CONTRIBUTING TO THE HIV CONTROL IN DRC: ASSESSING VIRAL LOAD SUPPRESSION AND ART ADHERENCE IN LIKASI, DRC

by

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(Under the Direction of Mohammad R. Haider)

ABSTRACT

Statement of the problem. The 90-90-90 UNAIDS targets to measure the progress toward HIV control were not achieved globally in 2020, with significant differences between countries. Many low- and middle-income countries in sub-Saharan Africa, including the DRC, had the worst outcomes. These target shortfalls suggest continued HIV transmission, mortality, and morbidity. This study examines the factors associated with adherence to ART and viral load suppression among PLHIV to contribute to the control of HIV and address the lack of research evidence in Likasi.

Methods. A cross-sectional study was carried out in 2021 among adult HIV patients taking ART in 42 health facilities in Likasi. Adherence to ART was measured using self-report and was categorized as adherent and not adherent. Viral load level was the most recently measured value, and viral load suppression was defined using the 1000 copies/mL WHO cut-off. Using SAS software, bivariate and multivariate logistic regression analyses were performed to determine the

socio-demographic, clinical, and facility factors associated with 1) adherence to ART and 2) viral load suppression.

Results. 82% of PLHIV was adherent to ART, and 74% suppressed their viral load. Adherence was most likely among those who 1) disclosed their status, 2) were in health facilities of > 459 patients, and 3) were in health facilities with very good hospitality. Adherence was less likely among patients 1) who disclosed to their partners, 2) who were in secondary levels facilities, and 3) in Kikula health zone. The likelihood of suppressing viral load was higher in 1) adherent patients and 2) those who disclosed their HIV status. Subjects with an NGO support group and those from a secondary-level facility were less likely to suppress their viral load.

Conclusions. Likasi is behind in achieving the UNAIDS viral load suppression goal. Several factors impact ART adherence and viral load suppression. The health system management, policymakers, and practitioners could target these factors for improvement and contribute to the achievement of the 95-95-95 UNAIDS targets. This first assessment of the factors associated with ART adherence and viral load suppression in Likasi fills the existing literature gap and calls for further studies.

INDEX WORDS: HIV, Viral load suppression, ART adherence, Patients' Factors, Health Facilities' Factors, Likasi, DRC

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DEDICATION

Almighty God, you allowed me to start the DrPH program and gave me the courage, strength, and perseverance to stay in regardless of storms and wars encountered, to you the glory and honor.

Koko Mado, my dear mom, your presence has been a blessing; I am grateful for your unwavering support.

Tracy, Maddy, Pascal Jr., and Patrice, my children, you have been around in your way! What could you do better than being a teenager? I know these years have also been hard for you, but we DID IT. May this accomplishment inspire you to keep going and do your best in any life project and count only on God's Grace.

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CHAPTER 1: INTRODUCTION

Background and Context

HIV/AIDS is a public health problem in the world. In 2021, about 38.4 million people were living with HIV, 1.5 million were newly infected, and 650,000 died from AIDS-related illnesses worldwide (HIV.gov, 2021). According to the Global Burden of Disease study, HIV is the second most fatal infectious disease globally (Roser & Ritchie, 2018). There is no curative treatment or preventive vaccine for HIV, and people must take daily medicine (Govender et al., 2021). HIV affects the physical and overall quality of life and perceptions of people living with HIV (Handayani et al., 2019). Consequently, PLHIV and their countries cannot reach their whole potential (UNAIDS, n.d).

Although there have been advances in HIV prevention and treatment, many people and populations do not have access to these services (HIV.gov, 2021). Globally, there is an increased prevalence of HIV and decreased deaths related to HIV because of the highly efficacious antiretroviral treatment (Kharsany & Karim, 2016). However, these benefits are not equally distributed throughout the world. Low- and middle-income countries do not have the same access to antiretroviral as high-income and face more challenges in controlling the HIV epidemic (Joint United Nations Programme on HIV AIDS, 2022; Obiako & Muktar, 2010). Further, within countries, there is a difference in quality and access to healthcare between rural and urban areas, which is noticeable in low and middle-income countries (Joint United Nations Programme on HIV AIDS, 2022; Le Roux et al., 2019). Consequently, there is a disproportionate global

distribution of HIV, with Africa, whose population is equivalent to 16.72% of the world population (Worldometer, 2022), accounting for two-thirds, i.e., 25.4 million of all people living with HIV. Additionally, Sub-Saharan Africa (SSA) bears the world's highest HIV prevalence and incidence (Avert, 2020; WHO, 2020, 2021). While globally, HIV is one of the largest killers, it is the leading cause of death in SSA countries such as South Africa, Botswana, and Mozambique (Roser & Ritchie, 2018).

The HIV disparity persists despite the global community's engagement led by the joint United Nations program on HIV/AIDS (UNAIDS). As a part of this worldwide effort to address the HIV/AIDS epidemic, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and other organizations fund programs in different countries to provide HIV prevention and treatment services (KFF, 2021). The goal is to eliminate the public health threat due to the HIV/AIDS epidemic. To achieve this goal, the international community has adopted the HIV care continuum as a framework to follow. The framework consists of successive steps that individuals with HIV go through for their care, from testing, treatment, and viral load suppression (HIV.gov, 2022a).

At the population level, the HIV care continuum is represented as the HIV cascade, which shows the number of individuals at each continuum step and how the number reduces from one step to another (Kay et al., 2016; Mugglin et al., 2021). The number of people at each step of the cascade is informative of how many and what kind of people, by race, ethnicity, location, age group, gender, etc., do not get the full benefits of the treatment they need to manage their disease. Thus, the HIV care cascade is a valuable public health tool as it provides policymakers and health service providers with the information for gaps identification and

strategy development for improvement to support PLHIV as they move across the care continuum and, hence, achieve the HIV elimination goal (CDC, 2022a; Medland et al., 2015).

Problem Statement

The UNAIDS used the HIV cascade to set targets that constitute the measures of progress toward the HIV elimination goal achievement. However, previous UNAIDS targets set as follows, "by the end of 2020, 90% of all people with HIV will know their HIV status, 90% of all people who know their status will be on ART, and 90% of all people receiving ART will have viral suppression", (Joint United Nations Programme on HIV/AIDS, 2014), were not achieved. While globally, the attainments were at only 84%, 73%, and 66%, respectively (HIV.gov, 2021), there were significant differences between countries. Many low- and middle-income countries in sub-Saharan Africa were not on track for the achievement of these global HIV/AIDS goals, with the DRC being one of the countries that had the worst outcomes. In 2019, the DRC reached 62.9%-60.9%-15.7% of the 90-90-90 prongs (PNMLS, 2020).

The UNAIDS target reach shortfall suggests continued HIV transmission, which perpetuates HIV/AIDS-related mortality and morbidity and hinders the achievement of the current 95-95-95 goals set for HIV elimination by 2030. It is, therefore, crucial to examine HIV programs to find insufficiencies at any step of the care continuum and take corrective action. According to the WHO, Viral load suppression is the ultimate outcome of the care continuum and is the preferred approach to monitoring the treatment response (World Health Organization, 2021, p. 147). Adherence to treatment assessment must complement the viral load monitoring to provide additional information about the risk of failure to viral load suppression (World Health Organization, 2021, p. 364). Thus, viral load suppression and adherence to ART are essential to address the problem of continued HIV transmission and subsequent consequences. To assess

these two outcomes, the Andersen and Newman health utilization framework (Andersen, 1995) can be used as it is one of the widely used models in health services research to determine the factors influencing health outcomes and inform policy development.

Research Questions

This study aims to determine the factors influencing ART adherence and HIV viral load suppression among PLHIV in Likasi in DRC and to address the lack of research evidence in Likasi. This study's goal is to contribute to HIV control in the region.

The research questions are the following:

1) How do patient- and facility-level factors impact patient adherence?
    - Hypothesis: "There is an association between patients and healthcare facility characteristics with adherence to ART."
2) What are the viral load suppression correlates among PLHIV in Likasi?
    - Hypothesis: "There are differences between PLHIV who suppressed and those who did not suppress their viral load on the patients and healthcare facility factors."

The research objectives are to:

1. Describe the characteristics of patients who receive services in the health zones under TUSIMAME.
2. Assess the impact of sociodemographic, clinical, and facility characteristics on adherence to ART.
3. Determine the association between the sociodemographic, clinical, and facility characteristics of PLHIV with viral load suppression.

Relevance and Importance of the Research

The DRC is affected by a disproportionated burden of HIV and did not achieve the viral load suppression UNAIDS targets. The issue of HIV viral load non-suppression poses a significant problem as it influences and maintains transmission and continues to increase morbidity and mortality and decrease quality of life and survival (Handayani et al., 2019; UNAIDS, n.d). Assessing this HIV area is essential to address the related issues and to otherwise contribute to eliminating HIV/AIDS by 2030. This study could determine the factors more likely to influence adherence to ART and viral load suppression in Likasi. Knowing the association of these factors could equip providers with tools to impact patients' treatment success and evidence-based strategies for effective healthcare services and, thus, address the HIV problem.

Additionally, programs are the originator of quality strategies and policies at the regional and national levels. The results of this study will assist the region and country in HIV/AIDS intervention prioritization and resource allocation and inform policy development to increase the population's adherence to treatment viral load suppression, thus ensuring the achievement of HIV/AIDS control and elimination by 2030. Further, there is a lack of studies on HIV in the DRC. Previous studies focused on the province of Kinshasa, and only a few included the Haut-Katanga province, where the setting of our research is located. These published studies used the routine dataset, which is not as comprehensive as the survey data included in our study. To our knowledge, no previous studies assessed the factors associated with adherence to ART and viral load suppression in our study area. The results of this study will fill the literature gap.

Structure of the Dissertation

This dissertation has five main parts. Chapter 1 is the introduction, which defines the topic and its importance. Chapter 2 includes a relevant review of the literature on the topic.

Chapters 3 and 4 will detail the first and second studies, including the methods, results, and discussions. Chapter 5 summarizes the two studies and provides overall conclusions, including practice implications.

CHAPTER 2: LITERATURE REVIEW

Our literature review aimed to explore previous researchers' examination of associated factors to viral load suppression and adherence to ART.

The literature review was limited to Global Health, PubMed, and Web of Science public health databases, and the search combined the following terms. “HIV/AIDs,” “HIV/AIDS program,” “viral load,” “HIV viral load suppression,” and “ART adherence,” with a focus on full-text articles published between 2018 and 2023.

This chapter will first provide an HIV overview, including the concepts and theories about this disease and epidemic control. This will be followed by conceptualizing outcomes’ determinants according to the Andersen framework. These determinants will be used when presenting the analysis of relevant studies for this research purpose.

Key Concepts and Theories

HIV/AIDS Definition

“HIV (Human immunodeficiency virus) is an infection that attacks the body’s immune system, specifically the white blood cells called CD4 cells. HIV destroys these CD4 cells, weakening a person’s immunity against opportunistic infections, such as tuberculosis and fungal infections, severe bacterial infections, and some cancers” (WHO, n.d.-b). AIDS (acquired immunodeficiency syndrome) is the late stage of HIV in which either the CD4 number goes below 200 cells per cubic millimeter of blood or the infected person develops one or more opportunistic infections regardless of their CD4 count (HIV.gov, 2022b).

HIV Epidemic Underlying Theory

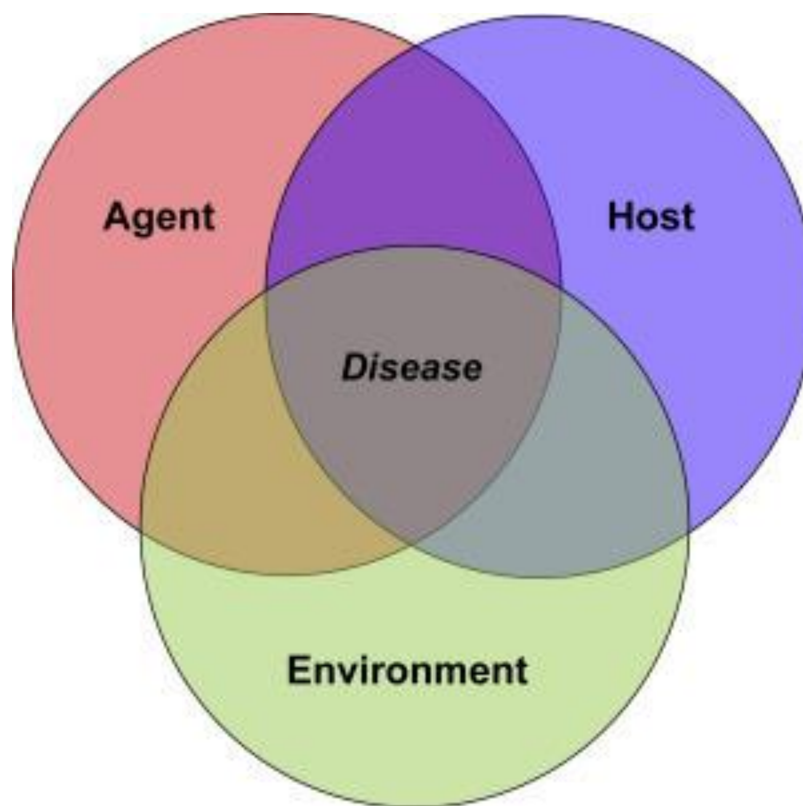
The epidemiological triad (Figure 2.1) is the underlying theory explaining HIV/AIDS causation and transmission. According to this traditional model of infectious diseases, infectious diseases result from the interaction between an agent, a host, and an environment that supports transmission. The probability of transmission from one person to another (infectivity) depends on factors related to these three elements. The HIV agent, the virus, must be present to cause the disease. The host refers to the human who can get the disease and a variety of risk factors that can influence his exposure (sexual practices, hygiene, and other personal choices as well as by age and sex), susceptibility, or response (genetic composition, nutritional and immunologic status, anatomic structure, presence of disease or medications, and psychological makeup) to the HIV virus. Environmental factors, including the social, cultural, and political milieu, determine the transmission probability from one infected person to another (CDC, 2012, p. 52; Royce et al., 1997).

A transmission from one person to another occurs through a sequence of interconnected steps called the chain of transmission (Figure 2.2) (CDC, 2012, pp. 64,74; Van Seventer & Hochberg, 2016). For HIV/AIDS, the agent (i.e., HIV) inserts in the host's DNA and replicates in the infected host. Infected hosts exhibit a high level of active viral replication if left untreated and constitute the reservoir (Pomerantz, 2002). Viral load is the amount of virus in an infected person's blood (Ryding, 2023). HIV lives in human blood and other body fluids, such as semen, vaginal secretions, and breast milk, from which it exits the reservoir to infect other people. The transmission mode is direct contact with these ports of exit elements through unprotected sex, sharing needles or other injections, transfusion, delivery, and breastfeeding. Susceptible hosts include PLHIV's partners, babies, and drug and alcohol users. HIV treatment aims to suppress

VL and targets the transmission chain's reservoir and exit portal. Because viruses can persist regardless of the treatment (Pomerantz, 2002), other strategies are used to target other parts downstream of the chain. Refraining from unprotected sex or needle sharing, for example, breaks up the link between the mode of transmission and the portal of entry.

Figure 2.1

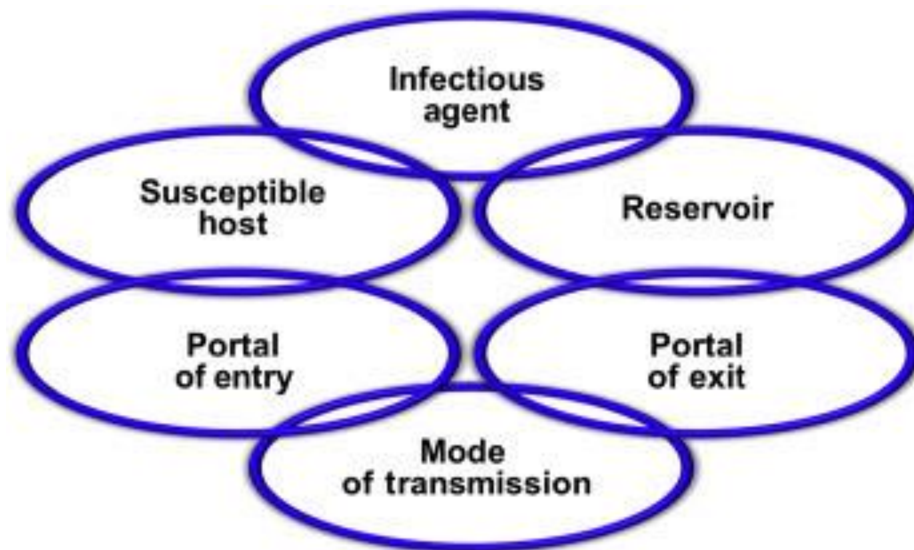
Epidemiological Triad



Note. This model was produced by Seventer, describing the elements of infectious disease causation. From: "Principles of Infectious Diseases: Transmission, Diagnosis, Prevention, and Control," by J.M.van Seventer, 2016, *International Encyclopedia of Public Health, 22-39.*

Figure 2.2

Infectious Diseases Transmission Chain



Note. Sequences of the infectious diseases' transmission chain. From: "Principles of Infectious Diseases: Transmission, Diagnosis, Prevention, and Control," by J.M.van Seventer, 2016, *International Encyclopedia of Public Health, 22-39.*

HIV Transmission and Risk Factors

HIV transmission is done mainly through exchanging body fluids from infected people, such as blood, breast milk, semen, and vaginal secretions, and from mother to child during pregnancy and delivery (WHO, 2022). Sexual contact is the most common route and accounts for 75% of transmissions in developing countries (d'Cruz-Grote, 1996)

Risk factors for contracting HIV include not using condoms or other sexually transmitted infections (STI); harmful use of alcohol and drugs; sharing needles, syringes, or other injecting equipment; blood transfusion and tissue transplantation, medical procedures that involve unsterile cutting or piercing; accidental needle stick injuries (WHO, 2022).

HIV Prevention

HIV prevention is done by limiting exposure to risk factors and often includes a combination of the following key approaches (Frieden et al., 2005; WHO, 2022).

- "Male and female condom use
- prevention, testing, and counseling for HIV and STIs
- voluntary medical male circumcision (VMMC)
- use of antiretroviral drugs (ARVs) for prevention (oral PrEP and long-acting products), the dapivirine vaginal ring, and injectable long-acting cabotegravir
- harm reduction for people who inject and use drugs.
- elimination of Mother-To-Child Transmission (MTCT) of HIV".

HIV diagnosis

HIV diagnosis is often done through rapid diagnostic tests (RDTs). RTDs are of different types based on what they detect in the body. Nucleic Acid Tests detect the actual virus in blood and determine the viral load. Antigen/antibody tests that detect both HIV and antigens. Antibody-based tests detect antibodies to HIV in the blood, urine, or oral fluid. The latter is the most used in Sub-Saharan Africa as it is cost-effective and easy to use (Armstrong-Mensah et al., 2021; CDC, 2022c).

HIV Treatment

There is no cure for HIV. PLHIV must take pills or shots during their lifetime to reduce the virus's amount (viral load), stay healthy, and reduce transmission to other people (CDC, 2022b). A combination of therapeutics for HIV or Highly Active Antiretroviral Therapy (HAART) has led to a substantial reduction in viral replication, increased life expectancy, enhanced quality of life, and decreased morbidity and mortality in PLHIV (Melhuish & Lewthwaite, 2018; Pomerantz, 2002).

HIV Epidemic Control

Infectious disease control and prevention rely on a thorough understanding of the chain of transmission. Interventions that disconnect any part of the chain will stop the transmission of the infectious agent (Van Seventer & Hochberg, 2016). From this perspective, the international community adopted the HIV care continuum (Figure 2.3) as a framework to stop transmission. The framework consists of successive steps individuals with HIV go through in their care (HIV.gov, 2022a).

Figure 2.3

HIV Care Continuum

Note. Steps of the HIV care continuum. From HIV.gov, 2022. (https://www.hiv.gov/federal-response/policies-issues/hiv-aids-care-continuum/)

According to this model, everyone should have the opportunity to be tested for HIV. Testing for HIV refers to a range of services, including counseling, diagnosis, and coordination with a laboratory (World Health Organization, 2021, p. 10). Diagnosis of HIV is the first step that allows connection to the HIV care system. It also informs people about their status and helps them avoid being engaged in risky behaviors that might spread the infection to others. The next step is to engage in care. People who test positive must be directly connected to a healthcare provider and receive treatment and counseling services. This step is important because receiving care allows people to have a better life with HIV. The WHO recommends starting ART on the same day as the diagnosis to avoid losing people between diagnosis and treatment initiation (World Health Organization, 2021, p. 354). People who start treatment must be retained in care by going to their HIV appointments regularly to be monitored on their viral load (WHO, n.d.-b). This control strategy aims to have PLHIV suppress their VL, keep them in care continuously,

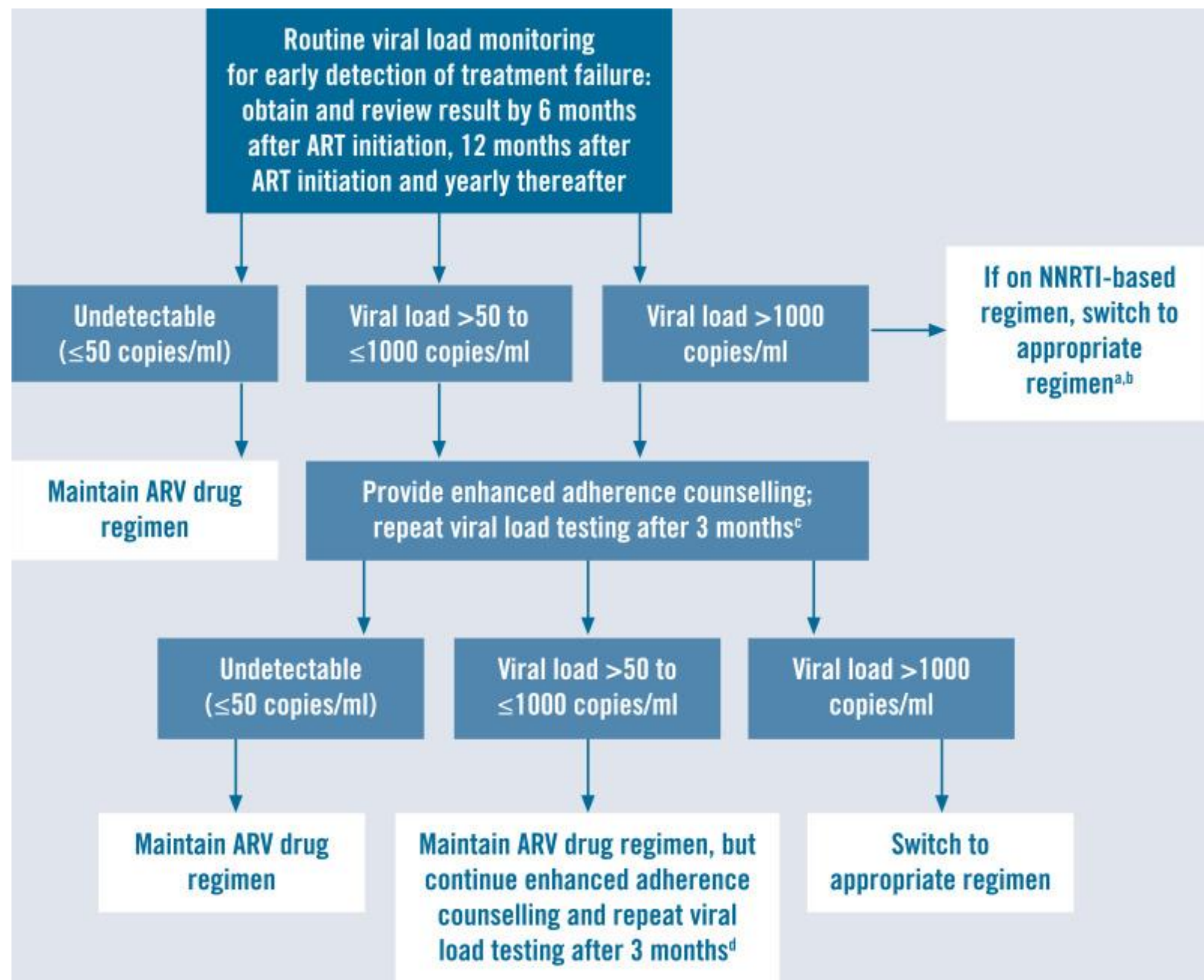
and thus interrupt the transmission chain at the reservoir and portal of exit levels, as explained above (Figure 2.2).

The HIV cascade starts with the number of people in a community who have been tested and diagnosed with HIV. The goal is to have 95% of people who have HIV be included. Of those who are diagnosed, 95% must be linked, engaged, and retained in care. Finally, 95% of these must be monitored to suppress their viral load. These numbers are important because if all people are diagnosed, they will be linked to the appropriate care, and know how to avoid engaging in risky behaviors that might spread the infection to others. If all people linked in care remain in care, they will continually receive the necessary treatment, counseling, and monitoring services. Following all these steps as planned will lead to undetectable or very low viral low level, which will eliminate passing the virus to other people.

Treatment Monitoring. Measuring the viral load level is the recommended approach of treatment monitoring at 6 months, 12 months, and then every 12 months after ART establishment (Figure 2.4). Monitoring helps determine treatment failure and adherence issues and whether to change the ART regimen (World Health Organization, 2021).

Figure 2.4.

Treatment Monitoring Algorithm



Note: Treatment monitoring Algorithm. From 4.7. Monitoring Response to ART (World Health Organization, 2021).

This viral load suppression goal achievement can be hindered by the following. Non-adherence to medication, ART resistance, drug-to-drug interactions, and other factors affecting ART effectiveness (Frieden et al., 2015).

Adherence to Treatment

According to the WHO, "Adherence is the extent to which a person's behavior – taking medication, attending scheduled clinic appointments, following a diet and/or changing lifestyle – corresponds with care and treatment plans conjointly agreed between the health worker and the person living with HIV" (WHO, n.d.-a). Treatment adherence is the primary determinant of viral load suppression and is essential to prevent disease progression and transmission and to improve treatment outcomes (CDC, 2022b; HIV.gov, 2022a; Melhuish & Lewthwaite, 2018; Pomerantz, 2002; Sendaula et al., 2022; World Health Organization, 2016, p. 255). Thus, the WHO recommends adherence to treatment assessment as a complement to viral load monitoring to provide additional information about the risk of failure to viral load suppression. This assessment can be done through strategies such as pill counts, pharmacy refill records, and self-reporting (World Health Organization, 2021). Electronic monitoring and assessment of pharmacologic drug levels in blood or hair can also be used to assess adherence to ART (Duong et al., 2001; Gandhi et al., 2019). There is no gold standard to evaluate adherence to ART. Clinicians and researchers choose a strategy that best fits their needs and resources (Chesney, 2006; Williams et al., 2013).

Self-reporting

Self-reporting is the method most used to assess adherence in research and in clinical settings. There are several ways to perform self-reporting, including inquiring about the number of medications taken or missed and estimating how often medication was taken as prescribed. Besides recall strategies, prospective monitoring, Short Message Services, voice response systems or web-based data collection strategies can also be used. Further, these assessments can include the period of time (Williams et al., 2013).

Electronic Monitoring

Electronic Monitoring consists in using a microelectronic device or communication over a cellular network, to determine how often and when the patients take their medication. The device can be embedded in the medication cap or pill box, which, when activated, the time and date are recorded, stored, and downloaded to a computer for analysis (Bell & Haberer, 2018).

Pill Counts

This strategy consists in counting the number of pills the patients possess, which reflects the number of pills dispensed minus those ingested. It is performed by inspecting the medication containers at the clinic or unannounced home visits, or it can be over the phone, asking the patient to count their pills. Adherence rate is calculated by dividing the number of pills consumed by the number of days elapsed since the last dispense (Basu & Garg, 2017).

Pharmacy Refill

This method assesses ART acquisition at the pharmacy and is generally performed using three methods: medication possession ratio (MPR), pill count (PC), or pill pick up (PPU). The MPR assesses the time between two medication pick-ups. Pill count reports the number of pills dispensed between two pick-ups. The PPU measures whether all or the majority of the medications prescribed were picked up (Williams et al., 2013).

While all these ART adherence assessments have strengths and weaknesses, only self-report asks directly about adherence compared to other methods, which assess proxies of adherence. Electronic monitoring devices monitor the opening of the bottle but not necessarily

the consumption of the medicine. Pills count, and pharmacy refills assume that patients consumed all the missing or picked-up pills. Further, self-report is easy to perform and costs less to implement (Williams et al., 2013). Using some strategies to avoid factors that could compromise self-adherence accuracy is recommended. The assessment should be done in a simple, nonjudgmental, routine, and structured format that normalizes less-than-perfect adherence and minimizes socially desirable responses. It is suggested for example to inquiring about missed doses during a defined time period using Likert scale or qualitative response categories (HIV.gov, 2023a).

Viral Load Suppression

Viral load is the amount of HIV particles in a blood sample test, reported as the number of copies of HIV per milliliter (copies/mL) of blood. The viral load test is useful to 1) guide treatment decisions once the diagnosis is determined, 2) see how well the treatment is working, and 3) watch for any changes in the infection (MedlinePlus, 2022). The higher the viral load, the higher the risk of disease progression. The WHO categorizes PLHIV in three based on their viral load levels as follows. A viral load level of less or equal to 1000 copies/mL is called a suppressed viral load. A viral load greater than 1000 copies/m is called Unsuppressed. It is called undetectable when the test cannot detect the viral load because it is so low (World Health Organization, 2022). As a part of the global strategy to control HIV, 95% of people taking ART must suppress their viral load. Antiretroviral treatment can lower the viral load to suppressed and undetectable levels, thus reducing the risk of transmitting HIV to almost zero or negligible when suppressed or zero when undetectable (World Health Organization, 2022). Therefore, antiretroviral treatment is essential to achieve viral load suppression (HIV.gov, 2022a).

HIV Control in the DRC

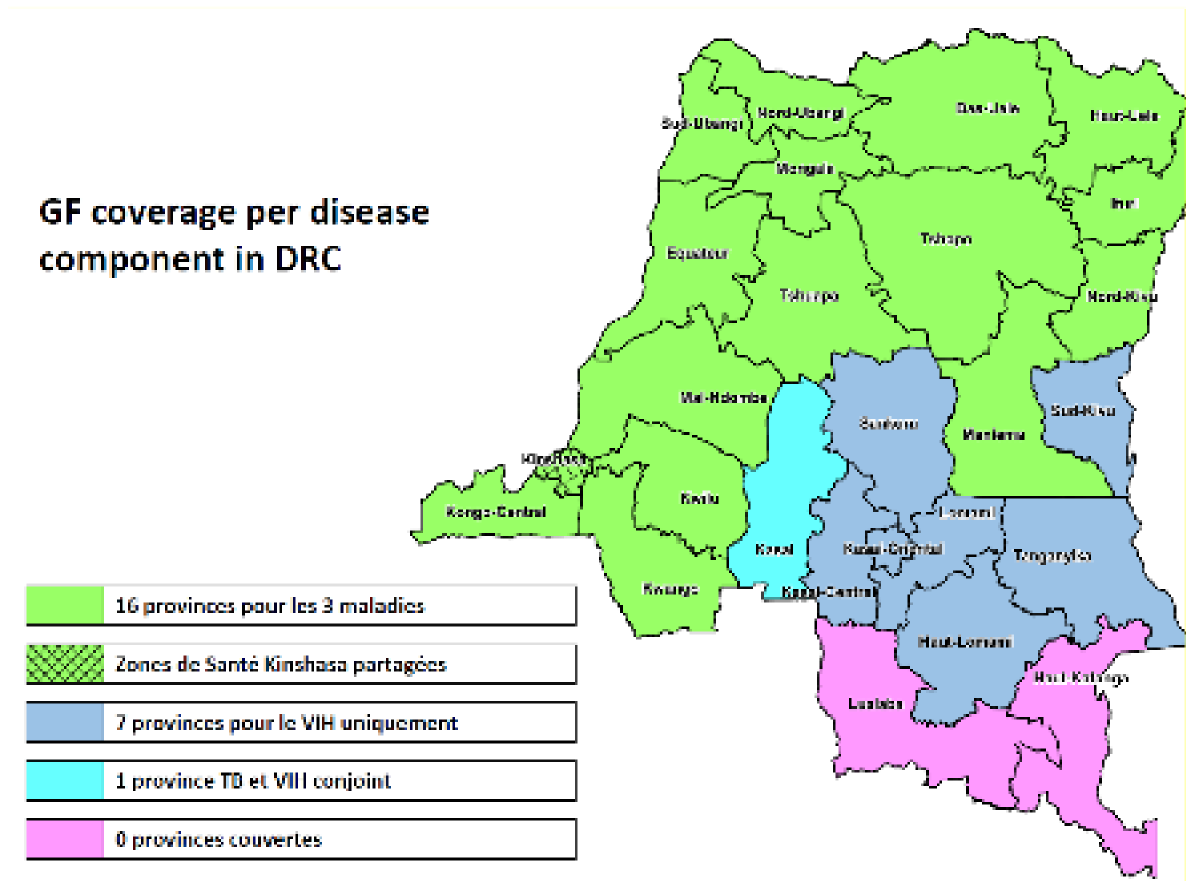
The Democratic Republic of Congo (DRC) is in Central Africa and shares borders with nine countries, including Uganda, Rwanda, Burundi, Tanzania, Zambia, Angola, Republic of Congo, Central African Republic and Sudan (PNLS, 2018).The population size was estimated at 87.7 million in 2019 (IHME, N.d.).The health system in DRC is organized at three levels: 1) Central, responsible for defining policies, strategies, standards and guidelines, 2) intermediate, responsible for supervising, monitoring and translation of policies and strategies to be implemented in health zones, 3) operational level, which implement health care strategies in health zones. The "Programme Nationale de Lutte contre le VIH/SIDA et les IST (PNLS) is responsible for coordinating the fight against HIV at the central level (PNLS, 2018). A Health zone is a geographic entity within the limits of a territory or a municipality with a population of about 100,000 inhabitants. The health zone is managed by a team that organizes health services at two complementary levels:1)health center, which is the structure of first contact with the population and offers ta minimum package of activities, and 2)General Reference Hospital, which is a reference structure and offers a complementary activity package (Mboko, 2019).

The HIV response in DRC is mostly privately funded (45%), followed by donors (43%) and the local government (12%). The epidemic control in DRC is led by three main partners, including PEPFAR, the Government of the DRC (GDRC), and the Global Funds. The local government, through the National AIDS Control Program (PNLS), provides the health infrastructure and staffing, while the donors are responsible for providing ARVs and other commodities in assigned health zones. HIV services are integrated into the standard care packages delivered by health facilities all over the country. PEPFAR supports the PNLS by implementing programs in three

provinces representing about 50% of all PLHIV in DRC: Kinshasa, Haut-Katanga, and Lualaba (PEPFAR, 2020). As shown in Figure 2.5, the Global Funds do not cover the Haut Katanga and Lualaba.

Figure 2.5

Global Fund Coverage per Disease Component in DRC



Note. Haut Katanga and Lualaba are not covered by Global Funds (PEPFAR, 2020)

According to the latest DHS survey in the DRC, the HIV prevalence was 1.2% among 15 to 49 years old. The prevalence was higher among females (1.6%) compared to males (0.6%) and in urban (1.6%) areas compared to rural (0.9%). The prevalence based on the education level is different in men and women. Women with no formal education have the lowest prevalence, while among men, the prevalence is low in those with high education levels. As for marital status, widows had the highest rate (7.9%), followed by divorced or separated (2.9%) (Ministère du Plan et Suivi de la Mise en œuvre de la Révolution de la Modernité (MPSMRM) & Publique (MSP) et ICF International, 2014).

ART Management in DRC

In DRC, after ART initiation, the patient is seen every two weeks in the first month and then monthly until the third month, the sixth month, and every six months. During the visit, clinical and biological assessments are performed to assess adherence, treatment efficacy, and treatment tolerance. There are also educational sessions consisting in providing information on HIV infection, the importance and necessity of taking ART correctly and respecting the dosage and possible adverse effects. Additionally, support mechanisms to improve compliance with treatment have been implemented, including the following. The support of a relay person chosen by the patient, psychological support, and social support. Adherence to ART assessment is performed by one of the following. Tablets count, questioning the patient (number of doses missed over the last week, dose schedule, etc.), patient self-assessment, measurement of viral load. Treatment effectiveness is evaluated by clinical improvement (progressive weight gain, fewer episodes of illness, resumption of physical activity, etc.). Treatment effectiveness is

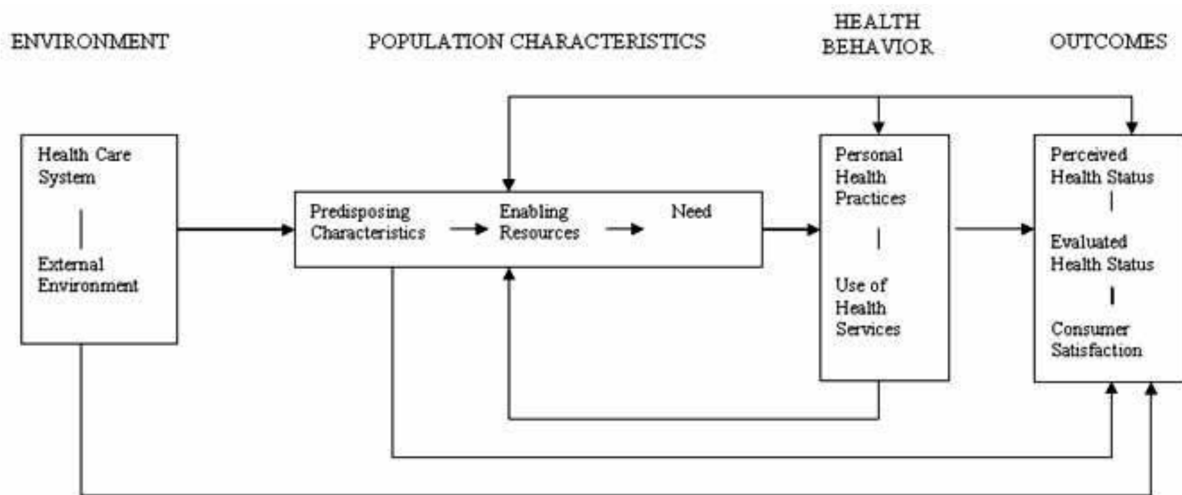
confirmed by viral load suppression (<1000 copies/ml), which is expected after 6 months of ART. (Programme Nationale de Lutte Contre le Sida, 2021).

Theoretical Framework

The Andersen and Newman framework is one of the theoretical frameworks widely used in Health Services Research. Phase 4 of this framework (Figure 2.6) helps identify and understand the factors influencing healthcare utilization and, ultimately, health status outcomes. This phase of the framework is useful in informing policy development to promote equitable healthcare access (Ayanian & Markel, 2016). According to this framework, the primary determinants of health outcomes include environment and population characteristics. Population characteristics comprise predisposing, enabling, and needs factors. Predisposing factors refer to factors that may influence the likelihood an individual needs health services (biological), how an individual can cope with health problems (social structure), and the individuals' perception of their need for health service (health belief). Predisposing factors include demographics (gender and age), socio-structural characteristics (education, marital status, occupation, ethnicity), health beliefs (attitudes, values, and knowledge that people have about health and health service), genetics, and psychological factors. Enabling factors refer to the availability of health personnel and facilities, as well as people's means and know-how to get to those services and make use of them. They include income, health insurance, a regular source of care, travel and waiting time, and social relationship. Perceived and evaluated needs are the prime determinant of healthcare use. These factors relate to "how people view their own general health and functional state, as well as how they experience symptoms of illness, pain, and worries about their health and whether or not they judge their problems to be of sufficient importance and magnitude to seek professional help."(Andersen, 1995).

Figure 2.6.

Andersen and Newman Model for Healthcare Utilization and Outcomes

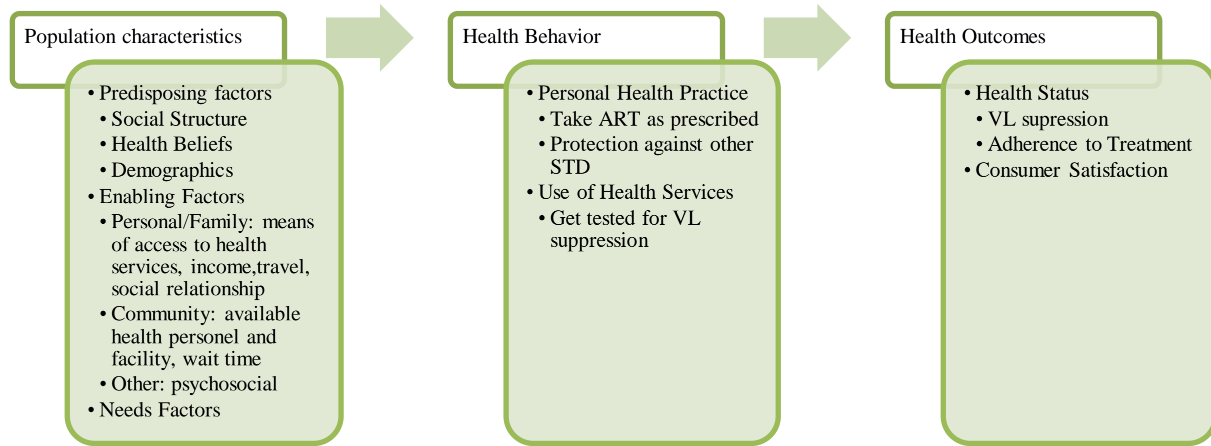


Note. Andersen's framework shows the factors that contribute to health outcomes. From: Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? By Ronald M. Andersen

The Andersen framework can be used to depict the factors influencing the ultimate HIV outcome, i.e., viral load suppression and adherence to ART (Figure 2.7).

Figure 2.7

Factors Associated with Viral Load Suppression and ART Adherence Conceptual Model



Previous Studies

Most factors examined in relation to viral load suppression and adherence to ART align with the population characteristics described in the Andersen model. Most studies considered one or a combination of psychosocial, sociodemographic, and healthcare system factors. The results provided various insights, as highlighted below.

Psychosocial Factors

Psychological factors such as HIV-related stigma affect the emotional well-being and mental health of PLHIV who develop a negative self-image and a fear of being discriminated against or judged negatively. Consequently, they live in isolation, with shame, fear, and despair, which in turn reduces the motivation to get tested and treated (CDC, n.d.). Further, stigma delays the disclosure of HIV status, which in turn can be a barrier to access to HIV services and

adherence to ART (Tsai et al., 2013). The higher the stigma concern is among PLHIV, the less they adhere to their treatment (Rintamaki et al., 2006). This was evidenced in a community cross-sectional study in Liberia that assessed the relationship between different stigma domains and social support with ART non-adherence. From this study, PLHIV with poor levels of information support and high levels of experiencing stigma had higher odds of non-adherence compared to the group of those with good levels of social support and low levels of experiencing stigma (Strother et al., 2022). Social support refers to all activities that enhance the recipient's well-being and can be practical/ instrumental support (picking up medications, paying for prescriptions, or physical assistance) or emotional support (encouragement, listening, nourishment, and informational support) (Damulira et al., 2019). PLHIV who are helped or encouraged to pick up their medicine will most likely adhere to treatment than those who are not. This was supported by a randomized clinical trial in Uganda that showed an association between social support and increased adherence to HIV medication (Damulira et al., 2019). Also, in a qualitative study done among adolescents in Tanzania, it was shown that psychosocial support, such as peer support groups, improves knowledge and positively influences adherence to the treatment (Audi et al., 2021). Similarly, in a cohort study conducted to understand patterns of ART adherence among women initiating ART, it was reported that there was a higher adherence per unit of increased emotional support (Matthews et al., 2020), Similar results were found in association with viral load suppression. A cross-sectional and retrospective study in Uganda assessed the clinical and psychosocial factors associated with HIV viral suppression levels among adolescents. Using interviews and clinical data review, they found that having no treatment interruption, belonging to a support group, having a parent alive, and having meals in a day were significantly associated with viral load suppression (Gordon et al., 2022).

Sociodemographic Factors

Traditional sociodemographic factors include age, gender, education, occupation, ethnicity, culture, social network, and social interactions. As evidenced elsewhere, sociodemographic characteristics are the major determinants of many health outcomes. The association of sociodemographic factors with viral load suppression and adherence to ART varies based on diverse factors, including region, population of interest, and type of study. In a quantitative study conducted in the DRC using routine data to analyze factors associated with variation in VL, 19% of the sample was not virally suppressed. The mean viral load was significantly higher in males and patients under 15 years of age (Shah et al., 2021). Age < 15 years at ART and the male gender were also reported to be associated with viral load suppression in a cross-sectional study in South Africa that also used electronic medical records (Joseph Davey et al., 2018). Further, a study that included only pregnant and postpartum women in South Africa found that younger age than 25, being on first-line ART and being married/cohabiting were more likely to be associated with viral load suppression (Ngandu et al., 2022). But another cross-sectional study in rural KwaZulu-Natal, South Africa, on pregnant adolescents and women living with HIV, reported that those aged between 14 and 19 were the least virally suppressed compared to the older age group. They also found that married women were more likely to achieve viral load suppression than unmarried women (Ntombela et al., 2022). Females were also been reported to be more likely to suppress their viral load than males in another adolescent population (Ayanian & Markel, 2016). Similar outcomes resulted from a retrospective study conducted in Ethiopia which reported greater odds of not suppressing viral load among married and employed by the government than their counterparts (Anito et al., 2022).

Healthcare Services

Inefficiency in the healthcare system can also impact viral load suppression and adherence to ART. Healthcare service characteristics include structural and process features such as facility environment, equipment, staff training, provider knowledge, the interaction between patients and staff, coordination, and care performance. Issues such as poor staff attitudes toward patients, the inadequacy of medical supplies, and low patient satisfaction with services have a negative impact on health outcomes (Titi-Ofei et al., 2021). Staff attitudes are very important as it makes patients feel like they are being taken care of with compassion, and it can make a difference in their overall well-being and health outcome (Lockton Affinity, 2022). A shortage in medical supplies impacts the patients' outcomes as they will not receive the expected service. Further, distance to health services, long waiting times to receive care and obtain prescription refills, receiving only one month's supply of drugs, pharmacy stock-outs, and the burden of direct and indirect costs of care impact adherence to HIV treatment (World Health Organization, 2016, p. 255). It was shown in a study in Tanzania that long distances from health facilities, transport challenges, and unprofessional conduct of health workers that make adolescents unwelcome at health facilities negatively affected viral load suppression (Gordon et al., 2022)

Gaps in Existing Knowledge

While several studies conducted in Sub-Saharan have documented determinants of viral load suppression and adherence to ART, there is a lack of studies in the DRC. Previous studies in DRC focused on Kinshasa, and only a few included other provinces. There is a lack of information on HIV/AIDS in the rest of the country. To our knowledge, only one group of authors included the Haut Katanga province, where Likasi, the setting for our study, is located. According to one of these studies, 19% of PLHIV were not virally suppressed, and the overall

viral load means in the Haut Katanga was 8021copies/mL (Shah et al., 2021). These authors also reported that the retention rate of PLHIV in care was 78.2% (Shah et al., 2022). These studies suggested that there is still much to do regarding the viral load and adherence to ART in the two provinces to achieve the 95% UNAIDS goal. These studies did a good job providing characteristics of HIV/AIDS patients and the factors associated with the Viral Load non-suppression in both provinces combined, based on routine data; they did not specify how each province was affected. Further, the studies used only routine data, which might not be as comprehensive as surveys.

As highlighted by other authors, HIV distribution varies within a country, and the burden is heterogenous within provinces and is associated with ethnicity, urban status, and unemployment (Kleinschmidt et al., 2007; Mweemba et al., 2022; Shaikh et al., 2006). Studies have also indicated national and regional variations in medication adherence based on cultural differences (Adu et al., 2022). It is also recognized that to fight HIV effectively, tailored interventions to specific populations and integrated into the social context in HIV prevention and care approaches at every level are essential (Cassels & Camlin, 2016).

Hence, there can be variations in the factors influencing viral load suppression from one community, province, or country to another. These differences need to be considered in planning healthcare interventions. It is, therefore, vital to examine these factors in communities with viral load suppression shortfalls to provide evidence-based recommendations, develop appropriate interventions, and inform policies in those areas to ensure that all PLHIV are virally suppressed and eliminate the HIV/AIDS epidemic by 2030.

Thus, this study is original by examining HIV details specific to Likasi; it will extend previous research, fill the gap in research and literature, and contribute to improving the HIV

control problem. Centering this study on TUSIMAME, which main' goal is to provide prevention, care, and treatment to the population, surely will contribute to health service research.

CHAPTER 3:
FACTORS ASSOCIATED WITH ADHERENCE TO ART[1]

[1] Kabongo, M.M., Haider,M.R., Sekandi, J., and Lukanu, P. To be submitted to the HIV Medicine Journal.

Abstract

Statement of the problem. Adherence to ART is the primary determinant of viral load suppression. The shortfall of the UNAIDS viral load suppression target in low- and middle-income countries, including the DRC, suggests continued HIV transmission, mortality, and morbidity. The lack of studies in the DRC and the focus of the few studies in the province of Kinshasa call for examining less explored areas to develop evidence-based policies and strategies for HIV control. The objective of this study was to determine the factors associated with adherence to ART among PLHIV, to contribute to HIV control, and to address the lack of research evidence in Likasi. **Methods.** A cross-sectional study was conducted in 2021 among adult HIV patients taking ART in Likasi. Adherence to ART was measured using self-report, categorized into adherent and non-adherent. Andersen-Newman framework and literature review were used to select predictors. A bivariate analysis and a multivariate logistic regression were performed in SAS to determine the socio-demographic, clinical, and facility factors associated with adherence to ART. **Results.** Out of 367 participants included in this study, 82% were adherent to ART. Adherence was most likely among those who 1) disclosed their status, 2) were in health facilities of > 459 patients, and 3) were in health facilities with very good hospitality. Adherence was less likely among patients 1) who disclosed to their partners, 2) who were in secondary levels facilities, and 3) in Kikula health zone. **Conclusions.** Several factors impact ART adherence in Likasi. Practitioners and policymakers could target these factors to improve adherence to ART and contribute to HIV control. Future research could use this study as a baseline.

INDEX WORDS: HIV, ART adherence, Viral load suppression, Patients' Factors, Health Facilities' Factors, Likasi, DRC.

Methods

Research Setting

The setting for this project is the HIV/AIDS program (TUSIMAME), one of the "Fight against HIV" PEPFAR' projects. PEPFAR is the main funder of commodities in the DRC, and its efforts are focused on three provincial health divisions: Kinshasa, Haut-Katanga, and Lualaba (Oum et al., 2021). TUSIMAME was implemented in the Haut -Katanga by SANRU (Soins de Sante primaire en milieu rurale =Rural Health Program), a Non-Governmental Organization (NGO) in DRC that partners with local and international organizations to implement various programs (SANRU, 2020).

Likasi is the seventh biggest city in the DRC, comprising 422,414 inhabitants (Worldometer, 2023). It is located in the South-East part of the DRC, in the Haut-Katanga province, which shares borders with Zambia, one of the African countries with the highest HIV prevalence (Kharsany & Karim, 2016; PEPFAR, 2019). According to a programming report along the Zambia border, there was a much higher HIV prevalence than the national average (PEPFAR, 2020), suggesting that much effort must be made in the region to achieve HIV elimination. Our study contributes to this effort. Figure 3.1 is a color representation of the prevalence of HIV in African countries; the darker color is for high prevalence countries.

This setting was ideal because it provided the opportunity to reach the majority of PLHIV in Likasi. All the health facilities in Likasi that provided HIV care services were under TUSIMAME. This program allowed free or at very low charge comprehensive services, including testing, treatment, counseling, and support groups, enabling PLHIV in the region to get access to care. Figure 3.2 shows the health zones under the TUSIMAME project.

Figure 3.1

Prevalence of HIV in Africa in the Total Population

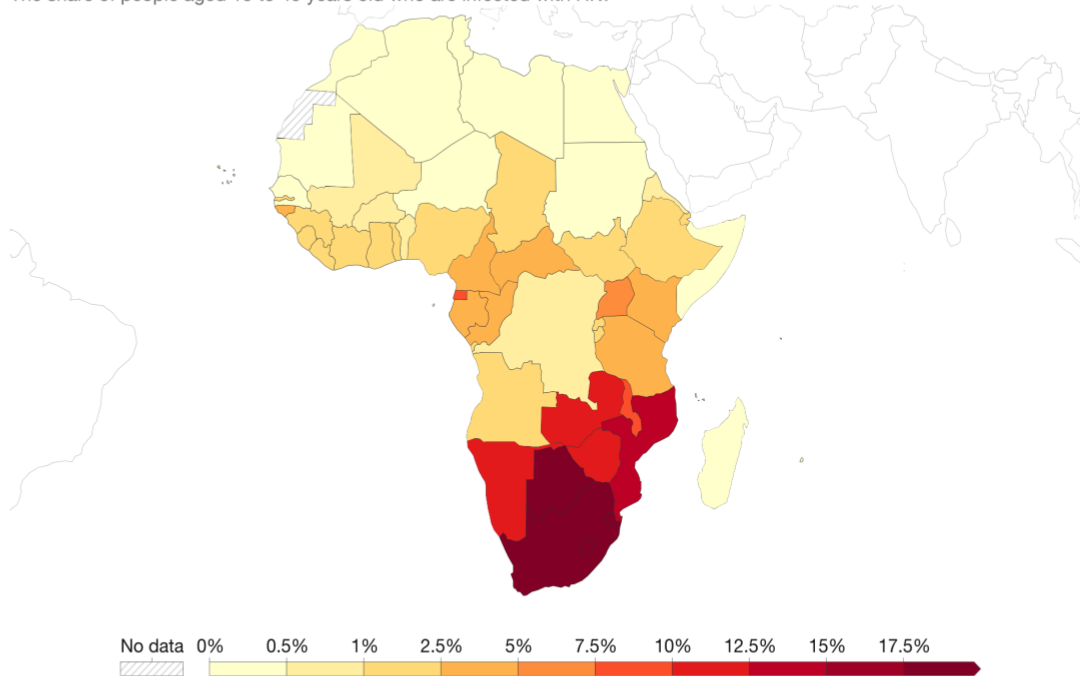
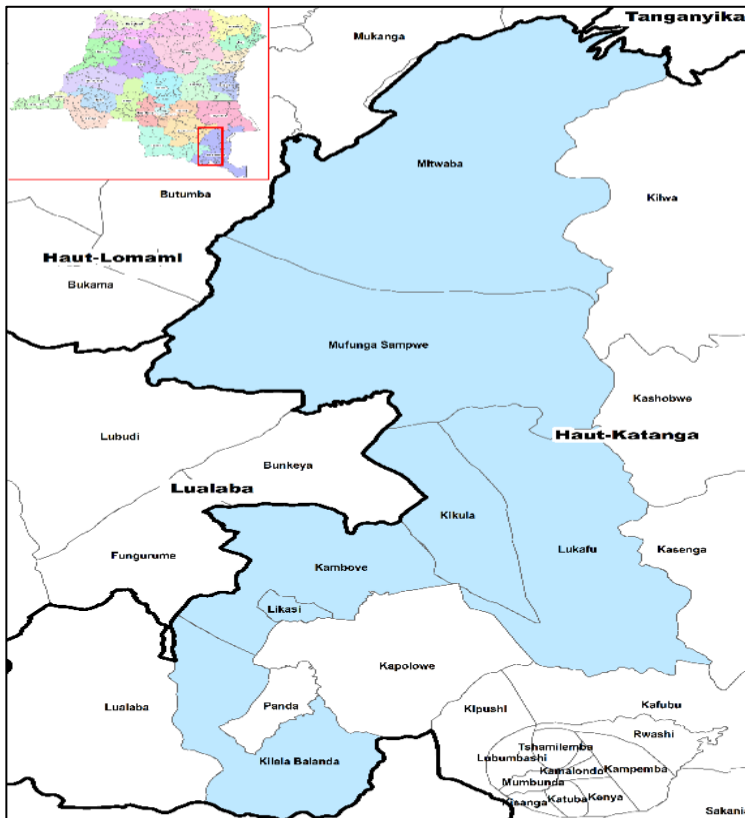


Figure 3.2

Health Zones under TUSIMAME



Ethical Procedures, Approval, Institutional Review Board (IRB)

This study is a part of the study “Facteurs de persistence de la charge virale chez les PVVIH sous ARV dans la ville de Likasi,” which was submitted to the closest Ethics committee at the University of Lubumbashi. The main study includes a survey, interviews, and focus groups. The study was approved under UNILU/CEM/120/2018. All subjects provided informed

consent to participate. Our proposal was submitted to the UGA IRB and approved under the ID: PROJECT00005954.

Research Design

This cross-sectional study assesses the risk factors associated with adherence to ART.

Data Collection and Sample Size

The data was collected from PLHIV on ART attending the health facilities under TUSIMAME in Likasi and their providers. Given that the proportions of people who have suppressed and those who have not suppressed were not known, purposive sampling was used to enroll patients. Participants were selected as follows. A non-suppressed patient was added for each patient with suppressed viral load until no more non-suppressed were found. The patients' sample size was estimated at 384 using stat calc in EpiInfo 7. Patients and providers provided informed consent to participate in the study. A questionnaire in French containing information on health facilities and key viral load suppression factors was administered (See appendix A) to elucidate the factors of viral load persistence in PLHIV despite treatment and find ways to improve treatment efficacy. Trained research staff administered the questionnaire and recorded other relevant details, such as "viral load" from patients' files. The data was entered in EpiInfo and saved in Excel.

Data Analysis

The Excel file containing de-identified data was exported into SAS for analysis.

Outcome Variable: The outcome of this study is Adherence to ART.

Adherence to ART was assessed through self-reporting. Self-reporting is the most frequently used method to assess adherence and is associated with successful viral load suppression (Department of Health and Human Services, 2022; World Health Organization, 2021, p. 364).

Adherence to ART was defined using the answer to the question: How often do you forget to take ART? There were four answer options: Never, Rarely, Often, and more often. Two categories were created. The first was the adherent category, which included those who never forget and those who rarely forget. The non-adherent category included those who often and more often forget.

Independent Variables: Based on the literature review and the Andersen framework (described in the literature review), patients' sociodemographic and clinical characteristics and facility characteristics were included in this study.

The independent variables of interest for this study included age, gender, education level, marital status, employment status, HIV status disclosure, to whom disclosed status, NGO support group, peer support group, means of transport, duration on ART, WHO stage, hospitality at the facility, health zone, healthcare structure type, healthcare facility size.

Descriptive Analysis. A descriptive analysis was performed on these variables of interest to report the characteristics of the sample.

- Numerical variables are reported as median +/- IQR. These variables were then categorized into groups for the analysis.
- Categorical variables were reported as frequency and percentage of categories. The following variables were transformed for analysis.

The health facility names were used to create a new variable, "Health Zone," using the list of health zones and their healthcare facilities. Duration on ART options were combined into two groups. The first group included those on ART for less or equal to 12 months. The second group included those who were on ART for more than 12 months". "To whom disclosed HIV status" answers were grouped into three: none, partner, and other. The partner group included these

relationships: spouse, fiancé, and girlfriend or boyfriend. Any different response was included in the “other” group (family members, children, friends, parents, pastor, provider). The new WHO stage variable combined stages 3 and 4 as the stage 4 group had only 3 observations. Structure type was redefined as “primary” and “secondary” level facility based on the DRC definition of health facility types (Mboko, 2019).

Bivariate Analysis. A bivariate analysis assessed the relationship between each independent variable with Adherence to ART. The Chi-square test of independence was performed, and $p<0.05$ was used to determine the statistical significance of the association.

Multivariate Analysis. Multivariate logistic regression was done to determine the association of each independent variable with adherence to ART, controlling for other variables. All the variables were included in the multivariate logistic regression. Since our interest is adherence to ART, non-adherence was used as a referent category and was compared to adherence. Odds Ratios and 95% CI were used to measure the strength, and the statistical significance of the associations was assessed at $p<0.05$.

Results

Descriptive Analysis

The sample included 367 subjects, predominantly females (65%). The median age was 36 years (IQR: 15). More than half of the sample had a high school or college education (53%), while the rest had primary-level education or no formal education (47%). The majority were married or cohabiting (64%), employed (70%), suppressed their viral load (74%), and adhered to ART (82%). Table 3.1 contains the parameters that describe the study sample.

Table 3. 1

Sociodemographic, Clinical, and Facility Characteristics of Study Participants

Characteristic		N	%
		367	100
Socio-demographics factors			
Sex			
	Male	128	34.88
	Female	239	65.12
Age			
	Age <=29	94	25.61
	Age 30-44	182	49.59
	Age >44	91	24.80
Occupation			
	Unemployed	110	29.97
	Employed	257	70.03
Marital status			
	Married/cohabiting.	236	64.31
	Single	71	19.35
	Widow or Divorced	60	16.35
Education status			
	None or Primary	171	46.59
	High School or College	196	53.41
Means of transport			
	Walk	157	42.78
	Motorcycle	162	44.14
	Bike or Car	48	13.08
Disclosed HIV status?			
	No	95	25.89
	Yes	272	74.11
To whom disclose			
	No one	95	25.89
	Partner	148	40.33
	Other	124	33.79
Clinical factors			
Duration on ART			
	<=12 months	140	38.15
	>12 months	227	61.85
WHO stage			
	Stage 1	242	65.94
	stage 2	88	23.98
	stage 3-4	37	10.08

Table 3.1 (Continued).

Adherence		
Not adherent	65	17.71
Adherent	302	82.29
VL suppressed		
No	97	26.43
Yes	270	73.57
Facility factors		
Structure type		
Primary level	243	66.21
Secondary level	124	33.79
Health zone		
Likasi	93	25.34
Kikula	158	43.05
Kambove	116	31.61
Facility size		
<=151	111	30.25
152-459	172	46.87
>459	84	22.89
Meds Pick up interval		
1-month	54	14.71
3-months	261	71.12
6-month	52	14.17
Hospitality at the facility		
Fair or Bad	21	5.72
Good	187	50.95
Very good	159	43.32
Peer Support		
No	284	77.81
Yes	81	22.19
NGO Support group		
No	246	67.03
Yes	121	32.97

Note. Univariate analysis of variables included in this study. N=367

Factors Associated with Adherence to ART

Only about 82% of PLHIV were adherent to ART. The following factors were associated with adherence to ART in a bivariate analysis. Education status, disclosure of status, to whom

disclosed status, structure type, facility size, hospitality, pickup interval, and health zone. Table 3.2 details the factors associated with adherence to ART and their statistical significance.

Table 3.2

Association of sociodemographic, Clinical, and Facility Factors with Adherence to ART

Characteristic	Adherent N	Adherent %	Not Adherent N	Not Adherent %	Chisq	p-value
All	302	82.29	65	17.71		
Socio-demographics factors						
Sex					0.089	0.924
Male	105	28.61	23	6.27		
Female	197	53.68	42	11.44		
Age					1.699	0.425
Age <=29	76	20.7	18	4.9		
Age 30-44	147	40.06	35	9.54		
Age >44	79	21.53	12	3.27		
Occupation					3.783	0.0517
Unemployed	84	22.89	26	7.08		
Employed	218	59.4	39	10.63		
Marital status					2.874	0.237
Married/cohabiting	199	54.22	37	10.08		
Single	58	15.8	13	3.54		
Widow or Divorced	45	12.26	15	4.09		
Education status					4.47	0.034*
None or Primary	133	36.24	38	10.35		
High School or College	169	46.05	27	7.36		
Means of transport					2.586	0.274
Walk	124	33.79	33	8.99		
Motorcycle	139	37.87	23	6.27		
Bike or Car	39	10.62	9	2.45		
Disclosed HIV status?					12.168	0.0005*
No	67	18.25	28	7.63		
Yes	235	64.04	37	10.08		
To whom disclose					14.577	0.0007*
No one	67	18.25	28	7.63		
Partner	123	33.52	25	6.81		
Other	112	30.52	12	3.27		

Table 3.2 (Continued).

Clinical factors						
Duration on ART					1.141	0.285
<=12 months	119	32.43	21	5.72		
>12 months	183	49.86	44	11.99		
WHO stage					1.355	0.597
Stage 1	202	55.04	40	10.9		
stage 2	72	19.61	16	4.36		
stage 3-4	28	7.62	9	2.45		
Facility factors						
Structure type					0.347	0.555
Primary level	202	55.24	41	11.17		
Secondary level	100	27.25	24	6.54		
Health zone					13.294	0.0013*
Likasi	84	22.89	9	2.45		
Kikula	117	31.88	41	11.17		
Kambove	101	27.52	15	4.09		
Facility size					10.11	0.0064*
<=151	97	26.43	14	3.81		
152-459	130	35.42	42	11.44		
>459	75	20.44	9	2.45		
Meds Pick up interval					8.884	0.0118*
1-month	38	10.36	16	4.36		
3-months	216	58.86	45	12.26		
6-month	48	13.08	4	1.09		
Hospitality at the facility					30.752	<.0001*
Fair or Bad	9	2.45	12	3.27		
Good	149	40.6	38	10.35		
Very good	144	39.24	15	4.09		
Peer Support					1.125	0.288
No	231	63.29	53	14.52		
Yes	70	19.18	11	3.01		
NGO Support group					3.651	0.056
No	209	56.95	37	10.08		
Yes	93	25.34	28	7.63		

Note. $N = 367$. This table contains the chi-square of factors associated with Adherence to ART. Adherence to ART has two categories: adherence and non-adherence.
*=statistically significant association.

Multivariate Analysis of Factors Associated with Adherence to ART

Multivariate analysis assessed the factors associated with Adherence to ART, holding other variables constant. Table 3.3 provides the results of the multivariate analysis of the factors associated with adherence to ART. After logistic regression, the following factors remained associated with adherence. Disclosed status, to whom disclosed, structure type, health zone, facility size, and hospitality.

People who disclosed their status were more likely to be adherent than those who did not (OR=3.709, 95% CI[1.499,9.182]. Those who disclosed their status to their partners were less likely to be adherent than those who disclosed to no one (OR=0.308, CI: 0113,0.834. Patients in health facilities of >459 capacity size were more likely to be adherent than those in health facilities < 152 (OR=7.067, CI[1.66,30.079]. Patients in the health zone Kikula were less likely to be adherent than those in the health zone of Likasi (OR=0.309, 95% CI[0.112,0.853]. Patients in health facilities with very good hospitality were more likely to be adherent than those in health facilities with bad or fair hospitality (OR=7.133, 95% CI[1.902,26.75]. Patients in secondary health facilities were less likely to be adherent than those in primary health facilities (OR=0.133, 95% CI [0.047,0.377].

Table 3.3

Multivariate Analysis of Factors associated with Adherence to ART

	Adherent			
Characteristic	OR	95% CI		p-value
		LL	UL	
Socio-demographics				
Sex				
Male	1			
Female	1.86	0.862	4.012	0.1139
Age				
Age <=29	1			
Age 30-44	0.973	0.435	2.18	0.9476
Age >44	1.82	0.647	5.123	0.2565
Occupation				
Unemployed	1			
Employed	1.505	0.716	3.161	0.2805
Marital status				
Married/cohabiting	1			
Single	1.148	0.422	3.125	0.7868
Widow or divorced	0.491	0.173	1.396	0.1821
Education status				
None or Primary	1			
High School or College	1.693	0.795	3.605	0.172
Means of transport				
Walk	1			
Motorcycle	1.695	0.799	3.592	0.1688
Bike or Car	0.875	0.301	2.541	0.8065
Disclosed HIV status?				
No	1			
Yes	3.709	1.499	9.182	0.0046*
To whom disclose				
No one	1			
Partner	0.308	0.113	0.834	0.0206*
Clinical factors				
Length on ART				
<=12 months	1			
>12 months	0.684	0.326	1.438	0.3166
WHO stage				
Stage 1	1			
stage 2	1.662	0.715	3.863	0.2377
stage 3-4	0.912	0.321	2.594	0.8636

Table 3.3 (Continued).

Facility factors				
Structure type				
Primary level	1			
Secondary level	0.133	0.047	0.377	0.0001*
Health zone				
Likasi	1			
Kikula	0.309	0.112	0.853	0.0234*
Kambove	1.844	0.608	5.599	0.28
Facility size				
<=151	1			
152-459	0.994	0.411	2.407	0.99
>459	7.067	1.66	30.079	0.0081*
Meds Pick up interval				
1-month	1			
3-months	1.68	0.639	4.421	0.293
6-month	3.61	0.814	16.017	0.0912
Hospitality at the facility				
Fair or Bad	1			
Good	2.39	0.702	8.14	0.1635
Very good	7.133	1.902	26.75	0.0036*
Peer Support				
No	1			
Yes	1.69	0.72	3.966	0.2281
NGO Support group				
No				
Yes	0.81	0.358	1.833	0.6126

Note. $N = 365$. This table contains the odds ratio of factors associated with Adherence to ART. Adherence to ART has two levels: adherence and non-adherence. Here we use the non-adherence group as referent. OR=Odds Ratio; CI = confidence interval; LL = lower limit; UL = upper limit. *=statistically significant association.

Factors Preventing from Taking ART and Circumstances Contributing to Forget ART

Most PLHIV (67%) did not have specific factors preventing them from taking their medication. For the majority (43%), no specific circumstances contributed to forgetting to take ART.

Figure 3.3

Factors Preventing to Take ART.

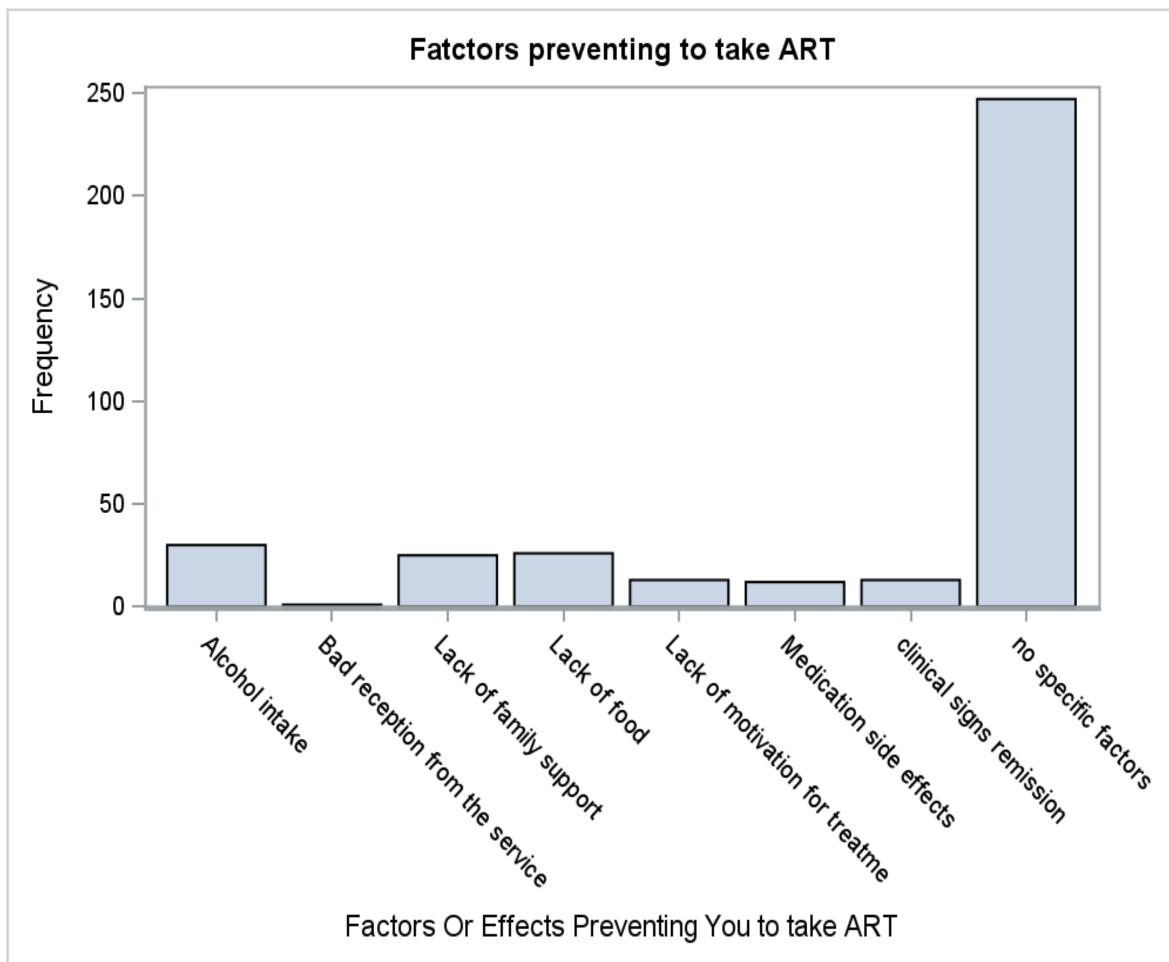
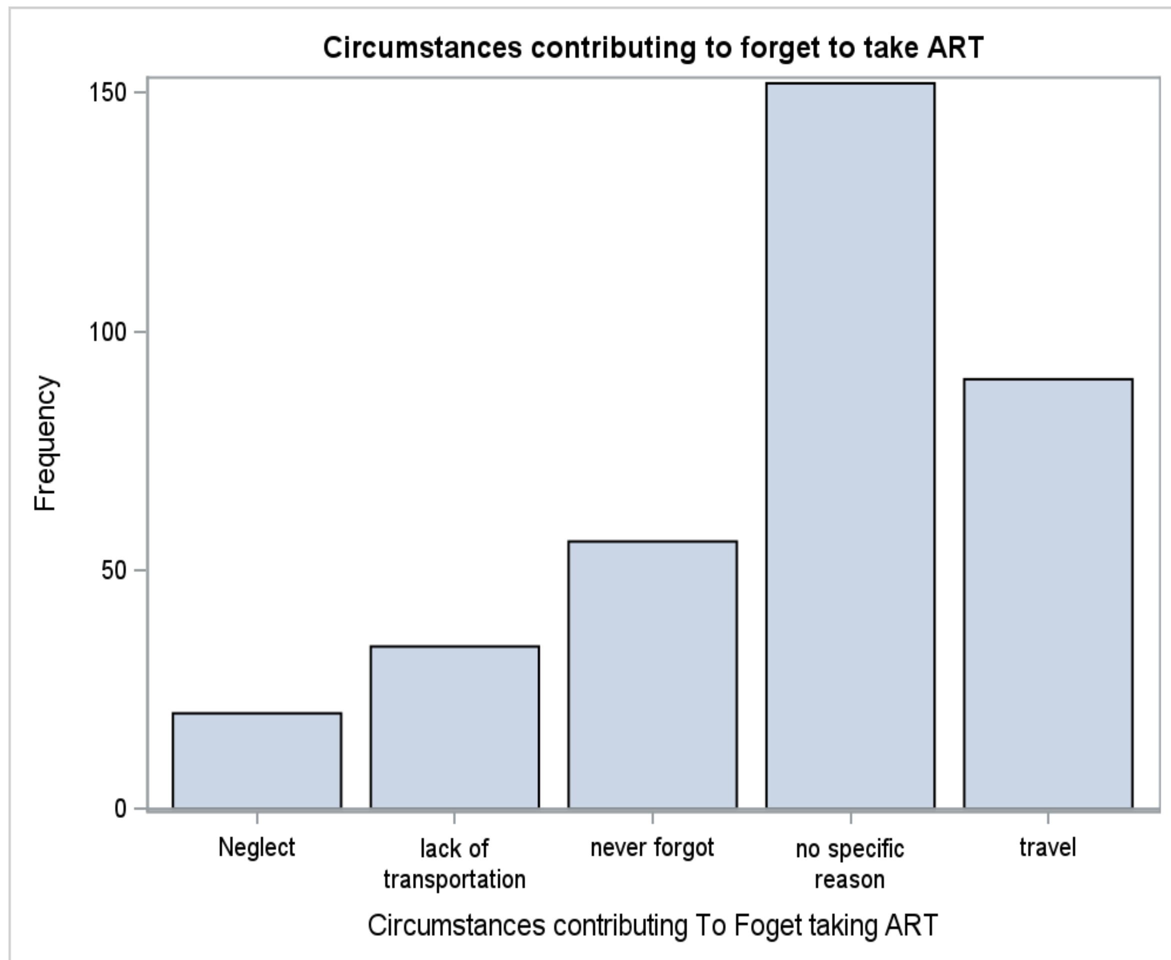


Figure 3.4

Circumstances Contributing to Forget to Take ART.



Discussion

We conducted a cross-sectional study to determine the factors associated with adherence to ART among PLHIV in Likasi. Our Hypothesis was: "There is an association between patients and healthcare facility characteristics with adherence to ART."

The data analysis shows that 82% of PLHIV were adherent to ART in Likasi. In line with the Andersen and Newman framework of health services utilization and hypothesis, the following patient and healthcare facility factors were associated with adherence to ART.
Disclosed status, to whom disclosed, structure type, health zone, facility size, and hospitality.

Although adherence to ART is not a UNAIDS goal, good adherence to ART is essential for effective viral load suppression and subsequent reduction of HIV transmission and control. According to the UNAIDS targets, 95% of people who start treatment must suppress their viral load. The 82% prevalence of adherence implies that some patients on treatment are at risk of not suppressing their viral load in Likasi, and thus, put HIV control in jeopardy. We did not find any study conducted in Likasi or Haut-Katanga province reporting adherence to ART. Previous studies assessed retention in care (Akilimali et al., 2017; Shah et al., 2022), not adherence to ART. While we believe that PLHIV who are lost to follow and those who are still in care but not taking the medicine as required all represent the cohort of not achieving viral load suppression and present a risk of HIV transmission, we believe that focusing on those who are still in care should be prioritized to ensure that they stay in care. A study conducted in Kinshasa reported a 20.9% non-adherence rate (Musumari et al., 2014). This finding is similar to ours (18% non-adherence), although they used a combination of measurements (Smith et al., 2022). Our measurement included only self-report, whereas Musumari et al. combined self-report with pharmacy refill. Further, the previous authors used 95% of taking the prescribed pills for the last seven days as the cut-off for adherence; we included those who rarely forget with those who never forgot as adherents. The similarity makes us more confident in the way our assessments were conducted. Regardless of the differences in the methodologies, both studies show that adherence to ART is not optimal in DRC.

People who Disclosed their HIV status were more likely to be adherent to ART than those who did not disclose their status. This association is consistent with the literature that explains that, by disclosing your status to others, you will more likely not refrain from taking your treatment in the presence of others and, thus, will always take ART (Bulali et al., 2018; Buma et al., 2015). A study conducted in Goma, DRC, reported that people who did not share their HIV status were more likely to be lost to follow-up (Akilimali et al., 2017). It is believed that by disclosing your status, you will receive support from your partner, family, and friends and, therefore, maintain adherence to ART (Stirratt et al., 2006). However, this is not always true, as people can be discriminated against and stigmatized because they are known as HIV-positive (Makin et al., 2008; Seid et al., 2012). This can explain why in our study, those who disclosed to their partner were less likely to be adherent to ART than those who disclosed to no one. It is therefore suggested to provide patients with education to help them make informed choices on to whom to disclose their status (Stirratt et al., 2006).

We also found that health facilities with very good hospitality were likelier to have adherent patients than those with bad or fair hospitality. This finding was consistent with our expectations, as poor staff attitudes toward patients and low patient satisfaction with services have a negative impact on health outcomes (Lockton Affinity, 2022; Titi-Ofei et al., 2021). Several studies have also shown that dissatisfaction with health services or healthcare facilities led to less likelihood of adhering to ART than satisfaction with health services (Dibaba et al., 2021; Heestermans et al., 2016). Other studies reported that unpleasant experiences with clinic staff, such as rudeness, condemnation, and fatigue, were associated with non-adherence to ART (Boyer et al., 2011; Kagee et al., 2012; Penn et al., 2011). A low staff-to-patient ratio is one of the causes of negative clinical staff attitudes and can result in service inefficiency (Wachira et

al., 2014). This is generally seen in health facilities with high caseloads, where providers cannot effectively provide the necessary care, education, and instruction to help their patients understand their disease and adhere to ART. According to the WHO, quality care standards require person-centered care, which has been shown to improve outcomes, including adherence to ART (WHO, N.d.-c). In our study, however, only health facilities with caseloads of 152-459 had patients who were less likely to be adherent than those in facilities with fewer than 152 patients. This finding is similar to the one reported in Ethiopia, where the likelihood of adherence decreased with the increase in the number of patients in the facility (Wedajo et al., 2022). In our study, health facilities with caseloads of more than 459 patients were more likely to have adherent patients than health facilities with fewer than 152 patients. We believe that these bigger-size facilities have patients categorized as stable and transferred to facilities for long-term follow-up, resulting in having more stable patients concentrated in some facilities. These health facilities are also more likely to have experienced staff, which could positively affect adherence (Horberg et al., 2012).

Subjects receiving care at a secondary level facility were less likely to adhere to ART than those at a primary level facility (OR:0.133, CI [0.047,0.377]. The association might be explained by the organization of the healthcare delivery system in DRC, consisting of delivering the minimum package of primary health care, including curative, preventive, and promotional services at health centers, which are the primary level facilities (Mboko, 2019). Thus, the health centers are the first contact of PLHIV for testing and diagnosis, where the relationship between clinician and patient is established. Additionally, in health centers, patients see the same nurses throughout their care, while in secondary-level facilities, nurses rotate between departments, resulting in a lack of connection with patients. The continuity of the patient-clinician relationship

allows retention in care and, ultimately, better outcomes (Starfield et al., 2005). Also, when patients start their care at a higher-level facility and then are referred to a primary-level facility to receive the appropriate care, they tend to get lost in follow-up if there is no good planning (Decroo et al., 2009). Therefore, secondary level facilities in our study may have patients who have been off treatment while they were lost-to-follow-up. Our study suggests a need for establishing a good relationship between providers and patients, starting at the first contact.

The health zone of Kikula had patients who were less likely to adhere to treatment than those in the Likasi health zone. The health zone in DRC constitutes the operational unit for planning and implementing the health policy; it functions as an autonomous decentralized entity equipped with its own management bodies and its action plan (Ministère de la santé, 2008). Thus, if the health zone management team does not function at its best, the repercussions can be observed in the health facilities they manage. We suspect management must be the main reason based on a similar finding in the 2020 semi-annual report by SANRU, documenting that Kikula health zone did not achieve the expected performance level for HIV testing (SANRU, n.d.). The following reasons could explain our findings. First, the caseloads. The health zone of Kikula was, on one hand, most likely to have health facilities of 152-459 caseloads, which were also negatively associated with adherence; the management could be overwhelmed and consequently not provide the necessary support the health facilities needed and thus, resulting in health services inefficiencies. On the other hand, Kikula was less likely to have facilities of >459 caseloads, which showed a positive association with adherence. Second, the education level of people in the Kikula health zone was lower. Although the association was not significant, we found that patients with secondary or college-level education were more likely to be adherent than not adherent compared to those with primary or no formal education. When comparing the

education level in health zones, we found that people in Kikula were significantly less likely to have secondary or college-level education than primary education or no formal education compared to those in the Likasi health zone. The literature has demonstrated the relationship between a lower level of education, lower health literacy, and poor health (van der Heide et al., 2013). Prior studies also showed an association between non-adherence and low education level (Heestermans et al., 2016), as well as between non-adherence and low literacy (Waite et al., 2008; Wolf et al., 2007).

Limitations

This study has limitations, including the following. First, the cross-sectional design limits the establishment of a causal relationship, it is possible that confounding factors affect the relationship between adherence to ART and the predictors. Second, since we sampled participants at the health facility level, the results cannot be generalized to other settings or the whole population. Third, although self-report for adherence has been established as a practical method to assess adherence to ART (Been et al., 2017; Mekuria et al., 2016), and have a significant association with viral load (Nieuwkerk & Oort, 2005), this method can overestimate our outcome because of recall bias and social desirability bias (Nieuwkerk et al., 2010). Nevertheless, any other method of adherence measurement would have a limitation as suggested in a literature review. Regardless of these limitations, this is the first study conducted in Likasi, an understudied area, to assess the factors influencing adherence to ART. It constitutes, therefore, a reference for future studies and replication in other settings.

Recommendations

The findings of this study emphasize the importance of conducting research in less explored areas because of the geographical differences in HIV prevalence and outcomes and provide evidence-based recommendations.

We recommend a few initiatives at the program management and health facility levels to increase adherence to ART and promote associated factors in Likasi.

Health zones should organize care at different health facilities by ensuring that appropriate policies are in place, including those that enable to:

- Tasks sharing between different health system levels to match human and structure capacity (World Health Organization, 2021). The health zone of Kikula had a poor adherence outcome compared to the other health zones, and it also had more facilities with 152-459 patients. Having the tasks shared with community workers can unload health facilities and result in better monitoring of patient (Mukherjee et al., 2016).
- Provide ongoing training, mentoring, supportive supervision, and monitoring of healthcare and community workers to improve patient-provider relationships and enable discussion of ART adherence.
- Implement and encourage strategies such as mobile phone text messages to remind patients not to forget to take their medicine and use peer counselors for support (World Health Organization, 2021).

Practitioners should be aware and reminded of the risk of non-adherence and integrate effective ART adherence strategies, including the following:

- Go through ongoing training about patient care in general and learn new skills about medication adherence.

- Build trust with patients and address stigma.
- Educate the patient continuously to take ART as prescribed.
- Assess patients' adherence regularly.

Further research that includes follow-up of patients and measures different time points of adherence will be beneficial to assess the causality. This will require assessing adherence at every clinic visit and daily by community healthcare workers or support groups. Additionally, combining different adherence measurements will provide better insight into adherence.

Conclusion

This study aimed to determine the factors associated with adherence to ART in Likasi. The results show that adherence to ART is a problem and is associated with patient and facility factors, including disclosing status, to whom disclosed status, facility size, healthcare structure type, hospitality at the health facility, and health zone. The health zone management team could use these results to improve the services provided in the health facilities. Practitioners could target these factors to reinforce adherence. These actions will help achieve viral load suppression and ultimately control HIV. Because this study is the first to assess the factors associated with adherence to ART in Likasi, it fills the existing literature gap.

CHAPTER 4:
FACTORS ASSOCIATED WITH VIRAL LOAD SUPPRESSION[2]

[2] Kabongo, M.M., Haider, M.R., Sekandi, J., and Lukanu, P. To be submitted to the HIV Medicine Journal.

Abstract

Statement of the problem. The issue of failure of viral load suppression targets attainment in low- and middle-income countries, including the DRC, suggests continued HIV transmission, mortality, and morbidity. The lack of studies in the DRC and the focus of the few studies in the province of Kinshasa call for examining less explored areas to develop evidence-based policies and strategies to address the problem. This study determines the factors associated with viral load suppression to contribute to the control of HIV and to address the lack of research evidence in Likasi. **Methods.** A cross-sectional study was conducted in 2021 among adult HIV patients taking ART in 42 health facilities in Likasi. Viral load level was the most recent value, and viral load suppression was defined using the 1000 copies/mL WHO cut-off. The predictors were determined by the Andersen-Newman framework and literature review. Using SAS software, bivariate analysis and multivariate logistic regression were performed to determine the socio-demographic, clinical, and facility factors associated with viral load suppression. **Results.** Out of 367 participants included in this study, 26 % of PLHIV did not suppress their viral load. The likelihood of suppressing viral load was higher in 1) adherent patients and 2) those who disclosed their HIV status. Subjects with an NGO support group and those from a secondary-level facility were less likely to suppress their viral load. **Conclusions.** The DRC was not on track with the UNAIDS targets in 2020. Likasi is behind the UNAIDS viral load goal achievement. Several factors impact viral load suppression. Practitioners and policymakers could target these factors to improve viral load suppression and contribute to achieving HIV control. Future research could use this study as a baseline.

INDEX WORDS: HIV, Viral load suppression, ART adherence, Patients' Factors, Health Facilities' Factors, Likasi, DRC.

Methods

The research setting, the ethical procedures, the data collection, and the descriptive analysis are detailed in Chapter III.

Research Design

This is a cross-sectional study assessing the risk factors associated with viral load suppression.

Data Analysis

The Excel file containing de-identified data was exported into SAS for analysis.

Outcome

The outcome of this study is Viral load suppression.

Viral load suppression (VLSup) was determined using the WHO definition of "less than 1000 copies/ml" (PEPFAR, 2019, p. 159). The viral load levels were the most recently recorded in the patient's charts, and viral load suppression was transcribed as "Yes" or "No" if the viral load value was < 1000 or >= 1000 copies/ml, respectively.

Independent Variables

Based on the literature review and the Andersen framework (described in the literature review), patients' sociodemographic and clinical characteristics and facility characteristics were included in this study.

The independent variables of interest for this study included age, gender, education level, marital status, employment status, HIV status disclosure, to whom disclosed status, NGO support group, peer support group, means of transport, duration on ART, WHO stage, hospitality at the facility, health zone, healthcare structure type, healthcare facility size.

Bivariate Analysis

A bivariate analysis assessed the relationship between each independent variable and viral load suppression. The Chi-square test of independence was performed, and a $p<0.05$ was used to determine the statistical significance of the association.

Multivariate Analysis

Logistic regression was done to determine the association of each independent variable with viral load suppression, controlling for other variables.

All the variables were included in the logistic regression. Odds Ratios and 95% CI were used to measure the strength, and the statistical significance of the associations was assessed at $p<0.05$.

Results

This study assessed the factors related to viral load suppression in Likasi, DRC; the findings are as follows.

Factors Associated with Viral Load Suppression

26 % of PLHIV did not suppress their viral load. The following factors had a significant association with viral load suppression. Adherence to ART, Disclose HIV status, to who disclose status, structure type, hospitality at the facility, NGO support group, and pickup interval. Table 4.1 details the relationship of each independent variable with viral load suppression and reports the associated chi-square and p-value.

Table 4.1

Association of Sociodemographic, Clinical, and Facility Characteristics with Viral Load Suppression

	VL Suppressed		VL not Suppressed		Chisq	p value
Characteristic	N	%	N	%		
Socio-demographics factors						
Sex					0.043	0.836
Male	95	25.89	33	8.99		
Female	175	47.68	64	17.44		
Age					0.107	0.947
Age <=29	68	18.53	26	7.08		
Age 30-44	135	36.78	47	12.81		
Age >44	67	18.26	24	6.54		
Occupation					0.248	0.619
Unemployed	79	21.53	31	8.45		
Employed	191	52.04	66	17.98		
Marital status					0.944	0.624
Married/cohabiting	176	47.96	60	16.35		
Single	49	13.35	22	5.99		
Widow or divorced	45	12.26	15	4.09		
Education status					0.183	0.669
None or Primary	124	22.79	47	12.81		
High School or College	146	39.78	50	13.62		
Means of transport					1.924	0.382
Walk	111	30.25	46	12.53		
Motorcycle	125	34.06	37	10.08		
Bike or Car	34	9.26	14	3.81		
Disclosed HIV status?					7.145	0.0075*
No	60	16.35	35	9.54		
Yes	210	57.22	62	16.89		
To whom disclose					9.258	0.0098*
No one	60	16.35	35	9.54		
Partner	109	29.7	39	10.63		
Other	101	27.52	23	6.27		
Clinical factors						
Duration on ART					0.0591	0.808
<=12 months	102	27.79	38	10.35		
>12 months	168	45.78	59	16.08		

Table 4.1 (Continued).

WHO stage					4.575	0.101
Stage 1	184	50.14	58	15.80		
stage 2	64	17.44	24	6.54		
stage 3-4	22	5.99	15	4.09		
Adherence					79.861	<.0001*
Not adherent	19	5.18	46	12.53		
Adherent	251	68.39	51	13.90		
Facility factors						
Structure type					5.331	0.021*
Primary level	188	51.23	55	14.99		
Secondary level	82	22.34	42	11.44		
Health zone					3.036	0.219
Likasi	71	19.35	22	5.99		
Kikula	109	29.7	49	13.35		
Kambove	90	24.52	26	7.08		
Facility size					0.364	0.833
<=151	83	22.62	28	7.63		
152-459	124	33.79	48	13.08		
>459	63	17.17	21	5.72		
Meds Pick up interval					7.592	0.023*
1-month	33	8.99	21	5.72		
3-months	193	52.59	68	18.53		
6-month	44	11.99	8	2.18		
Hospitality at the facility					16.826	0.0002*
Fair or Bad	9	2.45	12	3.27		
Good	131	35.69	56	15.26		
Very good	130	35.42	29	7.90		
Peer Support					1.118	0.29
No	213	58.36	71	19.45		
Yes	56	15.34	25	6.85		
NGO Support group					9.159	0.0025*
No	193	52.59	53	14.44		
Yes	77	20.98	44	11.99		

Note. N=367. Association of each independent variable with viral load suppression.

Multivariate Analysis of Factors Associated with Viral Load Suppression

After multivariate analysis, the following factors remained significantly associated with viral load suppression. Adherence to ART, Disclose status, Structure type, and NGO support group.

People who were adherent to ART were most likely to suppress their viral load than those who were not adherent (OR=10.934, 95% CI [5.13,23.306]. Subject who had an NGO support group were less likely to suppress their viral load than those who did not have one (OR= 0.383, 95% CI [0.178,0.824]. People who disclosed their HIV status were more likely to suppress their viral load than those who did not disclose their status (OR=2.324, 95% CI [1.037,5.208]. People who attended a secondary level facility were less likely to suppress their viral load then those who attended a primary level (OR=0.187, 95% CI [0.076,0.461]. Table 4.2 provides the results of the multivariate analysis of factors associated to viral load suppression.

Table 4.2

Multivariate Analysis of Factors Associated with Viral Load Suppression.

Characteristic	VL Suppressed OR	95% CI LL	UL	p value
Socio-demographics factors				
Sex				
Male	1			
Female	0.994	0.506	1.952	0.9861
Age				
Age <=29	1			
Age 30-44	1.228	0.576	2.618	0.5957
Age >44	0.847	0.352	2.037	0.7112
Occupation				
Unemployed	1			
Employed	0.777	0.394	1.53	0.4652
Marital status				
Married/cohabiting	1			
Single	0.808	0.346	1.885	0.6217
Widow or Divorced	2.062	0.74	5.744	0.1664
Education status				
None or Primary	1			
High School or College	0.922	0.467	1.819	0.815
Means of transport				
Walk	1			
Motorcycle	1.181	0.602	2.319	0.6284
Bike or Car	0.762	0.296	1.962	0.5737
Disclosed HIV status?				
No	1			
Yes	2.324	1.037	5.208	0.0406*
To whom disclose				
No one	1			
Partner	0.736	0.323	1.68	0.4669
Other				
Clinical factors				
Duration on ART				
<=12 months	1			
>12 months	1.594	0.811	3.131	0.1763

Table 4.2 (Continued).

WHO stage				
Stage 1	1			
stage 2	0.872	0.426	1.786	0.7083
stage 3-4	0.819	0.323	2.08	0.6748
Adherence				
Not adherent	1			
Adherent	10.934	5.13	23.306	<.0001*
Facility factors				
Structure type				
Primary level	1			
Secondary level	0.187	0.076	0.461	0.0003*
Health zone				
Likasi	1			
Kikula	0.872	0.382	1.991	0.7449
Kambove	1.175	0.474	2.916	0.7277
Facility size				
<=151	1			
152-459	2.08	0.929	4.656	0.0747
>459	3.11	0.96	10.075	0.0585
Meds Pick up interval				
1-month	1			
3-months	1.289	0.547	3.038	0.5611
6-month	1.18	0.346	4.021	0.7917
Hospitality at the facility				
Fair or Bad	1			
Good	1.556	0.442	5.477	0.4912
Very good	2.945	0.786	11.028	0.1089
Peer Support				
No	1			
Yes	0.631	0.304	1.309	0.216
NGO Support group				
No	1			
Yes	0.383	0.178	0.824	0.014*

Note. N = 365. This table contains the odds ratio of factors associated with viral load suppression. OR=Odds Ratio; C.I. = confidence interval; LL = lower limit; UL = upper limit. *=statistically significant association.

Discussion

We conducted a cross-sectional study to determine the factors associated with viral load suppression among PLHIV in Likasi. Our Hypothesis was: “There are differences between PLHIV who suppressed and those who did not suppress their viral load on the patients, clinical and healthcare facility factors.” This section includes a summary and interpretation of the major findings of our investigation.

The analysis of the data shows that 26 % of PLHIV in Likasi did not suppress their viral load. In line with the Andersen and Newman framework of health services utilization and our hypothesis, the following factors were associated with viral load suppression. Adherence to ART, disclosing HIV status, health facility structure type, and NGO support group.

The 26% of people who did not suppress their viral load represent a risk to the non-achievement of HIV control because it infers potential HIV transmission and increased incidence in this community and general population (Das et al., 2010; Rozhnova et al., 2018; Tanser et al., 2017). Our finding is slightly different from the 19 % reported by a most recent study on viral load suppression in two provinces of DRC, including the Haut-Katanga, where Likasi is located, that suggested that there was a lot to do regarding the viral load suppression (Shah et al., 2021). Our finding is also different from the results of another study in the city of Kinshasa, which reported 82.3% viral load suppression (Ngongo et al., 2023). Besides the fact that these two prior studies used the same database, which explains why their numbers are close, the difference with our study can be explained by the variation of HIV distribution within a country and province (Kleinschmidt et al., 2007; Mweemba et al., 2022; Shaikh et al., 2006), which was one of the reasons that drove the focus of this present study on Likasi, a less explored region. Our higher

number of people who did not suppress their viral load might be attributed to the one-time viral load measurement, while other studies reported a mean value. To our knowledge, the dataset used by the other studies has many missing and invalid viral load data that can lead to under- or overestimating the mean value. In fact, a cross-sectional study that measured viral load levels by testing patients in Kinshasa reported viral load suppression at 62% (Yotebieng et al., 2019). Additionally, the PNMLS reported only 15.7% viral load suppression in 2019 (PNMLS, 2020). Nevertheless, all the reported rates of viral load suppression in our study and in previous studies are below the UNAIDS requirements of 95% and indicate that viral load non-suppression is a problem in Likasi and DRC overall and HIV control is in jeopardy. It is noteworthy to mention that the discrepancy between our study and the national reports is most likely due to our research setting being one of the areas that receive PEPFAR support, which allows integrating HIV services better than where there is no support. The DRC is a huge country with about 519 health zones; the outcomes of better health services provided in the 7 health zones covered by the TUSIMAME project are hidden by the greater number of PEPFAR or other organizations' non-covered areas. This study shows that where there is better health service, the outcome is also better and calls for continued funding to better control HIV.

The result shows that the likelihood of suppressing viral load was higher in subjects who were adherent to treatment than those who were not adherent (OR=10.934, 95% CI [5.13,23.306]. This result is in accordance with our expectations. The plausible explanation of this association is the fact that missing a dose gives an opportunity for the virus to grow rapidly and thus not to achieve viral load suppression (HIV.gov, 2023b). There is strong evidence about this relationship, including the following. The assessment of the level of virus in the blood demonstrated that lower ART adherence increases the risk of persistent low-level viremia

(Konstantopoulos et al., 2015), and poor adherence increases the level of HIV RNA levels (Pasternak et al., 2012). Also, in longitudinal studies, it was reported that people with suboptimal adherence had more detectable viral load than those with best adherence (Bijker et al., 2017; Milward de Azevedo Meiners et al., 2023). Further, a Randomized Control Trial found a negative association between poor self-report adherence and viral load suppression (Coker et al., 2015). Our finding suggests a need of monitoring and assessing ART adherence to achieve viral load suppression in Likasi.

People who Disclosed their HIV status were more likely to suppress their viral load than those who did not disclose (OR=2.324, 95% CI [1.037,5.208]. This association is consistent with the literature that explains that, by disclosing your status to others, you will more likely not refrain from taking your treatment in the presence of others and, thus, will always take ART (Bulali et al., 2018; Buma et al., 2015). Consequently, as explained above, with adherence to ART, it is expected to have viral load suppression. Similar findings were reported by others showing a significant association between either non-disclosure with non-viral load suppression or disclosure with viral load suppression (Melis Berhe et al., 2020; Sithole et al., 2018). However, another study reported a non-significant positive association between non-disclosure and viral load non-suppression in the heterosexual group and a negative association in the MSM group (Daskalopoulou et al., 2017). This negative relationship in the MSM group is most likely due to the associated stigma that refrains them from disclosing their status (Hirsch Allen et al., 2014) and consequently leads to less adherence to ART and viral load non-suppression as explained above. It is possible that people who did not disclose their status in Likasi face stigma that impedes their viral load suppression. Our finding suggests that patients should be

empowered and supported to take their medicine regardless of the environment or people surrounding them.

In this study, PLHIV who had an NGO support group were less likely to suppress their viral load than those who did not have one (OR= 0.383, 95% CI [0.178,0.824]. This finding can be interpreted as the NGO has a negative impact on viral load suppression. The WHO recommends HIV programs to integrate support groups to address retention and ART adherence (World Health Organization, 2016). A literature review that assessed the impact of HIV support groups suggested that support groups contribute to increasing PLHIV's health literacy and improve outcomes, including mortality, morbidity, retention in care, quality of life, and enhanced treatment success (Bateganya et al., 2015). Thus, we expected to find a positive relationship between NGO support groups and viral load suppression in this study. However, our results did not corroborate with the review or with other studies' findings, including the following. 1) A study conducted in Uganda that reported that belonging to a support group was significantly associated with viral load suppression (Gordon et al., 2022), 2) In Rwanda, participation in HIV association was associated with low risk of detectable viral load(Elul et al., 2013). 3) In Canada, it was shown that better social support was associated with a great likelihood of viral load suppression (Burgoyne, 2005). 4) In the USA, they reported that MSM who had medium or high social support were more likely to suppress their viral load compared to those with low social support (Friedman et al., 2017). Our findings are similar to those reported in a randomized study in Zimbabwe that found that women who received motivational enhanced adherence counseling were less likely to be virally suppressed than those who did not receive it (Mutambanengwe-Jacob et al., 2022). Other authors reported no significant association between participation in a support group and viral load suppression in Rwanda (Barnhart et al., 2022) and other African

countries, including Kenya, Tanzania, Uganda, and Nigeria (Mbah et al., 2021). The differences in the types of association between the support groups and viral load might be due to the variety of support groups' main goals. If a support group focuses on a community's specific need, they can miss other factors that are not the focus of their programs. Indeed, according to SANRU, there was only one NGO support group that served the health facilities included in this study, and it was in the health zone of Kikula. The focus of this NGO was offering stand-alone Voluntary Counseling and Testing (VCT) and mobile HIV Testing Services (HTS) (SANRU, 2020). Thus, the negative relationship found in this study might be due to NGO's focus on testing. It is important to mention that all patients enrolled in the health facilities under TUSIMAME were offered the opportunity to join a self-support group with the goal of reinforcing and enhancing adherence to ART. However, we did not find any association of this type of support group with viral load suppression or adherence to ART. It is, therefore, essential to ensure that the support groups assist PLHIV in suppressing their viral load.

Subjects receiving care at a secondary level facility were less likely to suppress their viral load than those receiving care at a primary level facility (OR=0.187, 95% CI [0.076,0.461]. Our findings are similar to those reported in Zimbabwe, where the odds of non-suppression were higher in secondary and tertiary levels health facilities compared to primary levels care settings (Mhlanga et al., 2022). The association might be explained by the organization of the healthcare delivery system in DRC, consisting of the delivery of the minimum package of primary health care, including curative, preventive, and promotional services at health centers, which are the primary level facilities (Mboko, 2019). Thus, the health centers are the first contact of PLHIV for testing and diagnosis and where the relationship between clinician and patient is established. Additionally, in health centers, patients see the same nurses throughout their care, while in

secondary-level facilities, nurses rotate between departments, resulting in a lack of connection with patients. The continuity of the relationship patient-clinician allows retention in care and, ultimately, better outcomes such as viral load suppression (Starfield et al., 2005). Also, when patients start their care at a higher-level facility and then are referred to a primary-level facility to receive the appropriate care, they tend to get lost in follow-up if there is no good planning (Decroo et al., 2009). It is possible, therefore, that secondary-level facilities in our study have patients who have been off treatment while they were lost-to-follow-up. Our study suggests a need for establishing a good relationship between providers and patients, starting at the first contact.

Limitations

This study has limitations, including the following. First, the cross-sectional design limits the establishment of a causal relationship, it is possible that confounding factors affect the relationship between viral load suppression and the predictors. Second, since we sampled participants at the health facility level, the results cannot be generalized to other settings or the whole population. Lastly, Viral load measurements can differ daily, and therefore long-term trends are used to evaluate disease progression. Nevertheless, this is the first study conducted in Likasi to assess the factors that influence viral load suppression. It provides insights about what to keep an eye on to achieve viral load suppression. It also constitutes a reference for future studies and replication in other settings.

Recommendations

The findings of this study emphasize the importance of conducting research in less explored areas because of the geographical differences in HIV prevalence and outcomes, to provide evidence-based recommendations. We recommend a few initiatives at the program

management level as well as at the health facility level, to increase viral load suppression and promote associated factors in Likasi.

The management should:

- Advocate for evidence-based policies to increase viral load suppression and promote associated factors.
- Train practitioners and community workers involved in ART delivery, to build and maintain a relationship with their patients to enable discussion on viral load suppression.
- Develop partnerships with NGOs and other established advocacy groups to provide support that target viral load suppression.
- Coordinate collaboration between health facilities to ensure appropriate transfer of patients from one facility to another for sustained care (World Health Organization, 2021).

At the facility level, practitioners should be aware of the risk of viral load non-suppression and integrate effective strategies, including the following:

- Increase adherence to ART by continuously educating patients to take ART as prescribed and assess how they do it.
- Perform ongoing counseling about the benefits and risks of disclosing their HIV status to others and enable them to determine whether, when, how, and to whom to disclose their status (World Health Organization, 2021).
- Acquire competencies to reduce stigma, which can be a barrier to viral load suppression.

Researchers could further investigate viral load suppression to assess causality by using longitudinal data and measuring viral load levels at different time points. Also, including a representative sample of the whole population will be useful for results generalization.

Conclusion

This study aimed to determine the factors associated with viral load suppression in Likasi and address the lack of studies. The results show that viral load suppression is a problem in Likasi and is associated with patients and facility factors, including adherence ART, disclosing HIV status, health facility structure type, and NGO support group. The health zone management team could use these results to improve the services provided in the health facilities. Practitioners could target these factors to reinforce the achievement of viral load suppression and ultimately HIV control. Because this study is the first assessing the factors associated with viral load suppression in Likasi, it fills the existing literature gap.

CHAPTER 5: SYNTHESIS AND IMPLICATIONS

The two previous chapters presented the details of each of the manuscripts included in our project. This Chapter will provide a summary of the two studies and overall discussion, including the implications for practice and future research.

Summary

HIV/AIDS is still a public health problem in the world and disproportionately affects sub-Saharan Africa (Avert, 2020; WHO, 2020, 2021). The UNAIDS leads the global effort to address this issue and has set targets (HIV cascade) to measure the progress towards elimination of this global epidemic (KFF, 2021). The shortfall of previous 90-90-90 UNAIDS targets in low- and middle-income countries such as the DRC suggests continued HIV transmission and perpetuates HIV/AIDS-related mortality and morbidity and hinders the achievement of the current HIV elimination target set for 2030. Viral load suppression is the ultimate outcome of the HIV care and is the preferred approach to monitor the treatment response. Adherence to ART is the primary determinant of viral load suppression and it should be assessed to complement the viral load assessment (World Health Organization, 2021). This study purpose was to contribute to the HIV control in the DRC and the goal was to determine the patients and facility factors that influence viral load suppression and adherence to ART in Likasi, one of the less explored regions. We hypothesized that there were differences between PLHIV adherent to ART and those who were not adherent to ART as well as between those who suppressed and those who did not suppress their viral load.

We conducted a cross-sectional study using a survey performed on PLHIV in health zones in Likasi. The Andersen and Newman framework and the literature review were used to determine the predictors. Bivariate and multivariate logistic regression were performed to determine the association with each the two outcomes.

This study found that only 82% of PLHIV were adherent to ART and 74% suppressed their viral. These two outcomes were differently associated with patients and facility factors. Adherence to ART was significantly associated with disclose status, to who disclose status, structure type, hospitality, facility size, and health zone. Viral load suppression was significantly associated with adherence to ART, disclosing HIV status, structure type, and NGO support.

Discussion

Viral load suppression is central to the achievement of the end of the HIV pandemic because there is no cure for HIV, and it allows to lessen the risk of transmission and reduce morbidity and mortality. Adherence to ART is essential to sustain viral load suppression in PLHIV and non-adherence is the main cause of viral load non-suppression (Altice et al., 2019; Myer et al., 2019). The best way to assess adherence is by testing the viral load level. In other words, a low viral load level or viral load suppression implies optimal adherence. In resource-limited areas, it is difficult to measure viral load; therefore, alternatives are used to determine adherence, including self-report, medicine counts, pharmacy records, and electronic monitoring (Smith et al., 2022).

Our results show a low adherence rate (82%) and a low viral load suppression rate (74%). The relationship between adherence and viral load suppression is not linear; other factors influence viral load suppression, including drug resistance, history of suppression, pharmacokinetics such as absorption, genetics, and drug interaction (Smith et al., 2022). The

non-linear relationship explains why the rates are not equal. Our adherence rate is similar to what was found in another study in Kinshasa DRC, which reported 20.9% non-adherence (Musumari et al., 2014). The viral load suppression rate in our study is slightly different from previous studies in DRC that reported 81% and 82% (Ngongo et al., 2023; Shah et al., 2021), but very different from the national report of 15% (PNMLS, 2020). The discrepancy with the national data is most likely due to the better HIV service coverage in Likasi by the PEPFAR support.

This study shows that adherence to ART and viral load suppression are differently impacted by patients and facility factors. Viral load suppression is significantly associated with adherence to ART, disclosing HIV status, structure type, and NGO support group. Only disclosing status and structure type are the predictors for both outcomes. This finding underscores the importance of assessing the two outcomes to get a comprehensive picture of factors that impact the achievement of HIV control.

The association of disclosure of status and the two outcomes is consistent with the literature that explains that, by disclosing your status to others, you will more likely not refrain from taking your treatment in the presence of others and, thus, will always take ART and ultimately suppress your viral load (Bulali et al., 2018; Buma et al., 2015). Additionally, when disclosing status, the hope is to receive support from people you disclose to (partner, family and friends) to help maintain adherence to ART (Stirratt et al., 2006). However, this not always true as people can be discriminated and stigmatized because they are known as HIV positive (Seid et al., 2012). In our study, those who disclosed to their partner were less likely to be adherent to ART than those who disclosed to no one. It is therefore suggested to provide patients with education to help them make informed choices on to whom to disclose their status (Stirratt et al., 2006).

The organization of the healthcare delivery system in DRC consists of the delivery of the minimum package of primary health care, including curative, preventive, and promotional services at health centers, which are the primary level facilities (Mboko, 2019). This structure explains the negative outcomes of adherence and viral load suppression in secondary levels facilities. Health centers are the first contact of PLHIV for testing and diagnosis and where the relationship between clinician and patient is established. When patients stay in the same health center, they see the same nurses throughout their care, while in secondary-level facilities, nurses rotate between departments, resulting in a lack of connection with patients. The continuity of the relationship patient-clinician allows retention in care and, ultimately, better outcomes (Starfield et al., 2005). Also, when patients start their care at a higher-level facility and then are referred to a primary-level facility to receive the appropriate care, they tend to get lost in follow-up if there is no good planning (Decroo et al., 2009). It is possible, therefore, that secondary-level facilities in our study have patients who have been off treatment while they were lost-to-follow-up. Our study suggests a need for establishing a good relationship between providers and patients, starting at the first contact.

It is noteworthy to point out the connection between some factors. The health zone of Kikula had significantly lower odds of adherence to ART. There were no association between health zone and viral load suppression in the bivariate analysis, but the odds were lower in the health zone of Kikula in the multivariate analysis. It is in this health zone that the only NGO support group that partnered with the TUSIMAME project was located. The NGO support group was significantly associated with viral load non-suppression. The odds of adherence were lower among those who had the NGO support compared to those who did not. The expected outcome for an NGO support group should be increased adherence and viral load suppression. The

negative findings from our study calls for assessing the activities the NGO carries and align them with adherence and viral load suppression. This health zone also had the most facilities of 152-459 patients, which is negatively associated with adherence. This correlation suggests inefficiency in this health zone's management.

Limitations

The limitations of this study include the following. First, the cross-sectional design limits the establishment of causal relationship between the outcomes and predictors. Second, since we sampled participants at health facility-level, the results cannot be generalized to other settings nor the whole population. Third, self-report for adherence can overestimate our outcome because of recall bias and social desirability bias. Lastly, Viral load measurements can differ daily, and therefore long-term trends are used to evaluate disease progression.

Nevertheless, this original research conducted in an understudied area, provides significant knowledge on this topic.

Practical and Policy Implications

Viral load and adherence to ART are two essential outcomes that need to be monitored to control HIV. This study reported low rates and provided factors influencing these outcomes in Likasi. Non-adherence and viral load non-suppression have consequences on the population's health as well as on the efficiency of the healthcare system.

Given that it is the healthcare system's responsibility to provide care to PLHIV to achieve viral load suppression, several practical implications can be drawn from the findings of this study. The findings can help health leaders reshape how the system operates, the types of services and resources available, and health providers to think and act differently in managing HIV patients.

Recommendations

The following are a few strategies that can be implemented at the management and health facility levels.

- Organize care in health facilities to allow task-sharing and community empowerment (World Health Organization, 2021). This is particularly important in health facilities and health zones that have more patients, allowing community workers to provide care in the community rather than having patients go back to the clinic where there is not enough resource. This will reduce the health facilities' workload and result in quality care.
- Provide and perform ongoing training, mentoring, supportive supervision, and monitoring of healthcare workers and community workers (World Health Organization, 2021). This is important to build and maintain the patient-practitioner relationship from the beginning at a health facility regardless of the time and place that the patient has been on ART. A good provider-patient relationship allows better discussion and helps address issues when they arise.
- Monitor patients' viral load suppression and adherence to ART regularly using any of the recommended methods to ensure that they are on track to HIV control.
- Emphasize on stigma and discrimination reduction, especially in regard to PLHIV taking their medication without worrying about who is seeing them taking it.
- Implement and encourage the use of mobile phone messages and peer counselors, to help not forgetting to take medicine (World Health Organization, 2021). This strategy will be helpful considering that adherence in this study was based on the forgetfulness of taking ART. Behavioral and motivational intervention, memory aids and reminders can improve patient' adherence.

- Collaborate with NGO support groups to expand their services and include health literacy in their program, particularly about the importance of treatment to achieve the expected outcome of viral load suppression. Extend the collaboration to other stakeholders to supports PLHIV. Review the role of self-support groups to ensure that they incorporate viral load suppression and adherence to ART support.

Future Research

Future research should further investigate viral load suppression and adherence to ART in different ways, including the following. Use longitudinal data and assess causality. Include a representative sample of the whole population to generalize the results. A combination of different methods of adherence measurement can help increase the sensitivity to predict virologic failure (Ngowi et al., 2022).

Conclusion

This study's purpose was to contribute to HIV control in the DRC and to fill the research gap. The goal was to determine the patient and facility factors that influence viral load suppression and adherence to ART in Likasi, one of the less explored regions. While this research emphasized on the relationship between viral load suppression and adherence to ART, it also underscores that these outcomes are not impacted in the same way. Thus, future research should consider assessing both outcomes to provide comprehensive recommendations.

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APPENDICES

APPENDIX A

Questionnaire d'étude sur les facteurs de persistance de la charge virale chez les PVVIH sous ARV

Questions de recherche

1. Quel est le profil Sociodémographique des patients sous ARV avec charge virale non supprimées
2. Est-ce le coût de prise en charge des PVVIH sous traitement est réellement gratuite ?

Facteurs de persistance de la Charge virale chez le PVVIH sous traitement ARV.

Information Générale

La suppression de la charge virale est l'expression de l'efficacité du traitement correctement suivi pour une PVVIH. La non-suppression de la CV virale constitue un problème de santé publique en ce sens que la PVVIH, en plus de faire face à la recrudescence des infections opportunistes, reste contaminant et constitue donc un danger pour lui-même et pour son environnement social et sexuel.

Ce projet de questionnaire vise à élucider les facteurs de persistance de la charge virale chez les PVVIH en dépit d'un traitement administré au 6e et/ou au 12e mois du traitement en vue d'améliorer l'efficacité thérapeutique encore < 95% qui est l'objectif mondial dans l'optique de l'élimination du VIH/SIDA d'ici 2030.

Consentement éclairé

Chaque participant à cette étude devra accepter d'y participer et de répondre librement aux questions lui soumises. Le participant a le libre choix de continuer ou de se retirer de l'étude quand il veut et aucun préjudice ne lui sera infligé.

Les réponses sont anonymes et ne seront utilisées que pour l'intérêt des programmes du contrôle du VIH/SIDA. Aucune identité ni information pouvant conduire à la personne ne seront diffusées.

Toutes les PVVIH de moins de 18 ans devront recueillir l'assentiment d'un des parents ou gardiens avant l'administration du questionnaire.

Merci d'appeler le numéro *+243 815 190 382* pour tout besoin d'informations ou pour toute autre préoccupation ou encore pour signaler un fait en rapport avec l'atteinte de la dignité humaine.

A Compléter par la PVVIH.

Je reconnais avoir pris connaissance des objectifs de cette étude et accepte en toute liberté de participer à cette étude et améliorer les interventions en faveur des PVVIV.

Code ou Initials des noms :____________________________

Date : _____/_____/_________

Signature Participant Signature Enquêteur

______________________ ______________________

QUEFPCV

Merci de cocher la réponse ☑

Partie I. Informations de la structure

1. Type de structure

   1. HGR ☐ 2. CSR☐ 3. CS☐
   4. Autres☐ ____

2. Combien des personnes sont commis a la gestion des activités de lutte contre les VIH/SIDA :
   |______________| _

3. Le responsable direct commis à la gestion des activités de lutte contre le VIH/SIDA est :
   1. Médecin☐ 2. Infirmier(e)☐
   2. Autres (à preciser) ☐

   ____

4. Quel est le paquet d'intervention VIH/SIDA est intégré dans la structure
   1. PTME, Key Pop, OVC, Prep ☐
   2. Dépistage ☐
   3. Prise en charge Médicale (IO/ARV) ☐
   4. TB/VIH ☐
   5. Rétention et suppression(VL) ☐

5. Combien des malades suivez-vous en ce moment au niveau de votre structure ?
   F :………M :…………dont Enf :………. M………F…………Total :……………..

6. Avez-vous connu une rupture en intrants de lutte contre les VIH SIDA : un ou plus y compris les ARV ?

   1. Oui ☐ (Si oui, répondez a la question 7)
   2. Non ☐ (Si non, passez a la question 8)

.

7. Si oui lequel ?

   1. Test VIH ☐ durée de : …………. Jours
   2. Test TBC ☐ durée de : …………. Jours
   3. ARV ☐ durée de : …………jours
   4. INH ☐ durée de : ……….....jours
   5. Médicaments contre les IO☐ Durée : …………. Jours

   Lesquels et nombre de jours de rupture :

   ……………………………………………………………………………
   ……………………………………………………………………………

   6. Autres à préciser et durée de rupture ☐

   ____

8. A quelle distance du BCZ est votre structure (en Km) ?

Partie II. Supervision

1. Avez-vous reçu au cours des 3 derniers mois une visite de supervision de la ZS adressant la gestion du VIH/SIDA

   1.Oui☐ 2. Non☐

2. Lequel des responsables suivants de la ZS vous a supervisé ?

   1. Médecin Chef de Zone de Santé ☐
   2. Superviseur de la Zone de Santé ☐
   3. Médecin Coordinateur Provincial ☐
   4. Pharmacien du BCZ……………. ☐
   5. MCP/AT PNLS Provincial ☐

3. Quels sont les cinq majeures recommandations avez-vous reçues des superviseurs?

   1 :………………………………………

   2 :……………………………………….

   3 :……………………………………….

   4 :……………………………………….

   5 :……………………………………….

4. Les aviez-vous résolues ?

Oui sauf………………………………………………………………………

Non (évoquer les raisons) :……………………………………………….

5. Avez-vous reçu au cours des 3 derniers mois au moins une visite de l'équipe de SANRU/CDC ?

   2.Oui ☐ 2. Non ☐

6. Quel âge avez-vous ? _________________ Sexe : M☐ F☐

7. Quel est votre niveau d'études : ………….

8. Depuis combien de temps êtes-vous dans la structure

   ____

9. A quand remonte votre dernière formation en paquet VIH/SIDA ?

   ____

10. Quand est-ce que vous avez intégré l'équipe de gestion des activités VIH

   ____

Partie III. Réservée aux PVVIH n'ayant pas supprimé

11.Patient ayant supprimee ☐ 12. Patient ayant supprimee ☐

13. Quel âge avez-vous ? |_____________|

14. Stade clinique OMS a l'admission:

   Stade1☐ stade2☐ stade3☐ stade 4☐

15. Sexe : 1. M ☐ 2. F☐

16. Quel est votre état civil ?

   1. Marié(e) ☐ 2. Célibataire☐ 3. Divorce(e)☐ 4. Veuf/Veuve☐
   5. En couple ☐

17. Quel est votre niveau d'étude.

   1.pas était à l'école primaire☐ 2. Primaire☐ 3. Secondaire☐ 4. Université☐

18. Depuis combien de temps êtes-vous sous ARV (information vérifiée par l'enquêteur dans le registre de suivi des malades sous ARV)?

   1. > 6 mois☐ 2. 6 mois☐ 3. 12 mois☐ 4. >12 mois☐

19. Il vous arrive d'oublier de prendre vos médicaments ?

1. Oui ☐ 2. Non ☐

20. A quelle fréquence il vous arrive d'oublier ?

1. Rarement ☐ 2.Souvent ☐ 3.Très souvent ☐

21. Dans quelles circonstances il vous arrive d'oublier ou de ne pas prendre vos médicaments (l'enquêteur cochera la réponse ici et ajutera le reste) ?

1. Rupture en médicaments au CS/HGR/PODI ………..… ☐
2. Voyage ……………………………………………… ☐
3. Manque de transport pour me réapprovisionner ……..… ☐
4. Manque de frais de consultation………………………. ☐
5. Autre ☐ (Préciser)

____

22. Lesquels des facteurs ou effets suivants vous empêche de prendre régulièrement votre médicament ?

1. Prise d'alcool ☐
2. Manque de motivation pour le traitement ☐
3. La rémission des symptômes cliniques ☐
4. Les effets secondaires des médicaments ☐
5. Le mauvais accueil du prestataires ☐
6. Manque de nourriture ☐
7. Manque d'appui familial ☐

23. A quelle distance êtes-vous de votre Centre de traitement

1. < 5Km ☐ 2. 5Km ☐ 3. 10Km ☐ 4. > 10Km ☐

24. A quelle fréquence vous vous approvisionnez en médicaments

1. Chaque mois ☐ 2. Chaque 3 mois ☐ 3. Chaque 6mois ☐ 4. Chaque 12 mois

25. Combien de temps faites au Centre a chaque RDV de retrait médicaments ou pour le laboratoire ?

1. 30 minutes ☐ 2. 1heure ☐ 3. 2heures ☐4. >2heures☐

26. Comment trouvez-vous l'accueil au centre de santé

    1.Mauvais ☐ 2. Passable ☐ 3. Bon☐4. Très bon☐

27. Que faites-vous dans la vie ?
    1. Dépends de ma famille (Rien) ☐
    2. Travail personnel….. ☐
    3. Travailleur rémunéré ☐ (Préciser)
       ____

28. Quel moyen utilisez-vous pour atteindre le centre de traitement ?
    1. Pieds……………….. ☐
    2. Vélo……………….. ☐
    3. Moto……………….. ☐
    4. Véhicule ………….... ☐

29. A combien vous revient la course aller – retour pour atteindre le centre (en FC) ?
    |____________________|

30. La consultation lors des RDV est-elle payante ou gratuite ?

    1. Gratuite…………….. ☐
    2. Payante…………….. ☐ (Si payante, préciser le prix d'une consultation en FC)
       |____________|

31. Est-ce les examens de Laboratoire dans le cadre du suivi de traitement sont gratuits ou payant ?
    1. Gratuits☐
    2. Payante☐ (Si payante, préciser le prix d'une consultation en FC)
       |______________________|
        - Suivi biologique. ☐ |_____________|
        - Charge virale …. ☐ |_____________|
        - Autres (a preciser) ☐ |_____________|
          ____

32. As-tu partagé ton statut sérologique avec quelqu'un?

1.Oui ☐ 2.Non ☐

33. Si oui avec :

1. Epoux/épouse …… ☐
2. Membre de famille… ☐
3. Mes enfants ……….. ☐
4. Mon ami(e)………… ☐
5. Pasteur/Prêtre …… ☐
6. Autres …………… ☐ (Préciser) ____

34. Faites-vous parti d'une association des PVVIH

1.Oui ☐ 2. Non ☐

Laquelle ?.....................................

35. Avez-vous un lien avec une ONG de soutien ?

1.Oui ☐ 2. Non ☐