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EVALUATION OF PLASMA VIRAL-LOAD COVERAGE AND THE PREVENTION OF MOTHER-TO-CHILD TRANSMISSION OF HIV-1 AT THE YAOUNDE GYNECO-OBSTETRIC AND PEDIATRIC HOSPITAL

A thesis submitted in the Partial Fulfilment of the Requirements for the Award of the Master in Public Health

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DEDICATION

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MA= Maître Assistant

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ABSTRACT

Background: Prevention of mother-to-child transmission (PMTCT) of HIV is crucial in sub-Saharan Africa, where challenges such as inadequate plasma viral load (PVL) monitoring persist. This study evaluates PVL coverage and PMTCT outcomes at a reference hospital in Yaoundé, Cameroon.

Methods: We conducted a cross-sectional, hospital-based survey, with both retrospective and prospective components, from February 1th, 2024, to July 31th, 2024, at the Yaoundé Gynaeco-obstetric and paediatric Hospital. The study included HIV-infected pregnant women who delivered at the hospital or attended antenatal and early infant diagnostic appointments. Data collection included a review of medical records and interviews using a structured questionnaire. Key outcomes included PVL monitoring coverage and rate of HIV transmission at 6 weeks and at 9 months. Data analysis was performed using SPSS version 23, with statistical significance set at $p < 0.05$, utilizing both bivariate and multivariate analyses.

Results: We included 235 participants in our study which consisted of women aged 21-40 years, predominantly single and unemployed, with a majority having secondary school education. We noticed a notable disparity in PVL monitoring coverage, with 59.1% during antenatal care compared to 28.9% postnatally. Adherence to PCR testing timelines was high, with 94.7% of tests conducted within the 6–8-week window and 75.6% at 9 months. The vertical HIV transmission rates were 5.3% at 6 weeks and 8.9% at 9 months, indicating a need for enhanced preventive measures. Key determinant of transmission included adherence to antiretroviral therapy (aPR=17.56; CI: 1.80-169.44; p=0.014).

Conclusion: Our study highlights significant gaps in postnatal PVL monitoring and the need for improved adherence to testing schedules. Although vertical transmission rates are relatively low, the observed increase over time underscores the necessity for ongoing vigilance and refinement of PMTCT strategies. Our finding supports the continued emphasis on ART adherence in reducing HIV transmission.

Keywords: HIV, Plasma Viral Load Coverage, Mother-to-Child Transmission, PMTCT, Cameroon

RESUME

Contexte : La prévention de la transmission du VIH de la mère à l'enfant (PTME) est cruciale en Afrique subsaharienne, où des défis tels que le suivi inadéquat de la charge virale plasmatique (CVP) persiste. Cette étude évalue la couverture de la CVP et les résultats de la PTME dans un hôpital de référence à Yaoundé, au Cameroun.
Méthodologie : Nous avons mené une étude transversale avec des composantes rétrospectives et prospectives, du 1er février 2024 au 31 juillet 2024, à l'Hôpital Gynéco obstétrique et pédiatrique de Yaoundé. L'étude a inclus des femmes enceintes vivant avec le VIH qui ont accouché à l'hôpital ou qui ont assisté aux rendez-vous de soins prénataux et de diagnostic précoce des nourrissons. La collecte des données a inclus une révision des dossiers médicaux et des entretiens à l'aide d'un questionnaire structuré. Les principaux résultats comprenaient la couverture du suivi de la CVP et le taux de transmission du VIH à 6 semaines et à 9 mois. L'analyse des données a été réalisée à l'aide du logiciel SPSS version 23, avec une signification statistique fixée à $p < 0,05$, en utilisant à la fois des analyses bivariées et multivariées.

Résultats : Nous avons inclus 235 participantes dans notre étude, principalement des femmes âgées de 21 à 40 ans, majoritairement célibataires et au chômage, avec une majorité ayant un niveau d'éducation secondaire. Nous avons constaté une disparité notable dans la couverture du suivi de la CVP avec 59,1% de couverture pendant la période prénatale contre 28,9% en postnatale. L'adhésion aux délais de test PCR était élevée, avec 94,7 % des tests réalisés dans la fenêtre de 6 à 8 semaines et 75,6 % à 9 mois. Les taux de transmission verticale du VIH étaient de 5,3 % à 6 semaines et de 8,9 % à 9 mois, indiquant un besoin de mesures préventives renforcées. Le principal déterminant de la transmission était l'adhésion à la thérapie antirétrovirale (aPR=17,56 ; IC : 1,80-169,44 ; p=0,014).

Conclusion : Notre étude met en évidence des lacunes significatives dans le suivi postnatal de la CVP et la nécessité d'améliorer l'adhésion aux programmes de tests. Bien que les taux de transmission verticale soient relativement faibles, l'augmentation observée au fil du temps souligne la nécessité d'une vigilance continue et d'un raffinement des stratégies de PTME. Nos résultats soutiennent l'accent continu mis sur l'adhésion à la thérapie antirétrovirale pour réduire la transmission du VIH.

Mots-clés : VIH, Couverture de la Charge Virale Plasmatique, Transmission de la Mère à l'Enfant, PTME, Cameroun

LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
AIDS:	Acquired Immuno-deficiency syndrome
ANC:	Antenatal care
ART:	Antiretrovirals therapy
CAMPHIA:	Cameroon Population-based HIV Impact Assessment
cART:	combined Antiretroviral therapy
EGPAF:	Elizabeth Glaser Paediatric AIDS Foundation.
EID:	Early infant diagnosis
EPP:	Estimation and Project Package
FMBSIRB:	Faculty of Medicine and Biomedical sciences Institutional Review Board
HAART:	Highly active antiretroviral therapy
HIV:	Human Immunodeficiency Virus
IDPs:	Internally Displaced Persons
MTCT:	Mother-to-child Transmission
LMIC:	Low- and Middle-Income Countries
NGO:	Non-Governmental Organization
PMTCT:	Prevention Mother-to-child transmission

Abbreviations	Meaning
PCR:	Polymerase Chain Reaction
PLWHIV:	People living with HIV
PVL:	Plasma viral load
ROM:	Rupture of membranes
RNA:	Ribonucleic Acid
SDGs:	Sustainable Development Goals
UN:	United Nation
UNAIDS:	United Nations Programme on HIV/AIDS
YGOPH:	Yaoundé Gynaeco-Obstetric and paediatric Hospital
WHO:	World Health Organization

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CHAPTER I : INTRODUCTION

1.1. BACKGROUND

In spite of global progress in maternal and child health, HIV/AIDS remains a significant threat to pregnant women, with higher prevalence reported among target populations in sub-Saharan Africa (SSA)[1,2]. This disproportionate burden on women has led to a substantial number of HIV-exposed children in SSA, resulting in high rates of new HIV infections and HIV-related illness and death[3]. Similarly, pregnant women in Cameroon are disproportionately affected by HIV, with a national prevalence of 4.26% [CI 95%: 3.79–4.79], compared to 2.7% in the general population. Notably, in some regions of Cameroon, the proportion of HIV-infected women of reproductive age is 3.5 times higher than that of men, reflecting their increased vulnerability to infection. This disparity suggests a significant risk of HIV transmission to newborns in the absence of targeted maternal and child healthcare interventions[4].

The Prevention of Mother-To-Child Transmission (PMTCT) program remains a priority for ensuring HIV-infected pregnant women and their babies are protected from the virus, aiming to produce a generation of HIV-free infants while keeping mothers alive. Strategies to reduce mother-to-child transmission (MTCT) include the use of antiretroviral drugs, mode of delivery based on viral load (VL) in the antepartum period, and breast milk substitutes[5]. These interventions are crucial in addressing the high burden of HIV vertical transmission in SSA, which has a cumulative *in utero*, intrapartum, and postpartum MTCT rate of 25-35%[3]. Maternal VL is the most predictive factor for perinatal HIV transmission, with higher VLs correlating with a greater risk of transmission[6]. The goal of antiretroviral therapy (ART) in the PMTCT framework is to suppress maternal VL to reduce the risk of transmitting HIV to the infant during pregnancy, delivery, and breastfeeding[7]. Since plasma VL levels are a primary driver of HIV-1 MTCT, the World Health Organization (WHO) has recommended routine VL testing for pregnant women living with HIV since 2016[8]. The ultimate objective is to achieve and sustain maternal viral suppression before delivery and throughout breastfeeding[9].

In Cameroon, routine VL testing has been endorsed as the reference marker for treatment monitoring and for eliminating MTCT, following WHO recommendations. However, considering the financial, logistical, and operational challenges of expanding VL testing in SSA countries[9–12], it is crucial to closely monitor the scale-up of VL testing within the PMTCT cascade in Cameroon. This monitoring is important for

identifying implementation bottlenecks and proposing evidence-based measures to optimize PMTCT performance. Despite these efforts, there is limited knowledge about current VL monitoring practices in accordance with Cameroon and WHO PMTCT guidelines and the impact of VL monitoring on maternal and fetal outcomes in the Cameroonian context[13]. Although a recent study in the Littoral region of Cameroon revealed suboptimal PVL coverage[14], making it the one of the main studies to assess VL in the Littoral region of Cameroon thus far. There are few data on PVL coverage and its impact to the PMTCT of HIV-1 in the centre regional of Cameroon.

This is our main focus of this study entitled ***"Evaluation of viral load coverage* and *the Prevention of Mother-To-Child Transmission at the Yaoundé gynaeco-obstetric and paediatric Hospital"***

1.2. PROBLEM STATEMENT

PMTCT is a major concern amongst HIV-infected pregnant women. Over the world, strategies have been developed to reduce mother-to-child transmission as combined antiretroviral therapy, the mode of delivery related to viral load in the antepartum period, breast milk substitutes are some of the measures taken to promote the prevention of mother-to-child transmission of HIV (PMTCT)[5].

The goal of antiretroviral therapy (ART) is to suppress maternal viral load (VL) to substantially lower the risk of transmitting the virus to their infant during pregnancy and breastfeeding[7]. However, in several Sub-Saharan African PMTCT study populations, the proportions of pregnant women with unsuppressed VL range from 6.1–15.4%, with 9.4–22% experiencing postpartum episodes of virologic rebound.[15]

Since plasma viral load level is one of the key elements of mother-to-child transmission, we were concerned to assess how plasma viral load is monitored from ANC up to 9 months postpartum; to understand mother to child transmission of HIV and compare it at 6 weeks and 9 months.

1.3. JUSTIFICATION

Cameroon adopted new strategies to manage HIV-infected pregnant women better; a new guideline has been made which focus on maternal plasma viral load testing during pregnancy and in the postpartum period[13]. These strategies have been well implemented in developed countries compared to Sub-Saharan Africa (SSA). This gap in the implementation is undoubtedly due to the low socioeconomic index in SSA; patients cannot pay for their treatment and related laboratory investigations[16]. Thanks to the Cameroon government, which made free HIV-related care since January 2020. Cameroon could now apply some recommendations in PMTCT already done in developed countries. Since then, there are few real-world data on viral load coverage among HIV-infected pregnant women to tackle the risk factors of mother-to-child transmission in our context. This study will provide reliable information on mother-to-child transmission of HIV.

1.4. RESEARCH GOAL

We aimed to contribute in reducing mother to child transmission of HIV.

1.5. RESEARCH QUESTIONS

1- How does the coverage of plasma viral load monitoring of HIV-infected pregnant women during the antenatal and postnatal periods impact the management and outcomes of HIV treatment in these women?
2- What is the level of adherence to recommended timelines for conducting PCR tests in exposed infants at 6 weeks and 9 months, and how does adherence affect the accuracy of HIV diagnosis?
3- What are the differences in the rate of vertical HIV transmission among exposed infants at 6 weeks versus 9 months of age, and what factors contribute to these differences?
4- What are the key determinants of mother-to-child transmission of HIV at 6 weeks and 9 months of age, and how do these determinants vary between different populations or regions?

1.6. RESEARCH OBJECTIVES

General Objective

To evaluate viral load coverage and the Prevention of Mother-To-Child Transmission of HIV-1 in one facility in Yaoundé.

Specific Objectives

1- Evaluate and compare the plasma viral load monitoring coverage for HIV-infected pregnant women during both the antenatal and postnatal periods;

2- Determine adherence to the recommended timelines for conducting PCR tests in exposed infants at 6 weeks and 9 months;

3- Assess and compare the rate of vertical HIV transmission among exposed infants at 6 weeks and 9 months of age;

4- Identify and compare potential determinants of mother-to-child transmission of HIV at 6 weeks and 9 months of age.

1.7 RESEARCH SCOPE

At the end of this study, we will strengthen the implementation strategy for managing HIV among pregnant women to reduce mother-to-child transmission of HIV-1. Additionally, this study will support the promotion of implementation research within our context to address public health challenges more effectively. This research is more aligned with implementation science than with traditional scientific research, as it focuses on evaluating a real-world intervention in our specific context.

1.8 CONCEPTUAL FRAMEWORK

During pregnancy and in the postpartum period, HIV-infected pregnant women should monitor their viral load for an adequate approach to reduce mother-to-child transmission.

To assess factors associated with early infant diagnosis (EID) of HIV status, and all potential factors should be taken in consideration.

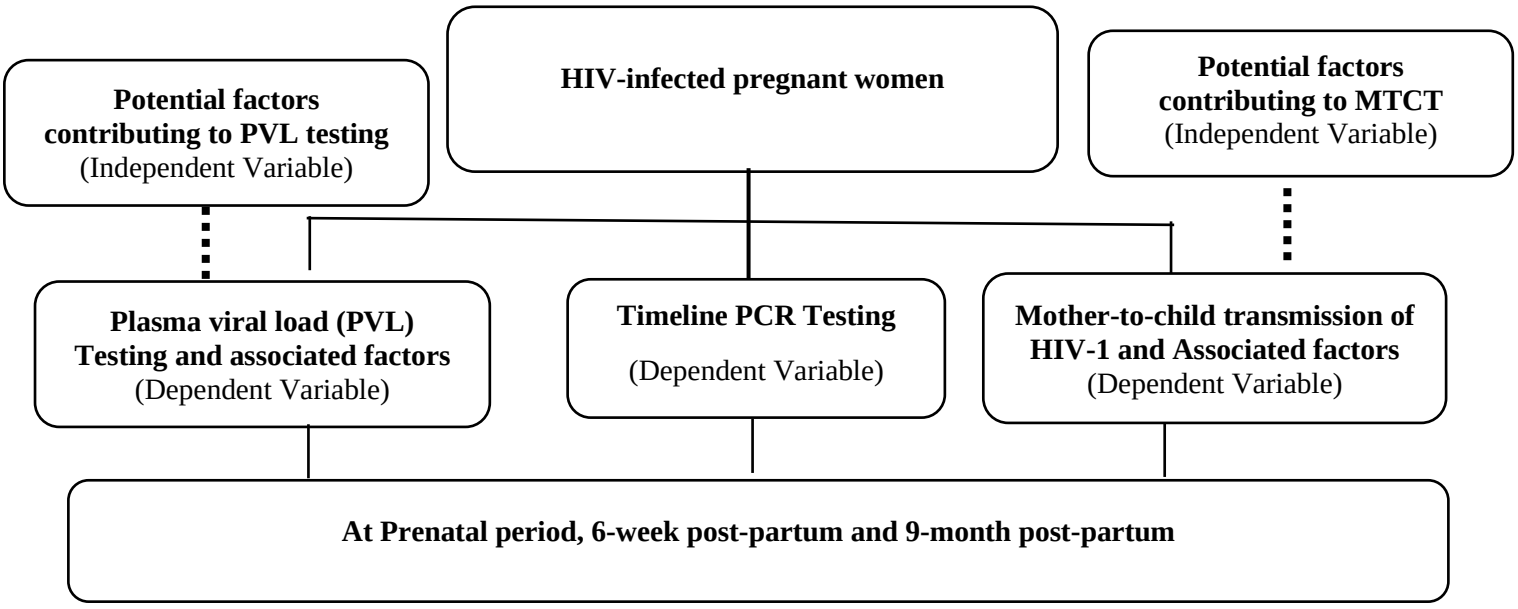

Figure I: Conceptual framework

The visual conceptual framework graphically represents the interconnected elements of the study on maternal viral load and the prevention of mother-to-child HIV transmission. It links the overall objective of the study to its four specific objectives: monitoring maternal viral load before and after delivery, ensuring timely blood sample collection for PCR testing, measuring the prevalence of HIV transmission at 6 weeks and 9 months, and identifying risk factors for transmission. The model highlights the independent variables (such as antiretroviral treatment, comorbidities, and mode of delivery), the processes for monitoring viral load, as well as the key time points for assessing HIV transmission to the child.

1.9 DEFINITIONS OF TERMS

ANC (by WHO): The care provided by skilled healthcare professionals to pregnant women and adolescent girls to ensure the best health conditions for both mother and baby during pregnancy.

Complete files: Files with at least 80% of information about plasma viral load assessment, mode of delivery and communication on the exposed child (at least information on plasma viral load assessment during pregnancy, information on labour and mode of delivery)

Dependent variables: The variable being tested and measured in an experiment and "dependent" on the independent variable.

Independent variables: The experimenter manipulates or changes and is assumed to affect the dependant variable directly.

Incomplete files: Files with less than 80% of information of information needed.

Exposed foetus or infant: Foetus or infant born from an HIV positive Woman.

Good maternal adherence: No missing or missing taking cART < 1 week a month during pregnancy.

High-risk MTCT: HIV pregnant women with high viral load (greater than 1000copies/mL) and never did plasma viral load testing.

HIV infection: Considered as a positive HIV serology test and/or intake of antiretroviral drugs.

Low-risk MTCT: HIV pregnant women with low viral load (less than 1000copies/mL)

Option B+: Approach of life-long ART for all HIV-infected pregnant women, regardless of CD4 count.

PLV Coverage: Proportion of plasma viral load realised compared to the national guidelines of plasma viral load monitoring among HIV-infected pregnant women.

PMTCT: Strategies developed to tackle mother-to-child transmission.

Poor maternal adherence: Missing taking cART ≥ one week a month during pregnancy.

Vertical transmission: transmission from mother-to-child during pregnancy or breastfeeding

Viral load: Amount of HIV RNA copies per millilitre of blood

Viral load Assessment: Routine evaluation of viral load testing every trimester during pregnancy or antenatal period.

Viral load Suppression: Viral load value less than 1000 copies/ml

Viral load undetectable: Viral load value less than 50 copies/ml

CHAPTER II : LITERATURE REVIEW

2.1 OVERVIEW OF HIV INFECTION

2.1.1 Definition and epidemiology of HIV infection

HIV infection refers to the viral replication of retroviruses HIV-1 or HIV-2 within the T CD4+ lymphocytes cells of the immune system, which definitely leads to their destruction and gradually to a state of immune-suppression[17,18]. If left untreated the condition leads to a state of acquired immune-deficiency syndrome, where infected individuals are prone to opportunistic infections and malignancies[19,20].

HIV is the etiologic agent of HIV infection and the Acquired Immunodeficiency Syndrome (AIDS) [21,22]. AIDS is the most advanced stage of HIV infection defined by the development of certain cancers, infections, or other severe long-term clinical manifestations [20,22]. First identified in 1981, HIV/AIDS remains a major public health challenge and global pandemic [22,23]. Fortunately, with increasing access to effective HIV prevention, diagnosis, treatment and care, HIV infection has become a manageable chronic health condition, enabling people living with HIV to lead long and healthy lives[24]. Worldwide, the number of people living with HIV was estimated at 38.0 million (31.6 million–44.5 million) in 2019, 26 million (25.1 million-26.2 million) people were accessing antiretroviral therapy as the end of June 2020, around 1.7 million (1.2 million–2.2 million) people became newly infected and 690 000 (500 000–970 000) people died from AIDS-related illnesses in 2019. Of all people living with HIV, 81% (68–95%) knew their status, 67% (54–79%) were accessing treatment and 59% (49–69%) were virally suppressed in 2019, reflecting failure to achieve the UNAIDS 90-90-90 target[24–26].

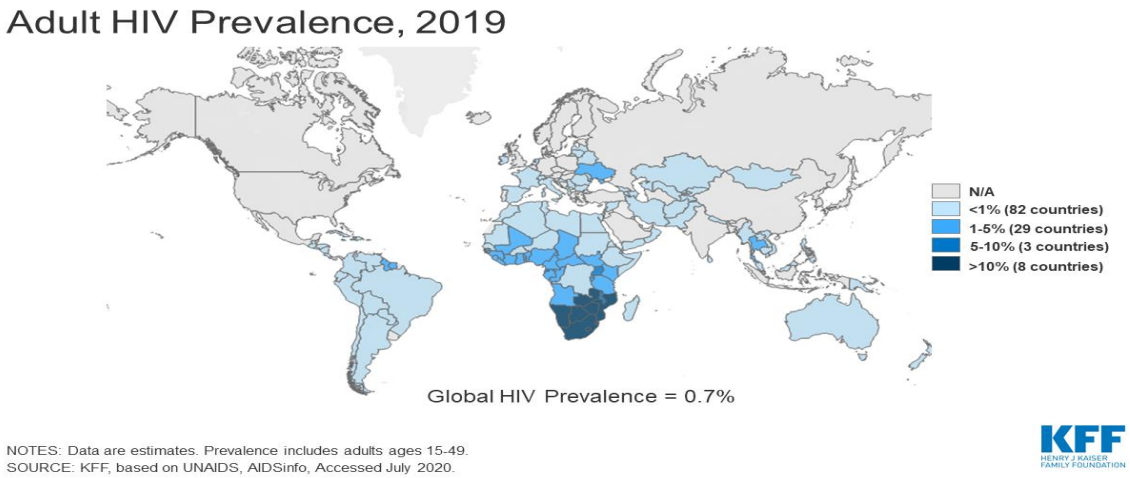

Figure II: ***Adult HIV prevalence*** **[24]**

Sub-Saharan Africa carries a disproportionate burden of HIV, accounting for more than 70% of the global burden of infection[27]. The WHO African Region is the most affected region with 25.7 million people living with HIV in 2019 [28,29]. This region also accounts for almost two-thirds of the global total of new HIV infections [30]. The increasing HIV infections is thought to be due to slowing public health response to HIV[31].

According to UNAIDS, in Cameroon, the prevalence of HIV was estimated at 3.1% at the end of 2019, representing about 510 000 infected individuals. There was a total number of 17 000 new infections in 2019, among which 9000 where females aged 15 years and above, representing more than half of all new infections[32].

This prevalence continues to drop over the time. In 2020, overall adult HIV prevalence continues to decrease, moving from 5.4% in 2004 (DHS, 2004) to 4.3% in 2011 (DHS, 2011), 3.4% in 2017 (CAMPHIA, 2017) and recently 2.7% in 2018 (DHS, 2018). Prevalence among women is nearly twice that of men (3.4% vs. 1.9%, DHS 2018)[16], with 53% ART coverage *(DHIS2 National Data)*[33]. and that of pregnant women is estimated at 5.7%[34].

The economic capital, Douala, and the political capital, Yaounde, have a 2.4% prevalence, with 3.2% among women and 1.5% among men. Others cities combined have an overall HIV prevalence of 3.4% with 4.3% among women and 2.3% among men.[16] In Littoral region, the prevalence HIV is 3.9% among women and 1.1% among men[16].

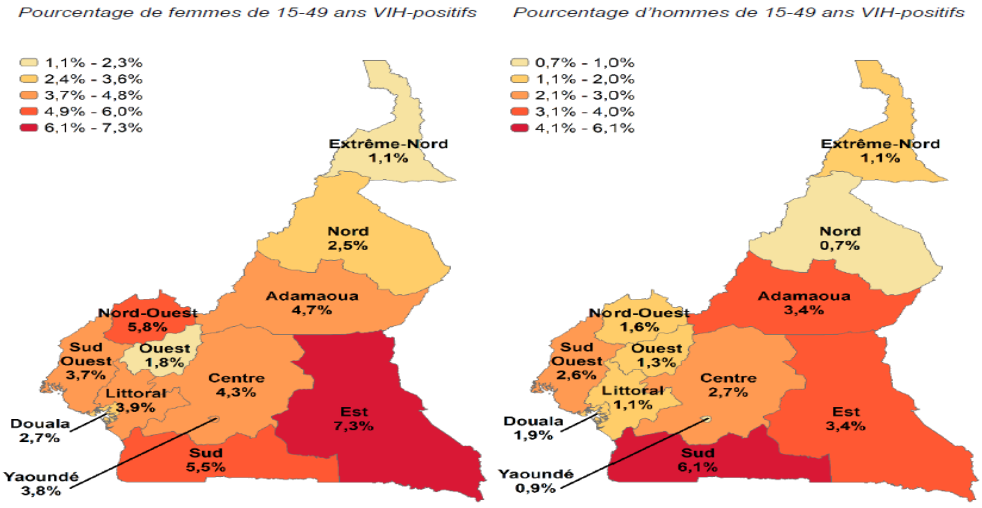

Figure III: Prevalence of HIV infection by region [16]

According to WHO, HIV is the first cause of death in Cameroon and accounts for 13% of the nation's total deaths [35]. Considering the "90-90-90" targets in Cameroon, 74% of PLWHIV know their status, with 91.3% being on treatment and 80% being virally suppressed [36,37].

Mode of transmission of HIV

HIV transmission is the spread of HIV from person to person. HIV transmission is only possible through contact with HIV-infected body fluids [38]. These body fluids include: blood, semen, pre-seminal fluid, vaginal fluids, rectal fluids, and breast milk [38]. There is no evidence that HIV is transmitted by casual contact or that the virus can be spread by insects, such as by a mosquito bite [21]. Risk factors include the following [39,40].

- Unprotected sexual intercourse, especially receptive anal intercourse
- Multiple of sexual partners
- Prior or current sexually transmitted diseases (STDs) [41]: Gonorrhea, chlamydia, syphilis, and herpes genitalis infection.
- Sharing of intravenous drug
- Receipt of blood products
- Mucosal contact with infected blood or needle-stick injuries
- Maternal HIV infection (for newborns, infants, and children)

  Factors that may decrease the risk include condom use, male circumcision, antiretroviral treatment, and pre-exposure prophylaxis [41].

2.1.2 Natural history of HIV infection

Clinical HIV infection undergoes 3 distinct phases: acute seroconversion, asymptomatic infection, and AIDS [42].

Acute seroconversion:

In humans, rapid occurrence of plasma viremia with widespread dissemination of the virus is observed 4-11 days after mucosal entrance of the virus [42]. During this phase, the infection is established and a proviral reservoir is created [43]. At this point, the viral load is typically very high, and the $CD4^+$ T-cell count drops precipitously [42].

Seroconversion may take a few weeks, up to several months. Symptoms during this time may include fever, flu-like illness, lymphadenopathy, arthralgia, myalgia, headache, gastrointestinal symptoms, oral ulcer, weight loss, and rash [42]. However, some patients might have no symptom at all during this stage [44].

Asymptomatic (latent) stage:

At this stage in the infection, persons infected with HIV exhibit few or no signs or symptoms for a few years to a decade or more. Viral replication is ongoing during this time, [45] and the immune response against the virus is effective and vigorous [42]. In some patients, persistent generalized lymphadenopathy is an outward sign of infection. During this time, the viral load, if untreated, tends to persist at a relatively steady state, but the $CD4^+$ T-cell count steadily declines [42].

Symptomatic (AIDS) stage:

When the immune system is damaged enough that significant opportunistic infections begin to develop, the person is considered to have AIDS [42]. One or more of the indicators that characterize AIDS include opportunistic infections, malignancy, wasting syndrome, or CD4 <200 (or <15%) [46].

2.1.3 Clinical presentation of HIV infection

History

The history should be carefully taken to elicit possible exposures to the HIV [42]. The patient may present with signs and symptoms of any of the stages of HIV infection. AIDS manifests as recurrent, severe, and occasionally life-threatening infections and/or opportunistic malignancies. The signs and symptoms are those of the presenting illness, meaning that HIV infection should be suspected as an underlying illness when unusual infections present in apparently healthy individuals [42].

Physical Examination

No physical findings are specific to HIV infection. The physical findings are those of the presenting infection or illness [42].

2.1.4 Diagnosis of HIV infection

The diagnosis of HIV depends on the demonstration of antibodies to HIV and/ or the direct detection of HIV or one of its components [21]. Antibodies to HIV generally

appear in the circulation 3–12 weeks following infection [21]. HIV testing should be voluntary and the right to decline testing should be recognized[47].

Serological tests used include:

- Antibody test that detects HIV IgM and/or IgG antibodies in blood or oral fluids.
- Antigen/antibody combination tests detects both HIV p24 antigen as well as HIV IgM and IgG antibodies. P24 can be detected as early as 14days after exposure [48,49].
- Nucleic acid tests (NATs) detect HIV ribonucleic acid (RNA). HIV RNA can be detected as early as 5 to 10 days after exposure to HIV [49].

Fourth generation tests: detects both HIV-1 and HIV-2 antibodies together with p24 antigens, was recommended by CDC as standard of care test for the diagnosis of HIV in a clinical setting [48]. It is sensitive in early infection and sensitivity/specificity approaches 100% for chronic infection [34].

In the nonclinical setting, enzyme-linked immunosorbent assay (ELISA) antibody test which is a third-generation antibody test is performed as a rapid test. Results are presented within 20 minutes [48]. It has a sensitivity >99.5% [34] but needs to be confirmed with a serum western blot.

• Confirmatory test: Western blot. It detects antibodies to at least two different HIV protein bands. Specificity >99.9%.

2.2 VIRAL LOAD

2.2.1 Definition and clinical significance of viral load

Viral load is the number of copies of viral RNA per ml of blood [50]. It is the best measure of the level of progression of HIV infection [50]. Viral load is recommended as the preferred monitoring approach to diagnose and confirm treatment failure [51]. More viruses will lead to faster destruction of CD4 cells (immunological failure) and more severe immunosuppression (clinical failure) [50]. Therefore, viral load is used as an indicator of the:

- Response to HAART
- Risk of clinical progression of the disease
- Risk of sexual and/or mother-to-child transmission of the virus

Viral load values can be classified into three categories [52]

- Undetectable viral load: VL <50 RNA copies/ml, reflecting control of viral replication; the ultimate goal of antiretroviral therapy and the ideal condition for long-term prevention of resistance;
- Viral suppression or suppressed viral load: VL <1000 RNA copies/ml. With viral load suppression, the CD4 count increases, the patient's clinical state improves, the risk of transmission of HIV and disease progression is low.
- High viral load: VL >1000 copies/ml, reflecting either non-adherence/interruption of therapy (especially for viremia ≥6 Log RNA copies/ml) or proven failure of the current treatment (after confirmation of this viral load on a consecutive sample after a 3-month interval).

Viral load testing gives a measure of understanding, control, and motivation to adhere to treatment [51]. In most patients, viral load should be less than 1000 copies per ml after six months of ART [53].

2.3.2 Viral load measurement

VL is done using an advanced laboratory method (RNA-PCR) on a blood sample [50].

VL can be done from:

- Blood (plasma): Transport in a cooler box to the lab within 24 hours.
- Dried blood spot (DBS): Transport in a plastic bag with a desiccant at ambient temperature, sample viable for 3 months or more [50].

Dried blood spot specimens using venous or capillary whole blood can be used to determine the HIV viral load using a treatment failure threshold of 1,000 copies/ml. While plasma specimens are preferred, dried blood spot specimens can be used in settings where logistical, infrastructural, or operational barriers prevent routine viral load monitoring using plasma specimens [51].

2.3.3 Viral load testing strategy

Routine viral load testing is a more sensitive and earlier indicator of treatment failure. Routine viral load testing should be done at 6 and 12 months of initiating ART and then every 12 months thereafter to detect treatment failure proactively [54].

WHO now recommends routine VL testing as the preferred method to detect ART failure rather than immunological and clinical monitoring. Aside from the routine viral

load testing schedule, viral load testing should be used whenever there is clinical or immunologic suspicion of treatment failure [54].

2.4 SPECIAL CONSIDERATION: HIV INFECTION IN PREGNANCY.

2.4.1 overview

A disproportionate burden has been placed on women and children who in many settings continue to experience high rates of new HIV infections and HIV-related illness and death[3]. 85% (36-100%) of pregnant women living with HIV had access to antiretroviral medicines to prevent transmission of HIV to their children[25].

Most children living with HIV acquired the infection through mother-to-child transmission (MTCT), which can occur during pregnancy, labour, and delivery or breastfeeding[3]. The risk of MTCT can be reduced to under 2% by interventions that include antiretroviral prophylaxis given to women during pregnancy and labour and to the infant in the first weeks of life, obstetrical interventions including elective caesarean delivery (before the onset of labour and rupture of membranes), and complete avoidance of breastfeeding[3]. With these interventions, new HIV infections in children are becoming increasingly rare in many parts of the world, particularly in high-income countries[3].

Start Free Stay Free AIDS Free embraced the goals adopted by UN member states in the 2016 Political Declaration on Ending AIDS. It committed to the dual elimination of mother-to-child transmission of both HIV and congenital syphilis (syphilis can result in miscarriage, stillbirth, neonatal infections and death). As PMTCT was not 100% effective, elimination of HIV was defined as reducing the final HIV transmission rate to 5% or less among breastfeeding women and to 2% or less among non-breastfeeding women by 2020[55].

The delivery rate of HIV-positive women in health facilities varied between 50% and 52.6% between 2015 and 2016, thus suggesting poor access for the mother-child couple to the peri- and the post-natal package of interventions[56].

In Cameroon, the Littoral region has the lowest rate of health coverage of PMTCT with 71.1%[56]. The final vertical transmission rate including breastfeeding in Cameroon was 14.3%[32] whereas the estimated risk of transmission with breastfeeding up to 6 months is 25-35%[3]. This reduction is probably due to OPTION B+ adopted in august

2014 which promoted the systematic use of ART in any case of newly diagnosed HIV pregnant women.

For known HIV mothers, they should receive antiretroviral therapy during pregnancy according to currently accepted guidelines for adults. Plasma HIV ribonucleic acid (RNA) levels in pregnant women should be monitored at the initial prenatal visit, 2–4 weeks after initiating (or changing) cART drug regimens; monthly until RNA levels are undetectable; and then at least every 3 months during pregnancy[57]. Across sub-Saharan Africa, prevention of mother-to-child transmission services are encountering increasing numbers of women already established on antiretroviral therapy (ART) when entering antenatal care. However, there are few data examining ART adherence and HIV viral load in this group.[58]

2.4.2 Follow-up of HIV pregnant women during pregnancy and PMTCT

Women with HIV must be carefully monitored all through pregnancy on the effects of infections as well as the effects of cART. Those who are newly diagnosed with HIV do not require any additional baseline investigations compared with nonpregnant women living with HIV other than those routinely performed in the general antenatal clinic.[59] It will, however, be essential to have monthly assessments of viral loads to monitor the progress and efficacy of management. In women who commence cART in pregnancy, an HIV viral load should be performed 2–4 weeks after initiating treatment, and later at least once every trimester, and at 36 weeks and at delivery.[5]

In Sub-saharan Africa, intensified viral load monitoring for pregnant and breastfeeding women has been proposed to help address concerns around antiretroviral therapy (ART) adherence, viraemia and transmission risk, but there have been no systematic evaluations of existing policies.[60] HIV viral load (VL) monitoring is a central tool to evaluate ART effectiveness and transmission risk. There is a global movement to expand VL monitoring following recent recommendations from the World Health Organization (WHO), but there has been little research into VL monitoring in pregnant women.[61]

In 2019, a worshop in the East region of Cameroon offered by National aids control committee and partner George Town university sensitized healthcare givers concerned with HIV care on changes in HIV management guidelines but these importants points in new guidelines in no way replaces the actual guidelines. A summary of this worshop related to PMTCT is shown is the table below.

Table 1: Monitoring of HIV during Pregnancy (report of workshop done in 2019, East region Cameroon)

	1st ANC	After ART initiation			Postpartum					Every Year
Appointment		M1	M3	M6	W6	Every 3-6 months if patient stable	M12	M18	M24	
Clinical exam	X	X	X	X	X	X	X	X	X	X
Hepatitis B screening					X					
ART and CTX Distribution	X	X	X	X	X	X	X	X	X	X
Evaluation and reinforcement of drug compliance	X	X	X	X	X	X	X	X	X	X
VL testing	X*		X**	X**	X**	X**	X**	X**	X**	X**
Serum creatinine	X	X		X			X		X	X
Transaminases		X					X		X	X
Blood sugar level	X						X		X	X
Hemoglobin level	X				X		X		X	X

ANC= antenatal visit; ART= Antiretroviral therapy; CTX= cotrimoxazole; M=month; VL=viral load; W= week;

*: Exclusively for HIV pregnant women on ART before pregnancy

**: For pregnant women and breastfeeding women diagnosed and initiated on ART during pregnancy

NB: HIV pregnant women not followed and newly diagnosed at first antenatal visit at 28 weeks of gestation, initiate on ART and should do viral load testing a month before delivery (W32-W36) and other one between W4-W6 postpartum

VL testing one month before delivery determines whether Nevirapine should be giving to new born for 6 weeks (if VL suppressed) or 12 weeks (if VL not suppressed)

2.5 OVERVIEW OF THE LITERATURE ON VIROLOGIC FAILURE FOLLOWING VIRAL LOAD SUPPRESSION

Table II below gives a summary of the different studies conducted on viral load monitoring and Prevention mother-to-child-transmission with their results.

Table 2:summary of the different studies conducted on viral load monitoring and Prevention mother-to-child-transmission with their results

AUTHOR/ YEAR OF PUBLICATION/ COUNTRY	TITLE	METHOD/ SAMPLE SIZE (n)	RESULTS / CONCLUSION
Kafack et al. 2021 Cameroon	Evaluate Plasma Viral-Load Coverage and the Prevention of Mother-To-Child Transmission of HIV-1 in the Littoral region	Hospital based N= 135	VL-coverage remains suboptimal (below 90%) among ANC attendees, and women at high-risk of MTCT mainly have vaginal delivery. Viral suppression rate remains below the target (below 90%) for accelerating the elimination of MTCT. HIV-MTCT persists, and might be driven essentially by poor VL monitoring. Thus, achieving an optimal PMTCT performance requires a thorough compliance to virologic assessment during ANC.
Sandbulte et al. 2020 Kenya	Maternal viral load monitoring: Coverage and clinical action at 4 Kenyan hospitals	Retrospective cohort n=424	VL testing was documented for 305 (72%) women and repeat VL testing was documented for 79 (19%). Only 115 women (27%) received a guideline-adherent baseline VL test and 27 (6%) received a guideline-adherent baseline and repeat VL test sequence. Clinical action for unsuppressed VL results was even lower: 11 of 38 (29%) unsuppressed baseline results and 2 of 14 (14%) unsuppressed repeat results triggered clinical action.
Lesosky et al. 2017/South Africa	Optimal timing of viral load monitoring during pregnancy to predict viraemia at delivery in HIV-infected women initiating ART in South Africa: a simulation study	Retrospective cohort	Strategies to measure VL relative to gestational age may be more useful than strategies relative to duration on ART, in women initiating ART during pregnancy, supporting better integration of maternal and HIV health services.

Myer et al /2016/South Africa	HIV viraemia and mother-to-child transmission risk after antiretroviral therapy initiation in pregnancy in Cape Town, South Africa	Prospective cohort n=620	High rates of Viral Suppression at delivery and low rates of MTCT can be achieved in a routine care setting in sub-Saharan Africa, indicating the effectiveness of currently recommended ART regimens.
Thompson et al/2015/USA	Mode of Delivery among HIV-Infected Pregnant Women in Philadelphia, 2005-2013	Retrospective cohort n= 824	Only half of deliveries for women with an unknown VL or VL >1,000 copies/ml occurred via Scheduled Caesarean. Delivery prior to 38 weeks, particularly among minority women, resulted in a missed opportunity to receive a scheduled Caesarean
Brittain et al/ 2018/South Africa	Determinants of suboptimal adherence and elevated HIV viral load in pregnant women already on antiretroviral therapy when entering antenatal care in Cape Town, South Africa	Cross-sectional study n= 482	Our findings highlight specific beliefs and concerns about ART use during pregnancy that should be addressed in counselling messaging. adherence and viral load monitoring as part of pregnancy planning for women on ART may be important to achieve safer conception and promote healthy pregnancies
Lesosky et al /2020/ South Africa	Comparison of guidelines for HIV viral load monitoring among pregnant and breastfeeding women in sub-Saharan Africa	An individual Monte Carlo simulation	Coverage of VL monitoring in pregnancy and breastfeeding varied markedly, with between 14-100% of women monitored antenatally and 38-98% monitored during breastfeeding

CHAPTER III: MATERIALS AND METHOD

Study Design

The study was a cross-sectional hospital-based survey with both retrospective and prospective components. It aimed to evaluate plasma viral-load coverage and the prevention of mother-to-child transmission of HIV-1.

Study Period

The study was conducted from January 1, 2022, to June 30, 2024. The study duration, which includes the period for analysis and reporting, was from February 2024 to July 2024.

Study Area

The study was carried out at Yaoundé Gynaeco-Obstetric and Paediatric Hospital, selected for its extensive HIV care and focus on preventing mother-to-child HIV transmission. This hospital, a result of Sino-Cameroonian cooperation, was inaugurated on March 28, 2002, and started operations the following day. It offers a wide range of services, including Gynaecology/Obstetrics, Paediatrics, Paediatric Surgery, Anaesthesia, Ophthalmology, ENT, Emergency Care, Pathology, Radiology, Acupuncture, and Physiotherapy.

The Gynaecology-Obstetrics Department is organized into four main sections: maternity, inpatient rooms, outpatient offices, and the operating theatre. It features fourteen inpatient rooms with 36 beds, an archive room, a nurse's room, a specialized consultation room with a secretariat, a treatment room, a storeroom, and four doctors' offices. Outpatient services are managed by a senior nurse and include gynaecology and obstetrics consultations. The department's staff of 48 includes gynaecologists, obstetricians, midwives, and support personnel, and it is also involved in training medical students and gynaecology-obstetrics residents.

The department's activities are scheduled as follows: outpatient consultations are available on weekdays; scheduled surgeries occur from Monday to Thursday; daily rounds are conducted for hospitalized patients; and family planning, cancer screening, and HIV testing are performed daily on weekdays. The HIV care unit comprises more than 20 healthcare providers, recruited by both the Cameroonian government and non-

governmental organisation. Within this unit, plasma viral load and PCR tests are collected and analysed at the hospital.

Study Population and Sampling

3.4.1. Target Population

The study targeted HIV-infected pregnant women who delivered from January 2022 to June 2024 and attended antenatal care (ANC) and HIV appointments at the selected study hospitals.

3.4.2. Sampling Technique and Sample Size Calculation

Sampling Technique:

A combination of consecutive non-probabilistic and convenience sampling methods was employed.

Sample Size Calculation:

Consecutive non-probabilistic sampling will be used.

Sample size calculation
Exhaustive inclusion of participants who meet inclusion criteria.

Estimated sample size using:

$$n = \frac{(Z\alpha/2+Z\beta)2 * (p1(1-p1)+p2(1-p2))}{(p1-p2)^2}$$

Where:

- $Z_{\alpha/2}$ is the critical value of the Normal distribution at α/2 (at 95% CI, α is 0.05 and the critical value is 1.96),
- Z_{β} is the critical value of the Normal distribution at β (for a power of 80%, β is 0.2 and the critical value is 0.84)
- and $p_{1=\ 94\%}$ and $p_{2=\ 99\%}$ are the expected sample proportions of the plasma viral load during pregnancy and out of pregnancy in the centre region

Therefore

$n = 209\ HIV\ pregnant\ women$

Minimum sample size: 209 HIV-infected pregnant women.

Therefore, the minimum sample size was 209 HIV-infected pregnant women, but to ensure robustness, we aimed for 235 participants.

3.4.3. Inclusion and exclusion criteria:

a- Inclusion criteria

The study included two groups of HIV-infected mothers: retrospectively, those followed at the study site for HIV from January 2022 to June 2024, and prospectively, those who were followed for HIV at the hospital site and either came for early infant diagnostic (EID) results or delivered at the hospital site during the study duration.

b- Exclusion criteria
- Incomplete files
- Non-consenting patient
- HIV-infected women without available EID result

Enrolment of Study Participants:

At the study site, written informed consent was obtained from every eligible HIV-positive mother whose child had undergone at least one polymerase chain reaction (PCR) for early HIV diagnosis. After consent, participants were interviewed using a structured questionnaire, and their medical records were reviewed.

Data Collection

3.5.1. Data Collection Procedure:

Data collection was facility-based and occurred over a period of six months. The study included:

- **Retrospective Component (24 months):** Review of medical records for HIV-infected pregnant women who delivered between January 2022 and December 2023. This review was conducted at the paediatric ward for exposed infants information and at the maternity ward and HIV care unit for HIV-infected mothers.
- **Prospective Component (6 months):** Data Collection from HIV-infected mother who delivered in the hospital or came for routine PCR testing at 6 weeks or 9 months postpartum from January 2024 to June 2024.

3.5.2. Data Collection Sheet:

The data collection sheet included:

- **Outcomes:** maternal viral load (VL) measurements and early infant diagnosis result.
- **Potential factors associated with HIV MTCT:** Mode of delivery, Feeding, Obstetric care information, options and adherence to antiretroviral therapy (ART)…

Data Management and Analysis

3.6.1. Data Management:

To ensure confidentiality, data were coded and entered into a secure, password-protected database. Data were collected using Microsoft Excel 2016 and analyzed with SPSS version 23.

3.6.2. Data Analysis:

- **Statistical Analysis:** Frequencies and percentages were computed for categorical variables. Means and standard deviations were calculated for continuous variables. Chi-square or Fisher's exact tests were used to compare categorical variables. Bivariate analysis and multivariate models were used to identify factors associated with VL coverage and HIV MTCT, with a significance level set at p-value < 0.05.

Ethical Considerations

Ethical Approval:

Ethical clearance was obtained from the Institutional Review Board of the Faculty of Medicine and Biomedical Sciences, University of Yaoundé. Administrative authorizations were secured from hospital directors.

Informed Consent:

Informed consent was obtained from all participants. Confidentiality was maintained through the use of unique identifiers and secure data storage. Participants were free to withdraw from the study at any time without any repercussions.

Respect for Autonomy:

Participants were provided with consent forms and given a detailed explanation of the study. They had the right to withdraw at any stage.

Confidentiality:

Participant confidentiality was ensured by using coded identifiers, storing paper records securely, and using encrypted databases for electronic data.

Beneficence:

Participants had access to medical advice and care during the study, and the results aimed to improve HIV care practices and patient management.

Non-maleficence:

No risks were posed to participants during the study.

Justice:

All participants were treated equitably and fairly throughout the study.

CHAPTER IV : RESULTS

ENROLMENT OF PARTICIPANTS

During the study period, a total of 514 participants were approached at the Yaoundé Gynaeco-Obstetric and paediatric Hospital. Out of these, 235 participants were successfully recruited and consented to participate in the study. Specifically, 235 participants were selected for the study after excluding those who either did not provide consent or did not meet the inclusion criteria. Among those approached, 2 participants (0.4%) did not consent to the study and were excluded. Additionally, 277 participants (53.9%) were not included for various reasons: 207 (40.3%) lacked basic information on HIV follow-up, and 70 (13.6%) were followed but early infant Diagnosis (EID) were unavailable at six weeks. Therefore, 235 participants were ultimately included for analysis.

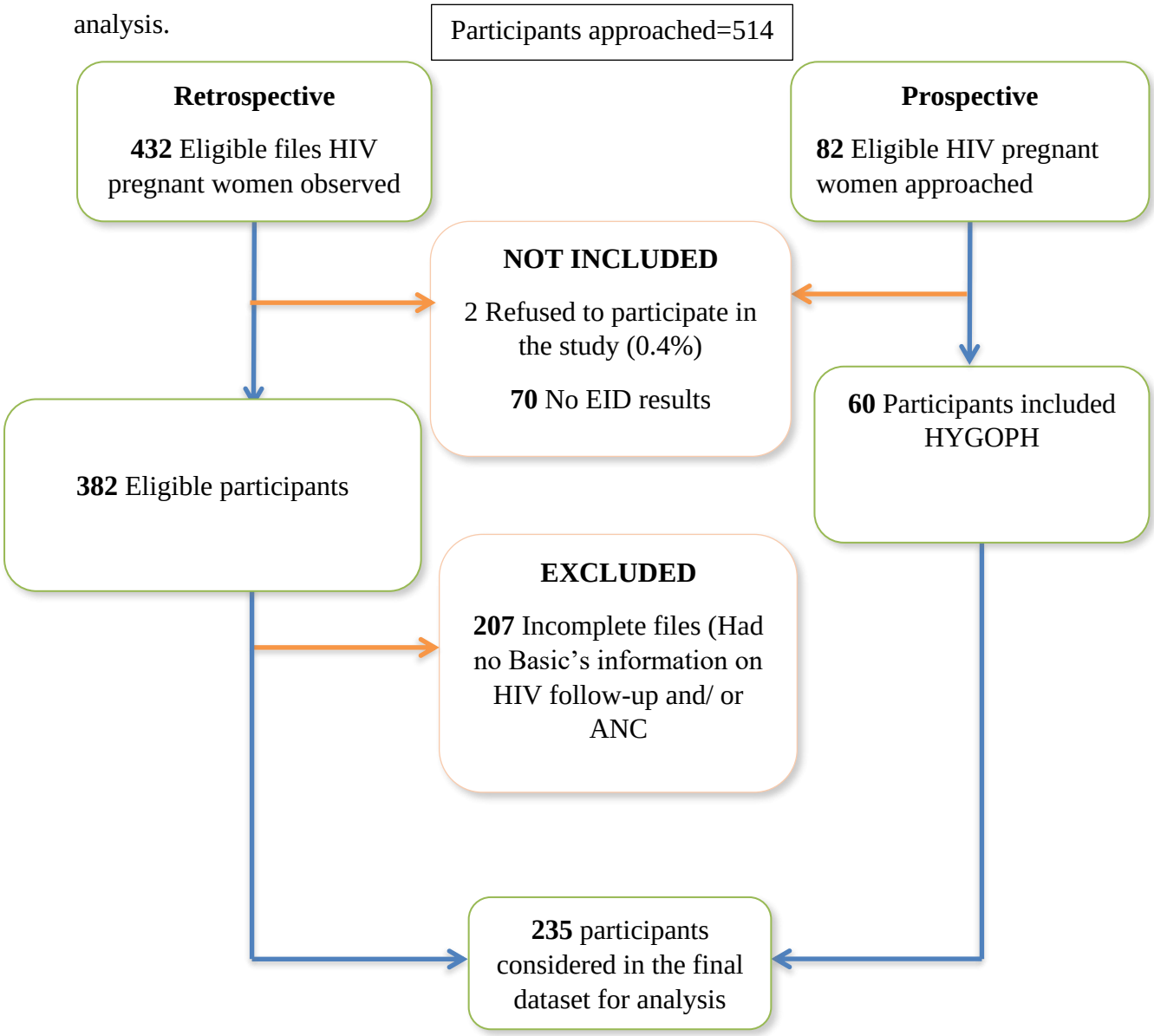

Figure IV: Diagram consort of participants

4.2 GENERAL CHARACTERISTIC OF THE POPULATION:

4.2.1. Sociodemographic characteristics

As shown in the **table 3,** the majority of mothers are aged between 21 and 40 years. Most mothers are single and unemployed, with a significant proportion practicing Christianity. Most of the population delivers at health facilities, particularly the Yaoundé Gynaeco-Obstetric Hospital, and has secondary education, with fewer mothers having primary or tertiary education.

Table 3: Sociodemographic characteristic of the population

Variables	Category	Total (N=235)
Age group		Mean: 30.13 ±5.66 years old
	< 21 years	3 (1.3%)
	[21-30]	114 (48.5%)
	[31-40]	115 (48.9%)
	[41 and above]	3 (1.3%)
Marital status		
	Single	147 (62.6%)
	Married	88 (37.4%)
Mother's Occupation		
	Employed	92 (39.1%)
	Housewife	73 (31.1%)
	Unemployed	70 (29.8%)
Religion		
	Christianity	219 (93.2%)
	Islam	16 (6.8%)
Place of Delivery		
	YGOPH	200 (85.1%)
	Out of-YGOPH	35 (14.9%)
Level of Education		
	Primary	14 (6.0%)
	Secondary	195 (83.0%)
	Tertiary	26 (11.1%)

4.2.2. Medical and Obstetrics Information

The following **table 4** provides an overview of maternal HIV management and antenatal care characteristics among 235 participants. It highlights that the majority of women were diagnosed with HIV before pregnancy and primarily used the TELE regimen for ART. Most participants regularly took ART during pregnancy and had more than four ANC visits, with care mainly provided by general practitioners and gynaecologists. The table also details parity distribution, initiation timing of ANC, and gravidity status.

Table 4: Medical and obstetric characteristics

Variables	Category	Total (N=235)
HIV diagnose before pregnancy		
	No	22 (9.4%)
	Yes	213 (90.6%)
Which Regimen		
	None	2 (0.9%)
	DLT	74 (31.5%)
	TELE	159 (67.7%)
Regularly Taking ART During Pregnancy		
	No	24 (10.2%)
	Yes	211 (89.8%)
Parity		
	Primiparous	116 (49.4%)
	Multiparous	113 (48.1%)
	Grand Multiparous	6 (2.6%)
Initiation of ANC		
	1st Trimester	60 (25.5%)
	2nd Trimester	110 (46.8%)
	3rd Trimester	65 (27.7%)
Obstetric Caregiver		
	General Practitioner	97 (41.3%)
	Midwives	13 (5.5%)
	Gynaecologist	125 (53.2%)
ANC Visits		
	No more than 4	231 (98.3%)
	More than 4	4 (1.7%)
Gravidity		
	Primigravida	27 (11.5%)
	Multigravida	177 (75.3%)
	Grand Multigravida	31 (13.2%)

Most women did not experience membrane rupture or prolonged labor, and the majority delivered at or beyond 37 weeks of gestation. Vaginal deliveries were more common than cesarean sections. Newborns were predominantly of average birth weight, with a majority being female. Regarding infant nutrition in the first six months, most were breastfed, while a smaller proportion received artificial or mixed feeding **(Table 5)**

Table 5: Characteristic of labor, delivery and newborns

Variables	Category	Total (N=235)
Rupture of Membrane		
	No	191 (81.3%)
	Yes	44 (18.7%)
Prolonged Labor		
	No	180 (76.6%)
	Yes	54 (23.0%)
Gestational Age at Labor		
	< 37 weeks	58 (24.7%)
	≥ 37 weeks	177 (75.3%)
Mode of Delivery		
	C-section	37 (15.7%)
	Vaginal delivery	198 (84.3%)
Child Sex		
	Female	135 (57.4%)
	Male	100 (42.6%)
Birth Weight of Child	Mean: 3101.3±563.0g	
	< 2500	9 (3.8%)
	[2500-4000]	210 (89.4%)
	> 4000	16 (6.8%)
Nutrition Mode During First 6 Months		
	Artificial	81 (34.5%)
	Maternal	138 (58.7%)
	Mixed	16 (6.8%)

4.3 Evaluation and comparison of plasma viral load coverage among HIV-1 infected pregnant women during antenatal et postnatal period

a. Plasma viral load coverage

During the antenatal care (ANC) period, PVL testing was relatively frequent, with 59.1% of mothers undergoing at least one test and 42.6% having two or more tests. Results showed that most women had a viral load of less than 1000 copies/ml (56.6%), while only a small percentage had higher viral loads (2.6%). In the third trimester, 84.9% of tests were conducted, indicating focused monitoring during this crucial period.

In contrast, post-natal PVL testing was notably less frequent, with only 28.9% of mothers being tested. The average number of post-natal tests was much lower (0.31 ± 0.52). All post-natal testing occurred within HGOPY, with no testing done outside. This shift reflects a significant reduction in testing frequency and coverage after delivery, highlighting a possible gap in ongoing care compared to the more rigorous ANC period. **(Table 6)**.

Table 6: Plasma viral load coverage and characteristics

Variables	Category	Total (N=235)
PVL testing during ANC		
	No	96 (40.9%)
	Yes	139 (59.1%)
PVL testing during post-natal period (n=45)		
	No	32(71.1%)
	Yes	13(28.9%)
Numbers of PVL testing done during ANC	Mean : 1.42±1.09	
	0	96 (40.9%)
	1	26 (12.7%)
	2	87 (42.6%)
	3	30 (14.7%)
Numbers of PVL done during post-natal period (n=45)	Mean: 0.31±0.52	
	0	32(71.1%)
	1	12(26.7%)
	2	1(2.2%)
Plasma viral load level in the 3rd trimester		
	< 1000 copies/ml	133 (56.6%)
	>= 1000 copies/ml	6 (2.6%)
	Unknown value	96 (40.9%)
Plasma viral load level in the 3rd trimester according to result		
	< 50 copies/ml	128 (54.5%)
	[50-1000[copies/ml	5 (2.1%)
	>= 1000 copies/ml	6 (2.6%)
	Unknown value	96 (40.9%)
Numbers of plasma viral load testing in the 3rd trimester		
	3rd Trimester	118 (84.9%)
	Others	21 (15.1%)

b. Factors associated with PVL testing at 6 weeks and 9 months

The analysis reveals that at 6 weeks, the place of delivery is a significant factor influencing PVL testing, with mothers delivering at HGOPY having significantly higher odds of PVL testing (PR = 25.92, p = 0.002) compared to those delivering at non-HGOPY facilities. In contrast, the occupation of the mother, employment status, regular ART use, and timing of ANC initiation do not significantly affect the likelihood of PVL testing, as indicated by p-values greater than 0.05 **(Table 7)**.

Table 7: Predictors factors associated with PVL testing during antenatal care

Variable	B	PR	aPR	95% C.I.	P-value
Occupation of the mother					
Housewife/Employed	-0.765	0.35	0.465	0.222 - 1.975	0.434
Unemployed/Employed	0.262	0.46	1.300	0.614 - 2.751	0.493
Place of Delivery					
HGOPY/Non-HGOPY	1.493	3.38	25.92	3.42 - 195.95	**0.002**
Regularly Taking ART During Pregnancy					
No/Yes	-1.208	1.67	0.299	0.118 - 1.758	0.112
ANC Initiation					
1st trimester/3rd trimester	1.003	0.72	2.726	0.210 - 6.143	0.160
2nd trimester/3rd trimester	0.417	1.03	1.517	0.771 - 2.985	0.228

Comparing the predictors of plasma viral load (PVL) testing during antenatal care (ANC) and post-natal periods reveals key differences and similarities. During ANC, the place of delivery at HGOPY is a significant predictor of PVL testing, with a notable aPR of 25.92 and a p-value of 0.002, indicating a strong association. In contrast, during the post-natal period, while the place of delivery also shows an exceptionally high proportional ratio, the exact significance is unclear. Other factors, such as the

mother's occupation and regular ART use, do not show significant effects in either period **(Table 8).**

Table 8: Predictors factors of Plasma viral load testing at post-natal period

Independent Variable	Sub-variables	Is PVL done during ANC - No	Is PVL done during ANC – Yes	PR	aPR	95% CI	p-value
Age group	≤30 years	16	8	1.00	1.00		
	[31 and older]	16	5	0.39	0.39	[0.27, 0.57]	0.823
Marital status	Single	22	6	1.00	1.00		
	Married	10	7	0.66	0.66	[0.43, 1.01]	0.795
Mother's Occupation	Employed	17	0	1.00	1.00		
	Housewife	4	7	2, 39	2,14	[0.00- [	1.00
	Unemployed	11	6	2.39	2.44	[0.00- [	1.00
Place of Delivery	YGOH	16	13	$2,2^{E}9$	$4,0^{E}9$	[0.00- [	
	Out of YGOH	16	0	1.00	1.00		
Known LAV+	No	4	0	1.00	1.00		
	Yes	28	13	$2,1^{E10}$	$2,1^{E10}$	[0.00- [	1.00
Which regimen	DLT	20	10	0.62	0.62	[0.46, 0.84]	0.309
	TELE	12	3	1.00	1.00	[0.45, 2.22]	
Regularly taking ART during pregnancy	No	9	9	1.67	1.67	[0.85, 3.28]	0.234
	Yes	12	3	0.62	0.62	[0.48, 0.81]	
ANC Initiation	1st trimester	8	5	1.00	1.00	[0.50, 2.00]	0.160
	2nd trimester	10	6	1.51	1.51	[0.77, 2.99]	
	3rd trimester	12	5	2.72	2.72	[1.21, 6.14]	

4.4 Adherence to the recommended timelines for conducting PCR tests in exposed infants at 6 weeks and 9 months;

The **table 9** reveals that for **PCR 1**, the majority of tests (94.7%) were conducted within the recommended 6–8-week timeframe, indicating strong adherence to the scheduled testing period. However, 5.3% of tests were performed outside this optimal window, suggesting some deviations. In **PCR 2**, 75.6% of tests were conducted at the ideal 9-month mark, demonstrating a good level of compliance, while 24.4% occurred outside this timeframe, reflecting a significant deviation. Overall, while the adherence to recommended testing schedules is generally high, both categories show a notable percentage of tests performed outside the ideal periods, highlighting areas for potential improvement in adherence to testing guidelines.

Table 9: Adherence to timeline PCR testing

Type of PCR Performed	Frequency	Percentage
PCR 1		
6-8 weeks	180	94.7%
Out of timeline	10	5.3%
Total	190	100.0%
PCR 2		
9 months	34	75.6%
Out of timeline	11	24.4%
Total	45	100.0%

4.5 To assess and compare the rate of vertical HIV transmission among exposed infants at 6 weeks and 9 months of age;

At 6 weeks, only 5.3% of the infants tested positive for HIV. However, by 9 months, this positivity rate increased slightly to 8.9%. Overall, when combining results from both tests, the total positivity rate is 6.4%, with 93.6% of tests showing negative results. This suggests that while the majority of infants tested negative at both 6 weeks and 9 months, there is a small proportion of cases where HIV either persisted or was newly acquired over time **(Table 10).**

Additionally, the data on the mode of delivery and plasma viral load (PVL) levels indicates that infants with high PVL levels (≥ 1000 copies/ml) or unknown values were more likely to be delivered by caesarean section. In contrast, vaginal deliveries were more common among infants with low-risk PVL levels (< 1000 copies/ml). These delivery practices align with strategies to effectively manage the risk of HIV transmission during childbirth **(Table 11).**

Table 10: Early Diagnosis Infant Result

Variables		6 weeks (%)	9 months (%)	Total (%)	P-value
Result of PCR	Negative	180 (94.7)	41 (91.1)	221(93.6)	0.26
	Positive	10 (5.3)	4 (8.9)	14(6.4)	
Total		190 (100.0)	45 (100.0)	235 (100.0)	

Table 11: Mode of delivery according to PVL

PVL value	Mode of Delivery	Frequency	Percentage
< 1000 copies/ml (Low Risk MTCT)	C-section	14	10.5%
	Vaginal delivery	119	89.5%
	Total	**133**	100.0%
>= 1000 copies/ml (High Risk MTCT)	C-section	3	50.0%
	Vaginal delivery	3	50.0%
	Total	**6**	100.0%
Unknown value (High Risk MTCT)	C-section	20	20.8%
	Vaginal delivery	76	79.2%
	Total	**96**	100.0%
	Total	235	100.0%

4.6 To identify and compare potential determinants of mother-to-child transmission of HIV at 6 weeks and 9 months of age

Following bivariate analysis, comparing the determinants of mother-to-child HIV transmission at 6 weeks (PCR 1) and 9 months (PCR 2) reveals consistent findings in several areas. Nevirapine prophylaxis and regular ART during pregnancy are strongly associated with reduced transmission rates in both PCR 1 and PCR 2. The mode of nutrition also shows a significant impact, with breastfeeding associated with lower transmission. Variables such as HAART regimen and rupture of membranes demonstrate varying effects between the two time points, with some factors like prolonged labour showing significant associations in PCR 1 but not in PCR 2. Overall, adherence to prophylaxis and ART remains crucial across time points, while other determinants' influence may shift as the child grows **(Table 12 & 13).**

Table 12: Bivariate analysis of potential factors associated with MTCT at 6 weeks

Variable	Sous-variables	Proportions (PCR 1) N= 190		PR	95% CI	p-value
		Negative (%)	Positive (%)			
Age group	=< 30 years	87(93.5)	6 (6.5)	0.49	0.05-4.080	0.51
	> 30 years	93(95.9)	4(4.1)	1		
Nevirapine prophylaxis	No	1(12.5)	7(87.5)	53.08	13,727-205,278	**<0.001**
	Yes	179(98.4)	3(1.6)	1		
Mode de nutrition	Formula Feeding	55(93.2)	4(6.8)	,136	0,034-0,542	**0.005**
	Breastfeeding	121(98.3)	2(1.7)	,033	0,006-0,178	**<0.001**
	Both	4(50.0)	4 (50.0)	1	.	.
HAART Regimen	DLT	109 (95.6)	6(4.9)	5.45	1.30-22.82	**0.020**
	TELE	71 (94.7)	4(5.3)	1		
Patient on Treatment	No	1(50.0)	1 (50.0)	23.50	4.99-110.63	**<0.001**

Table 12 (Continuous): Bivariate analysis of potential factors associated with MTCT at 6 weeks

Variable	Sous-variables	Proportions (PCR 1) N= 190		PR	95% CI	p-value
		Negative (%)	Positive (%)			
	Yes	178(94.7)	9(4.2)	1		
Regularly taking ART during pregnancy	No	11(55.5)	9(44.5)	76.50	9.62-603.81	**<0.001**
	Yes	169(99.4)	1(0.6)	1		
Rupture of membrane	No	155(98.1)	3(1.7)	1		
	Yes	25(78.1)	7(22.9)	0.87	0.02-0.33	**<0.001**
Prolonged Labour	No	144(97.3)	4(2.7)	0.18	0.05-0.67	0.010
	Yes	36(90.0)	6(10.0)	1		
PVL Testing	No	71(88.8)	9(11.2)	23.88	3.02-188.52	0.003
	Yes	109(99.1)	1(0.9)	1		
Weight of the child	<2500g	2(40.0)	3(60.0)	8.40	0.87-80.75	0.065
	2500-4000	165(96.5)	6(3.5)	0.49	0.05-4.080	0.51
	+4000g	13(92.8)	1(7.8)	1		

Table 13: Bivariate analysis of potential factors associated with MTCT at 9 months

Variable Independent	Sous-variables	Proportions (PCR 2) N= 45		PR	95%CI	p-value (PCR 2)
		Negative	Positive			
Age group	=< 30 years	22(91.7)	2(8.3)	0.96	0.87-80.75	0.496
	> 30 years	19(90.5)	2(9.5)	1		
Nevirapine prophylaxis	No	2(40.0)	3(60.0)	1.90	1.87-80.75	**0.000**
	Yes	39(97.5)	1(2.5)	1		
Mode de nutrition	Formula Feeding	0(0.0)	0(0.0)	<0.0001	0.000-	0.447
	Breastfeeding	4(80.0)	1(20.0)	1.000	0.80-80.75	
	Both	37(92.5)	3(7.5)	1		
Known HIV	No	4(100.0)	0(0)	<0.0001	0.000-	0.570
	Yes	37 (90.2)	4(9.2)	1		
HAART Regimen	DLT	29(96.7)	1(3.3)	2.87	1.47-40.75	0.179
	TELE	12(80.0)	3(20.0)			
Patient on Treatment	No	41(91.1)	4(8.9)	<0.0001	0.00-	-
	Yes	4(100.0)	0(0.0)	1		
Regularly taking ART during pregnancy	No	0(0.0)	4(100.0)	<0.0001	<0.0001	**0.001**
	Yes	41(100.0)	0(0.0)	1		
PVL Testing	No	28(87.5)	4(12.5)	<0.0001	0.00-	**0.034**
	Yes	13(100.0)	0(0.0)	1		
PVL value	<1000copies/ml	26(100.0)	0(0.0)	<0.0001	0.00-	**0.026**
	≥1000copies/ml	0(0.0)	0(0.0)	1.00	0.00-	
	Unknown value	15(78.9)	4(21.1)	1		

Factors Associated with Mother-to-Child Transmission After Multivariate Analysis

The analysis of HIV transmission predictors shows that at 6 weeks, not regularly taking ART during pregnancy is a major risk factor for MTCT, with a significant increase in risk (aPR = 17.49; p=0.014). Nevirapine prophylaxis is also a key factor, but it was not statistically significant. By 9 months, the effects of Nevirapine prophylaxis and regular ART adherence are no longer significant. The HAART regimen, mode of nutrition, and rupture of membranes do not significantly impact MTCT risk at either time point. This suggests that early and consistent ART adherence is crucial for reducing MTCT in the early postnatal period **(Table 14 & 15)**.

Table 14: Predictors factors of MTCT of HIV at 6 weeks

Variable	Sous-variables	PR	a**PR**	95% CI	**p-value**
Nevirapine prophylaxis	No	53.08	5.51	0.06-467.36	0.45
	Yes	1	1		
Mode of nutrition	Formula Feeding	0.136	2.50	0,23-27.06	0.44
	Breastfeeding	0.033	1.10	0.12-9.52	0.92
	Both	1	1	.	
HAART Regimen	DLT	5.45	0.96	0.14-6.64	0.97
	TELE	1	1		
Regularly taking ART during pregnancy	No	76.50	17.49	1.80-169.44	**0.014**
	Yes	1	1		
Rupture of membrane	No	0.87	1.17	0.02-68.34	0.93
	Yes	1	1		

Table 15: Predictors factors of MTCT of HIV at 9 months

Variable	Sous-variables	PR	a**PR**	95% CI	**p-value**
Nevirapine prophylaxis	No	1.90	9.3E14	0.00-	1.000
	Yes	1	1		
HAART Regimen	DLT	1.002	1.00	0.09-11.20	1.000
	TELE	1	1		
Regularly taking ART during pregnancy	No	1.001	1.07E14	0.000-0.000	-
	Yes	1	1		
Rupture of membrane	No	1.0	1.002	0.000-	1.000
	Yes	1	1		

CHAPTER V : DISCUSSION

Discussion

Preventing mother-to-child transmission (PMTCT) of HIV is a critical focus of global healthcare policies and a key component of the UNAIDS 95-95-95 targets for 2030. Cameroon did not meet the UNAIDS 90-90-90 targets for 2020, prompting the government to develop new strategies aimed at achieving the 2030 goals. As part of these new strategies, a revised guideline for managing pregnant women living with HIV has been implemented. Additionally, since January 2020, all HIV-related care has been provided free of charge to improve access and outcomes for affected individuals[16].

The goal of this study was to advance the reduction of mother-to-child transmission of HIV by comprehensively evaluating several critical aspects of HIV management. The study aimed to assess and compare plasma viral load monitoring coverage for HIV-infected pregnant women during both the antenatal and postnatal periods. Additionally, it sought to determine adherence to recommended timelines for conducting PCR tests in exposed infants at 6 weeks and 9 months, and to compare the rates of vertical HIV transmission among these infants at the specified ages. Furthermore, the study aimed to identify and compare potential determinants of mother-to-child transmission of HIV at 6 weeks and 9 months. By thoroughly understanding these elements, including viral load monitoring practices, early infant diagnosis outcomes and associated factors, the study intends to inform and refine strategies to effectively minimize HIV transmission from mother to child.

5.1.1. Sociodemographic Factors

The maternal population at Yaoundé Gynaeco-Obstetric Hospital is predominantly young, single, and unemployed. Most mothers were between 21 and 40 years old, a common reproductive age range. The majority have secondary school education, while tertiary school education is less prevalent**.** Majority of the women were diagnosed with HIV prior to pregnancy, with the majority adhering to ART throughout pregnancy. We also found that many women began ANC in the second trimester.

5.1.2. Evaluation and Comparison of Plasma Viral Load (PVL) Monitoring Coverage

Our study reveals a notable difference in the coverage of PVL monitoring between the antenatal and postnatal periods. While 59.1% of mothers received PVL testing during pregnancy, postnatal testing coverage was markedly lower at 28.9%, primarily concentrated at the Yaoundé Gynaeco-Obstetric Hospital (HGOPY). This decline indicates a gap in postnatal care that could affect HIV management in the postpartum period. This finding resonates with the observations of Kafack *et al*., who reported suboptimal VL coverage among antenatal care (ANC) attendees in Cameroon, though our rates are somewhat higher[14]. Similarly, Sandbulte *et al.* highlighted significant deficiencies in VL monitoring and follow-up in Kenyan hospitals, where only a fraction of women received guideline-adherent testing[9]. This comparison underscores a broader challenge in maintaining comprehensive PVL monitoring throughout both antenatal and postnatal periods.

5.1.3. Adherence to Recommended Timelines for PCR Tests

In terms of PCR testing for exposed infants, our study shows high adherence to recommended timelines, with 94.7% of tests performed within the 6-8 week window and 75.6% at the 9-month mark. Despite this, there is room for improvement, as some tests fell outside the ideal timeframes. This aligns with the findings of Lesosky *et al.*, who emphasized the importance of timely VL monitoring relative to gestational age to optimize maternal and infant health [61]. Our results reinforce the need for consistent adherence to testing schedules to ensure early and accurate diagnosis, which is crucial for initiating timely treatment.

5.1.4. Rate of Vertical HIV Transmission

The vertical HIV transmission rate observed in our study—5.3% at 6 weeks and 8.9% at 9 months—suggests that while preventive measures are largely effective, there is a slight increase in transmission over time. This observation is consistent with Myer *et al.*, who found that high rates of viral suppression and low rates of mother-to-child transmission (MTCT) are achievable with effective antiretroviral therapy (ART) in a routine care setting [62]. The increase in transmission rate in our study highlights the

need for ongoing vigilance and potential enhancements in preventive strategies to further reduce transmission.

5.1.5. Determinants of Mother-to-Child Transmission of HIV

Our study identifies shows that at 6 weeks, not regularly taking ART during pregnancy is a major risk factor for MTCT, with a significant increase in risk (aPR = 17.49; p=0.014). Nevirapine prophylaxis is also a key factor, but it was not statistically significant. By 9 months, the effects of Nevirapine prophylaxis and regular ART adherence are no longer significant. The HAART regimen, mode of nutrition, and rupture of membranes do not significantly impact MTCT risk at either time point. This suggests that early and consistent ART adherence is crucial for reducing MTCT in the early postnatal period. This finding aligns with Brittain *et al*., who highlighted the impact of ART adherence and specific beliefs about treatment during pregnancy on transmission rates [58]. Though Kafack *et al*. did not find any associated factors of MTCT of HIV[14], it is well known that the protective effect of exclusive breastfeeding or formula feeding and the importance of adherence to preventive measures underscore the need for continued education and support to further reduce transmission rates[60].

5.1.6. Factors Influencing PVL Testing.

Our results indicate that the place of delivery significantly impacts PVL testing rates, with higher testing likelihood at HGOPY. This finding is consistent with Lesosky *et al*., who reported variability in VL monitoring coverage based on geographic and facility factors [60]. Addressing these disparities is crucial for improving overall testing coverage and further reducing transmission rates. The variability in coverage highlights the need for more equitable distribution of resources and services to ensure comprehensive care for all patients.

LIMITATIONS AND STRENGTHS

5.2.1. Limitations

The study's focus on a single reference hospital limits its ability to capture data from women who gave birth outside this facility, such as those delivering at home or at other healthcare centres. This restriction limits the study's scope in evaluating community-based vertical HIV transmission and its implications for broader PMTCT programs at the public health level.

Data collection was constrained by incomplete records, as over 60% of the participant files were excluded due to missing information. This highlights the need for improved data recording practices to ensure comprehensive tracking of PMTCT processes and outcomes. Additionally, the study's brief duration limited our ability to track HIV status and outcomes of exposed infants beyond the immediate postnatal period, underscoring the need for longer follow-up to fully assess the effectiveness of PMTCT interventions.

5.2.2. Strengths

This pilot study conducted at a specialized reference hospital provides valuable insights into the effectiveness of PMTCT strategies within a focused setting. The findings offer a foundation for future research, including larger multicentre or national studies, to further explore and refine PMTCT approaches.

The study delivers strong evidence on early-phase HIV vertical transmission within this specialized hospital, demonstrating the effectiveness of current PMTCT practices and highlighting areas for improvement. The detailed sociodemographic and medical data, including adherence to ART and PVL testing, offers a nuanced understanding of factors influencing MTCT in this context.

CONCLUSION

Specific objective 1's Conclusion (**Plasma Viral Load Monitoring Coverage**): This study revealed a significant disparity in plasma viral load (PVL) monitoring coverage, with 59.1% of pregnant women receiving testing during the antenatal period compared to only 28.9% during the postnatal period. This gap underscores the need for enhanced postnatal care protocols to ensure ongoing HIV management and minimize the risk of transmission after delivery.

Specific objective 2's Conclusion (**Adherence to PCR Testing Timelines)**: Adherence to the recommended timelines for PCR testing in exposed infants was found to be generally high, with 94.7% of tests conducted within the 6-8 week window and 75.6% at 9 months. However, the presence of tests outside the ideal timeframes highlights opportunities for improvement in adherence practices to optimize early diagnosis and treatment initiation for infants.

Specific objective 3's Conclusion (Rate of Vertical HIV Transmission): The observed vertical HIV transmission rates of 5.3% at 6 weeks and 8.9% at 9 months suggest effective preventive measures, although the increase over time indicates a need for ongoing vigilance and potential enhancements in interventions. Continuous monitoring and refinement of prevention strategies are critical for further reducing transmission rates.

Specific objective 4's Conclusion (Determinants of MTCT of HIV-1): The study identified inconsistent adherence to antiretroviral therapy (ART) during pregnancy as a major risk factor for mother-to-child transmission (MTCT) at 6 weeks. While the significance of nevirapine prophylaxis diminished by 9 months, the findings emphasize the critical importance of early and consistent ART adherence to minimize MTCT risk, as well as the need for ongoing education and support for mothers.

Overall Conclusion:

This study highlights the crucial role of comprehensive strategies in preventing mother-to-child transmission (PMTCT) of HIV in Cameroon. While significant advancements have been made in access to HIV-related care and monitoring guidelines, notable gaps remain, particularly in postnatal plasma viral load monitoring and adherence to PCR testing timelines. The observed vertical transmission rates, although relatively low, emphasize the necessity for continued vigilance and targeted interventions to further reduce these rates. Key determinants, such as adherence to antiretroviral therapy, underline the importance of consistent healthcare support and education for mothers. Addressing these challenges is essential for achieving the UNAIDS 2030 targets and enhancing PMTCT practices to ensure better health outcomes for both mothers and their infants.

RECOMMENDATIONS

To the Ministry of Public Health:

- Promote the updated guidelines for managing HIV-infected pregnant women, emphasizing the need for quarterly PVL testing during pregnancy.
- Enhance support for PVL testing infrastructure at specialized PMTCT centers to ensure timely and accurate viral load monitoring.

To Obstetric Caregivers:

- Adhere to the new management guidelines for HIV-infected pregnant women, focusing on regular PVL monitoring and ART adherence.
- Identify and manage high-risk pregnancies with unknown or elevated PVL levels proactively, including consideration of cesarean sections to reduce transmission risk.
- Improve ANC practices, ensuring timely initiation and sufficient frequency of visits to monitor and manage maternal and infant health effectively.

To Pregnant Women Living with HIV:

- Follow the standard care and monitoring guidelines established in the PMTCT program, including regular ART adherence.
- Ensure optimal infant feeding practices and adhere to recommendations for protective breastfeeding as part of the PMTCT cascade care.

To the Research Community:

- Investigate the rate of HIV vertical transmission throughout the entire PMTCT cascade, from pregnancy through to 18 months of infant age.
- Expand research to include additional specialized centres or a national perspective to enhance the effectiveness and performance of PMTCT programs across various settings.

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APPENDIX

APPENDIX ONE: INFORMATION SHEET

Section	Question	Responses
I. SOCIODEMOGRAPHIC INFORMATION		
1. Age	_____	
2. Marital Status	1. Married 2. Divorced 3. Single 4. Widow	
3. Occupation	1. Unemployed 2. Employed 3. Housewife 4. Other: _____	
4. Religion	1. Catholic 2. Muslim 3. Animist 4. Other: _____	
5. Level of Education	0. None 1. Primary 2. Secondary 3. Tertiary	
II. OBSTETRIC AND SOCIAL INFORMATION		
6. Gravidity	_____	
7. Parity	_____	
III. ANC INFORMATION		
14. Number of ANC Visits	_____	
16. Where?	0. FOSA 1. Hors FOSA _____	
17. Gestational Age at First ANC Contact	_____	
18. Healthcare provider	0. Gynecologist/Resident 1. General practitioner 2. Midwife 3. Nurse	
V. LABORATORY INVESTIGATIONS		
23. Postive HIV Status	0. Before pregnancy 1. During pregnancy	
24. Is she on ART?	0. No 1. Yes	
25. Which ART Regimen?	_____	
26. Last Viral Load Done During ANC	_____	
27. Number of Viral Loads Done During ANC	_____	
VI. MEDICATIONS		

Section	Question	Responses
28. Regularly Attends ART During Pregnancy	0. No 1. Yes	
29. If No, Has She Missed More Than 1 Month of Therapy?	0. No 1. Yes	
VII. PREGNANCY OUTCOMES		
32. Mode of Delivery	1. Vaginal Delivery 2. C-section	
33. Gestational Age at Delivery	_____	
34. Type of Labor	1. Spontaneous 2. Induced 3. Augmented	
35. Any Complications During Labor or Delivery?	0. No 1. Yes	
36. Rupture of Membranes	1. Spontaneous 2. Artificial	
37. Weight of the Baby	_____	
38. Mode of Nutrition During First 6 Months	1. Breastfeeding 2. Artificial 3. Mixed	
39. Mode of Nutrition From 6 Months	1. Breastfeeding 2. Artificial 3. Mixed	
40. PCR Test Results at 6 Weeks	1. Positive 2. Negative 3. Indeterminate 4. Not Done	
40. Age of the child at PCR collection at 6 weeks		
32. PCR Test Result at 9months	1. Positive 2. Negative 3. Indeterminate 4. Not Done	
40. Age of the child at PCR collection at 9 months		
41. Other PCR Test	1. Positive 2. Negative 3. Indeterminate 4. Not Done	

APPENDIX 2: CONSENT FORM

INFORMATION SHEET

Title of Study: **Etienne Fouedjio**

Introduction

My name is FOUEDJIO KAFACK ETIENNE VERLAIN. I am a MPH student at the Faculty of Medicine and Pharmaceutical Sciences, University of Yaounde I and I am the main investigator of this study.

Dear Madam,

Invitation into the study

We kindly ask you to participate in this study, which we will describe. The study seeks to evaluate plasma viral load coverage is during antenatal care (ANC); to describe the mode of delivery of HIV mother and evaluate adherence with relevant recommendation and to appreciate the foetal HIV status. This would be done under the supervision of **Pr. NGUEFACK-TSAGUE Georges,** Associate Professor in Public Health/Biostatistics, **Pr LYONGA EMILIA ENJEMA,** Senior lecturer in Medical Microbiology and **Dr KWEDI SYLVIE**, Senior Lecturer in Public Health.

Voluntary Participation

We will like to emphasize that this study is strictly voluntary. You are free to decide to participate. If you decide not to participate in the study, it will not affect the policy you made for your patient in your hospital.

Study Procedures

If you decide to allow your hospital to participate in this study, you will be asked to allow us to collect from HIV care unit and ANC records office.

Risks: The Data will not be exposed to ANY risks as a result of their participation in the study.

Benefits: There will be no financial or material compensation for Data with room given for any clarifications.

Confidentiality: Data are assured that their privacy will be respected as identification will be done with codes rather than names during the study. Under no circumstances will the raw information be divulged to third parties.

Autonomy: Hospital administration reserve the right to withdraw from the study at any time, should they deem it necessary, without penalty or prejudice.

The research and this consent form have been approved by the ethical review board of the Faculty of Medicine and Pharmaceutical Sciences, University of YAOUNDE, which ensures that research involving humans follows national regulations. Any new information that develops during the project will be provided to you, if the information might affect your willingness to continue participation in the project. Questions regarding this project can be answered by contacting:

1. FOUEDJIO Kafack Etienne Verlain (697496699), Faculty of Medicine and Pharmaceutical Sciences, University of Yaounde I.

CONSENT FORM.

I……

……. having understood the study, after having the data information sheet well explained to me, having been given the opportunity to ask questions, do hereby agree my hospital to participate in this study.

……. ……

Date/signature of hospital's Administrator Date/signature of investigator

APPENDIX 3: ETHICAL CLEARANCE

UNIVERSITÉ DE YAOUNDÉ I

FACULTÉ DE MÉDECINE ET DES SCIENCES BIOMÉDICALES

COMITÉ INSTITUTIONNEL D'ÉTHIQUE DE LA RECHERCHE
Tel/ fax : 22 31-05-86 22 311224
Email: decanatfmsb@hotmail.com

UNIVERSITY OF YAOUNDE I

FACULTY OF MEDICINE AND BIOMEDICAL SCIENCES

INSTITUTIONAL ETHICAL REVIEW BOARD

Ref. : N° 0443/UY1/FMSB/VDRC/DAASR/CSD

CLAIRANCE ÉTHIQUE

12 MAI 2023

Le COMITÉ INSTITUTIONNEL D'ÉTHIQUE DE LA RECHERCHE (CIER) de la FMSB a examiné

La demande de la clairance éthique soumise par :

M.Mme : FOUEDJIO KAFACK Etienne Verlain **Matricule: 22E0015**

Travaillant sous la direction de :

- **Pr Nguefack Tsague Georges**
- **Pr Lyonga Emilia Enjema**
- **Dr Kwedi Jippe Anne Sylvie**

Concernant le projet de recherche intitulé : **Evaluation of plasma viral-load coverage and the prevention of mother-to- child transmission of HIV-1 in three facilities in Yaounde, Cameroon**

Les principales observations sont les suivantes

Evaluation scientifique	
Evaluation de la convenance institutionnelle/valeur sociale	
Equilibre des risques et des bénéfices	
Respect du consentement libre et éclairé	
Respect de la vie privée et des renseignements personnels (confidentialité) :	
Respect de la justice dans le choix des sujets	
Respect des personnes vulnérables :	
Réduction des inconvénients/optimalisation des avantages	
Gestion des compensations financières des sujets	
Gestion des conflits d'intérêt impliquant le chercheur	

Pour toutes ces raisons, le **CIER** émet un avis **favorable** sous réserve des modifications recommandées dans la grille d'évaluation scientifique.

L'équipe de recherche est responsable du respect du protocole approuvé et ne devra pas y apporter d'amendement sans avis favorable du **CIER**. Elle devra collaborer avec le **CIER** lorsque nécessaire, pour le suivi de la mise en œuvre dudit protocole.

La clairance éthique peut être retirée en cas de non - respect de la réglementation ou des recommandations sus évoquées.

En foi de quoi la présente clairance éthique est délivrée pour servir et valoir ce que de droit

LE PRESIDENT DU COMITE ETHIQUE

PROFESSEUR

Pr. A. Obama

APPENDIX 4: HGOPY RESEARCH AUTHORIZATION

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie
MINISTERE DE LA SANTE PUBLIQUE
HOPITAL GYNECO-OBSTETRIQUE ET PEDIATRIQUE DE YAOUNDE
HUMILITE – INTEGRITE – VERITE – SERVICE

REPUBLIC OF CAMEROON
Peace-Work-Fatherland
MINISTRY OF PUBLIC HEALTH
YAOUNDE GYNAECO-OBSTETRIC AND PEDIATRIC HOSPITAL
HUMILITY – INTEGRITY – TRUTH – SERVICE

COMITE INSTITUTIONNEL D'ETHIQUE DE LA RECHERCHE POUR LA SANTE HUMAINE (CIERSH)

Arrêté n° 0977 du MINSANTE du 18 avril 2012 portant création et organisation des Comités d'Ethiques de la Recherche pour la santé Humaines. (CERSH).

AUTORISATION N°635/CIERSH/DM/2024

CLAIRANCE ETHIQUE

Le Comité Institutionnel d'Ethique de la Recherche pour la Santé Humaine (CIERSH) a examiné le 21 février 2024, la demande d'autorisation et le Protocole de recherche intitulé « **evaluation of plasma viral-load coverage and the prevention of mother – to- child transmission of HIV-1 in three facilities in Yaounde, Cameroon** » soumis par l'étudiant Dr FOUEDJIO KAFACK ETIENNE VERLAIN.

Le sujet est digne d'intérêt. Les objectifs sont bien définis. La procédure de recherche proposée ne comporte aucune méthode invasive préjudiciable aux participants. Le formulaire de consentement éclairé est présent et la confidentialité des données est préservée. Pour les raisons qui précèdent, le CIERSH de HGOPY donne son accord pour la mise en œuvre de la présente recherche.

Dr FOUEDJIO KAFACK ETIENNE VERLAIN devra se conformer au règlement en vigueur à HGOPY et déposer obligatoirement une copie de ses travaux à la Direction Médicale de ladite formation sanitaire.

Yaoundé, le 2 8 FEV 2024

LE PRESIDENT

Prof MBU Robinson
Directeur Général
HGOPY

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