. For maximum benefits from potent combination of HAART, individuals need to be made aware they are HIV infected, be engaged in HIV care and optimally adhere to medications.

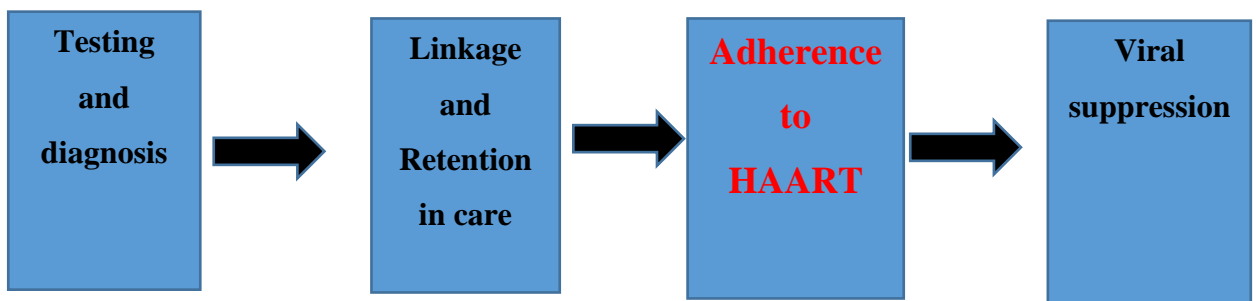


Figure 2.1: Steps of engagement in HIV care continuum

2.6.1 HIV testing and diagnosis

This is the first stage of HIV care continuum and is the gateway into HIV/AIDS care and prevention interventions. Voluntary HIV counselling and testing enables an individual to make informed choice about being tested for HIV, one is expected to undertake an HIV test so as to know their HIV status. Individuals who are not aware that they are infected and are not enrolled on HAART treatment can unknowingly pass the virus to others. Increasing the uptake and frequency of HIV testing needs to be done so as to reduce the proportion of people unaware of their HIV status. Offering HIV testing for different populations and in different settings increases opportunities for access to knowledge of HIV status and to a variety of HIV treatment and prevention services. Once tested,

individuals who are HIV positive can be linked to care and support programs while those who are negative are linked to preventive services.

2.6.1.1 Predictors of HIV testing and diagnosis

The number of Voluntary Counselling and testing (VCT) centres in Kenya has been increasing with time. As at 1998, there were only 3VCT centres in Kenya, as at the year 2013, the number had risen to 3000 while as at 2015, there were 5980 centres across the country (NASCO, 2015). HIV counselling and testing (HCT) has been identified as one of the most effective strategies in the management of HIV since it is a gateway for PLHIV to access treatment (WHO,2003). Despite the countrywide coverage of VCT centres, their uptake and utilization is still not optimal and the following risk factors have been associated with their low utilization.

The level of HIV-related knowledge and awareness-The HIV prevention and management interventions have developed programmes which are aimed at increasing HIV-related knowledge aimed at reducing risky behaviors. HCT provides an opportunity for promotion of behavior change and education on HIV related information. An individual's understanding of the modes of HIV transmission and the avenues of exposure to the virus influences them to take an HIV test when they feel that they may have been exposed to the virus (Gobind & Ukpere, 2015).

Fear of being HIV Positive-Findings from studies have identified fear of being HIV positive as one of the major impediments to the utilization of VCT services. Individuals have reported that finding out their HIV positive status would result in stress and that they would lose focus in life hence they were not willing to undertake an HIV test (Sanga *et al.*, 2015).

Perception of being at risk of HIV Infection-Findings from different studies indicate that an individual perceived level of HIV risk influences their uptake of HTC services. It has been reported that people who recognize their risk of being infected with HIV being high are more likely to utilize HTC services as compared to individuals who perceive their risk as low (Wang *et al.*,2018).

Confidentiality issues- Findings from various studies have identified health care workers' confidentiality on matters related to patients' health and treatment as a major determinant of the utilization of HTC services. Many patients have reported to have been anxious on taking up VCT due to lack of confidentiality among health care workers (Wang *et al.*, 2018). On contrary, when patients are assured of confidentiality by the health care workers, they are more likely utilize HTC services as they are confident that their results will be kept private. HIV related stigma and discrimination negatively affects the uptake and utilization of HTC services by reducing an individual's willingness to engage in HIV testing. People feel that they may be unfairly treated when their HIV status gets to be known hence, they may not readily undertake an HIV test. Stigmatized individuals are in most cases considered deviant and they mostly experience self and societal discrimination (WHO, 2012).

Age and gender Difference-Men are more likely not to access HTC services as compared to women. This is as a result of poor health seeking behavior among men and also their insufficient participation in HIV prevention programs. Women also are advantaged in accessing HIV services since they are offered in antenatal clinics. Age also influences the uptake and utilization of HTC services, as people grow, they get exposed to VCT services and HIV education which make them recognize the importance of knowing their health status. Hence the utilization of HTC services has been shown to increase with the increase in an individual's age (Heestermans *et al.*, 2016).

2.6.2 Linkage and retention in care

Linkage to care is the initiation of HIV-related treatment services for people newly diagnosed with HIV. It is a bridge between HIV testing and HIV care. Linkage to care is considered as successful when an individual completes a visit to an HIV care provider within 30 days of HIV diagnosis while delayed linkage into care is when an individual diagnosed as HIV positive makes the first visit to after more than 30 days. Early linkage to care is critical for commencement of medical interventions (Kay *et al.*, 2016).

Retention in care involves establishment of connection with medical care by patients diagnosed with HIV. Retention in care is important if optimal clinical results in PLHIV is needed. For patients who have not been enrolled to HAART, retention is important for the provision of preventive treatments against opportunistic diseases and prevention of mother-to-child transmission. Social support services are also provided in care and this helps the patients to manage through the complicated and long journey of medication. For patients on HAART, retention in care allows for continuous access to antiretroviral, monitoring emergence of drug resistance, medical toxicities and occurrence of treatment failures (Geng *et al.*, 2011).

2.6.2.1 Predictors of Retention in care

Professional and social Support-Professional support services such as HIV case management and mental health services has been shown to be significantly associated with greater retention in care. These services make PLHIV feel that they are cared for and hence they maintain a strong connection with the HIV care. Social support facilitates the connection between mental impairment and retention in care, such that those who are mentally challenged and have some supports are more likely to be retained in care as compared to those who did not receive such support (Saag *et al.*,2018). Mental state- Psychiatric illness has been identified in a number of the studies reviewed as being a significant predictor of poor retention in care. The HIV patients with such illnesses have been reported not to return to care in their next clinic visit. Conversely, PLHIV who are mentally sound have been reported to have high retention rate since they maintain their connection to the HIV care (Saag *et al.*,2018).

Distance from the HIV Clinic-Findings from studies indicate that PLHIV who live farther from clinics and had longer travel time were less likely to be retained in care as compared to those patients who lived not far from clinics and had short travel time. This can be attributed to financial constraints where high travel costs are incurred to clinics and also the competing needs that forces patients to make a choice between seeking treatment and meeting those needs (Mountain *et al.*, 2014).

Substance use- PLHIV who use drugs and alcohol are reported to experience gaps in each stage of the HIV care continuum. Substance abuse affects and individuals' cognitive functions and HIV patients have reported to forget scheduled clinic visits hence interrupting treatment schedules (Petse *et al.*,2018 & Semvua *et al.*,2017).

Gender-Male sex has been identified as a predictor of poor retention as compared to females. The demanding nature of work done by men has been attributed to the poor retention rates. Their migratory labour patterns for example truck drivers and migrant agricultural workers make it difficult for them to maintain their clinic visits hence easily lost to follow up (LTFU) (Petse *et al.*,2018. According to a systematic review by Bulsara *et al.*, (2016), most PLHIV are LTFU within the first few years of starting treatment. The average retention rate in developed countries ranges from 64 to 94% within the first 12 months after initiating medication while in in resource-limited countries, retention can reach 60% at 60 months.

2.6.3 Adherence to Highly active antiretroviral therapy

Adherence is the degree to which an individual follows the medication schedule as prescribed by a healthcare provider. It involves following a diet and/or executing lifestyle changes that corresponds with agreed recommendations (WHO, 2001). It is a behavioral process and has a multifactorial cause. Sub-optimal adherence occurs when a patient deviates negatively from the recommended near perfect adherence levels (>95%). This can be characterized by discontinuity or cessation of part or all of the treatment for instance missing doses, overdosing, underdosing or drug holidays.

Suboptimal adherence is common in chronic disease where patients are expected to take multiple treatment regimens. An interaction of many factors affect adherence to HAART only that their intensity and time of action vary. A particular individual can display a unique behavior when exposed to some external factors. Adherence to HAART is still unsatisfactory and it ranges between 27 and 80% across diverse populations and sub-populations in different studies, as compared with the stipulated optimal adherence level

of 95% (Iacob *et al.*, 2017). The level of adherence to ART differs depending on the population group. Results from a meta-analysis on 84 observational studies in 2011 revealed that approximately half (62%) of HIV positive patients achieved an adherence rate of 90% (Ortego *et al.*, 2011). They noted that there is a high discrepancy between various groups and this calls for a need for separate analysis.

Higher adherence rates have been seen in children. Analysis of various documented studies from 2012 to 2014 showed that 80.9% and 78.6% respectively of HIV infected children achieved adherence rates as high as 95% (Azmeraw & Wasie, 2012; Arage *et al.*, 2014). Among teenagers, there is a high variability in adherence; in Africa and Asia, it ranged from 70-85% while in Europe and North America, the range was from 50-60% (Kim *et al.*, 2014). This subpopulation has been reported to be sexually active and they contribute more than 40% of new HIV infections (Iacob *et al.*, 2017). Women as compared to men are at a higher risk of non-adherence (Ortego *et al.*, 2012). Fear of HIV diagnosis and the resultant discrimination are reported to affect the initiation of ART and the implementation phase. High discrepancies have been reported among pregnant women and this is attributed to the location (urban/rural) and healthcare settings. In rural and low-income settings, only 1 in 122 mother-child pairs met the 95% adherence threshold (Kirsten *et al.*, 2011).

According to a systematic review by Reda & Biadgilign (2012), patients in developing countries are able to achieve adherence levels similar to or higher than those of patients in developed countries. There is a reported consistency in barriers to optimal adherence even though issues related to background setting like access are commonly reported in developing countries. For instance, a review by Vreeman and colleagues reported an adherence level of more than 75% (range 45–100%) in developing countries and less than 75% (range 20–100%) in developed countries.

2.7.3.1 Quantifying adherence in HIV patients

Correct quantifying of medication adherence is of great importance to the patient and the healthcare system. A patient is expected to benefit fully from any medication administered and this can be achieved by ensuring that strict adherence is maintained. There is no standard established approach for assessing HAART adherence hence different methods are used. These methods can be direct or indirect. Direct methods use body fluid assays and biologic markers while indirect methods include; pill counts, self-report, pharmacy refill records, and electronic monitoring systems such as the Medication Event Monitoring System (MEMS) (*Jacob et al., 2017*).

Patient self-reporting is the simplest method of quantifying adherence. It has the advantage of low cost as data can be easily collected directly from the respondents. Their designs are also flexible as questionnaires can be tailored to suit the respondent's language. They also have the advantage of non-invasiveness. Patient self-reporting has been shown to correlate with viral load and clinical outcomes in some studies while many studies have reported of patients overestimating their adherence levels for fear of criticism or as a result of recall bias. Self-reports have high specificity but low sensitivity, they are also prone to recall bias (*Jacob et al., 2017*). Several studies reported discrepancies between self-reported adherence and biomedical markers. In a study done in South Africa, it was noted that out of the patients who had reported 100% adherence, only 75% of them had achieved viral suppression (*Brown et al., 2003*).

Pill counts have also been used extensively. The patients are expected to return the medication packaging to the health care provider during every clinic visit and a return of excess pills is a clear indicator of sub-optimal adherence. There have been reports of patients dumping their pills so as to appear adherent and this has in most cases resulted in overestimation of adherence. This method has the advantage of being inexpensive and can give accurate information when done at unscheduled home visit as compared to scheduled clinic visit. It has disadvantages of being time consuming, does not provide information on drug taking behavior and it poses logistical difficulties when home-based

pill counts are recommended (*Iacob et al.*, 2017). The measurement of body fluid assays and biologic markers are highly recommended as a measure for adherence since they are objective and they give a good correlation with adherence. However, they are rarely used because of their high costs and general unavailability. They also require adequate infrastructure and trained personnel. The data from these assays are limited and mostly reflect the recent doses taken (Castillo-Mancilla & Haberer, 2018).

MEMS are fitted into medication bottle caps and contain a computerized chip that keeps records of the date and time that the bottle was opened and closed. This method also gives the best correlation with virologic. outcomes with Analysis of the data assumes that a single dose is picked every time the bottle is opened hence is a time specific measure of adherence. However, this method is very expensive and also data could be inaccurate if multiple doses are removed at once(*Iacob et al.*, 2017).

2.6.4 Viral suppression

This is achieved when HAART reduces an individual's viral load to undetectable levels. Persons on treatment are expected to maintain high adherence levels so that they can achieve better health outcomes and reduce the chances of passing HIV to others.

2.6.4.1 Predictors of viral suppression

Age-Findings from various studies have identified younger age as an independent predictor of incomplete viral suppression. Young patients have been reported to experience a lot of challenges in seeking HIV treatment as compared to older patients and hence they are more likely to be non-adherent. Lack of friendly services, stigma, socio-economic challenges and migratory labor patterns have been identified as major challenges facing young patients (*Kay et al.*, 2016).

Level of Education-Findings from studies have shown that HIV patients with no formal education are at a higher risk of not achieving complete viral suppression as compared to those patients with formal education. This is because HIV education and awareness programmes are mostly offered in schools and hence individuals who did not have an

opportunity to attend a school may miss such awareness. The level of education also influences how one understands and adheres to the prescribed treatment guidelines and hence patients with no formal education are less likely to understand the importance of strict adherence to antiretroviral treatment which eventually affects viral suppression (NASCO, 2018).

2.7 Adherence to HAART in specific subpopulations

2.7.1 Adherence to HAART in children

Measuring adherence in children is more complicated than measurement in adults. This is because adherence in children is impacted by caregivers, sociocultural factors and health-services related factors. A study in children by Neiva, W& Ferreira, J. (2007) documented an adherence level of 50.5%, another study done in Nigeria by Akahara *et al.*, (2017) documented an adherence level of 91% while a study done in Uganda by Wadunde *et al.*, (2018) documented an adherence level of 79%. Children are however a vulnerable group since they depend on caregivers and parents for routine medication uptake and refills.

2.7.2 Adherence to HAART in adolescents

Adolescents just like children face many barriers to adherence as compared to adults. This sub-population is characterized by high-risk sexual behavior and it contributes greatly to new sexual transmissions. This category also has high treatment discontinuation rates. Poor adherence in this category is contributed by lack of social support, fear of disclosure, depression resulting from knowledge of being HIV positive and social stigma. Alcohol and drug abuse are also common in this category and it is a risk factor for non-adherence. According to a systematic review and meta-analysis on adolescents and young adults by Kim *et al.*, (2014) reported a pooled adherence of 62.3% in this category. North America had the lowest HAART adherence at 53%, Europe 62%, South America 63% while Africa and Asia had high adherence levels; both at 84%.

2.7.3 Adherence to HAART in women

All women including the pregnant women are at a higher risk of non-adherence compared with their counterparts (Ortego *et al.*, 2012). Adherence among women is influenced by context specific factors. Documented data on adherence among pregnant show high discrepancies. pregnant and breastfeeding women, HAART is important in preventing mother-to-child transmission. A systematic review and meta-analysis by Olumuyiwa *et al.*, (2018) revealed that stigma and discrimination at community level. fear of disclosure of HIV infection status and the negative consequences following disclosure are strong barriers to adherence during pregnancy. A study by Adeniyi *et al.*, (2018) reported an adherence level of 69% among pregnant women, another study by Mellins *et al.*, (2008) reported an adherence level of 61% while another study done by Agboeze, J. *et al.*, (2018) reported an adherence level of 89.2%.

2.7.4 Adherence to HAART in key populations

2.7.4.1 Adherence to HAART among Female sex workers (FSWs)

Female sex workers (FSWs) are a population with a high risk of acquiring and transmitting HIV infection. They also represent a vulnerable group with a high and worrisome variability in terms of adherence to treatment. A systematic review and meta-analysis done by Mountain *et al.*, (2014) reported a global prevalence of 12% among FSWs; with middle East and North Africa ranging between 1.7 % while sub-Saharan Africa has 36.9%. The review further documented that the pooled adherence estimates among FSWs is similar to that of the general population in SSA; 77% estimated to be $\geq 80\%$ adherent. Adherence among this category was also reported to be almost similar to that of women in the general population where 2% are were estimated to be $\geq 90\%$ adherent.

2.7.4.2 Adherence to HAART among Men who have sex with men (MSM)

Men who have sex with men (MSM) as well as lesbian, gay, bisexual, transsexual, intersex (LGBTIQ) communities are at extremely high risk of HIV infection. MSM have a 22 times risk of HIV infection as compared to other men (UNAIDS, 2018). Despite high rates of HIV among MSM, there is limited data on adherence to HAART among MSM. This group is highly marginalized and criminalized hence barring them from accessing care and prevention services. In a study done by Liu *et al.*, (2014), only 45% of MSM reported a good adherence to ART.

2.7.4.3 Adherence to HAART among people who inject drugs (PWIDs)

PWIDs are 22 times more at risk of HIV infection as compared to the general population. This risk results from sharing needles and other injecting equipment. Globally, Eastern Europe and Central Asia constitute the majority of new infections among PWIDs. It is estimated that one in ten new infections are caused by sharing of needles. Despite the high risk of HIV infection among PWIDs, they have little access to HIV prevention and treatment services. This is because drug use is habitually criminalized and stigmatized. A systematic review by Szu-szu (2019) documented that the proportion of PWIDs who achieved $\geq 95\%$ adherence across the studies varied widely, from 19.3 to 83.9%.

2.7.4.4 Adherence to HAART in incarcerated people

Prisons are a high-risk environment for HIV transmission. Sharing of needles for drug use, tattooing and rape and sexual abuse are common issues. According to UNAIDS data (2018), incarcerated people are on average five times more likely to be living with HIV as compared to people not incarcerated. Prisoners are rarely given access to HIV prevention programmes while those living with HIV have limited access to HAART. For those on HAART, daily stresses, sub-standard prison conditions, poor nutrition and violence make adherence difficult. In addition, prison health services often have few or inadequately trained staff hence the comprehensive care becomes insufficient.

A systematic review done by Olalekan *et al.*, (2017) documented that a pooled estimate of 54.6% of prison inmates had adequate ($\geq 95\%$) adherence.

2.8 Importance of adherence to HAART

HAART is the only proven remedy known to enable PLHIV to achieve and maintain utmost viral suppression, reduce the risk of drug resistance development. Complete viral suppression also reduces the risk of transmission of HIV to other individuals. However, Poor viral suppression has detrimental effects on the immediate health of the patient as it contributes to the continued destruction of the immune system which in-turn exposes and individual to opportunistic infections (Bangsberg *et al.*, 2001).

Optimal adherence also prevents the emergence of drug resistant strains hence a patient's future treatment options are not limited. Adhering patients also save the healthcare system from the costs of switching to a new-line of HAART treatment, prevent the transmission of HIV and reduce AIDS-related mortalities. Through HAART, HIV/AIDS has been transformed into a chronic manageable disease for a substantial proportion of PLHIV who have access to treatment (Orrell *et al.*, 2013).

2.9 Factors associated with adherence to HAART

Adherence has multifactorial causes which are complex. It can be caused by socio-demographic and socio-economic factors, therapy-related factors, disease-related factors and health care system-related factors. Long term adherence to HAART requires accurate and consistent monitoring. This however still remains a challenge for many African countries. A myriad of clinical and social obstacles has resulted to low adherence rates which eventually deny HIV patients opportunity to fully benefit from treatment (Reda & Biadgilign, 2012). It's always a challenge for patients to maintain adherence during the first few months of treatment because they have not adjusted to daily medication intake, still battling with accepting their status and stigma and also not used to medication side effects. High viral loads coupled with sub optimal adherence leads to selection of drug resistant strains (NASCO, 2018).

There are various forms of non-adherence; not observing correct medication time, not taking the medication at all, not taking the correctly prescribed dose or terminating the medication before finishing the dose. Non-adherence can be intentional (voluntary); where patients choose not to follow treatment recommendations or unintentional (involuntary) where the patient lacks understanding or fails to respect all indications. Intentional non-adherence result from many factors; denial of diagnosis, challenges in fitting treatment into daily routine, having no trust in health-care providers and in the treatment itself, fear of HIV stigma, restraints due to a life-long treatment and disappointment due to the impossibility of cure HIV infection (Jacob *et al.*, 2017). Unintentional non-adherence mostly occurs as a result of not understanding or overlooking treatment indications. For example, forgetting to take doses or intentionally changing the dosing frequency. Predictors of unintentional non-adherence include the cognitive challenges, pill burden, behavioral aspects, comorbidities and associated treatments. The use of drugs and alcohol are also reported to increase non-adherence (Millar *et al.*, 2017).

2.9.1 Socio-economic and socio-demographic factors associated with adherence to HAART

Young age and male gender have a significantly higher risk of non-adherence (Muya, 2014). Young people have low utilization of VCT services and many are reported to find out about the HIV positive status after the onset of opportunistic infections. Male gender also has been associated with poor health seeking behaviors; they rarely visit hospitals for routine checkup unless they are feeling unwell. A study done in Tanzania found that younger age, unemployment, marital status, low level of education, alcohol use, higher CD4 counts, male gender and urban residence are associated with non-adherence (Semvua *et al.*, 2017). A systematic review done by Heestermans *et al.*,(2016) reported that age is a determinant for adherence, with better adherence seen in older patients (>35 years) compared with younger patients. They further reported that higher adherence was

observed among patients with formal education while lower levels of education corresponded with non-adherence.

Income status of the patient and place of residence are independent predictors of adherence to HAART (Hailasillassie ,2014). PLHIV who have their own source of income and from urban residence are more likely to adhere while patients with lower socio-economic status and who reside rural areas had higher non-adherence rates (Muya, 2014). Social and family supports are key factors that influence HAART adherence (Mariana *et al.*, 2008, Dibaba & Hussein, 2016). Living with a family, friend or relative who offer social support and physical interaction increases the levels of adherence to medication while PLHIV who are not socially supported by their families feel stigmatized and depressed and this may contribute to adherence challenges. A systematic review by Heestermans *et al.*, (2016) reported that disclosing one's HIV status to spouse, children and others has been observed to be a predictor of receiving support and was observed to be associated with adherence. They further documented that material; emotional and social support promotes adherence while by fear of discrimination and/or experiencing stigma contributes to non-adherence.

Marital status greatly impacts adherence; unmarried participants are more likely to be non- adherent than married participants. This suggests that lower levels of sub-optimal adherence are observed among individuals with family support as compared to those who are supported by friends, partners or other relations. This raises the possibility that participants who were married encouraged their spouses to adhere to treatment (Petse, 2018). Individuals who receive support directly through finances or indirectly through encouragement, information and reminders on when to take medications are reported to have better adherence. In a comparative analysis two regional cohorts; sub-Saharan Africa and Asia, Bijker *et al.*, (2017) reported that patients in low- and lower-middle-income countries has a higher risk of sub-optimal adherence. They identified make gender and younger age as risk factors for non-adherence.

An individual's level of education directly affects HIV knowledge which subsequently affects adherence (Petse, 2018, Wakibi, 2010). Very poor adherence levels were

reported in participants who had no formal education. Poor understanding of disease and the recommended treatment have resulted in some patients defaulting treatment. People who are educated; those who attained at least secondary school education display superior adherence to ART because they are able to follow treatment instructions as given by the healthcare providers.

Financial challenges, such as transport costs, health facility costs and financial insecurity are associated with non-adherence. In addition, distance to clinic, time taken to refill, travelling, forgetting to take medication, having children and inability to maintain healthy lifestyle are risk factors for non-adherence (Heestermans *et al.*, 2016, Wakibi, 2010). Patient's inability to raise sufficient money for transport to clinics have resulted to missed hospital appointments. Due to competing resource needs, HIV patients are sometimes forced to make a choice; to pay for transport to clinics or buy food (Syed *et al.*, 2013). Failure of PLHIV to accurately adhere to prescribed medication schedule and instead take their drugs much late or much earlier or completely miss doses, may lead to blood drug concentrations to drop below the level required to fully suppress the virus or increase to levels that are harmful to the patient due to drug toxicity. Transmission of HIV strains which are resistant to first-line antiretroviral therapy raises the need for second-line treatment which will eventually result in increased healthcare costs. Low levels of adherence to therapy have also been associated with increased hospital admissions and decreased productivity (Orrell *et al.*, 2013). Sub-optimal adherence to therapy lowers the efficacy of the antiretroviral regimens and eventually results in the emergence of drug resistant HIV strains (Biadgilign & Reda, 2012).

2.9.2 Attitude and practices associated with adherence to HAART

Patient's long experience on HAART and their willingness to tolerate common adverse drug effects was motivated by their belief in the effectiveness in the therapy (Momanyi, 2016, wakibi, 2010). In studies involving a small group of patients who had achieved 100% adherence to ART, patients' optimism towards art, effective doctor-patient

relationship, and confidence in ART and lack of medication side effects are reported to have improved the clinical, immunological and virological parameters (Sidat *et al.*, 2007). A systematic review by Heestermans *et al.*,(2016) documented that depression characterized by being ready to die and loss of hope of ever getting better promotes non-adherence while coming to terms and acceptance of illness, desire to live and take care of children and fear of returning to pre-ART health state are predictors of good adherence. Heestermans *et al.*,(2016) further reported that a patients' positive perceptions of ART, such as a strong belief in value of treatment and understanding importance of adherence were associated with adherence, whereas rumours and false beliefs about ART, including that ART can cause harm and is a sexual stimulant, were associated with non-adherence) reported that the concurrent use of herbal medicines and HAART is a probable impediment to adherence in SSA.

Religious beliefs influence patient's adherence to ART. Some Pentecostal Christian churches have been reported to have negative attitude towards antiretrovirals, their interpretation of life, death and healing are based on traditional explanations hence they consider the use of ARVs to prolong life as competing God who is the sole provider of life and healing (Togarasei, 2010). Some religious affiliations hold that God has supernatural powers able to heal HIV and AIDs. Such beliefs have been associated with elevated levels of non-adherence among women in Malawi (Mbirimtengerenji *et al.*, 2013). Religious beliefs that HIV/AIDS can be cured spiritually has resulted in reduced adherence. Some patients have been reported to spend much time in prayers, performing rituals, visiting prayer shrines and herbalists for cures (Igbende *et al.*, 2016).

In their systematic review, Heestermans *et al.*,(2016) reported that religion is both a barrier to and a promoter of adherence. Belief and faith that God provided the knowledge to make ART acts was observed to promote adherence, whereas belief in religious cures for HIV over conventional medical approaches observed increased non-adherence. Alcohol consumption negatively influences an individual's health status and adherence to treatment; it increases the risk of unprotected sex and HIV virus

transmission. It directly affects adherence through missing or stopping ARVs (Da Santos *et al.*, 2017). Petse (2018) further noted that alcohol consumption affects adherence. They reported that clients who took alcohol failed to take their medications as they feared mixing treatment with alcohol while others claimed that alcohol use made it difficult for them to remember to take medications. Other studies have reported that alcohol impairs ones' reasoning and its use is reported to increase the risk of non-adherence as patients are likely forget to take their medication. It is further reported that alcohol use among men may be due to denial of the truth of being HIV-positive. Forgetfulness, side effects, Pill burden, depression and stigma are associated with non-adherence (Bijker *et al.*, 2017, Momanyi, 2016).

2.9.3 Dietary factors associated with adherence to HAART

Dietary conditions that accompany HAART prescription complicate the adherence schedule as patients are required to adjust their lifestyle. Some antiretroviral regimens, mostly the protein inhibitors are recommended to be taken with taken with food so as to increase their efficacy and to reduce the medication side effects and individuals who begin treatment without following dietary recommendations are likely to have elevated side effects which may lead to treatment disruptions. Findings from some studies have reported that HIV patients stopped taking HAART due to unavailability or insufficient food. Patients have reported that taking HAART on an empty stomach worsens the drugs side effects and it also increases hunger (Mills *et al.*,2003).

Food insecurity contributes to sub-optimal adherence to antiretroviral therapy and is associated with poor HIV clinical outcomes. Since HAART requires regular medical visits involving transport costs and lost work time, the household monetary resources available for food acquisition becomes limited and this may result to trade-offs between seeking medication and other competing needs. PLHIV also have increased energy requirements and dietary recommendations require asymptomatic PLHIV to increase

their energy intake by 10% over the requirement for healthy people while symptomatic PLHIV are required to increase their energy intake by more than 20-30%. From the above dietary recommendations, it can be seen that maintaining a diet with sufficient quantities of nutrient-rich foods is critical for PLHIV to acquire maximum regimen efficacy since appropriate nutrition aids in the strengthening of the immune system, management of opportunistic infections, optimizing response to medical treatment and delaying the progression to AIDS (Castleman, 2003).

The interaction between HAART and food can either result in positive or negative outcomes. Different classes of antiretroviral interact differently with different types of food. Food can enhance or inhibit the efficacy of HAART regimen by affecting their absorption, metabolism, distribution or excretion. Managing these interactions of important in maintaining the effectiveness of the therapy. Medication side effects can lead to reduced food intake and reduced nutrient absorption that worsens the weight loss and dietary problems experienced by PLHIV. Vomiting, taste changes and appetite loss may reduce food consumption and this may result in some HIV patients interrupting the medication (Castleman, 2003). Food insecurity results in non-adherence through two mechanisms: stopping ART when food is not available to avoid aggravated gastrointestinal side effects or increased hunger due to taking ART when insufficient food is available (Heestermans *et al.*, 2016). Some factors that negatively affect adherence in developing countries have been identified through systematic reviews. They include; alcohol abuse, stigma, pharmacy stock outs and structural factors that include lack of transport to clinics (Monjok *et al.*, 2010).

2.9.4 Health system factors associated with adherence to HAART

Health system factors also contribute significantly to the extent to which a patient adheres to their HIV medications. A systematic review on determinants of adherence in SSA done by Heestermans *et al.*, (2016) reported that healthcare workers play a great role on patients' adherence. They reported that A confidential and good relationship with

healthcare providers resulted in better adherence. Non-adherence was observed in patients who encountered unpleasant experiences with clinic staff, such as rudeness, condemnation and fatigue. The following health facility factors are associated with non-adherence; lack of privacy at the facility, overcrowding in pharmacies, consultations with multiple patients and lost files. For the employed people who would need to take time off to collect their medication, long waiting times and limited clinic hours were reported to lead to non-adherence (Heestermans *et al.*, 2016). In addition, pill burden, change in medication, missing scheduled visits, pharmacy stock out and dietary instruction are predictors of non-adherence. Findings from various studies pointed the following clinic features as potential hindrance to adherence; unfriendly healthcare workers, long waiting time in clinics, privacy and confidentiality issues and clinic opening and closing hours (Heestermans *et al.*, 2016).

Patients feeling of lack of trust in information confidentiality among healthcare providers has been reported as an obstacle to adherence as PLHIV fear that their HIV status may be exposed and this will lead them to be stigmatized. Long queues at the HAART clinics have also been reported as a barrier to adherence as PLHIV feared that their HIV status could be exposed to other hospital staff and patients seeking various treatments in the same facility. However, patient's satisfaction with the healthcare providers; where they feel warmly welcomed and treated are associated with high adherence levels. Friendly and supportive staff have been reported to be a motivating factor for PLHIV to take and adhere to their medication (Iacob *et al.*, 2017 & Heestermans *et al.*, 2016).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study sites

This study was conducted in the three Comprehensive Care Centres (CCC) in selected hospitals in Kericho County: Kericho Referral Hospital (former Kericho District Hospital), Londiani Sub-County Hospital (former Londiani District Hospital) and Litein mission Hospital. Kericho Referral CCC is the largest facility among the three. It is located within Kericho town and it serves patients from within the town and its surroundings. The facility is centrally located hence accessible to patients from all parts of the county. The Kericho Referral CCC operates from Monday to Thursday every week serving an average of 80 patients per day. The adolescents have one clinic day per month which is on Saturday. On average, the facility serves nearly 1,300 patients per month. Litein mission hospital CCC is the second largest of the three facilities. It serves patients mainly from the Southern part of Kericho and its environs. The facility has two clinic days per week; Monday and Friday. The average number of patients served in each of the two days is 30. This translates to an average of 240 patients being served monthly. Londiani Sub- County hospital CCC is the smallest of the three. It is located in the North Eastern part of Kericho bordering Nakuru County. The facility has weekly clinic day serving 45 patients which translates to 180 patients monthly.

Kericho County is located within a very rich agricultural area and is predominantly occupied by the Kipsigis community who practice farming. Tea is the major cash crop although sugarcane, pineapples, maize and vegetables are also grown. Many large tea producing companies are based in Kericho County. The presence of this companies in this region have created a lot of employment opportunities to many people in the County. Animal keeping is also practiced with dairy farming on the lead.

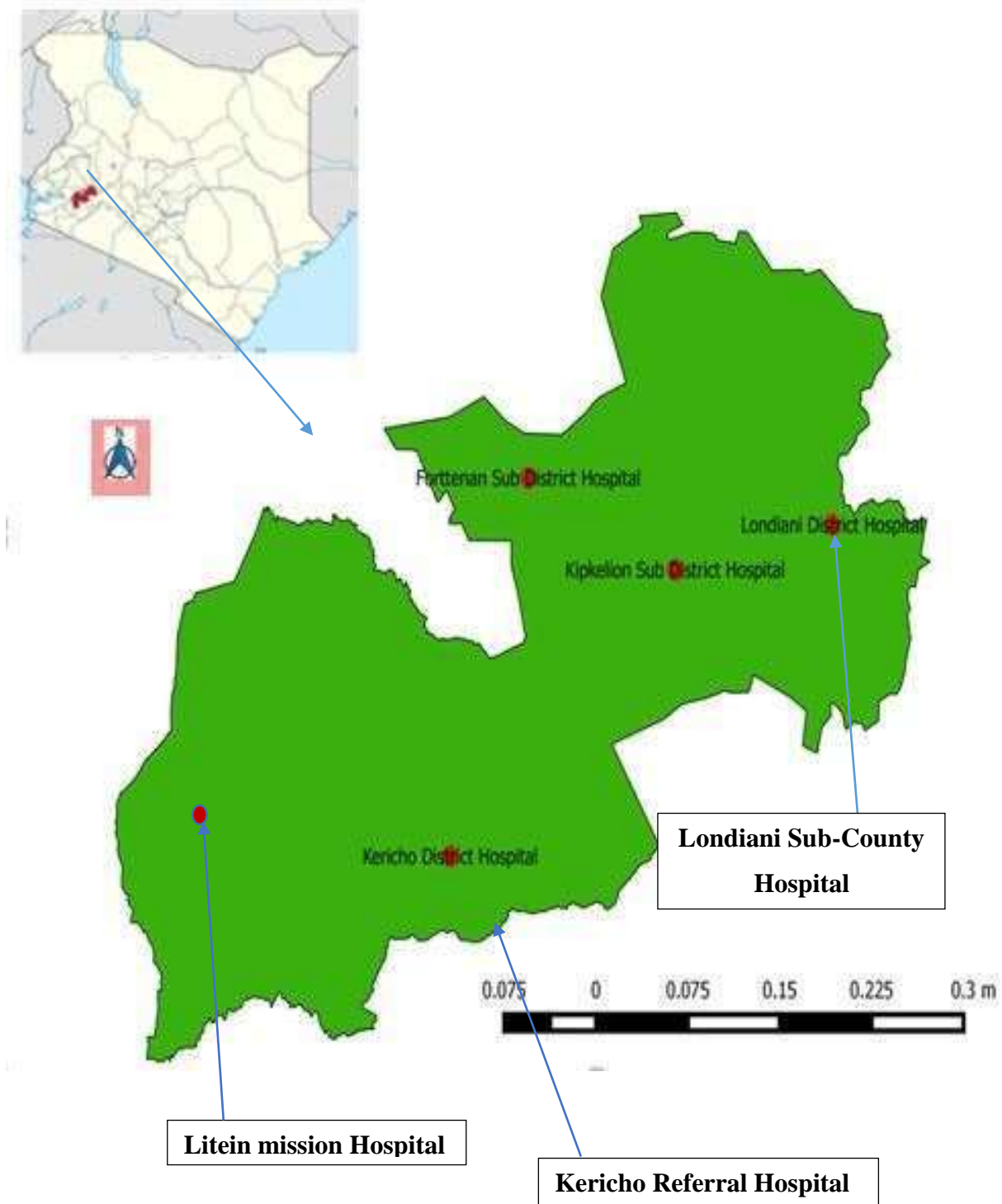


Figure 3.1: Map of Kericho County showing selected hospitals.

Source: Researcher 2022

3.2 Study design

The study adopted a cross-sectional study design.

3.3 Study variables

3.3.1 Dependent variables

Adherence to HAART.

3.3.2 Independent variables.

socio-demographic and socio-economic factors- Gender, age, marital status, level of income, level of education, type of residence, type of occupation, level of income, distance to health facility, expenditure on food and fare spent to-and-from health facility.

Attitude and practices towards HAART.

Dietary factors-food Security and dietary diversity.

3.4 Study Population

The study population for this study were HIV patients (≥ 15 years) on HAART attending comprehensive care centres in Kericho Referral Hospital, Londiani Sub-County Hospital and Litein mission Hospital.

3.5 Sample Size Determination

The required sample size was determined using Cochran formula (1963) with a 95% confidence interval and 5 % sampling error.

$$n_0 = \frac{Z^2 pq}{e^2}$$

n_0 =sample size

Z= statistic for a level of confidence at 95% which gives a value of 1.96

P= 24.5% which is the proportion of HIV patients on HAART not reaching optimal

Levels of adherence (Amberbir *et al.*, 2008)

$q=(p-1)$

e = level of precision with a margin of error of ± 0.05

Therefore, the sample size was,

$$n_0 = \frac{1.96^2 \cdot 0.245(1-0.245)}{0.05^2} = 284$$

However, since the study population was 3240 (less than 10,000), the final sample size was adjusted according to Cochran formula (1963).

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Hence, the minimum sample size was;

$$n = 284 / 1 + (284-1)/3240 = 261$$

3.6 Sampling procedure

The three hospitals where this study was undertaken were selected purposively. This was done based on their geographical locations within the. The number of respondents picked from each facility were determined according to probability proportionate to size (Table 3.1).

Table 3.1: Sample size for each CCC

Comprehensive Care Centre	Total population of patients on HAART (≥ 15 years)	Proportionate number in sample size
Kericho Referral Hospital	5000	$5000/6800*261=192$
Londiani Sub-County hospital	700	$700/6800*261=27$
Litein mission hospital	1100	$1100/6800*261=42$
Total	6800	261

Systematic sampling was used to recruit respondents from the selected facilities. Data was collected for a period of two months as per the work plan. The sampling interval (K^{th}) for each facility was calculated on a daily basis depending on the clinic appointments for that particular day (table 3.2). The first respondent to be interviewed was picked randomly between the first and the K^{th} . If the K^{th} respondent did not consent, the next respondent was picked. The second, third to the last respondents were picked after the calculated K^{th} interval for each facility.

Table 3.2: Sampling interval for each CCC

CCC	Calculated sample size	Clinic days per month	Patients served each clinic day	Total clinic days in 2 months	Questionnaires administered daily	Sampling interval
Kericho Referral Hospital	192	4@ week 16	80	32	192/32 =6	80/6 =13.33 14
Londiani Sub-County hospital	27	1@week 4	45	8	27/8 =3.4 4	45/4 =11.25 12
Litein mission hospital	45	2@week 8	30	16	45/16 =2.8 3	30/3 =10

3.6.2 Exclusion Criteria

Patients who were critically ill to participate.

3.6.1 Inclusion criteria

HIV patients (≥ 15 years of age) who had been on HAART for at least twelve months, had at least 2 viral load measurements after starting HAART and those who consented to participate in the study.

3.7. Data management

Data collected from this study were used to determine Predictors of adherence to HAART among HIV patients attending comprehensive care centres in selected hospitals in Kericho County.

3.7.1 Data collection

An initial request for private interview room was given to the health facility managers. The recruiting of the respondents was done while patients were waiting to receive their HAART at the clinics while interviews were done after refill. This was done by the principal investigator. The patients were informed on the nature and the purpose of the study and those who indicated their willingness to participate in the study were given an informed consent form which they were expected to sign. A total of 261 questionnaires were filled by the respondents and these were used for statistical analysis. The questionnaires were pre-tested by randomly recruiting 10 respondents from the target group. The respondents were asked to fill the questionnaires one at a time and answers from each respondents analyzed. Improvements were then made in areas where the respondents didn't understand, were hesitant to fill or made mistakes.

Quantitative data was collected from the patient's using interviewer administered semi-structured questionnaires while qualitative data was collected through Key informant interviews with healthcare providers involved in HIV care at the selected facilities. The principal investigator held face to face interviews with the respondents. The questionnaire comprised of sections on; socio-demographic and socio-economic profile of the participants, Participant's attitude and practices towards HAART and dietary factors affecting adherence. Attitudes were measured using the Likert scale. Food security was determined by placing respondents into four categories; 1 = Food Secure, 2=Mildly Food Insecure Access, 3=Moderately Food Insecure Access, 4=Severely Food Insecure Access (Coates *J.et al.*, 2007) (appendix I section D(I)).

Key informant interviews were conducted on the healthcare providers in each of the three facilities. Question guides modified from NASCOP (*Guidelines on Use of Antiretroviral Drugs for Treating and Preventing HIV Infection in Kenya – 2018 Edition*) were incorporated in the questionnaire. Viral load was used as a measure of adherence. This was done by looking retrospectively into the patient file. Individuals who achieved viral suppression (<50 HIV-1 RNA copies/ml) within 3-6 months of HAART initiation were considered to have optimal adherence while individuals who had viral load of between 50-1000 HIV-1 RNA copies/ml after 3-6 months of HAART initiation were considered to have sub-optimal adherence (Hine et al., 2018).

3.7.2 Data entry and analysis

The data collected was sorted, coded and entered Statistical Package for Social Sciences (SPSS) version 25.0. Analysis was done through descriptive and inferential statistics. Descriptive statistics such as mean, frequencies, and percentages was used to summarize the data set while inferential statistics (Chi square and multivariate logistic regression analysis) were used to determine the association between adherence to HAART and various independent variables. A chi square test was used as an initial screening tool for any association between dependent and independent variables. Independent predictors of adherence to HAART were determined using logistic regression analysis with the significance level set at $p < 0.05$.

3.7.3 Data presentation

Summary statistic of independent variables was presented using frequency tables, pie charts and bar graphs.

3.8 Dissemination of results

Findings from this study were published in the journal of Health Medicine and Nursing (Appendix V). Additionally, copies of this thesis were submitted to the JKUAT library. Understanding the predictors of adherence is of great significance in designing HAART rollout programmes in a patient-tailored manner that will address the barriers to achieving optimal adherence.

3.9 Ethical considerations

Permission to conduct study-This study was conducted upon ethical approval by Kenyatta National Hospital-University of Nairobi-Ethical Review Committee (KNH-UON ERC). A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Additional approval for data collection was sought from Kericho County Health department. Written client informed consent was also obtained from the respondents before collecting the data. The study participants were informed of what the study entailed, their involvement, potential benefits and risks involved. The participants were also informed that their participation in the study was voluntary. For respondents who had attained the legal age of consent (>18 years) informed consent was obtained from them. However, for respondents under 18 years, they had to express their willingness to participate in the study then informed consent was obtained from their parent/guardian. Confidentiality was maintained by coding data and delinking any information related to a participant's identity. The data was also being reported in group form and it was stored in password protected computers to restrict access to unauthorized personnel.

CHAPTER FOUR

RESULTS

A total of 261 patients on HAART were interviewed in the three selected comprehensive care centres and the results from all of them were used during the final analysis. Adherence was assessed using viral load results. Data on viral loads was extracted retrospectively from patients' files.

4.1 socio-demographic and socio-economic factors among the respondents

The socio-economic factors among the respondents is given in Table 4.1. Majority of the respondents, 73.6% were from Kericho, 16.1% were from Litein and 10.3% from Londiani. Majority, 63.2% were Female and 36.8% were male.

For age group, most, 16.1% were aged 30-34 years, 14.9% were aged +50 years, 14.2% were aged 35-39 years and the least, 5.8% were aged 15-19 years. Most of the respondents, 49.4% were married, 25.3% were single and the least 1.2% were widowed. Most of the respondents, 41.8% had attained secondary education, 36% had attained primary education, 17.2% had tertiary and 5% had no formal education. Majority of the respondents, 81.23% lived with their family, 15.7% lived alone and the least, 3.1% lived with friends. On the type of residence, 56.7% lived in residential homes while 43.3% lived in rentals.

About a third of the respondents, 38% were casual labourers, 27.6% were farmers, while the least 1.2% were nurses. On the level of income, slightly more than a quarter earned between Ksh. 5,000-10,000 a month, 24.5% earned between Ksh. 10,001 -15,000 while the least, 0.8% earned above Kshs.50, 000.

On the distance covered by the respondents from their homes to the CCC, approximately 26% covered 0-5 kilometers, 22.2% covered 6-11 kilometres while the least, 8.4% covered 24-29 kilometers.

Table 4.1: Socio-demographic factors among the respondents

Characteristic	n=261	Frequency	Percent
Facility			
Kericho Referral Hospital		192	73.6
Litein Mission Hospital		42	16.1
Londiani Sub-County Hospital		27	10.3
Male		96	36.8
Age			
15-19		15	5.8
20-24		25	9.6
25-29		35	13.4
30-34		42	16.1
35-39		37	14.2
40-44		37	14.2
45-49		31	11.9
50+		39	14.9
Marital status			
Married		129	49.4
Widow/ Widower		34	13.0
Single		66	25.3
Divorced/ Separated		32	12

Table 4.2: Socio-economic factors among respondents

Level of education		
No Formal Education	13	5.0
Primary Education	94	36.0
Secondary Education	109	41.8
Tertiary Education	45	17.2
Whom do you live with?		
Alone	41	15.7
Family	212	81.2
Friends	8	3.1
Type of residence		
Rental	113	43.3
Residential	148	56.7
Type of Occupation		
Teacher	12	4.6
Nurse	3	1.2
Self employed	105	12.6
Mechanic	4	1.5
Driver	8	3.1
Banker	4	1.5
Casual Labourer	99	37.9
Unemployed	26	10.0
Type of work schedule		
Full time	25	10.6
Over time	33	13.9
Part time	80	33.8
Split shift	3	1.3
Rotating shift	1	0.4
Casual	95	40.1

Table 4.2: Socio-economic factors among respondents

Characteristic	n=261	Frequency	Percentage
Level of income			
< Kshs. 1000		37	14.2
Kshs. 1000-5000		68	26.1
Kshs. 5001-10000		69	26.4
Kshs. 10001-15000		64	24.5
Kshs. 15001-25000		13	5.0
Kshs. 20001-50000		8	3.1
> Kshs. 50000		2	0.8
Fare to-and-from the CCC			
0-50		71	27.2
51 <100		28	10.7
101 < 200		84	32.2
201 <400		58	22.2
>401		20	7.7
0-50		71	27.2
Mode of transport -and-from the CCC			
Walking		41	15.7
Bodaboda		68	26.1
Matatu		149	57.1
Self-drive		3	1.2
Average daily expenditure on food			
0-200		200	88.1
200-400		25	11.0
400-800		2	0.9

Chi square was used as an initial screening test for any association between socio-economic and socio-demographic factors and adherence to HAART. The results are presented in the table 4.3.

Table 4.3: Chi square analysis of socio-demographic and socio-economic factors associated with adherence to HAART

Variable	Chi square value	p-Value
Gender	0.066	0.797
Age	14.604	0.041
Marital status	3.615	0.607
Level of education	2.918	0.404
Type of residence	14.391	0.039
Type of occupation	2.351	0.194
Type of work schedule	2.766	0.272
Level of income	4.170	0.903
Fare to and from clinic	1.172	0.279
Average daily expenditure on food	9.785	0.044
Whom do you live with?	2.692	0.362

Statistically significant at level $p < 0.05$

4.2 Distribution of respondents according to socio-economic and socio-demographic factors and adherence to HAART.

4.2.1 Gender among respondents and adherence HAART

Amongst the respondents, 165 were female while 96 were male. Majority among the females and males had optimal adherence, 111 and 65 respectively.

Table 4.4: Gender and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Gender				
Female	165	63.2	111(67.3)	54(32.7)
Male	96	36.8	65(67.7)	31(32.3)

There was no significant association between gender and adherence, (O. R=1.391, $p=0.379$, 95% CI [0.686-0.283]) (Table 4.15).

4.2.2 Age among the respondents and adherence to HAART

Most of the respondents, 42(16.09%) were aged between 30-34 years, 39(14.94%) were more than 50 years and a minority, 15(5.75%), were aged 15-19 years. The age category 40-44 had the highest proportion (75.68%) of those who had optimal adherence while the age category 20-24 reported the lowest (48.00%) adherence levels. Apart from the age category 20-24, other categories had high proportion of the respondents who had optimal adherence than those who sub-optimal adherence.

Table 4.5: Age and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Age				
15-19	15	5.8	13(86.7)	2(13.3)
20-24	25	9.6	12(48.0)	13(52.0)
25-29	35	13.4	20(57.1)	15(42.9)
30-34	42	16.1	30(71.4)	12(28.6)
35-39	37	14.2	25(67.6)	12(32.4)
40-44	37	14.2	28(75.7)	9(24.3)
45-49	31	11.9	19(61.3)	12(38.7)
50+	39	14.9	21(53.9)	18(46.1)

There was a significant association between age and adherence to HAART, (O. R=1.141, $p=0.023$, 95% CI [0.260-0.764]) (Table 4.15).

4.2.3 Marital status among the respondents and adherence to HAART

Almost half of the respondents, 129 (49%) were married, 66(25.29%) were single and a minority, 3(1.15%), were divorced. The proportion of those who had optimal adherence was higher than those who had sub-optimal adherence in all categories except among the widowers.

Table 4.6: Marital status and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Marital status				
Married	129	49.4	87(67.4)	42(32.6)
Widow	31	11.9	22(71.0)	9(29.0)
Widower	3	1.0	1(33.3)	2(66.7)
Single	66	25.3	45(68.2)	21(31.8)
Divorced	3	1.2	3(100)	0(0.00)
Separated	29	11.1	18(62.1)	11(37.9)

There was no significant association between marital status and adherence to HAART, (OR =1.186, $p=0.233$, 95% CI= [0.671-1.168]) (Table 4.15).

4.2.4: Level of Education among the respondents and adherence to HAART

Amongst the respondents, most ,109(41.8%) had secondary education, 94(36.0%) had primary education, 45(17.4%) has tertiary education and 13(5.0 %) had no formal education. In all the categories, the proportion of those who had optimal adherence was much higher than those with sub-optimal adherence.

Table 4.7: Level of Education and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Level of Education				
No Formal Education	13	5.0	8(61.5)	5(38.5)
Primary Education	94	36.0	58(61.7)	36(38.3)
Secondary Education	109	41.76	79(72.5)	30(27.5)
Tertiary Education	45	17.24	31(68.9)	14(31.1)

There was no significant association between level of education and adherence to HAART, (OR =0.624, $p=0.354$, 95% CI= [0.231-1.690]) (Table 4.15).

4.2.5 Whom the respondents lived with and adherence to HAART

Majority of the respondents, 212(81.2%) lived with family, 41(15.7%) lived alone and 8(3.1%) lived alone. In all the categories, the proportion of those who had optimal adherence was much higher than those who had sub- optimal adherence.

Table 4.8: Whom the respondents lived with and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Whom do you live with?				
Alone	41	15.7	30(73.2)	11(26.8)
Family	212	81.2	140(66.0)	72(34.0)
Friends	8	3.1	6(75.0)	2(25.0)

There was no significant association between whom the respondents lived with and adherence to HAART, OR =0.834, p=0.770, 95% CI= [0.246-0.288]) (Table 4.15).

4.2.6 Type of residence among respondents and adherence to HAART

Majority of the respondents, 148(56.7%) lived in residential houses while 113(43.3%) lived in rentals. In both categories, the proportion of those with optimal adherence was higher than those with sub-optimal adherence.

Table 4.9: Type of residence and adherence to HAART

Variable	Frequency	Percent (%)	Optimal	Sub-optimal
			Adherence n (%)	adherence n (%)
Type of residence				
Rental	113	43.3	82(46.6)	31(36.5)
Residential	148	56.7	94(53.4)	54(63.5)

There was no significant association between the type of residence and adherence to HAART, (OR= 0.832, p=0.719, 95% CI = [0.213-3.250]) (Table 4.15).

4.2.7 Fare to-and-from CCC among the respondents and adherence to HAART

Most of the respondents, 84(32.2%) spent between Ksh.101-200, 71(27.2%) spent between Ksh.0-50 and the minority, 20(7.7 %) spent more than Ksh.400.

Table 4.10: Fare to-and-from CCC and adherence to HAART

Variable			Optimal	Sub-optimal
	Frequency	Percent (%)	Adherence n (%)	adherence n(%)
Fare to-and-from CCC				
0-50	71	27.2	53(75.6)	18 (24.4)
51 <100	28	10.7	21(73.9)	7(23.1)
101< 200	84	32.2	57(67.9)	27(32.1)
201<400	58	22.2	43(74.1)	15(25.9)
>401	20	7.7	17(84.0)	3(26.0)

There was no significant association between the amount of Fare to-and-from the CCC and adherence to HAART, OR= 1.104, $p=0.517$, 95% CI = [0.941-2.252] (Table 4.15).

4.2.8 Level of Income among the respondents and adherence to HAART

Most of the respondents, 69(26.4%) earned between Ksh. 5,001-10,000, 68(26.1%) earned between Ksh. 5,001- 10,000 and a minority, 2(0.8%) earned more than Ksh.50,000.

Table 4.11: Level of Income and adherence to HAART

Variable			Optimal	Sub-optimal
	Frequency	Percent (%)	Adherence n (%)	adherence n (%)
Level of income				
< Kshs. 1000	37	14.18	24(65.8)	13(34.2)
Kshs. 1000-5000	68	26.05	44(64.7)	24(35.3)
Kshs. 5001-10000	69	26.44	46(66.7)	23(33.3)
Kshs. 10001-15000	64	24.52	44(68.8)	20(31.2)

Kshs. 15001-25000	13	4.98	10(76.9)	3(23.1)
Kshs. 20001-50000	8	3.07	6(75.0)	2(25.0)
> Kshs. 50000	2	0.77	2(100.0)	0(0.0)

The level of income has no significant influence on adherence to HAART, (OR= 0.732, $p=0.640$, 95% CI = [0.198-2.708]) Table 4.15).

4.2.9 Type of Occupation among the respondents and adherence to HAART

Close to 40.2% (105) of the respondents, were self-employed,99(37.9%) were casual labourers and a minority were 3(1.2%) were nurses. In all the categories, the proportion of those with optimal adherence was much higher than those with sub-optimal adherence. However, in the unemployed category, the proportion of those with optimal adherence was almost equal to those with sub-optimal adherence.

Table 4.12: Type of Occupation and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Type of Occupation				
Teacher	12	4.60	8(66.7)	4(33.3)
Nurse	3	1.15	3(100.0)	0(0.0)
Self employed	105	40.23	73(69.5)	32(30.5)
Mechanic	4	1.53	4(100.0)	0(0.0)
Driver	8	3.07	6(75.0)	2(25.0)
Banker	4	1.53	4(100.0)	0(0.0)
Casual Labourer	99	37.93	64(84.7)	35(33.3)
Unemployed	26	9.96	14(53.9)	12(46.1)

There was no significant association between the type of occupation and adherence to HAART, (OR= 0.901 and 95% CI = [0.101-5.365], $p=0.908$) Table 4.15).

4.2.10 Average daily expenditure on food among the respondents and adherence to HAART

Majority of the respondents, 220(89.1%) spent between Ksh. 0-200 daily on food, 25(10.1%) spent between Ksh. 200-400 and a minority, 2(0.8%), spent between Ksh.400-800.

Table 4.13: Average daily expenditure on food and adherence to HAART

Variable			Optimal	Sub-optimal
	Frequency	Percent (%)	Adherence n (%)	adherence n (%)
Average daily expenditure on food				
0-200	220	89.07	147(66.8)	73(33.2)
200-400	25	10.12	18(72.0)	7(28.0)
400-800	2	0.81	2(100.0)	0(0.0)
>800	0	0.00	0.0	0.0

Average daily expenditure on food had significant influence adherence HAART at the univariate level, (OR= 0.724, $p=0.023$, 95% CI = [0.548-0.957] (Table 4.14). However, on further analysis at the multivariate level, no statistically significant association was reported.

Analysis of the various socio-demographic and socio-economic variables associated with adherence was done. First at the univariate level (table 4.14) and thereafter at the multivariate level (table 4.15). At the univariate level; age, expenditure on food, type of residence and fare to-and-from the CCC had significant influence on adherence to HAART (table 4.14). However, after adjusting for confounders at the multivariate level (P=0.05), only Age (**20-24 years**) (**p=0.023**) had significant association with adherence to HAART (table 4.15).

Table 4.14: Univariate analysis of socio-demographic and socio-economic predictors of optimal adherence to HAART

Adherence	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
Gender	0.994	0.271	-0.020	0.982	0.582	1.696
Age	0.9085698	0.058	-1.510	0.032	0.802	1.029
Marital Status	0.982	0.073	-0.25	0.804	0.849	1.135
Level of Education	1.227	0.203	1.240	0.216	0.888	1.696
Level of Income	1.123	0.113	1.150	0.248	0.922	1.369
Type of occupation	1.013	0.050	0.260	0.794	0.919	1.116
Expenditure on food	0.724	0.563	-1.26	0.023	0.548	0.957
Type of residence Whom do live with	0.658	0.179	-1.540	0.042	0.387	1.120
Fare to-and-from the CCC	0.825	0.084	-1.900	0.035	0.677	1.006

Table 4.15: Multivariate analysis of socio-demographic and socio-economic predictors of optimal adherence to HAART

Variable	Odds ratio	Std.		P>z	[95% Conf.	Interval]
		Err	Z			
Age category						
20-24	1.141	0.121	-2.27	0.023	0.260	0.764
Gender	1.391	0.502	0.92	0.379	0.686	2.83
Marital Status	1.862	0.970	1.19	0.233	0.671	1.168
Level of Education	0.624	0.317	-0.93	0.354	0.231	1.69
Level of Income	0.732	0.489	-0.47	0.640	0.198	2.708
Type of occupation	0.901	0.820	-0.11	0.908	0.151	5.365
Expenditure on food	1.246	0.612	1.20	0.567	0.784	3.250
Type of residence	0.832	0.578	0.260	0.719	0.213	3.250
Whom do you live	0.834	0.519	-0.29	0.770	0.246	0.282
Fare spent to clinic	1.104	0.402	0.270	0.517	0.941	2.252

4.3: Attitudes towards HAART among respondents and adherence

Attitudes were measured using the Likert scale where the respondents were categorized to have optimal or sub-optimal adherence. Majority (90.8%) of the respondents strongly agreed that there were no better alternatives of HAART while 7.7% strongly disagreed that there are no better alternatives of HAART. On whether HAART is a complex regimen and this makes it difficult to adhere; 29.1% strongly disagreed, 24.9% disagreed, 8.4% were neutral, 22.2% agreed while 15.3% strongly agreed. Majority of the respondents (84.3%) strongly agreed that the effectiveness of HAART solely depends on adherence, 76.6% strongly disagreed that it is good to disclose to others that they were using HAART. Additionally, 61.3% strongly disagreed that People will be supportive if they find out that they were using HAART while most (35.2%) strongly agreed that People will discriminate them if they find out that they were using HAART (table 4.16).

Table 4.16: Likert scale showing attitudes towards HAART among respondents

Variable	Optimal adherence	Sub-optimal adherence	Total	P Value
There are no better alternatives than HAART				0.03
Strongly disagree	9(45)	11(55)	20(7.7)	
Disagree	2(50)	2(50)	4(1.5)	
Neutral	0(0)	0(0)	0(0.0)	
Agree	0(0)	0(0)	0(0.0)	
Strongly agree	226(95.4)	11(4.6)	237(90.8)	
HAART is a complex regimen and this makes it difficult to adhere				0.212
Strongly disagree	67(88.2)	9(11.8)	76(29.1)	
Disagree	52(80.0)	13(20.0)	65(24.9)	
Neutral	10(45.5)	12(54.5)	22(8.4)	
Agree	50(86.2)	8(13.8)	58(22.2)	
Strongly agree	20(50)	20(50)	40(15.3)	
The effectiveness of HAART solely depends on adherence				0.378
Strongly disagree	0(0.0)	0(0.0)	0(0.0)	
Disagree	0(0.0)	0(0.0)	0(0.0)	
Neutral	0(0.0)	0(0.0)	0(0.0)	
Agree	27(65.9)	14(34.1)	41(15.7)	
Strongly agree	172(78.2)	48(21.8)	220(84.3)	
It is good to disclose to others that I am using HAART				0.132

Strongly disagree	153(76.5)	47(23.5)	200(76.6)	
Disagree	15(75.0)	5(25.0)	20(7.7)	
Neutral	11(73.3)	4(26.7)	15(5.7)	
Agree	20(76.9)	6(23.1)	26(10.0)	
Strongly agree	0(0.0)	0(0.0)	0(0.0)	
People will be supportive if they find out that I am using HAART				0.106
Strongly disagree	128(80.0)	32(20.0)	160(61.3)	
Disagree	29(70.7)	12(29.3)	41(15.7)	
Neutral	24(80.0)	6(20.0)	30(11.5)	
Agree	18(90)	2(10.0)	20(7.7)	
Strongly agree	00(0)	0(0.0)	0(0.0)	
People will discriminate me if they find out that I am using HAART				0.194
Strongly disagree	15(68.2)	7(31.8)	22(8.4)	
Disagree	22(73.3)	8(26.7)	30(11.5)	
Neutral	35(71.4)	14(29.6)	49(18.8)	
Agree	55(80.9)	13(19.1)	68(26.1)	
Strongly agree	72(78.3)	20(21.7)	92(35.2)	

Among the attitudes analyzed, the attitude that there are no better alternatives of HAART is the only one that had significant influence on adherence (p=0.03)

4.4: Practices among respondents and adherence to HAART

4.4.2 Having someone/tool to remind of when to take medication and adherence to HAART

Majority of the respondents, 144(55.2%) had someone/tool that reminded them of when to take their medication while 117(44.8%) had nobody/tool to remind them of when to take their HIV medication. Patients who had someone/tool to remind them of when to take their medication were more likely to have optimal adherence to HAART as compared to those patients who had nobody/tool to remind them.

Table 4.17: Reminder tool/aid and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Do you have someone/tool that reminds you of when to take your medication?				
YES	144	55.17	120(83.3)	24(16.7)
NO	117	44.83	77(65.8)	40(34.2)

There was a significant association between having someone/tool to remind of when to take medication and adherence to HAART, OR= 0.466, $p=0.034$, 95% CI = [0.230-0.975]), (Table 4.22).

4.4.3: Fitting HIV medication schedule into daily routine and adherence to HAART

Majority of the respondents, 172(65.90%) had no difficulty fitting their medication to daily routine and majority of these had optimal adherence. Among those who reported having difficulty fitting their medication to daily routine, the proportion of those with optimal adherence was almost at par with those who with sub-optimal adherence.

Table 4.18: Fitting HIV medication schedule into daily routine and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Do you find it difficult to fit medication to daily routine?				
YES	89	34.10	45(50.6)	44(49.4)
NO	172	65.90	131(76.2)	41(23.8)

At the univariate level, fitting medication to daily routine and has significant influence on adherence to HAART, OR= 0.320, $p=0.067$ CI = [0.186- 1.551] (Table 4.21). However, further analysis at the multivariate level showed no statistical significance (table 4.22).

4.4.4 Carrying emergency dose of HIV drugs while away from home

Almost all of the respondents, 259(99.2%) reported that they carry emergency doses of HIV medication while they are away from home. A majority (73%) of those who carried their HIV medication had optimal adherence. Among those who reported not carrying HIV medication while away from home, both of them had sub-optimal adherence.

Table 4.19: Carrying emergency dose of HIV drugs while away from home and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Do you carry emergency dose of HIV drugs while away from home?				
YES	259	99.23	190(73.4)	69(26.6)
NO	2	0.77	0(0.0)	2(100.0)

Carrying emergency dose of HIV drugs while away from home had significance influence on adherence to HAART at the univariate level, (OR= 0.223, $p=0.045$, 95% CI = [0.043-1.166] (Table 4.21). However, further analysis at the multivariate level showed no statistical significance Table 4.2).

4.4.6: Alcohol consumption and adherence to HAART

Majority of the respondents, 209(80.08%) had never consumed alcohol in the last 30days preceding the survey while 52(19.92%) had consumed alcohol.

Most of the respondents, 35(67%) consumed spirits while 17(33%) consumed beer. The weekly consumption was distributed as follows; 4 consumed between 1-3 bottles per week, 10 consumed between 4-6 bottles, 16 consumed between 7-9bottles and 22 consumed more 10 than bottles per week.

Table 4.20: Alcohol consumption and adherence to HAART

Variable	Frequency	Percent (%)	Optimal Adherence n (%)	Sub-optimal adherence n (%)
Have you ever consumed alcohol?				
		NO		
	209	80.08	135(64.6)	72(35.4)
		YES		
	52	19.92	30(57.7)	22(42.3)
Between 1-3 bottles @week	4		4(100.0)	0(0.0)
Between 4-6 bottles @week	10		8(80.0)	2(20.0)
Between 7-9 bottles @week	16		8(50.0)	8(50.0)
+10 bottles @week	22		10(45.5)	12(54.5)

There was no significant association between the type of alcohol consumed and adherence. However, the number of bottles consumed had significant association with adherence to HAART.

Those who consumed between 7-9 bottles and above per week were more likely to have sub-optimal adherence as compared to those who consumed between 4-6 bottles and below per week. However, there was no statistically significant association between alcohol consumption and adherence to HAART, OR= 0.745, $p=0.345$, 95% CI = [0.404-1.373] (Table 4.21).

Table 4.21: Univariate analysis of practices associated with adherence to HAART

Attitude and practice	Odds Ratio	Std. Err.	Z	P>z	[95% Conf.]	Interval
Use of other alternatives of HAART	0.371	0.161	-2.280	0.022	0.159	0.869
Privacy and confidentiality	0.677	0.183	-1.450	0.148	0.399	1.149
Tool/someone to remind	0.558	0.152	-2.140	0.032	0.327	0.952
Fitting medication to daily routine	0.320	0.089	-4.110	0.067	0.186	1.551
Carrying emergency dose of HIV drugs while away from home	0.223	0.1881	-1.780	0.045	0.043	1.166
Alcohol Consumption	0.745	0.232	-0.950	0.345	0.404	1.373

Table 4.22: Multivariate analysis of practices associated with adherence to HAART

Adherence	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]
Use of HAART alternatives	0.275	0.140	-2.54	0.011	0.101 0.745
Having someone/tool to remind of when to take medication	0.466	0.168	-2.12	0.034	0.230 0.975

Statistically significant at level $p < 0.05$

However, after adjusting for confounders at the multivariate level ($P=0.05$), use of HAART alternatives ($p=0.011$) and having someone/reminder tool($p=0.034$) had significant association with adherence HAART.

4.5: Dietary factors among respondents and adherence to HAART

4.5.1 Food Security and adherence to HAART

Majority of the respondents, 142(54.4%) were Mildly Food Insecure, 73(28%) were Moderately Food Insecure, 46(17.6%) were food secure and 0% were Severely Food Insecure

Food secure category.

Amongst the respondents, 13.8% were never worried that their household would not have enough food to eat in the past four weeks preceding the study while 3.8% of the respondents were worried once/twice of not having enough food in the past four weeks preceding the study.

Mildly food insecure category

Amongst the respondents, 39.1% worried three to ten times that their household would not have enough food to eat in the past four weeks while 15.3% of the respondents were worried more than ten times of not having enough food in the past four weeks.

Among the respondents, 30.7% were once/twice not able to eat the kind of food they preferred because of lack of resources, 18.8% were three to ten times not able to eat the kind of food they preferred because of lack of resources while 5% were more than ten times not able to eat the kind of food they preferred because of lack of resources.

Amongst the respondents, 54.4% had to eat a limited variety of food or eat some food that they really did not want to eat because of lack of resources.

Moderately Food Insecure category

Amongst the respondents, 15.7% had to eat a limited variety of food three to ten times in the last four weeks due to lack of resources, 12.2% had to eat a limited variety of food more than ten times in the last four weeks due to lack of resources.

Among the respondents, 10.7% were three to ten times forced to eat the food that they really did not want to eat because of lack of resources while 17.2% were more than ten times forced to eat the food that they really did not want to eat forced to eat because of lack of resources.

Among the respondents, 18.4% once/twice had to eat a smaller meal than they needed because there was not enough food while 5.7% had to eat a smaller meal than they needed three to ten times in the previous four weeks.

Among the respondents, 23.8% once/twice ate fewer meals in a day because there was no enough food while 4.2% of them three to ten times ate fewer meals in a day due to insufficient food.

All the respondents 28% never lacked food because of lack of resources and none went the whole day and night without eating anything.

Severely Food Insecure category

None of the respondents fell in this category. None of them had to eat smaller food than they needed more than ten times because there was no enough food. None had to eat fewer meals in a day because there was no enough food. None ever had a day without food in their homes, none went to sleep at night hungry because there was not enough food. None went a whole day and night without eating anything because there was not enough food.

In all the categories a large proportion of the respondents had optimal adherence.

Table 4.23: Food security and adherence to HAART

Food security category	Adherence		TOTAL
	Optimal n (%)	Sub-optimal n (%)	n (%)
Food Secure	40(86.97)	6(13.03)	46(17.62)
Mildly Food Insecure	108(76.06)	34(23.94)	142(54.41)
Moderately Food Insecure	51(69.86)	22(30.14)	73(27.97)
Severely Food Insecure	0	0	261

There was a significant association between food security and adherence to HAART, OR= 2.57, $p=0.042$, 95% CI = [0.392, 0.867] (table 4.24). Food secure individuals were 2.6 times more likely to adhere as compared to other categories, mildly food insecure individuals were 1.3 times more likely to adhere while moderately food insecure individuals were 0.3 times more likely to adhere.

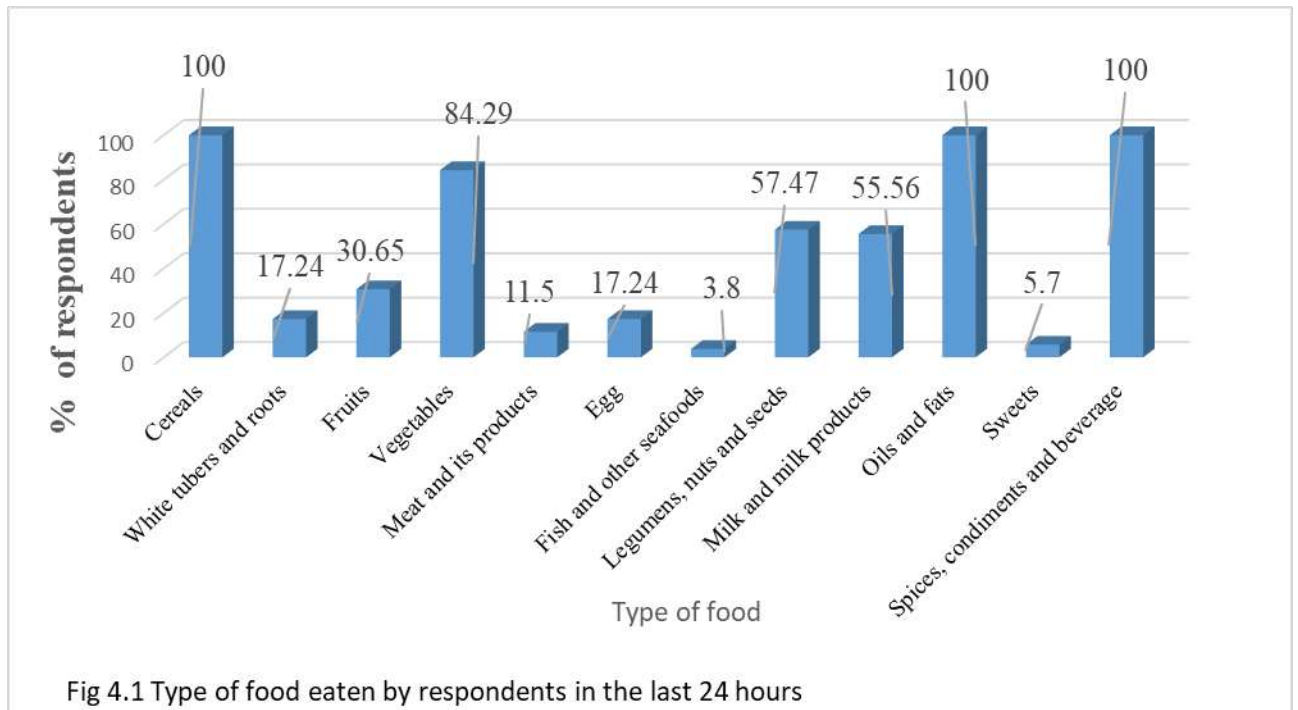
Table 4.24: Relationship between food security and adherence to HAART.

Variable	Odds ratio	Std Err.	Z	P>z	95% Interval	Conf.
Food secure category	2.57	0.015	-1.560	0.042	0.392	0.867
Mildly food insecure	1.273	0.456	0.670	0.045	0.630	2.569
Moderately food insecure	0.264	0.237	-1.490	0.049	0.045	1.530
Severely food insecure						

4.5.2 Dietary diversity and adherence to HAART

Dietary diversity was established using guidelines for Measuring Household and Individual Dietary Diversity (Gina K., 2010) (appendix I section D(II)). The respondents were asked to list the foods (meals and snacks) they had eaten in the last 24 hours.

All the respondents (100%) reported having consumed cereals, oils and fats and Spices, condiments and beverage in the last 24 hours. Fish and other seafoods (3.8%) and sweets (5.7%) were the least consumed foods respectively. Legumes, nuts and seeds (57.47%) and milk and milk products (55.56%) were the averagely consumed foods.



According to the food groups eaten, classification was done using Individual dietary diversity (IDD) score. High IDD (6 or more food groups), medium IDD (4–5 food groups) and low IDD (1–3 food groups). According to the total individual food scores, more than half (51.72%) had a high IDD, 30.27% had a medium IDD and 18% had low IDD.

Amongst the respondents, majority, 51.7% (135) had a high IDD and out of this 73.3% (99) had optimal adherence while the rest had sub-optimal adherence, 30.3% (79) had a medium IDD and out of this, 69.6% (55) had optimal adherence while the rest had sub-optimal, 18% (47) had low IDD and out of this, 46.8% (22) had optimal adherence while the rest had sub-optimal adherence.

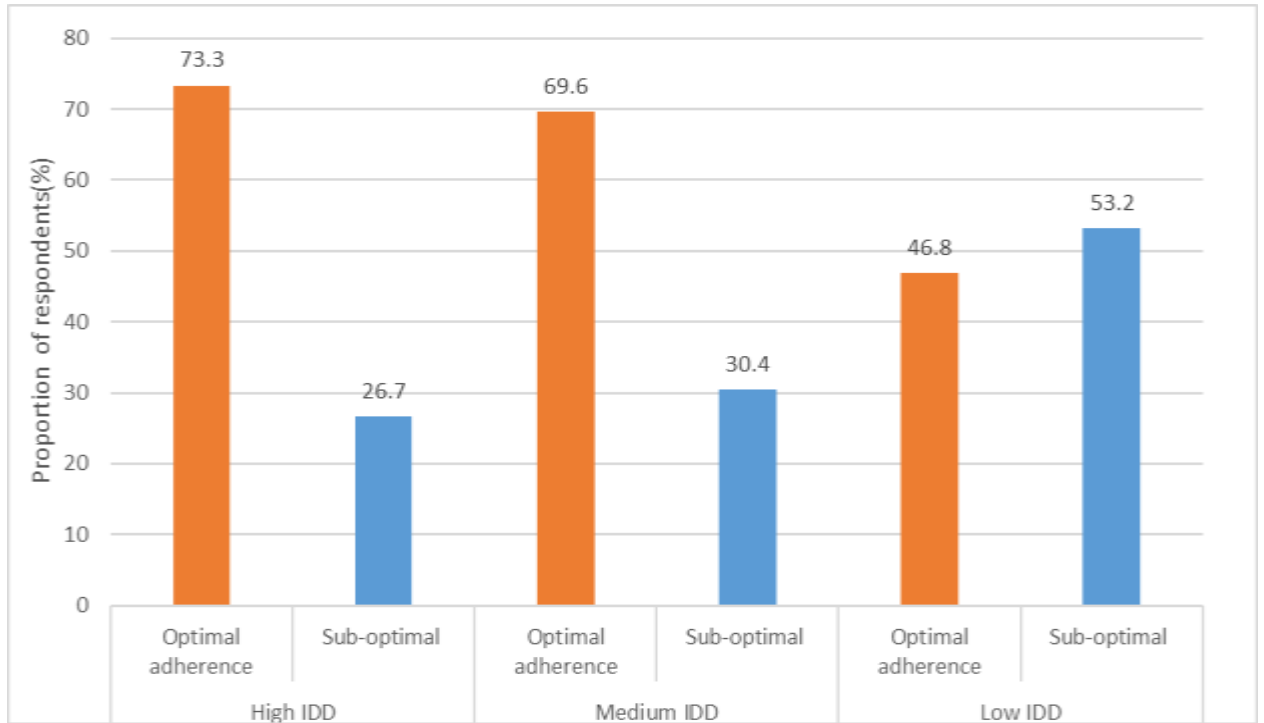


Figure.4.2: Distribution of respondents according to IDD and adherence to HAART

Table 4.25: Relationship between Individual dietary diversity (IDD) and adherence to HAART

Type of IDD	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]
High	0.87	0.38	-0.33	0.07	0.36 - 5.72
Medium	0.55	0.75	-0.44	0.06	0.04 - 8.03
Low	0.97	0.43	-0.07	0.09	0.40 - 2.32

Individual Dietary Diversity has no significant influence on adherence to HAART, (OR= 0.87, $p=0.07$, 95% CI = [0.360- 5.720]).

4.6 Adherence levels among the respondents

Findings from the study indicate that 76% of the respondents had optimal adherence while 24% had sub-optimal adherence.

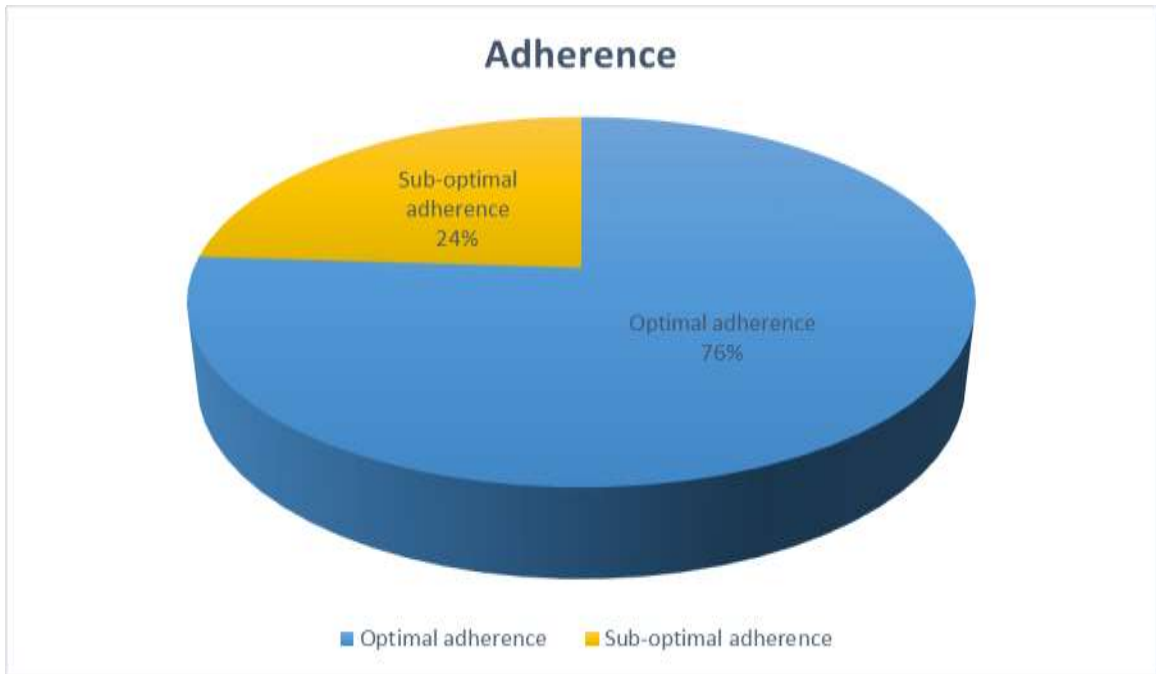


Figure 4.3: Adherence levels among the respondents.

4.7 Qualitative data analysis

From July to August 2018, I conducted 16 key informant interviews with the healthcare workers involved in HIV care and treatment; Nurses, clinical officers, nutritionists, pharmacists and counselors. The number of interviews done was determined using the saturation principle; KII's in Londiani Sub-County Hospital, 5 KII's in Litein mission Hospital and 8 KII's in Kericho County Referral Hospital. The data was then analyzed using R text mining package.

4.7.1 Socio-demographic and Socio-economic factors affecting adherence to HAART

According to the key informants, the socio-demographic and socio-economic factors affecting adherence to HAART are indicated in 4.11. Majority of the key informants 13 (86.7%) indicated that age was the only socio-demographic factor affecting adherence to HAART the socio-economic factors listed were; 6 (40%) indicated expenditure on food, 5 (33.3%) indicated fare spend to clinic, 3 (20%) indicated level of monthly income, 2 (13.7%) indicated gender and 1 (6.7%) indicated marital status.

Table 4.26: Socio-demographic and Socio-economic factors affecting adherence to HAART(KII)

Factor	Response	Percentage
Age	13	86.7
Level of Monthly income	3	20.0
Fare spent to clinic	5	33.3
Expenditure on food	6	40.0
Marital Status	1	6.7
Gender	2	13.7

4.7.2 Practices among respondents affecting adherence to HAART

The practices that affect adherence to HAART by the patients as provided by the key informants is displayed in table 4.12. Most of the key informants 7 (46.7%) indicated that using alternatives to HAART was affecting adherence to HAART by their patients; alcohol and substance abuse was mentioned by 40% of the key informants, while having no one to remind them to take medication and difficulty fitting medication to daily routine were mentioned by 6.7% of the key informants (table 4.27).

Table 4.27: Practices among respondents affecting adherence to HAART (KII)

Factor	Response	Percentage
Using alternatives to HAART		
Herbal/traditional medicine		
Prayers	6	40.0
	1	6.7
Alcohol and substance abuse	6	40.0
No one to remind them	1	6.7
Difficulty fitting medication to their daily routine	1	6.7

4.7.3 Dietary factors among respondents affecting adherence to HAART

The dietary factors affecting adherence to HAART by the patients as reported by the key informants is displayed in Table 4.28. As indicated majority of the respondents 8 (53.33%) indicated food security and 4 (26.67%) indicated adverse side effects due to food-drug interaction.

Table 4.28: Dietary factors among respondents affecting adherence to HAART (KII)

Factor	Response	Percentage
Food security	8	53.3

4.8 Themes from Key Informant Interviews

Age-Age was mentioned repeatedly. A clinical officer from Kericho County noted *“Adherence to HAART tends to increase with the patient’s age, adolescents and young adults aged 30 years and below mostly struggle with adherence. From the age of 30 years and above, patients seem to understand the importance of adherence hence tend to strictly follow the medication schedule”*. In Litein Hospital, a counsellors noted *“Older patients, above 35 years rarely give us adherence problems. However, from between 18-28 years, only a few patients manage to maintain good adherence. Most of these patients suffer from psychosocial problems ranging from denial of their HIV positive status, hopelessness, guilt about the disease and even some have reported having had suicidal thoughts”*. Fare to clinic- A clinical officer in charge of adherence monitoring at Kericho Referral Hospital noted *“Fare to clinic has been reported by some of our patients as the reason why sometimes they don’t turn up for refill. Some patients have reported having trekked for many kilometres to the clinic. We however always try to identify needy patients who for some reason cannot afford fare to clinic. we enroll them to a group “needy” and offer them financial support to enable them meet cost of fare and basic needs.”*

Food insecurity -A nurse at the Londiani sub-county Hospital noted *“some of my patients have reported not taking their medication when they have nothing to eat. They reported of side effects being worse when the drugs are taken on an empty stomach. Loss of energy, stomach pains, headaches and dizziness have been reported being common when HAART are taken on an empty stomach”*.

Use of other alternatives of HAART- Nearly half of the key informants 7(46.7%) reported that some of their patients in the recent past had stopped taking their medication due to the use herbal medicine. A clinical officer at Kericho Referral Hospital reported *“some of my patients had stopped taking their medication in the recent past, when we did a follow up, they informed me that they had been made to believe that there were herbal medicines which could cure HIV/AIDS hence they stopped taking HAART”*.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

There were more females (63.2%) than males (36.8%) in the study. This can be attributed to the fact that women have a good health-seeking behavior unlike men. There was however no significant difference in adherence between the males and females. The mean age of the respondents was 36.1 years, the average fare spent to-and-from the clinic was Ksh. 188, the average income was Ksh 8,222.2 while the average daily expenditure on food was Ksh. 124.

Findings from this study have demonstrated that the level of adherence to HAART in Kericho County is still unsatisfactory despite HAART being made accessible to all PLHIV. The study determined that there was an adherence rate of 76% (199 patients out of 261). These levels are much lower than that documented (82%) by Wakibi, (2010) and 82% documented by Momanyi (2016). However, the adherence levels in this study (76%) is much higher than what was documented (70%) by Petse *et.al.*, (2018) According to the available literature, no factors have been consistently associated with adherence to HAART. Some factors that were reported to have statistical significance in one study were found to be statistically insignificant in other studies. This necessitates the need for context-specific adherence studies to be undertaken. Semvua , (2017) noted that adherence is a dynamic process and the predictors also differ considerably.

5.1.1 Socio-economic and socio-demographic factors associated with adherence to HAART.

Findings from this study indicate that age has an influence on adherence to HAART. Among the respondents, most; 42(16.10%) were aged between 30-34 years while the minority 15(5.75%) were aged between 15-19 years. The age category 40-44 had the highest proportion (75.68%) of those who had optimal adherence while the age category 20-24 reported the lowest (48.00%) adherence levels. The age category 20-24 years

($p=0.023$) was associated higher levels of sub-optimal adherence. This group comprises of young adults who have been reported by many studies to face many challenges as they seek medication. Additionally, findings from the Key informant interviews indicate that age is a predictor of adherence; patients from above 30 years of age display higher adherence levels as compared to patients in the 18-28 years.

These findings are in agreement with findings from a study done by wakibi (2010) in Kenya which reported young age is associated with higher levels of non-adherence to HAART. These findings are also consistent with the study by Fonsah *et al.*,(2017) who noted that there is increased risk of non-adherence to HAART among younger patients as compared to older ones. In their study, they found that patients less than 40 years were significantly less likely to be adherent as compared to those above 40 years. Sabina *et al.*, (2006) further noted that older age is associated with higher adherence levels while younger age is a risk factor for non-adherence. MacCarthy *et al.*,(2018) reported that barriers to ART present additional complications to adolescents and young adults. They postulated that; poverty limited adolescents' ability to buy food, school limited their privacy further disrupting ART adherence, lack of family support due to constant change in guardianship and the high pill burden is a frustration to the youth with most resorting to drug-holidays.

5.1.2 Attitude and practices associated with adherence to HAART.

5.1.2 1 Use of HAART alternatives

Findings from this study indicate that 90.8% (237) of the respondents strongly agreed that there were no better alternatives of HAART while 1.5% (4) disagreed that there no better alternatives to HAART and another 7.7% (20) strongly disagreed that there no better alternatives to HAART. Majority of the respondents (55%) who strongly disagreed that there no better alternatives to HAART has sub-optimal adherence while the rest had optimal adherence. Among the respondents who strongly agreed that there were no better alternatives of HAART, 95.4% (226) had optimal adherence while the others 4.6% (11) had sub-optimal adherence. These findings show that individuals who

strongly agree that HAART is the only remedy to cure HIV/AIDS are more likely to have optimal adherence as compared to PLHIV who do not agree that HAART is the only remedy.

Findings from this study are in agreement with findings from a study by Togarasei *et al.*, (2011) who reported that some religious beliefs influence patient's adherence to HAART. They noted that some Pentecostal Christian churches have been reported to have negative attitude towards antiretrovirals. Their interpretation of life, death and healing are based on traditional explanations. They believe that God is the sole provider of life and healing and therefore consider the use of HAART to prolong life as competing with God. Igbende *et al.*, (2016) further reported that religious beliefs that HIV/AIDS can be cured spiritually has resulted in reduced adherence. Some patients have been reported to spend much time in prayers, performing rituals, visiting prayer shrines and herbalists for cures.

5.1.2.2 Having someone/ tool to remind of when to take medication

Reminder tools have been traditionally used by patients who are more likely to forget the time when they should take their medication. In this study, reminder tools were found to predict high adherence levels. Among the respondents, 55.17% reported having someone/tool to remind them of when to take medication while the rest had no reminder tools. The most common reminders were an alarm clock (52.5%) and cell phones (41.5%), followed by reminders from family (6.3%). Respondents who had reminder aids were 0.3 times more likely to have optimal adherence as compared to respondents who had no reminder aids. Findings from this study are consistent with a study done by Heestermans *et al.*, (2016), Langebeek *et al.*, (2014) and Hornschuh, (2017) who all reported that patients who use reminders to take medication were more likely to have better adherence than those who did not use any reminders. Langebeek *et al.*, (2014) reported further that Patients who use memory aids were three times more likely to adhere to treatment than those who did not use any memory aids. A lot of research has

been done on the positive impact of text message and telephone reminders on HIV clinic appointment attendance.

5.1.3 Dietary factors associated with adherence to HAART.

5.1.3.1 Food security

Findings from this study indicated that there was a significant association between food security and adherence to HAART ($p=0.042$). Majority of the respondents, 142(54.41%) were Mildly Food Insecure, 73(27.97%) were Moderately Food Insecure, 46(17.62%) were food secure and 0% were Severely Food Insecure. In terms of adherence, 86.97% (40) of the respondents in the food secure category had optimal adherence while the rest had sub-optimal adherence. In the mildly food insecure category, 76.06% (108) had optimal adherence while the rest had sub-optimal and in the moderately food insecure category, 69.86% (51) had optimal adherence while the rest had sub-optimal adherence. Findings from this study indicate reducing levels of adherence with increasing food insecurity. Food secure individuals are 2.6 times more likely to have optimal adherence, mildly food insecure individuals are 1.3 times more likely to adhere while moderately food insecure individuals are 0.3 times more likely to adhere to HAART.

These findings are in agreement with findings from a study by Mudzus Mavhandu-Mudzusi and Fikadu (2020) who reported that food insecure individuals are 2.7 times more likely to have sub-optimal adherence as compared to food secure individuals. Similar findings were also reported by Berhe *et al.*, (2013) who noted that individuals who are unable to get enough and quality food are 2.1 times more likely to have sub-optimal adherence. Weiser *et al.*, (2010) reported that food insecurity undermines ARVs through five mechanisms; 1) ARVs often increased appetite and food scarcities exacerbated the resulting hunger; 2) Side effects of ARVs being much worse in the absence of food; 3) Participants were counseled on the importance of taking ARVs with a balanced diet and reported that some people did not start ARVs because they could not afford the accompanying food; 4) Competing demands between the cost of obtaining food and the cost of medical treatment and transportation for monthly clinic visits led

people either to default from treatment, or to give up food and wages to get medications; and 5) Long days of farming in the fields or doing other work to earn money for food sometimes caused people to skip or forget to take their doses.

5.2 Conclusions

1. The level of adherence to HAART in Kericho County is still unsatisfactory (76%) despite HAART being made accessible to all PLHIV.
2. Age is a good predictor of adherence to HAART, patients between 18-28 years are at a higher risk of sub-optimal adherence while patients above 30 years are more likely to have optimal adherence. Socio-economic factors have no significance influence on adherence.
3. Adherence is mostly affected by a patient's practices towards HAART; use of reminder tools promotes adherence while use of other alternatives is a risk factor for non-adherence.
4. Food security status has an influence in adherence to HAART; patients are more likely to miss their medication when they have no food to eat.

5.2 Recommendations

1. More studies are warranted to determine barriers/challenges to HAART adherence.
2. Follow-up adherence monitoring should be routinely done for patients in the age category 18-28.
3. More research into other aspects of attitude and practices towards HAART is warranted.
4. The criteria for identifying the "needy patients" should be revised so as not to miss out on those that deserve to be given financial/material support.

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APPENDICES

Appendix I: Questionnaire

This questionnaire aims at collecting data on the predictors of adherence to Highly Active Antiretroviral Therapy (HAART) among HIV patients attending Comprehensive Care Centres (CCC) in selected Hospitals in Kericho County.

“I’m going to ask you a few questions that I ask all my patients. Please be honest. I will keep your answers confidential”

SECTION A: PATIENT DATA

1. Name of health facility.

Kericho Referral hospital

Litein Mission hospital

Londiani Sub-County hospital

2. Patient number.....

3. Gender Female Male

4. Age (in years)

15-19

20-24

25-29

30-34

35-39

40-44

45-49

>50

5. What is your marital status?

1 Married 2. Widow 3. Widower 4. Single 5. Divorced 6. Separated 7. Others, specify.....

SECTION B: SOCIO-ECONOMIC FACTORS

1. What is the highest level of education that you have attained?

1. No formal education 2. Primary school 3. Secondary school 4. Tertiary education

Je, ni kiwango gani cha juu cha elimu ambacho umekipata?

1. Hakuna elimu rasmi 2. Shule ya msingi 3. Shule ya upili 4. Elimu ya juu

2 Where do you live? Litein Londiani Kericho Others

Unaishi wapi? Litein Londiani Kericho Wengine

3. Whom do you live with? alone family friend(s) others ...

.Unaishi na nani? peke yako familia marafiki wengine

4. What is your type of residence? Rental Residential

Je! makazi yako ni ya aina gani? Kukodisha Makazi

5. What is your occupation? Teacher Doctor Nurse Farmer
 self-employed mechanic Driver Banker casual labourer
 Others,.....

*Una kazi gani? Mwalimu Daktari Nesi Mkulima aliyejiajiri mekanika
 Dereva Mfanyakazi wa benki mfanyakazi wa kawaida
 Wengine,.....*

6. How much do you earn per month? (Ksh) <1000 1001-5000 5001 – 10000

10001 – 15,000 15,001 – 20, 000 20,001 – 50,000 >50,000

Je, unapata kiasi gani kwa mwezi? (Sh.) <1000 1001-5000 5001 – 10000

10001 – 15,000 15,001 – 20, 000 20,001 – 50,000 >50,000

7. How many kilometres do you come from your residence to the health facility?

0-5km 6-11km 12-17 km 18-23km 24-29km >30km

Je, unatoka kilomita ngapi kutoka kwenye makazi yako hadi kwenye kituo cha afya?

[]0-5km []6-11km []12-17 km []18-23km []24-29km []>30km

8. How much fare do you spend from your residence to this clinic and back? (in Ksh)

1. None 2. ≤ 50 3. $50 < 100$ 4. $100 < 200$ 5. $200 < 400$ 6. > 500

Je, unatumia nauli kiasi gani kutoka nyumbani kwako hadi kliniki hii na kurudi? (Sh.)

1. None 2. ≤ 50 3. $50 < 100$ 4. $100 < 200$ 5. $200 < 400$ 6. > 500

10. What is your average expenditure on food? (in Ksh)

Daily (Ksh.)	Weekly (Ksh.)
0-200	0-1400
200-400	1400-2800
400-800	2800-5600
800-1600	5600-12800
>1600	>12800

Je, wastani wa matumizi yako kwenye chakula ni kiasi gani?

<i>Kila siku (sh.)</i>	<i>Kila Wiki (sh.)</i>
<i>0-200</i>	<i>0-1400</i>
<i>201-400</i>	<i>1401-2800</i>
<i>401-800</i>	<i>2801-5600</i>
<i>801-1600</i>	<i>5601-12800</i>
<i>>1600</i>	<i>>12800</i>

SECTION C (I): LIKERT SCALE FOR MEASURING ATTITUDE TOWARDS HAART

	Strongly disagree n, (%) Kwa nguvu sikubaliani	Disagree n, (%) sikubaliani	Neutral n, (%) wastani	Agree n, (%) nakubali	Strongly agree n, (%) Nakubaliana sana
There are no better alternatives than HAART <i>Hakuna matibabu bora zaidi kuliko vidonge ninavyotumia</i>					
HAART is a complex regimen and this makes it difficult to adhere <i>Vidonge ni tata na hii inafanya kuwa vigumu kuzingatia</i>					
The effectiveness of HAART solely depends on adherence <i>Ufanisi wa vidonge inategemea kuzingatia</i>					
It is good to disclose to others that I am					

using HAART <i>Ni vizuri kufichua kwa wengine kwamba ninatumia vidonge</i>					
People will be supportive if they find out that I am using HAART <i>Watu wataniunga mkono ikiwa wanajua kwamba ninatumia vidonge</i>					
People will discriminate me if they find out that I am using HAART <i>Watu watanichagua ikiwa wanajua kwamba ninatumia vidonge</i>					

SECTION C (II): PRACTICES TOWARDS HAART

1. Do you have someone or a tool that reminds you of when to take your medication?

Yes No

Je! una mtu au chombo kinachokukumbusha wakati wa kutumia dawa yako?

Ndiyo Hapana

If yes, which one?

Mobile phone alarm

Family member

Friend

Others, specify.....

Kama ndiyo, ipi?

Kengele ya simu ya rununu

Mwanafamilia

Rafiki

Nyingine, taja.....

2. Do you find it difficult to fit medication into your daily routine?

Yes No

Je, unaona ni vigumu kuingiza dawa katika utaratibu wako wa kila siku?

Ndiyo *Hapana*

If yes, how often?

1. Always 2 sometimes 3.Rarely 4. Never

Kama ndiyo, mara ngapi?

1. *Kila mara* 2 *wakati mwingine* 3.*Mara chache* 4. *Kamwe*

3. Is your spouse aware of your HIV status?

Yes No

Je, mwenzi wako anafahamu hali yako ya ugonjwa?

Ndiyo *Hapana*

If yes, is he/she supportive?

Yes No

Ikiwa ndio, anaunga mkono?

Ndiyo *Hapana*

4. Have you ever consumed alcohol? Yes No

Je, umewahi kunywa pombe? Ndiyo *Hapana*

If yes, have you consumed alcohol in the last four weeks? Yes No

Ikiwa ndio, umekunywa pombe katika wiki nne zilizopita?

Ndiyo *Hapana*

If Yes, how often? Daily 5-7 days/week 2-4days/week
Weekends only once/week

*Kama Ndiyo, mara ngapi? Kila siku Sikuu 5-7/wiki Sikuu 2-4/wiki Wikendi
pekee mara moja/wiki*

5. What type of alcohol do you consume? Beer Spirits wine
 Others.....

Je, unatumia pombe ya aina gani? Bia Spirits divai Nyingine.....

6. On average, how many bottles of alcohol do you consume per week?

1-3 4-6 7-9 more than 10

Kwa wastani, unatumia chupa ngapi za pombe kwa wiki?

1-3 4-6 7-9 zaidi ya 10?

Has alcohol consumption ever affected your daily life?

Yes No

Je, unywaji wa pombe umewahi kuathiri maisha yako ya kila siku?

Ndiyo Hapana

If Yes, how?

- i. I got forgetful and did not take my medication
- ii. It interfered with my interaction with others.
- iii. It interfered with family and social support
- iv. Others.....

Kama Ndiyo, vipi?

- i. Nilisahau na sikunywa dawa zangu*
- ii. Ilingilia mwingiliano wangu na wengine.*
- iii. Ilingilia msaada wa familia na kijamii*
- iv. iv. Nyingine.....*

7. Do you carry emergency dose of drugs when you are away from home?

Yes No

. Je, unabeba kipimo cha dharura cha dawa ukiwa mbali na nyumbani? Ndiyo

Hapana

If yes, do they affect your adherence to HIV medications?

Yes No

Kama ndiyo, je, yanaathiri ufuasi wako wa dawa ? Ndiyo Hapana

SECTION D(I): DIETARY FACTORS

FOOD SECURITY: Household Food Insecurity Access Scale (HFIAS) Measurement Tool

No	Question	Response options	CODE
1	In the past four weeks, did you worry that your household would not have enough food? <i>Katika wiki nne zilizopita, je, una wasiwasi kwamba familia yako haitakuwa na chakula cha kutosha?</i>	0=No (skip to Q2) 1=Yes <i>0 = Hapana (Ruka kwa Q2)</i> <i>1 = Ndiyo</i>	
1a	How often did this happen? <i>Hii ilitokea mara ngapi?</i>	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? <i>Katika wiki nne zilizopita, wewe au mwanachama yeyote wa kaya hawezi kula aina ya vyakula ulivyopenda kwa sababu ya ukosefu wa rasilimali?</i>	0=No (skip to Q3) 1=Yes <i>0 = Hapana (Ruka kwa 3)</i> <i>1 = Ndiyo</i>	
2a	How often did this happen? <i>Hii ilitokea mara ngapi?</i>	1 = Rarely (once or twice in the past four weeks)	

		<p>2 = Sometimes (three to ten times in the past four weeks)</p> <p>3 = Often (more than ten times in the past four weeks)</p>	
3	<p>In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources</p> <p><i>Katika wiki nne zilizopita, je, wewe au mwanachama yeyote wa kaya atakula chakula cha aina ndogo kutokana na ukosefu wa rasilimali</i></p>	<p>0=No (skip to Q4)</p> <p>1=Yes</p> <p><i>0 = Hapana (Ruka kwa Q4)</i></p> <p><i>1 = Ndiyo</i></p>	
3a	<p>How often did this happen?</p> <p><i>Hii ilitokea mara ngapi?</i></p>	<p>1 = Rarely (once or twice in the past four weeks)</p> <p>2 = Sometimes (three to ten times in the past four weeks)</p> <p>3 = Often (more than ten times in the past four weeks)</p>	
4	<p>In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of lack of resources to obtain other types of food?</p> <p><i>Katika wiki nne zilizopita, je, wewe au mwanachama yeyote wa kaya atakula vyakula ambavyo havikutaka kula kwa sababu ya ukosefu wa rasilimali kupata aina nyingine za chakula?</i></p>	<p>0=No (skip to Q5)</p> <p>1=Yes</p> <p><i>0 = Hapana (Ruka kwa Q5)</i></p> <p><i>1 = Ndiyo</i></p>	

4a	How often did this happen? <i>Hii ilitokea mara ngapi?</i>	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food <i>Katika wiki nne zilizopita, je, wewe au mwanachama yeyote wa kaya atakula chakula kidogo kuliko wewe ulivyohisi unahitajika kwa sababu hapakuwa na chakula cha kutosha</i>	0=No (skip to Q6) 1=Yes <i>0 = Hapana (Ruka kwa Q6)</i> <i>1 = Ndiyo</i>	
5a	How often did this happen? <i>Hii ilitokea mara ngapi?</i>	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food? <i>Katika wiki nne zilizopita, je, wewe au</i>	0=No (skip to Q7) 1=Yes <i>0 = Hapana (Ruka kwa Q7)</i>	

	<i>mwanachama mwingine wa familia atakula chakula chache kwa siku kwa sababu hakuwa na chakula cha kutosha?</i>	<i>1 = Ndiyo</i>	
6a	How often did this happen? <i>Hii ilitokea mara ngapi?</i>	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food? <i>Katika wiki nne zilizopita, hakuwa na chakula cha kula kwa aina yoyote katika nyumba yako kwa sababu ya ukosefu wa rasilimali kupata chakula?</i>	0=No (skip to Q8) 1=Yes <i>0 = Hapana (Ruka kwa Q8)</i> <i>1 = Ndiyo</i>	
7a	How often did this happen? <i>Hii ilitokea mara ngapi?</i>	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
8	In the past four weeks, did you or any household member go to sleep at night hungry because there	0=No (skip to Q9) 1=Yes	

	<p>was not enough food? <i>Katika wiki nne zilizopita, hakuwa na chakula cha kula kwa aina yoyote katika nyumba yako kwa sababu ya ukosefu wa rasilimali kupata chakula?</i></p>	<p>0 = <i>Hapana (Ruka kwa Q9)</i> 1 = <i>Ndiyo</i></p>	
8a	<p>How often did this happen? <i>Hii ilitokea mara ngapi?</i></p>	<p>1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)</p>	
9	<p>In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? <i>Katika wiki nne zilizopita, je, wewe au mwanachama yeyote wa kaya kwenda siku nzima na usiku bila kula kitu kwa sababu hakuwa na chakula cha kutosha?</i></p>	<p>0=No 1=Yes 0 = <i>Hapana</i> 1 = <i>Ndiyo</i></p>	
9a	<p>How often did this happen? <i>Hii ilitokea mara ngapi?</i></p>	<p>1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)</p>	

HFIA category	<p>Calculating Household Food Insecurity Access category for each household.</p> <p>1=Food Secure, 2=Mildly Food Insecure Access, 3=Moderately Food Insecure Access, 4=Severely Food Insecure Access</p> <p><u>HFIA category = 1</u> if [(Q1=1 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]</p> <p>HFIA category = 2 if [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]</p> <p>HFIA category = 3 if [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0]</p> <p>HFIA category = 4 if [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3]</p>
---------------	--

Adopted from (Coates J., Swindale A., and Bilinsky P., 2007)

SECTION D(II): Dietary diversity

Dietary diversity questionnaire

Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home. start with the first food or drink of the morning. Write down all foods and drinks mentioned. When composite dishes are mentioned, ask for the list of ingredients. When the respondent has finished, probe for meals and snacks not mentioned.

Breakfast	Snack	Lunch	snack	Dinner	snack

When the respondent recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

Question number	Food group	Examples	YES=1 NO=0
1	CEREALS	corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products) + insert local foods e.g. ugali, nshima, porridge or paste	
2	WHITE ROOTS AND TUBERS	AND TUBERS white potatoes, white yam, white cassava, or other foods made from root	
3	VEGETABLES	pumpkin, carrot, squash, sweet potato, amaranth, cassava leaves, kale, spinach, tomato, onion, eggplant	
4	FRUITS	ripe mango, cantaloupe, apricot, fruit juice	
5	MEAT & IT'S PRODUCTS	liver, kidney, heart or other organ meats or blood-based foods, beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects	
6	EGG	eggs from chicken, duck, guinea fowl or any	

		other egg	
7	FISH AND SEAFOOD	fresh or dried fish or shellfish	
8	LEGUMES, NUTS AND SEED	dried beans, dried peas, lentils, nuts, seeds or foods made from these (eg. hummus, peanut butter)	
9	MILK AND MILK PRODUCTS	milk, cheese, yogurt or other milk products	
10	OILS AND FATS	oil, fats or butter added to food or used for cooking	
11	SWEETS	sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes.	
12	SPICES, CONDIMENTS, BEVERAGES	spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages	
IDD SCORE	High IDD (6 or more food groups) medium IDD (4–5 food groups) low IDD (1–3 food groups).		

Modified from (Gina K., Ballard T. and MarieClaude D., 2010).

Appendix III: Ethical approval form



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355



KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: [@UONKNH_ERC](https://twitter.com/UONKNH_ERC) https://twitter.com/UONKNH_ERC



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/155

29th April, 2019

Kipkirui Collins Cheruiyot
Reg. No.HSH 311-1350/2017
School of Public Health
J.K.U.A.T

Dear Collins

Research proposal: Predictors of adherence to Highly Active Antiretroviral Therapy (HART) among HIV patients attending selected Comprehensive Care Centres(CCC) in Kericho county (P28/01/2019)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 29th April 2019 – 28th April 2020.

This approval is subject to compliance with the following requirements:

- a. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
- c. Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
- d. Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
- e. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
- f. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- g. Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover

Appendix IV: National Commission for Science, Technology and Innovation Permit



**NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION**

Telephone +254-20-2213471.
2241349,3310571,2219420
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref No. **NACOSTI/P/19/49857/31217**

Date **23rd July, 2019.**

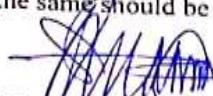
Kipkirui Collins Cheruiyot
Jomo Kenyatta University of
Agriculture and Technology
P.O. Box 62000-00200
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"Predictors of adherence to Highly Active Antiretroviral Therapy (HAART) among HIV patients attending selected Comprehensive Care Centres (CCC) in Kericho County."* I am pleased to inform you that you have been authorized to undertake research in **Kericho County** for the period ending **23rd July, 2020.**

You are advised to report to **the County Commissioner, the County Director of Health Services, and the County Director of Education, Kericho County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a **copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.


DR. STEPHEN K. KIBIRU., PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

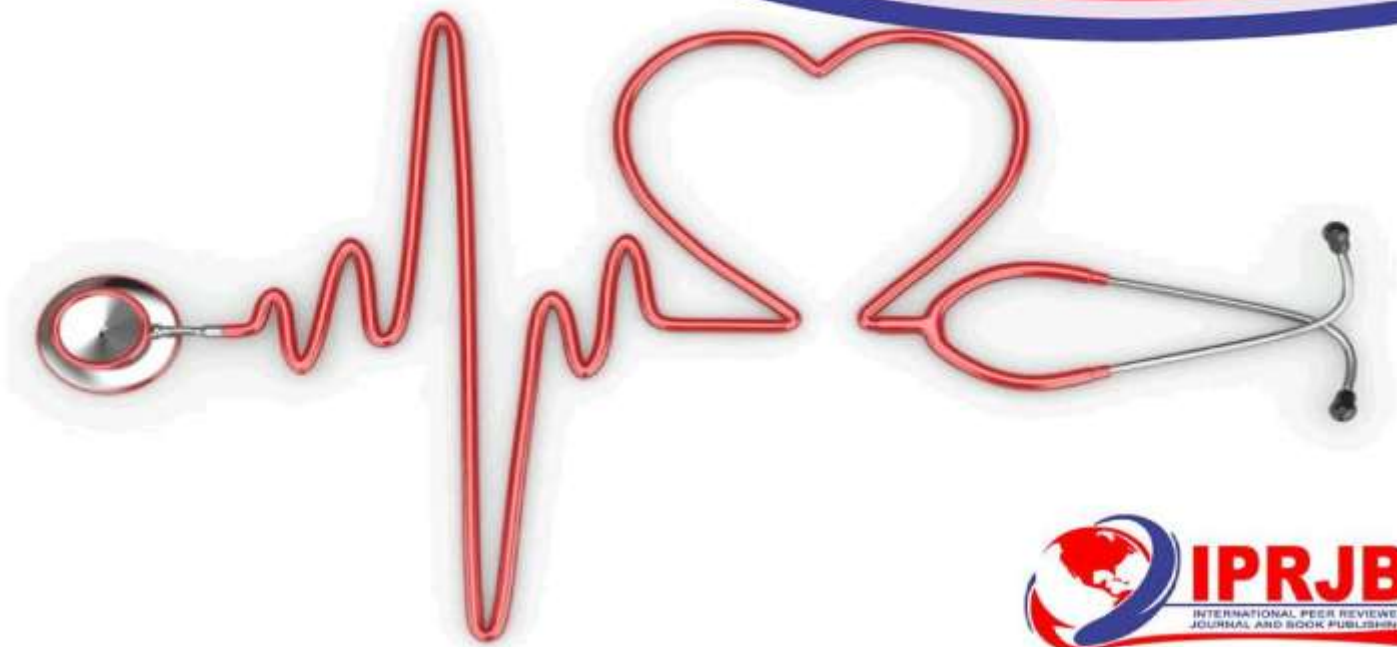
The County Commissioner
Kericho County.

Journal of
Health, Medicine and Nursing

(JHMN)

**PREDICTORS OF ADHERENCE TO HIGHLY ACTIVE
ANTIRETROVIRAL THERAPY (HAART) AMONG HIV
PATIENTS ATTENDING SELECTED COMPREHENSIVE CARE
CENTRES (CCC) IN KERICHO COUNTY**

Kipkirui Collins cheruiyot, Dr. Dennis Magu and Dr. Daniel
Mokaya



Appendix VI: Participant information and Informed consent form

For enrollment into the study

(To be administered in English or any other appropriate language e.g Kiswahili translation)

Title of Study: To determine Predictors of adherence to Highly Active Antiretroviral Therapy among HIV patients attending comprehensive care centres in selected hospitals Kericho County.

Principal Investigator\and institutional affiliation: Mr. Collins Cheruiyot, Master of Public Health Jomo Kenyatta University of Agriculture and Technology.

Co-Investigators and institutional affiliation: N/A

Introduction:

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in medical research: i) Your decision to participate is entirely voluntary ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Protocol No. _____

WHAT IS THIS STUDY ABOUT?

The researchers listed above are interviewing individuals who will consent to participate. The purpose of the interview is to determine Predictors of adherence to Highly Active Antiretroviral Therapy among HIV patients attending comprehensive care centres in selected hospitals in Kericho County.

Participants in this research study will be asked questions about socio-economic dietary factors and knowledge, attitude and practices about HAART. There will be 261 participants in this study randomly chosen. We are asking for your consent to consider participating in this study.

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, the following things will happen:

You will be interviewed by a trained interviewer in a private area where you feel comfortable answering questions. The interview will last approximately 25 minutes. The interview will cover topics such as socio-economic, health system factors, dietary factors and knowledge, attitude and practices about HAART.

After the interview has finished, you will be free to leave.

We will ask for a telephone number where we can contact you if necessary. If you agree to provide your contact information, it will be used only by people working for this study and will never be shared with others. The reasons why we may need to contact you include: Seeking clarifications on any unclear information or information that are deemed important to you.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will keep all of our paper records in a locked file

cabinet. However, no system of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you.

Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview.

You are likely to experience emotional distress since some questions asked will be touching on one's privacy and also they may trigger memories of past disturbing events. We will do everything we can to ensure that this is done in private. Furthermore, all study staff and interviewers are professionals with special training in these interviews.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

You may benefit by receiving free Counselling and health information testing. We will refer you to a hospital for care and support where necessary. Also, the information you provide will help us better understand the challenges that make it hard for patients to adhere to medications this information is a contribution to science and health.

WILL BEING IN THIS STUDY COST YOU ANYTHING?

(Explain) This study is voluntary, there are no entry charges for participation.

WILL YOU GET REFUND FOR ANY MONEY SPENT AS PART OF THIS STUDY?

(Enter statement) There is no refund since we don't anticipate any costs related to study participation.

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff: Kipkirui Collins Cheruiyot: Principal Investigator cell 0710248130 / ccheruiyot09@gmail.com or First Supervisor; Dr. Dennis Magu, cell 0722574388, email- magudennis@gmail.com or Second Supervisor; Dr. Daniel Mokaya, contact number 0731704573, email- dmokaya@jkuat.ac.ke.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and

Research Committee Telephone No. 2726300 Ext. 44102 email
uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits

CONSENT FORM (STATEMENT OF CONSENT)

Participant’s statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study: Yes No
I agree to have (define specimen) preserved for later study: Yes No
I agree to provide contact information for follow-up: Yes No

Participant _____ name:

Participant signature / Thumb stamp _____ Date

Researcher’s statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher ‘s Name: _____ Date:

Signature

Role in the study: _____ [i.e. study staff who explained informed consent form.]

For more information contact _____ at _____

from

_____ to _____

Witness Printed Name (*If witness is necessary, A witness is a person mutually acceptable to both the researcher and participant*)

Name _____ Contact information

Signature /Thumb stamp: _____ Date;

Appendix VII: Principal investigator confidentiality agreement

Predictors of adherence to HAART among HIV patients attending comprehensive care centres (CCC) in selected hospitals in Kericho County.

I, Collins Cheruiyot, agree to maintain complete confidentiality while carrying out the tasks in this study.

Specifically, I agree to:

- i. Keep all research information shared with me confidential by not discussing or sharing the information in any form or format (e.g., disks, tapes or transcripts)
- ii. Hold in strictest confidence the identification of any individual that may be revealed during the course of performing the research tasks.
- iii. Keep all raw data that contains identifying information in any form or format (e.g., disks, tapes, transcripts) secure while it is in my possession. This includes:
- iv. keeping all digitized raw data in computer password-protected files and other raw data in a locked file; closing any computer programs and documents of the raw data when temporarily away from the computer; permanently deleting any e-mail communication containing the data; and using closed headphones if transcribing recordings;

Name_____

Address_____

Telephone number_____

Signature_____ Date_____

Table 4.27: Practices among respondents affecting adherence to HAART (KII)

Factor	Response	Percentage
Using alternatives to HAART		
Herbal/traditional medicine		
Prayers	6	40.0
	1	6.7
Alcohol and substance abuse	6	40.0
No one to remind them	1	6.7
Difficulty fitting medication to their daily routine	1	6.7

4.7.3 Dietary factors among respondents affecting adherence to HAART

The dietary factors affecting adherence to HAART by the patients as reported by the key informants is displayed in Table 4.28. As indicated majority of the respondents 8 (53.33%) indicated food security and 4 (26.67%) indicated adverse side effects due to food-drug interaction.

Table 4.28: Dietary factors among respondents affecting adherence to HAART (KII)

Factor	Response	Percentage
Food security	8	53.3

4.8 Themes from Key Informant Interviews

Age-Age was mentioned repeatedly. A clinical officer from Kericho County noted *“Adherence to HAART tends to increase with the patient’s age, adolescents and young adults aged 30 years and below mostly struggle with adherence. From the age of 30 years and above, patients seem to understand the importance of adherence hence tend to strictly follow the medication schedule”*.

In Litein Hospital, a counsellors noted “Older patients, above 35 years rarely give us adherence problems. However, from between 18-28 years, only a few patients manage to maintain good adherence. Most of these patients suffer from psychosocial problems ranging from denial of their HIV positive status, hopelessness, guilt about the disease and even some have reported having had suicidal thoughts”.

Fare to clinic- A clinical officer in charge of adherence monitoring at Kericho Referral Hospital noted *“Fare to clinic has been reported by some of our patients as the reason why sometimes they don’t turn up for refill. Some patients have reported having trekked for many kilometres to the clinic. We however always try to identify needy patients who for some reason cannot afford fare to clinic. we enroll them to a group “needy” and offer them financial support to enable them meet cost of fare and basic needs.”*

Food insecurity -A nurse at the Londiani sub-county Hospital noted *“some of my patients have reported not taking their medication when they have nothing to eat. They reported of side effects being worse when the drugs are taken on an empty stomach. Loss of energy, stomach pains, headaches and dizziness have been reported being common when HAART are taken on an empty stomach”*.

Use of other alternatives of HAART- Nearly half of the key informants 7(46.7%) reported that some of their patients in the recent past had stopped taking their medication due to the use herbal medicine. A clinical officer at Kericho Referral Hospital reported *“some of my patients had stopped taking their medication in the recent past, when we did a follow up, they informed me that they had been made to believe that there were herbal medicines which could cure HIV/AIDS hence they stopped taking HAART”*.

