

Chapter One

Introduction

1.1 Background to the Study

The primary method of human immunodeficiency virus transmission in children under the age of 15 is mother-to-child transmission (MTCT). While unprotected sexual contact remains the primary means of HIV transmission, a significant proportion of transmissions of the virus also happen straight down from mother to kid. When HIV is passed from a mother to her kid during pregnancy, delivery, or breastfeeding, this is known as mother-to-child transmission (MTCT)¹.

HIV transmission from mother to child continues to be a major cause of the pandemic, accounting for 9% of new infections worldwide². The 2016 "Start Free, Stay Free, AIDS Free framework" set goals that by 2018, 95% of pregnant women living with HIV would be getting lifelong antiretroviral medication, and fewer than 40,000 children would contract the virus³. Though this was a drop from 280,000 in 2010, an estimated 150,000 children were newly infected with HIV in 2019, and only 85% of pregnant HIV-positive women were receiving antiretroviral medication⁴.

The human immunodeficiency virus (HIV) is a viral pathogen that compromises the immune system, rendering individuals susceptible to various opportunistic diseases. This has emerged as a significant worldwide health concern, particularly in Sub-Saharan nations⁵. Based on data provided by UNAIDS, the global population of individuals affected by HIV/AIDS in 2018 was estimated to be 37.9 million. Among this population, 36.2 million were classified as adults, while 1.7 million were children aged 14 years or younger. In the year 2018, it is projected that over 1.7 million individuals globally acquired new HIV infections. Among this population, there were approximately 160,000 cases of infection observed specifically among

children aged 0 to 14 years⁶. According to reports, Nigeria is currently recognized as the second greatest HIV epidemic globally⁷. In 2018, it was estimated that over 1.9 million individuals in Nigeria were afflicted with the Human Immunodeficiency Virus (HIV). The decline in prevalence estimates for the country can be due to improved surveillance methods⁸.

Without the presence of any intervention, the cumulative risk of vertical transmission of HIV from mother to child during pregnancy and childbirth ranges from 15 to 30 percent. Breastfeeding is associated with a heightened risk ranging from 20 to 45 percent^{9,10}. According to empirical studies, the administration of antiretroviral (ARV) medications to expectant mothers and their infants has been found to significantly decrease the likelihood of vertical transmission of the human immunodeficiency virus (HIV) from mother to child^{11,12,13}. Untreated HIV infections in children are correlated with significantly elevated mortality rates^{14,15}. The findings of a comprehensive investigation on the outcomes of new-borns infected with HIV in sub-Saharan Africa indicate that, within the region, around 35 percent and 52 percent of HIV-infected children experience mortality by the age of one and two, respectively¹⁴.

The efficacy of PMTCT therapies utilizing short course antiretroviral medication treatment has been convincingly proven through empirical evidence in extensive programs implemented within normal prenatal and obstetrics settings in South Africa and Zambia^{16,17,18}.

Early baby Diagnosis (EID) is an integral component of the comprehensive package of services for infant, maternal, neonatal, and child health within the framework of interventions for the prevention of mother-to-child transmission (PMTCT)¹⁹. The Polymerase Chain Reaction (PCR) technique, employed in Early Infant Diagnosis (EID) tests, detects HIV DNA directly instead of relying on the presence of HIV antibodies. This method offers a conclusive diagnosis for children below 18 months of age²⁰. The implementation of Early Infant

Diagnosis (EID) enables timely clinical assessment, administration of prophylactic measures against opportunistic infections, and initiation of antiretroviral medication (ART) for HIV-exposed newborns, as deemed necessary²¹. In addition, doing a comprehensive analysis of HIV test outcomes inside an Early Infant Diagnosis (EID) initiative presents a distinct prospect for assessing the efficacy of the Prevention of Mother-to-Child Transmission (PMTCT) program¹⁶. Nigeria bears a significant portion, namely 30 percent, of the worldwide burden associated with mother-to-child transmission (MTCT) of HIV. It is worth noting that Nigeria is among the 22 target nations identified by the Global Plan to Eliminate MTCT, highlighting its importance in addressing this issue on a global scale. While the Nigerian Government is making concerted efforts to enhance the PMTCT program in order to fulfil its objectives, there is a dearth of comprehensive evidence regarding the efficacy of PMTCT interventions or the obstacles that hinder their implementation²².

In order to accomplish the objective set forth by the United Nations to eliminate new HIV infections, a program aimed at preventing the transfer of the virus from mother to child, commonly referred to as Prevention of Mother-to-Child transfer (PMTCT), was initiated. In many countries, the implementation of effective measures, such as the administration of antiretroviral (ARV) medications, obstetric interventions, and adjustments in new born feeding practices, has resulted in a significant reduction of mother-to-child transmission (MTCT) rates to less than 2%^{23,24}. This has significantly reduced the incidence of paediatric HIV/AIDS and associated morbidity and mortality in those countries. The prevalence of mother-to-child transmission in Nigeria has persisted at a significant level, with an estimated rate of 22% in the year 2016^{25,26}. Therefore, the reduction of mother-to-child transmission continues to be a significant focus area.

The initiation of the national Prevention of Mother-to-Child Transmission (PMTCT) program in Nigeria took place in 2002, with assistance provided by the World Health Organization

(WHO) and the United Nations Children's Fund (UNICEF)²⁷. The extent to which PMTCT programs are applicable and effective in Adeoyo Maternity Centre Yemetu, Ibadan is not well understood. Therefore, this study aims to examine the effectiveness of the Prevention of Mother to Child Transmission of HIV program in Adeoyo Maternity Centre Yemetu, Ibadan.

1.2 Statement of the Research Problem

The transmission of HIV from mother to child, also known as mother-to-child transmission (MTCT), poses a significant obstacle in the context of the HIV/AIDS pandemic, particularly in resource-limited settings, such as developing nations. Africa bears the greatest disease burden, with approximately 90 percent of paediatric HIV infections occurring in this region. In 2009, an estimated 370,000 children worldwide contracted HIV, primarily through mother-to-child transmission (MTCT). This transmission is largely attributed to inadequate knowledge of prevention methods and non-adherence to treatment by the mother. Nigeria bears a significant portion, namely 30 percent, of the worldwide burden associated with mother-to-child transmission (MTCT) of HIV. It is worth noting that Nigeria is among the 22 nations prioritized by the Global Plan to Eliminate MTCT, highlighting its importance in addressing this issue on a global scale. Despite the Government of Nigeria's intensified efforts in the PMTCT program to meet its goals, there is limited research regarding the effectiveness of PMTCT interventions and their adherence to recommended therapy. Therefore, this study aims to address this gap in knowledge.

1.3 Justification of the study

The Human Immunodeficiency Virus (HIV) is a significant contributor to global mortality rates and is particularly responsible for the highest number of deaths among women of reproductive age worldwide. Nigeria, specifically, is among the four nations that have an annual incidence of over 10,000 new cases of pediatric HIV infections⁶. On a global scale,

there exists a significant disparity in the prevalence of HIV between women and men, with women between the ages of 15 and 49, who are of reproductive age, being particularly susceptible to HIV infection. The annual incidence of pediatric HIV infections²⁸. Despite a notable decline of 52% in new HIV infections among children since 2010, it remains concerning that children still constitute a substantial population of 1.7 million individuals living with HIV. Furthermore, the year 2021 witnessed the occurrence of 160,000 new HIV infections specifically among children²⁹.

The Nigerian government has demonstrated its dedication to the worldwide effort aimed at eradicating the transmission of HIV from mothers to their children, with the ultimate goal of achieving zero new infections by the year 2025. However, it is disconcerting to note that a significant number of pregnant women in Nigeria, specifically 83,000, have tested positive for HIV. A mere 44 percent of individuals are currently receiving antiretroviral therapy (ART), hence posing a potential threat of ongoing transmission of HIV from mother to child³⁰. According to existing literature, several issues have been discovered in the provision of Prevention of Mother-to-Child Transmission (PMTCT) services in Nigeria. These challenges include the lower utilization of antenatal services by women and the insufficiency of the national PMTCT unique identification systems in facilitating the delivery of high-quality care. The available evidence on the efficiency and acceptability of Prevention of Mother-to-Child Transmission (PMTCT) programs in Nigeria is limited due to a dearth of research conducted to assess the efficacy of PMTCT services.

The fundamental objective of the Prevention of Mother-To-Child Transmission (PMTCT) program is to mitigate the likelihood of HIV transmission from mother to child. This initiative primarily focuses on preventing HIV infection in women of reproductive age, as they are the primary sources of paediatric HIV transmission⁵. Despite the implementation of interventions aimed at preventing mother-to-child transmission (PMTCT) of HIV, a

significant proportion of new-borns continue to be infected with HIV and experience mortality due to HIV-related complications. The results of this study will serve as a catalyst for health professionals and policymakers to develop targeted health education programs and policies for women. These initiatives will enhance women's knowledge of PMTCT of HIV, leading to improved access to and utilization of PMTCT services. Consequently, this should result in a reduction in mother-to-child transmission of HIV and an enhancement of maternal and child health outcomes. The findings of this study will also provide valuable data for nursing education and other healthcare professionals, enabling them to effectively meet the needs of pregnant women by providing comprehensive information about HIV/AIDS and improving the quality of care for HIV-positive mothers.

1.4 Aim and Objectives of the Study

The aim of the study would assess the effectiveness of interventions in reducing the transmission of HIV from mother to child.

Specific objectives include

- i. To assess the intervention of PMTCT on HIV positive infant born to HIV-positive mother in Adeoyo maternity centre, Ibadan, Oyo state.
- ii. To assess the knowledge of healthcare providers on PMTCT of HIV in Adeoyo maternity centre, Ibadan, Oyo state.
- iii. To determine the perception of HIV positive pregnant women, HIV-positive mother in Adeoyo maternity centre, Ibadan, Oyo state.
- iv. To determine the effectiveness of PMTCT provided by the health care providers on HIV positive pregnant mothers in Adeoyo maternity centre, Ibadan, Oyo state

1.5 Research Questions

1. What are the experiences and perceptions of healthcare providers regarding the interventions to prevent mother-to-child transmission of HIV in Adeoyo Maternity Centre?
2. What are the knowledge and awareness of HIV-positive pregnant women, HIV-positive mothers regarding the interventions to prevent mother-to-child transmission of HIV in Adeoyo Maternity Centre?
3. What is the effectiveness of the interventions to prevent mother-to-child transmission of HIV in Adeoyo Maternity Centre, as measured by the proportion of HIV-positive infants born to HIV-positive mothers?
4. To what extent are the interventions to prevent mother-to-child transmission of HIV acceptable to healthcare providers and HIV-positive pregnant women and HIV-positive mothers in Adeoyo Maternity Centre?
5. How can the implementation of interventions to prevent mother-to-child transmission of HIV be improved in Adeoyo Maternity Centre, based on the experiences and perceptions of healthcare providers and HIV-positive pregnant women?

1.6 Significance of the study

1. This study will reduce the burden of HIV/AIDS in the population and improve maternal and child health outcomes by improving the effectiveness of interventions to PMTCT of HIV.
2. Understanding the experiences and perceptions of healthcare providers and HIV-positive pregnant women regarding the interventions to PMTCT of HIV could help identify areas for improvement in the delivery of healthcare services, including communication, counselling, and follow-up.

3. By exploring the acceptability of interventions to PMTCT of HIV among healthcare providers and HIV-positive pregnant women, this study can provide insights into how to ensure that care is patient-centred, respectful, and responsive to patients' needs and preferences.
4. This study will also provide and contribute to building research capacity in Nigeria and strengthen the evidence base for policy and practice in the field of HIV/AIDS and maternal and child health.

1.7 Scope of the study

The study included HIV-positive pregnant women, HIV-positive mothers and infants born by HIV-positive women receiving PMTCT services in Adeoyo Maternity Centre, Ibadan, Oyo state.

1.8 Limitation of Study

As a result of the sensitive nature of this research, it was not possible to collect a population frame for the Primary Healthcare Centres (PHCs) utilized. Anonymity served as a fundamental principle that informed the execution of this study.

The participants in the study exhibited hesitancy in disclosing personal information and need many reassurances on the confidentiality of their responses. Therefore, it is probable that the presence of responder and recollection bias could have influenced the replies obtained as a result of the objective character of the instruments. Certain participants may have engaged in over-reporting their activities with the intention of enhancing their self-esteem and presenting their marriages or relationships in a positive manner. Conversely, others may have engaged in under-reporting their activities due to apprehension of being perceived as incorrect or facing potential repercussions for undesirable behavior. Nevertheless, the researcher made concerted efforts to minimize the probability of such an occurrence to the utmost extent.

The researcher notes that the selection of respondents in this study may have introduced bias, as alternative sources of respondents, such as HIV pregnant women visiting private facilities or other government facilities, were not considered. The study exclusively included pregnant women with HIV who sought care at the Adeoyo health centre. The recruitment of participants occurred exclusively during visits to the antenatal care (ANC) clinic, resulting in the exclusion of pregnant women who did not seek care at the clinic from the assessment. Hence, these findings do not provide a fully comprehensive representation of the pregnant population at the Adeoyo health centre. Nevertheless, we contend that this study provides significant insights into the comprehension of the acceptability of interventions for the prevention of mother-to-child transmission (MTCT) among HIV-positive women who seek healthcare services at the Adeoyo health facility.

The study's cross-sectional design precluded the establishing of causal relationships from the findings, as it did not encompass an evaluation of clinical variables. No manipulation of the criteria under consideration occurred.

1.9 Expected Outcomes

1. Identification of factors that influence the effectiveness of the interventions to prevent mother-to-child transmission of HIV in Nigeria.
2. Recommendations for improving the delivery of healthcare services related to interventions to prevent mother-to-child transmission of HIV, including communication, counselling, and follow-up.
3. Identification of barriers and facilitators to the implementation of interventions to prevent mother-to-child transmission of HIV from the perspectives of healthcare providers and HIV-positive pregnant women.

4. Identification of patient-centred approaches to interventions to prevent mother-to-child transmission of HIV that are acceptable to HIV-positive pregnant women.

1.10 Operational Definition of Terms

HIV refers to the human immunodeficiency virus. There are two types of HIV: **HIV-1 and HIV-2**.

HIV-1 is responsible for the vast majority of HIV infections globally.

Acute infection is the period between a person being infected with HIV and HIV antibodies being detectable by a serological assay.

ARV (antiretroviral) drugs refer to the medicines used to treat HIV.

ART (antiretroviral therapy) refers to the treatment of HIV infection with a combination of three or more ARV medications. ART requires ongoing medical care. Combination ART and extremely active ART are synonyms.

Use of ARV drugs for HIV prevention refers to the advantages of ARV medication for HIV prevention. These benefits include the prevention of HIV from being passed from mother to child (PMTCT), the reduction of HIV transmission to sexual partners who are discordant, and the prevention of HIV acquisition following exposure (PREP and post-exposure prophylaxis, or PEP).

Viral suppression refers to a viral load below the detection threshold using viral assays.

Viral failure is used to describe the incapacity to attain or sustain viral suppression below a specific level. After taking antiretroviral therapy (ART) for at least six months, viral failure is defined as a continuously detectable viral load over 1000 copies/mL (two consecutive viral load assays within a 3-month gap with adherence assistance between measurements).

Universal access to ART is defined broadly as a high level of treatment coverage (80% or more of the eligible population) that is accessible and affordable. It does not necessarily mean 100% coverage.

Prevention of mother-to-child transmission of HIV refers to the use of ARV drugs to prevent the transmission of HIV from the mother during pregnancy and breastfeeding. Previous WHO guidelines have used the terms “options A, B and B+” to refer to different approaches to the prevention of the mother-to-child transmission of HIV.

Combination prevention refers to a combination of behavioral, biomedical and structural approaches to HIV prevention to achieve maximum impact on reducing HIV transmission and acquisition.

Early infant diagnosis is the testing of infants to determine their HIV status following possible exposure to HIV during pregnancy, delivery and postpartum through breastfeeding.

Point-of-care testing is conducted at or near the site at which care is being provided. The test results are usually returned rapidly so that clinical decisions can be made in a timely and cost-effective manner.

PEP of HIV is the use of ARV drugs by people who are not infected with HIV but who may have been exposed to HIV to block HIV infection.

(PrEP): Oral PrEP of HIV is the use of ARV drugs by people who are not infected with HIV to block the acquisition of HIV.

Rapid diagnostic test: in vitro immune-chromatographic or immune-filtration diagnostic test for detecting HIV-1 and -2 antibodies and/or HIV p24 antigen. **Dispensing ART** includes dispensing medication to people who are already receiving ART between regular clinic visits and assessing any new signs and symptoms and providing adherence monitoring and support.

Distribution of ART is the process of physically transporting ART from one geographical point to another.

Continuum of HIV care refers A continuum of HIV care is an all-inclusive package of services for HIV testing, prevention, treatment, and care that is offered to individuals who are at risk of contracting the virus, as well as those who are living with HIV and their families. Palliative care, HIV testing and connection to care, managing opportunistic infections and other concomitant diseases, initiating, maintaining, and monitoring antiretroviral therapy (ART), transitioning to second- and third-line ART, and combined HIV prevention, including PrEP, are a few examples of these services.

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Endnotes

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Chapter Two

Literature Review

This chapter provides an overview of prior research conducted by scholars that is pertinent to the present topic. The literature review encompassed various components, including the theoretical framework, theoretical review, empirical review, assessment of literature, and conceptual model.

2.1 Conceptual Review

2.1.1 Concept of Human Immunodeficiency Virus

This chapter provides an overview of prior research conducted by scholars that is pertinent to the present topic. The literature review encompassed various components, including the theoretical framework, theoretical review, empirical review, assessment of literature, and conceptual model¹.

2.1.1.1 Epidemiology of Human Immunodeficiency Virus Worldwide

By the end of 2021, there were about 38.4 million [33.9–43.8 million] HIV-positive individuals living in the world, and 1.5 million [1.1–2.0 million] new HIV infections (World Health Organization, 2022).¹ Right now, 75%–97% of HIV-positive individuals are aware of their status. An additional 4.0 million people must be made aware that they are HIV positive in order to meet the 95% target. Worldwide, 28.7 million HIV-positive individuals were getting antiretroviral medication (ART) in 2021. 75% [66–85%] of HIV-positive individuals were receiving treatment in 2021, falling short of the second 90 objective by 5.9 million. In 2021, there were 1.5 million [1.1–2.0 million] new cases of HIV infection. There has been a

32% decrease in new HIV infections since 2010—from 2.2 million to 1.7–2.9 million. In 2021, 650 000 [510 000–860 000] persons lost their lives to HIV-related causes. HIV-related mortality have decreased from 1.4 million [1.1–1.8 million] to 1.8 million [since 2010], a 52% decrease (World Health Organization, 2022)¹.

In 2021, there were an estimated 25.6 million HIV-positive individuals in the Africa region. Of these, 88% [80–>98%] were aware of their status, 78% [72–88%] were receiving treatment, and 72% [66–81%] had viral suppression. In 2021, there were an estimated 20.1 million individuals receiving antiretroviral treatment. According to estimates, 860 000 [660 000–1.2 million] persons contracted HIV for the first time in 2021. New infections across all age groups declined from 0.86 [0.66–1.18] per 1000 uninfected people in 2020 to 0.78 [0.60–1.07] in 2021. In 2021, HIV-related causes were responsible for about 420 000 [340 000–530 000] deaths, a drop of about 7.1% from 2020^{1,2}.

According to the Americas study, there were an estimated 3.8 million [2.9–4.7 million] HIV positive individuals in 2021; of these, 85% [64–>98%] were aware of their status, 74% [56–92%] were receiving treatment, and 66% [50–81%] had viral suppression. In 2021, an estimated 2.8 million individuals were receiving antiretroviral therapy. In 2021, there were an expected 160 000 [110 000–210 000] new HIV infections. The rate of new infections across all age groups stayed constant at 0.16 [0.11–0.21] per 1000 uninfected individuals. In 2021, around 43,000 fatalities (between 28,000 and 58,000) were ascribed to HIV-related causes; this represents a 7.4% decline over 2020^{1,3}.

An estimated 3.8 million [3.3–4.4 million] people in the South-East Asian region were predicted to have HIV in 2021; of these, 74% [65–86%] were aware of their status, 63% [55–73%] were receiving treatment, and 55% [48–64%] were virally suppressed. In 2021, an estimated 2.4 million individuals were receiving antiretroviral therapy. In 2021, there were an

expected 110 000 [82 000–160 000] new HIV infections. The rate of new infections across all age groups stayed constant at 0.06 [0.04–0.08] per 1000 uninfected individuals. In 2021, an estimated 86 000 [62 000–120 000] fatalities were ascribed to HIV-related causes; this is an approximate 2.0% increase from 2020^{1,2}.

In the European Region, the expected number of individuals living with HIV in 2021 was 2.8 million [2.5–3.1 million]. Of these, 73% [65–81%] were aware of their status, 63% [56–70%] were receiving treatment, and 60% [53–66%] had viral suppression. In 2021, an estimated 1.8 million individuals were receiving antiretroviral therapy. In 2021, there were an expected 180 000 [150 000–210 000] new HIV infections. The rate of new infections across all age groups stayed constant at 0.20 [0.16–0.23] per 1000 uninfected individuals. In 2021, about 39 000–60 000 fatalities were linked to HIV-related causes, representing a 0.2% increase from 2020^{1,2,3}. An estimated 430 000 [380 000–600 000] people in the Eastern Mediterranean Region were predicted to be HIV positive in 2021; of these, 41% [35–57%] were aware of their status, 27% [24–38%] were receiving treatment, and 24% [21–34%] were virally suppressed. In 2021, an estimated 120,000 individuals were receiving antiretroviral therapy. In 2021, there were an expected 42 000 [36 000–67 000] new HIV infections; the rate of new infections across all age groups stayed constant at 0.06 [0.05–0.1] per 1000 uninfected individuals. In 2021, an estimated 19,000 fatalities (15 000–28 000) were linked to HIV-related causes; this represents an increase of approximately 7.6% over 2020¹.

An estimated 1.9 million [1.4–2.4 million] people in the Western Pacific Region were predicted to have HIV in 2021; 88% [64–>98%] of them were aware of their status, 79% [57–>98%] were receiving treatment, and 76% [55–94%] had viral suppression. In 2021, an estimated 1.5 million individuals were receiving antiretroviral therapy. In 2021, there were an expected 120 000 [83 000–160 000] new HIV infections. The rate of new infections across all age groups stayed constant at 0.06 [0.04–0.08] per 1000 uninfected individuals. HIV-related

causes were identified as the cause of 42 000 [24 000–64 000] deaths in 2021, an increase of approximately 1.7% over 2020^{1,2}.

The World Health Organization advises everyone who might be at risk of HIV to get tested for the virus. Individuals who are more likely to contract HIV should look for thorough and efficient HIV testing, prevention, and treatment programs. Rapid diagnostic assays that are easy to use and reasonably priced, in addition to self-tests, can identify HIV infection. The 5Cs—consent, confidentiality, counselling, accurate results, and connection to treatment and other services—must be adhered to by HIV testing services¹.

As soon as possible after diagnosis, people with HIV should be offered and connected to antiretroviral therapy (ART). They should also be routinely evaluated using clinical and laboratory indicators, such as the test to assess the virus in the blood (viral load). ART also stops HIV from spreading to other people if it is taken regularly^{1,2}.

To determine a person's immunological status, a CD4 cell count should be performed at the time of diagnosis or shortly after beginning ART. A blood test called the CD4 cell count is used to monitor the course of HIV infection, as well as the likelihood of contracting opportunistic infections. It also helps determine when to start preventive medication. A person's CD4 count should vary between 500 and 1500 cells/mm³ of blood; in those who are not getting or are not responding well to ART, the level gradually declines over time. A person's immunity is seriously weakened if their CD4 cell count is less than 200, making them vulnerable to illnesses and even death. An individual is classified as having advanced HIV disease (AHD) if their CD4 count is less than 200^{1,2,3}.

The amount of virus in the blood is measured by the HIV viral load. This test is used to track the rate of viral replication and the efficiency of antiretroviral therapy. The objective of treatment is to bring the blood viral load down to undetectable levels (less than 50 copies/ml).

In HIV-positive individuals receiving antiretroviral therapy (ART), a persistently detectable viral load (more than 1000 copies/ml) is a sign of insufficient treatment response and a recommendation to modify the treatment plan. The 2022–2030 global health sector plan on HIV by WHO is to lower HIV-related mortality from 680,000 in 2020 to fewer than 240 000 by 2030, as well as HIV infections from 1.5 million in 2020 to 335 000 by 2030¹.



Figure 2.1: Worldwide Distribution of HIV-1 Infections, Modes of Transmission, and HIV-1 subtypes HSex=heterosexual. MSM=Men who have sex with men. IDU=injection drug users. Based on Joint UNAIDS and WHO AIDS epidemic update December, 2005¹.

2.1.1.2 Estimating HIV Incidence in Sub-Saharan Africa

The COVID-19 epidemic over the past three years has had an impact on sub-Saharan African health systems, which were already heavily impacted by other infectious diseases including HIV-1. Despite significant global progress in lowering the rate of new HIV infections, two-thirds of HIV-positive individuals live in Africa, where the impact is still disproportionate⁴. In order to meet the global goal of 95% HIV testing, treatment, and controlled viral suppression by 2030, it will be necessary to develop sophisticated and novel approaches to comprehending HIV transmission dynamics at the national, regional, and sub-regional levels as well as to make new treatments and preventive measures widely available^{4,5}.

Because incidence studies are expensive and complex, most nations have concentrated on HIV population prevalence studies despite the importance of incidence studies in HIV monitoring programs. Prevalence studies are losing significance since more individuals with HIV are surviving longer as a result of increased access to antiretroviral therapies. A new technique that combines mathematical algorithms with laboratory testing to estimate current infections gives a direct measure of incidence in cross-sectional surveys, hence lowering the expense of longitudinal incidence investigations⁶. These intricate studies are usually funded by the President's Emergency Plan for AIDS Relief (PEPFAR), yet they can still be expensive.

In a pooled cross-sectional analysis of data from 13 Population-Based HIV Impact Assessment (PHIA) surveys and two PHIA-like surveys carried out in 15 high-burden countries in sub-Saharan Africa between 2015 and 2019, Nora Rosenberg and colleagues (2023) estimated adult HIV-1 incidence rates in *The Lancet HIV*. Among the 265 million

HIV-1-negative individuals in the target group, the scientists calculated an HIV-1 incidence of 2.6 per 1000 person-years (95% CI 2.1–3.2). This translates to about 689000 (95% CI 546000–833000) new HIV-1 infections annually. Additionally, they projected that 6.1% (95% CI 5.8–6.3) of the 283 million persons represented by the surveys had long-term HIV-1 and 0.1% (0.1–0.1) had recent HIV-1. More than 60% of the most recent illnesses were in women, and 72.5 percent affected younger people between the ages of 15 and 34. The results of this analysis show that HIV-1 incidence varies by sub-region in sub-Saharan Africa, with over half of new infections occurring in the southern African region.

For the past five years, PEPFAR-supported nations have utilized the PHIA surveys carried out in sub-Saharan Africa to perform standardized monitoring of HIV trends. Even so, the assumptions made in order to estimate cross-sectional incidences are susceptible to sensitive algorithm imprecisions, which frequently depend on limiting factors such as antigen-avidity enzyme immunoassay normalized optical density values of 1.5 or lower, a viral load of at least 1000 copies per millilitre, the length of time the infection has been recent, the assay's cut-off time, and the percentage of recent false-positive cases. Any imprecision of those parameters—cut off times, population, and HIV subtypes, for example—raises the possibility of estimating recent infections incorrectly. Despite these drawbacks, cross-sectional incidence estimates derived from algorithm testing offer novel insights into a field that has previously depended heavily on far more questionable mathematical models⁷.

The increase of ART and the ensuing decline in mortality and new infections have been the primary drivers of the progress made in HIV control thus far. Nonetheless, the benefits are still marginal and brittle when considering how pandemics compete for dwindling resources, particularly in low-income environments^{4,8}. Proven-to-be-effective therapies like as pre-exposure prophylaxis (PrEP) need to be expanded and implemented. Regretfully, in comparison to other places with lower incidence but better access to treatments, sub-Saharan

Africa still lacks access to PrEP despite the region's ongoing high incidence levels. Unacceptably high structural and financial hurdles continue to impede access to effective preventive tools. Many of these issues are present in sub-Saharan Africa, where complicated HIV programs necessitate a deeper comprehension of HIV dynamics at the national, regional, sub-regional, and district levels, as noted by Rosenberg and colleagues in 2023^{9,10}. Ten to twenty times more female sex workers in Kigali than in the overall population—roughly 50% of them are HIV positive. The current approach of directly targeting female sex workers with testing and treatment could potentially reduce the frequency of new infections at the community level by approximately thirty percent¹¹.

The HIV epidemic is still mostly affecting Sub-Saharan Africa, and projections suggest that the pandemic is not slowing down as expected. After almost 40 years, the promise to end AIDS by 2030 still needs to be kept. New approaches that can identify infections in real time and adjust to the communities they target are needed, in addition to strong language¹¹.

2.1.1.3 HIV Prevalence in Nigeria

The first two cases of AIDS in Nigeria were discovered in 1985 and made public in Lagos in 1986. One of the cases was a 13-year-old girl who worked as a sex worker for a young West African country. Since AIDS was believed to be a disease exclusively affecting homosexual Americans, the news of this first case sparked fear, scepticism, and denial across the nation. At the period, many acronyms emerged, such as "American Idea for Discouraging Sex," as a result of people's perception that Americans were behind the AIDS epidemic and were trying to discourage sexual activity¹². Based on available data, Nigeria is home to the second-largest HIV epidemic globally and has the highest rate of new infections in the area. In 2020, there were 1.7 million HIV/AIDS positive individuals in Nigeria¹³. The prevalence of HIV in adults between the ages of 15 and 49 is 1.4%, with women more likely than men to be

infected (1.9 percent versus 0.9 percent). The greatest gender gap in HIV prevalence is seen in younger individuals, where young women are over three times more likely than young males in the same age group (20–24 years) to be infected. Based on the most recent data, 0.2% of children between the ages of 0 and 14 are HIV positive. Eighty percent of HIV cases in Nigeria are transmitted through heterosexual relationships. Ten percent of all other methods of transmission are through mother-to-child transmission, contaminated blood transfusions, and the use of blood products¹⁴.

An estimated 200 million people live in Nigeria. Since 1986, the Human Immunodeficiency Virus (HIV) has spread throughout the entire nation, infecting both adults and children, men and women. With 1,900,000 positive cases, HIV is considered a widespread epidemic that has impacted all geographic areas, ethnic and religious groups, and business sectors. The combined effects and repercussions of the sickness had a detrimental influence on the growth and development of the country, particularly in terms of the economical, cultural, physical health, and general well-being of households and communities¹⁵. Over the course of the last three decades, the country has employed diverse strategies and resources to implement a concerted national response aimed at mitigating and easing the effects of the epidemic. There were 130,000 new cases of infection, up from 120,000 in 2010, and 53,000 deaths from AIDS-related causes, down from 72,000 in 2010¹⁶. In accordance with the 90-90-90 targets that the international community and UNAIDS have suggested for 2020, by the end of 2018 81% of all HIV-positive individuals would be receiving treatment, and about 73% of all HIV-positive individuals would have suppressed viral levels. In actuality, as of the end of 2018, only 67% of all HIV-positive people knew they were positive; of these, 53% were taking treatment and 42% had viral suppression in place¹⁷.

Nigeria is currently the fourth-highest HIV-positive country in the world (1,900,000), after Mozambique (2,200,000), South Africa (2,100,000), and India (2,100,000). 7.700,000,000).

The main causes of the HIV epidemic in Nigeria include low personal risk perception, multiple concurrent sexual relationships, transactional and intergenerational sex, ineffective and inefficient services for STIs, inadequate access to and poor quality of healthcare services, and concurrent acute and chronic health conditions. The persistence of prejudice and stigma around HIV/AIDS, together with long-standing gender inequality and injustices, chronic and debilitating poverty, and these elements all play a major role in the virus's spread¹⁸.

HIV prevalence in the country peaked in 2001 at 5.8%, then decreased to 3.0% in 2014 after reaching a peak of 4.4% in 2005, 4.6% in 2008, and 4.1% in 2010. Concurrently, the whole population's HIV prevalence dropped from 3.6% to 3.4%. Even while the Key Populations' numbers were higher than the overall population's, their preponderance also declined. With the exception of BBFSW (37.0 % in 2007, 27.40 % in 2010, and decline to 19.40 % in 2014), NBBFSW (30.20 percent in 2007, 27.40% in 2010, and 8.60 % in 2014), and Men Who Have Sex with Men (whose prevalence has climbed from 13.50 % in 2007, 17.20 % in 2010, and 22.90 percent in 2014)¹⁹.

In 2018, the country conducted the National AIDS Indicator and Impact Survey (NAIIS), a cross-sectional survey designed to gauge the prevalence of HIV in the general population. The survey found that, following South Africa, India, and Mozambique, the national prevalence of the virus was 1.3% (15-49 years), with an estimated 1.9 million people living with the virus in the nation. With a 3.1% prevalence rate among individuals aged 15 to 49, the South-South area of the country has the highest rate of HIV prevalence. HIV prevalence rates are high (1.9%) in both the North Central Zone (2.0%) and the South East Zone (2.0%). HIV prevalence rates are lower in the North West (0.6%), North East (1.1%), and South West (1.1%) zones¹⁹.

2.1.2 Mother to Child Transmission of HIV

The General Assembly pledged to eradicate AIDS as a hazard to public health by 2030 in its Political Declaration on HIV and AIDS. This commitment was made in 2016²⁰. A commitment to "eliminate new HIV infections amongst children by reducing infection rates by 95% in every region by 2020" was part of this^{21,22}. The World Health Assembly approved the World Health Organization's (WHO) 2016–2021 global health sector initiatives on sexually transmitted infections (STIs) and HIV/AIDS in the same year²³. These policies require Member States to work together to achieve the following objectives: eradicating congenital syphilis by 2030; preventing viral hepatitis as a public health issue by 2020; and zero new HIV infections in babies by 2020.

HIV infections acquired from mothers continue to be a major cause of the epidemic, making up 9% of new cases worldwide²⁴. The 2016 "Start Free, Stay Free, AIDS Free framework" set goals that by 2018, 95% of pregnant women living with HIV would be on lifelong antiretroviral medication, and less than 40,000 children would contract the virus²⁵. The 2016 "Start Free, Stay Free, AIDS Free framework" set goals that by 2018, 95% of pregnant women living with HIV would be on lifelong antiretroviral medication, and less than 40,000 children would contract the virus²⁶.

Every year, almost 1.3 million women and girls who are living with HIV become pregnant worldwide. The risk of HIV transmission from an HIV-positive woman to her unborn child during pregnancy, labour, delivery, or breastfeeding is between 15% to 45% in the absence of intervention. Therefore, as soon as HIV infection is confirmed, a link to treatment and care for the rest of one's life should be made available, along with assistance in staying in treatment and receiving viral suppression as well as partner services²⁷.

Antiretroviral therapy (ART) was available to 85% of women and girls worldwide in 2019 in order to avoid mother-to-child transmission (MTCT). High levels of ART coverage, however,

do not account for the ongoing transmission that takes place after women are first recorded as having had treatment. In order to meet the worldwide eradication targets, maintaining care retention and preventing incident HIV infections in people that are not infected continue to be top priority. Virtual elimination of MTCT, also known as vertical transmission, has been demonstrated to be possible since the world shifted to and accelerated implementation of highly effective, simplified therapies based on lifetime ART for pregnant women living with HIV²⁷.

Global commitments, the promotion of integrating MTCT prevention strategies into maternity, new born, child, and adolescent health services, and enhanced health systems all substantially support the elimination of MTCT of HIV. Furthermore, there is a strong push for better access to sexual and reproductive health services, which include preventing unwanted pregnancies and providing women and girls living with HIV with screening and treatment for STDs^{27,28}.

The Triple Elimination Initiative, which promotes person-centered care and lowers incidence, morbidity, and death, is the result of the integration of initiatives. By using strategic information for response planning, the project also improves disease surveillance^{27,28}.

Injecting drug users were thought to be responsible for 10% of new HIV infections worldwide in 2019²⁹. International declarations and agreements push and assist nations in offering comprehensive services for the prevention of mother-to-child transmission (PMTCT) of infectious diseases to women and girls who use or inject drugs³⁰. "Promoting measures for the prevention of mother-to-child transmission of HIV, hepatitis B and C, and syphilis among women who use drugs" was the resolution 61/4 passed by the Commission on Narcotic Drugs during its sixty-first session, which took place in Vienna in March 2018³¹.

Programs and treatments that are specifically designed to reach drug-using women who would not otherwise be able to seek care because of stigma and discrimination are crucial. The majority of drug users access health and social services through harm reduction programs, which are crucial in the prevention of HIV, viral hepatitis B and C, and syphilis in drug-using women²⁰. Women who use drugs and their offspring will continue to be disproportionately affected by these diseases unless they have access to harm reduction programs and have strong connections and integration with other pertinent health services.

2.1.3 Pathogenesis of Hiv-1

The worldwide spread of HIV-1 indicates that the virus effectively counteracts innate, adapted, and intrinsic immunity^{32,33}. Despite having a small genome (less than 10 kb) and few genes (figure 2), HIV-1 is quite good at using cellular pathways to its advantage while neutralizing and evading the various immune system components^{34,35,36}. Notably, research on non-human primates and subtype B viruses frequently contributes to our understanding of pathogenesis.

The complicated HIV-1 life cycle (figure 2) is influenced by target cell type and activation in terms of both time and result³⁷. HIV-1 enters cells in the early stages without immediately killing off cells, however the process of entry can trigger intracellular signal cascades that could aid in viral replication^{38,39}.

The exterior glycoprotein (gp120) and trans-membrane protein (gp41), two components on the HIV-1 envelope, combine to create the spikes on the surface of the virion⁴⁰. Gp120 first binds to the CD4+ receptor in order to adhere to the cell membrane during the entrance phase. Irreversible conformational change is caused by subsequent contacts between the virus and chemokine co-receptors (such as CCR5, CXCR4). The viral core is released into the cell cytoplasm after irreversible conformational change during the actual fusion event, which

occurs in a matter of minutes due to pore development^{41,42}. The viruses own reverse transcriptase enzyme reverse transcribes the viral genome into DNA once the core disassembles³⁷. This mechanism can result in the generation of related but unique viral variants since reverse transcriptase is prone to errors and lacks proofreading function³⁷. The viral genome is inserted into gene-rich, transcriptionally active regions of the host's chromosomal DNA at the halfway point of infection by the viral protein integrase working with host DNA repair^{43,44,45}. Integration is facilitated by the host factor LEDGF/p75 (lens epithelium-derived growth enzymes factor), which binds to integrase and irreversibly changes the cell into a potential virus generator. Viral particle formation requires both host-driven and virus-driven transcription during the final stages^{37,46,47}. Transported to the vicinity of the cell membrane, viral proteins assemble there. The vesicular sorting pathway (ESCRT-I, II, III), which typically mediates the budding of endosomes into multivesicular bodies, is used by viruses during their non-lytic exit from cells^{48,49}. HIV-1 binds to TSG101 through its late domain, a small sequence motif in Gag p6 that allows access to this protein-sorting pathway^{59,60}. Mature infectious virions are created when the viral protease cleaves the Gag-Pol polyprotein³⁷.

Virion features are derived from the cells in which they were formed, as the new viral particle incorporates components of the cell surface lipid bilayer and cytoplasmic molecules of the producing cell⁵⁰. A virus's phenotypic can be determined by integrated host molecules in a variety of ways, such as by influencing the characteristics of replication in the subsequent infection cycle or by mediating the immunological activation of bystander cells⁵⁰.

Research on what transpires immediately after HIV-1 crosses the mucosal barrier points to the possibility of a window of time during which host defences may be able to limit viral spread and viral proliferation is not yet well-established⁵¹. Two chemokine receptors, CCR5 and CXCR4, are significant co-receptors for HIV-1 infection. The majority of new infections

are caused by viral variations that depend on CCR5 use, regardless of the mode of transmission⁵².

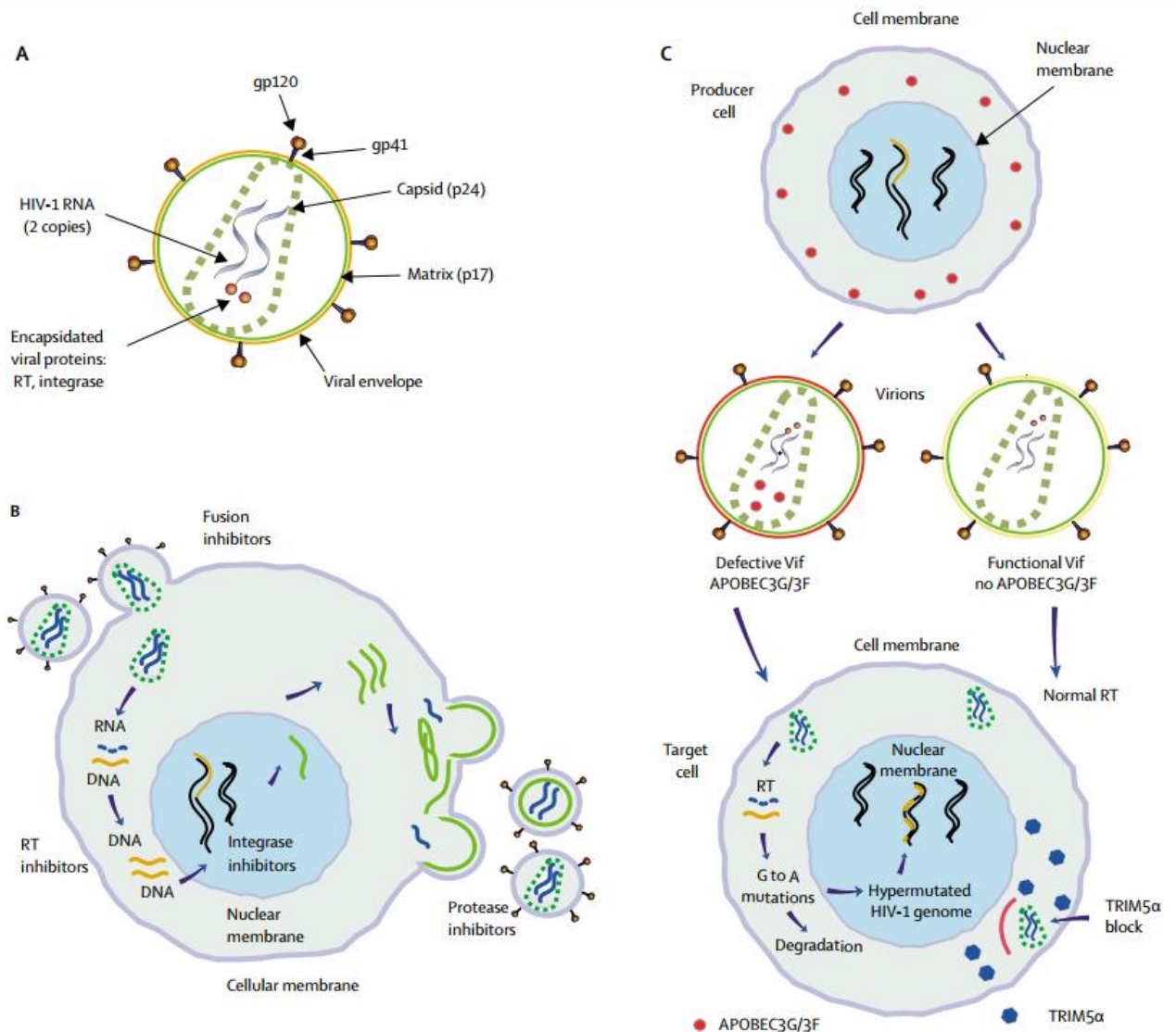


Figure 2.2: HIV-1 is a Retrovirus that Encodes Three Structural Genes (Gag, Pol, and Env)⁵².

(A) The surface of the virion is spiked by envelope glycoproteins gp120/41. The gag protein is broken during maturation, forming the core as Gag p24. Encapsulated components of the virus include the reverse transcriptase (RT), integrase, and other host proteins.

(B) Distinct phases of the viral life cycle within cells and possible targets for therapeutic therapies.

(C) To combat the restriction factors TRIM5 α and APOBEC3G/3F, HIV-1 has developed defense mechanisms. When a target cell becomes infected with HIV-1 Vif, APOBEC3G/3F encapsidates into the egressing virion and causes G-to-A hypermutations in the viral genome. Before the target cell reaches the reverse transcription stage, Rhesus TRIM5 α blocks HIV-1 replication in the early stages of infection⁵².

Strong evidence from models using non-human primates (such as rhesus macaques infected with the simian immunodeficiency virus [SIV]) indicates that vaginal transmission causes infection of a tiny number of dendritic cells, macrophages, and CD4⁺ T lymphocytes found in the lamina propria⁵¹. Potential viral transmission routes include attachment of the virus to mannose C-type lectin receptors (e.g., DC-SIGN) on dendritic cells and macrophages, as well as endocytosis and transcytosis⁵⁴. A moderate primary amplification results from the initial replication, which is constituted of a small number of viral variations and occurs in the regional lymph organs (such as draining lymph nodes). Massive infection of susceptible cells occurs as a result of secondary amplification in the spleen, bone marrow, and gastrointestinal tract following the migration of infected T lymphocytes or virions into the circulation. Clinical symptoms after primary HIV-1 infection can appear in close temporal proximity to the subsequent peak of viraemia (e.g., 10⁶ to 10⁷ copies per mL plasma) (figure 3).

One or two orders of magnitude separates the level of viraemia characteristic for the chronic phase of infection in an individual (viral set point) from the peak viraemia. Target cell restriction may also be involved, however HIV-1 specific CD8⁺ responses are primarily responsible for this decrease. Early on after transmission, the viral population is most homogeneous; however, as viral quasi-species diversify in different biological compartments,

mutant viruses resistant to neutralization by antibodies, cytotoxic T cells, or antiretroviral medications are produced and stored in long-lived cells, or viral reservoirs.

Activated and memory CD4⁺ T lymphocytes in the gut-associated lymphoid tissues have been markedly reduced in those who have been detected early in the infection process⁵⁵. Years of antiretroviral therapy have not stopped the preferential depletion of CD4⁺ cells in mucosal lymphoid tissues, a startling finding that contrasts with the ability of antiretroviral therapy to restore normalcy in the peripheral blood's CD4⁺ T lymphocyte count.

HIV-1 infection is characterized by a progressive depletion of naive and memory CD4⁺ T-lymphocyte populations, with AIDS being the last stage of the disease (figure)⁵⁶. Even in the early and chronic phases of the disease, when symptoms are often absent, HIV-1 replication is ongoing. A single virion's half-life is so brief that 50% of the plasma virus population can be replenished in under 30 minutes. Additionally, a chronically infected individual may produce up to 10¹⁰ particles of virus daily^{57,58}. During HIV-1 infection, lymphocyte turnover rates are elevated several times, but after antiretroviral therapy reduces viral replication, cell proliferation falls. 15, 60 various depletion mechanisms have been suggested, but a growing body of evidence points to generalized immunological activation as the root cause of the CD4⁺ cell reservoir's ongoing reduction⁶¹.

Since immune activation indicates the course of a disease, it appears to be a key component of pathogenic HIV-1 infections⁶². In their natural hosts, such as African green monkeys, Nef proteins from SIV line-ages that are not pathogenic have recently been shown to down-regulate CD3-T-cell receptors, which lowers cell activation and apoptosis⁶³. The high level of immunological activation observed in infected individuals may have resulted from HIV-1 Nef's inability to suppress T-cell activation.

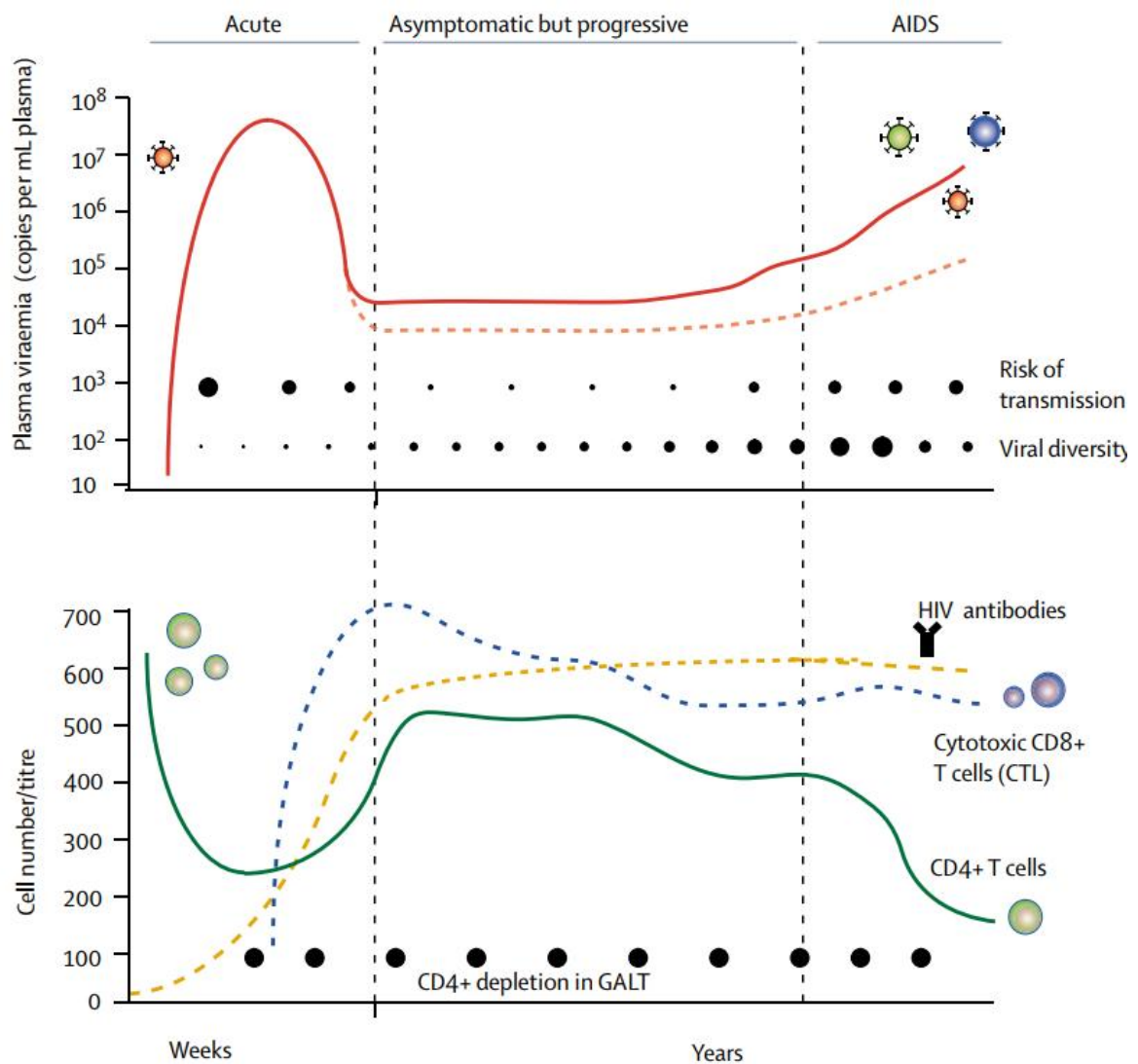


Figure 2.3: The Course of HIV-1 Infection Defined by the Level of Viral Replication⁶³.

Plasma viraemia (top), and dynamic changes of the CD4+ T-lymphocyte compartments (bottom). Primary infection characterised by high plasma viraemia (red line, top), low CD4 cells (green line, bottom), and absence of HIV-1 specific antibodies (orange line, bottom). Viraemia drops as cytotoxic CD8+ T-lymphocytes (CTL) develop (blue line, bottom) and an individual viral-load set point is reached during chronic infection. Viral set points differ greatly among individuals (e.g. red dotted line, top) and predict disease progression. Viral diversity increases throughout the disease (closed circles, top). The risk of transmission is

highest in the first weeks when viraemia peaks (closed circles, top). GALT=gut-associated lymphoid tissues.

2.1.4 Clinical Management of HIV

2.1.4.1 Diagnosis

There are numerous commercial kits available for the detection of specific antigens, antibodies, or both, which is the basis for the diagnosis of HIV-1 infection. For screening, serological testing are typically utilized. One significant development is the accessibility of quick HIV-1 antibody testing. These tests allow for accurate diagnosis and specimen collection in the same visit because they are simple to perform and can yield results in as little as 20 minutes. Healthcare professionals with limited laboratory experience can accurately perform rapid tests on plasma, serum, whole blood, or saliva. These tests are crucial tools for monitoring, screening, and diagnosis. These serological tests have two limitations: they cannot detect HIV-1 in infants under the age of 18 months who may have maternal antibodies, nor can they detect infection during primary infection when antibodies are lacking. There is no other choice in these cases except for direct virus detection (e.g., quantification of viral RNA [standard] or p24 antigen in heat-denatured serum [less costly])⁶⁴.

Measurements of viraemia and CD4⁺ cells are necessary for staging purposes. The measurement of plasma viral load is commonly employed to track the effectiveness of antiretroviral therapy. Sensitive measurement of plasma HIV-1 RNA copies is possible using a number of commercially available techniques. The initial suboptimal performance for non-B subtypes has been overcome by the more recent iterations of the Amplicor and Quantiplex assays (Roche, Indianapolis, IN, USA, and Bayer Diagnostics, Walpole, MA, USA, respectively)⁶⁵. The number of CD4⁺ cells indicates the degree of immunodeficiency and is therefore used to measure the stage of infection, whereas the viral load specifies the rate at

which the immune system is destroyed. Important factors for classifying HIV-1 illness include CD4⁺ cell counts and clinical indicators (such as the incidence of opportunistic infections). The most common technique for quantifying CD4⁺ cells is flow cytometry.

Conventional techniques for measuring CD4⁺ cell counts and virus loads necessitate sophisticated lab facilities, and assays demand that a material be examined quickly after collection. For environments with limited resources, these criteria provide difficulties. Transporting samples required for virological evaluations has been made easier in part by the use of dried blood spot specimens⁶⁶. In the future, less expensive options could be found by measuring reverse transcriptase activity in plasma samples, streamlining gene amplification techniques (like Taqman technology), and using paper-strip quantification (dipstick assays)^{67,68,69}. In resource-constrained environments, other methods for determining the degree of immunodeficiency include total white counts (panleucocyte gating), CD4⁺ chips, and microcapillary flow-based devices^{70,71,72,73}.

2.1.5 Drug Treatment

2.1.5.1 Antiretroviral Compounds

The best course of action for long-lasting viral suppression and, consequently, for lowering morbidity and mortality rates is antiretroviral therapy. However, lifelong treatment may be required as current medications do not completely eradicate HIV-1 infection. The viral reverse transcriptase or protease is the target of 20 of the 21 antiretroviral medications that are presently licensed by the US Food and Drug Administration. Replication of viruses is inhibited by eight nucleoside/nucleotide analogs and three non-nucleoside reverse transcriptase inhibitors during cell penetration but prior to integration. Drugs with a long half-life permit once or twice daily dosage, and fixed dose combination tablets ease treatment regimens by minimizing the number of pills required each day. Eight protease inhibitors stop

virions from maturing and producing non-infectious particles instead. The first drug in its class to maintain efficacy against viruses with decreased resistance to protease inhibitors is darunavir, which was just licensed. Enfuvirtide inhibits the fusion process prior to cell infection by targeting the gp41 region of the viral envelope. Due to its potential to overcome pre-existing drug resistance, this medication must be injected twice daily and is only to be used in the treatment of patients with extensive drug experience^{74,75}. Targeting molecules that reverse transcription, integrate, mature, or target entrance is the main focus of developing novel antiretrovirals. Since many patients treated in the past few decades have viral strains with reduced susceptibilities to many, if not all, existing medications, compounds targeted to block resistant viruses are desperately needed. Reduction of the morbidity and death commonly associated with HIV-1 infection is the aim of antiretroviral therapy. For most people, this requires a combination of three or more active medications. Treatment that works brings both CD4+ and CD8+ T-cell turnover rates back to almost normal⁶⁰. The options for first- and second-line chemotherapeutic therapies are improved by potent yet well-tolerated medications with extended half-lives and streamlined regimens.

2.1.5.2 Combination Antiretroviral Treatment

The properties of the virus that contribute to the diversity of HIV-1 species (quasi-species) in chronically infected individuals are high rate of viral replication, low fidelity of reverse transcription, and ability to recombine. Highly active antiretroviral therapies (HAART) were justified by this significant genetic diversity. Viral replication is inhibited to such low levels by a combination of multiple powerful antiretroviral drugs that the generation of drug-resistant HIV-1 variants was, if not prevented, at least delayed. This results in an increase in CD4+ T-lymphocyte counts and immunological reconstitution to the extent necessary to overcome clinically evident immunodeficiency. With the dramatic drop in morbidity and

death that followed the widespread use of HAART in developed nations, there is now hope that HIV-1 infection may be managed as a chronic illness^{76,77,78}.

The recommendation for starting HAART is based on a set of criteria that includes clinical symptoms, absolute or relative CD4+ cell counts, and plasma viraemia concentration. In patients with clinical symptoms of immunodeficiency (AIDS-defining diseases, for example) or with CD4+ levels fewer than 200 per μL , the benefits of treatment clearly exceed the possible side-effects (US Department of Health and Human Services, October, 2005). In asymptomatic individuals with modest levels of viraemia (less than 100,000 copies per millilitre) and minor depletion of CD4+ T cells (more than 350 per μL), the optimal timing to start treatment is still up for debate⁷⁹. It is challenging to conduct studies with clinical outcomes that demonstrate the efficacy of early vs late therapies in individuals who are asymptomatic, and there is currently a dearth of clinical evidence. Early treatment initiation is recommended due to early depletion of gut CD4+ T lymphocytes, rising viral variety, and limited regenerating capacities of important immune system populations⁸⁰. Treatment costs and long-term drug toxicities that lower quality of life are barriers to the widespread use of this concept. Decade-long HAART is complicated by long-term issues such as immunological reconstitution illness, metabolic alterations (such as lipodystrophy, diabetes mellitus), and toxicities (such as renal, hepatic, mitochondrial)^{81,82,83,84}.

Structured treatment breaks have been one tactic used to address HAART compliance on a regular basis for the rest of one's life. This strategy was justified by the idea that, in situations where viral replication was kept to a very low degree, the body's immune system could control the infection. If effective, this tactic might lower treatment expenses and limit drug toxicity⁸⁵. . Despite conflicting preliminary results about the strategy's benefits^{86,87,88}. The SMART trial's recent early completion was justified by higher rates of morbidity and death in the treatment interruption arm⁸⁹.

2.1.5.3 HAART in Resource-Constrained Settings

In resource-constrained environments, AIDS has not yet fully evolved from a chronic illness in industrialized nations. Humanitarian access to HAART is crucial to prevent the deaths of those who are essential to the continued existence of their nations⁹⁰. Surprisingly high rates of therapeutic effectiveness have been demonstrated in these areas despite limited health infrastructures and a wide range of co-morbidities; adherence rates are at least on par with those found in developed nations^{91,92,93,94}. The standard first-line regimen is recommended by WHO and UNAIDS treatment guidelines for resource-constrained settings, along with a series of more costly second-line options⁹⁵. These guidelines also call for the use of standardised decision-making steps, such as when to start, substitute for side effects, and switch for virological failure^{95,96}. Current estimates imply that 80% of patients infected with HIV-1 who have a clinical need for treatment do not currently have access to antiretroviral medications. Restrictive licensing policies further limit treatment alternatives in many countries.1. Antiretroviral therapy is an effective strategy for prevention, thus efforts and initiatives to further scale up treatment access are imperative^{97,98,99,100,101}.

2.1.5.4 Drug Resistance

The most frequent cause of therapy failure is the emergence of medication resistance. Suboptimal drug concentrations can cause viral rebound due to inadequate compliance, pharmacological adverse effects, or drug-drug interactions. Since viral resistance has been linked to all antiretroviral medications, it represents a significant clinical and public health concern¹⁰². The series of mutations that lead to treatment resistance varies throughout HIV-1 subtypes, and some polymorphisms that occur naturally may actually affect resistance^{103,104}. Drug-resistant HIV-1 is contagious and, in nations where anti-retroviral are widely available,

can be found in up to 20% of newly infected people¹⁰⁵. In areas where treatment is scarce, the untreated population's drug resistance prevalence is still modest¹⁰⁶.

Interventions based on short-term anti-retroviral are successful in preventing mother-to-child transmission. Nevertheless, the mother, child, or both may develop drug-resistant virus variations as a result of these therapies¹⁰⁷. About 50% of the women who took nevirapine once to stop the spread of the virus from mother to child have viruses that are resistant to NNRTIs, or non-nucleoside reverse transcriptase inhibitors^{108,109}. These resistant viruses are capable of rapid replication, are transferable through breast milk, and may reduce the efficacy of subsequent NNRTI-based therapy regimens if small resistant populations persist long after the intervention^{110,111}. Combining lamivudine, nevirapine, and short-course zidovudine lowers the incidence of nevirapine-resistant viruses while preventing peripartum transmission¹¹².

2.1.5.5 Viral Reservoirs

A tiny population of long-lived memory T cells and anatomical sanctuaries are the two main components of viral reservoirs. HIV-1 latency in long-lived cell types (such as macrophages and memory T lymphocytes) presents a challenge to eradication since integrated proviruses from resting cells cannot be eradicated with current antiviral combo therapy. Various tactics, such as immune-modulatory substances (interleukin 2, anti-CD3 mAb, interleukin 7) have been employed, have been used in the context of HAART, to stimulate dormant cells. Histone deacetylase-1 inhibitors, such as valproic acid, trigger the release of a transcriptional block, which encourages the development of viral long terminal repeats¹¹³. The number of latently infected CD4+ T cells was decreased (29–84%) by augmenting standard antiretroviral therapy with enfuviridine and valproic acid; however, it is challenging to determine the proportional contributions of each medication to the ultimate result¹¹⁴.

2.1.6 Prevention

2.1.6.1 Prevention of Mother-to-Child Transmission (PMTCT)

Both in industrialized and resource-constrained environments, there have been advancements in the prevention of mother-to-child transmission^{115,116,117}. By making interventions more widely available, such as giving the mother and new born a single dosage of nevirapine, intrapartum transmission has been decreased¹¹⁸. Concerns about drug-resistant viral strains have led to several trials with combination treatments to reduce transmission during the intrapartum period^{112,116,119}. In some circumstances, elective caesarean delivery can further prevent HIV-1 transmission during the intrapartum phase; nevertheless, post-partum sepsis and rising maternal mortality may outweigh the benefits of the surgery¹²⁰.

In many situations, replacement feeding is advised since breastfeeding can spread HIV-1. However, formula feeding is not an option in these situations due to poor access to clean running water; instead, exclusive nursing combined with abrupt weaning represents one strategy for minimizing transmission^{121,122}. Antiretroviral medication taken daily while breastfeeding is a potentially innovative technique that is now undergoing testing. Pregnant women are beginning to receive more attention, with particular emphasis on the introduction of antiretroviral medication in moms with low CD4+ counts both during and after pregnancy^{123,124}. Regarding the health of uninfected children delivered to HIV-1-positive moms, there is a dearth of information¹²⁵. No significant clinical symptoms were observed in a European cohort of exposed but uninfected infants, at least not in the short- to medium-term (median follow-up of two years) (exposure to antiretroviral medication in utero or early)¹²⁶.

2.1.7 Sexual Transmission

In many places of the world, reducing heterosexual transmission is essential to controlling the epidemic^{127,128}. Reducing the frequency of discordant sexual acts or the likelihood that HIV-1 will be transmitted during discordant sexual acts are two ways to achieve prevention. The first can be accomplished by abstinence and sexual relations between individuals who are concordantly seronegative. Clinical trials are now being conducted on a number of therapies targeted at reducing the risk of transmission for discordant sexual acts, as abstinence and lifetime monogamy may not be sufficient for many individuals. Condoms, both male and female, offer a reliable and reasonably priced option for prevention^{129,130}. Together, these choices are also more widely known as the ABC method (abstinence, stay faithful, use condoms).

Male circumcision, antiretrovirals for prevention (e.g., pre-exposure or post-exposure), chemo prophylactic treatment of herpes simplex virus-2 (HSV-2), microbicides, and vaccinations are other biomedical preventive approaches. Some of the uncertainty around the beneficial benefit of male circumcision has been eased by the results of one of three separate phase III trials that are currently taking place in South Africa, Kenya, and Uganda^{131,132}. According to the results of the South African experiment, male circumcision had a 60% protective effect¹³³. The foreskin contains Langerhans cells that express CD4 and other receptors in addition to apocrine glands that release lysozymes, which could be the mechanism^{134,135}. It is thought that these skin-specific dendritic cells contribute to the virus's transmission to T cells that are vulnerable to it. Studies on the foreskin mucosa using immunofluorescence reveal that these tissues may be more vulnerable to HIV-1 infection than the cervical mucosa¹³⁶. Prior to policy formulation and widespread access as a preventive strategy, results from this proof-of-concept trial should be compared with evidence from the two trials that are still ongoing in Kenya and Uganda, acceptability data,

behaviour change following circumcision, surgical complication rates, and logistics of carrying out the procedures^{137,138,139}.

Does lowering the viral load in the infected spouse through, say, antiretroviral treatment, lower the chance of HIV-1 transmission in the uninfected sexual partner, given that high plasma viraemia raises the risk of transmission by up to an order of magnitude?¹⁴⁰ The Adult Clinical Trials Group and the HIV Prevention Trials Network (www.hptn.org) are now conducting a trial in order to investigate this subject. Up to 80% HIV-1 reduction is predicted mathematically, while there are currently few observational data available^{141,142,143}. Although there are little data on the best drug combinations and their efficacy, post-exposure prophylaxis is advised following exposure to both non-occupational (such as sexual abuse and rape) and occupational (such as needle sticks) exposures^{144,145,146}. Several studies evaluating the advantages of once-daily pre-exposure chemoprophylaxis using antiretroviral drugs with extended biological half-lives (such tenofovir) have been suspended or terminated^{141,142}. The drug itself is well accepted; the protests stemmed from neither the general concept of pre-exposure prophylaxis nor from the medication itself. Clinical trials in low-resource environments and the apparent dearth of effective solutions safeguarding these vulnerable groups were the main sources of concern.

HSV-2 may raise the chance of contracting and spreading HIV-1^{147,148}. Antivirals, such as acyclovir and valaciclovir, are useful in lowering HSV-2 transmission and viral shedding in heterosexual couples that are not in harmony^{148,149,150,151}. The vaccine that is presently being developed may hold the key to the future of HSV-2 prevention¹⁵². It is unclear if using acyclovir prophylactically in populations with high HSV-2 prevalence and incidence rates lowers HIV-1 incidence rates, however a number of trials, such as HPTN039, are investigating this question.

Gender differences are a fundamental factor contributing to the vulnerability experienced by women. It is imperative to offer women with prevention alternatives that can be utilized autonomously, irrespective of their male sexual partner's awareness or agreement¹⁵³. Despite the fact that addressing these differences poses a long-term problem, there are numerous preventative strategies that can be undertaken in the meantime, given our limited understanding at a biological level of the risk of HIV-1 for women. For instance, a potential association has been observed between the levels of sexual hormones, such as progesterone, and the probability of transmission¹⁵⁴. Observational studies have also elucidated the correlation between aberrant vaginal flora and an elevated susceptibility to HIV-1 infection^{155,156}. The incidence of vaginal infections, such as bacterial vaginosis (30–50%), vulvovaginal candidosis (10–13%), and trichomonas vaginalis (7–23%), among African women is significantly linked to an increased susceptibility to HIV-1 transmission¹⁵⁵. Furthermore, ongoing trials are being conducted to evaluate the efficacy of alternative barrier technologies, including cervical caps, invisible condoms, diaphragms, and diaphragms in conjunction with microbicides, in addition to the promotion of female condom availability and the treatment of various sexually transmitted illnesses¹⁵⁶. The examination of vaginal infections as a potential strategy for reducing the risk of HIV-1 transmission remains unexplored and warrants further investigation. The potential use of periodic presumed therapy for vaginal infections is currently being investigated as a strategy for preventing HIV-1 transmission¹⁵⁷.

2.1.7.1 Microbicides

Microbicides are a significant biomedical intervention technique that is discreet and empowers women with control over their own health¹⁵⁸. The potential utilization of these topical medicines for the prevention of HIV-1 transmission through the rectal and vaginal routes has been a subject of investigation. However, the demonstration of their feasibility and

effectiveness has proven to be challenging. The results of the initial microbicide product (nonoxynol-9) trials conducted between the mid-1980s and 1990s, specifically the three phase III trials, did not demonstrate any significant protective effects. However, these trials have contributed valuable insights to the medical community regarding the selection of products, clinical testing procedures, and safety evaluations. Over the course of the last five years, significant progress has been made in the domains of investment and product development^{159,160,161,162}.

2.1.7.2 Vaccines

The implementation of a cost-effective vaccine that ensures safety and protection will likely serve as the most effective and maybe singular approach to mitigating the widespread impact of the HIV pandemic¹⁶³. Despite extensive research efforts, the creation of a viable candidate vaccination continues to be challenging and has not yet been achieved. The utilization of live-attenuated virus as an immunogen is restricted due to safety considerations¹⁶⁴. Over the course of the last twenty years, a wide range of methodologies utilizing recombinant technology have been actively explored. The primary focus of the early efforts was on the production of neutralizing antibodies using recombinant monomeric envelope gp120 (AIDSVAX) as the immunogen^{165,166}. The administration of this vaccine did not elicit the production of neutralizing antibodies, which, as anticipated, resulted in the phase III trials failing to demonstrate any protective effects^{167,168}. The process of neutralizing HIV-1 through antibody mediation is hindered by several factors, including the extensive genetic variability of the variable areas, the presence of epitopes concealed by a carbohydrate shield (known as glycosylation), and the limitations imposed by structural or energy constraints¹⁶⁹. Given that CD8 T-cell responses have been observed to exert control on viral replication in vivo, there has been a recent emphasis in vaccine research on the induction of cellular immune responses.

One of the hurdles in the field is finding ways to overcome pre-existing immunity against replication deficient immunogenic vectors, such as recombinant adenovirus type 5¹⁷⁰.

Ongoing investigations are being conducted to assess the safety and immunogenicity of replication deficient vaccine vectors, following initial trials in non-human primates that shown a degree of protective efficacy¹⁶⁹. The ability of the immune system to naturally eliminate HIV-1 is often ineffective, and the specific factors that determine protection against the virus remain poorly understood^{163,171}. Nevertheless, it is widely accepted that strategies focused on inducing both humoral and cell-mediated immune responses hold the most potential for preventing or, at the very least, managing retroviral infections¹⁶³.

2.1.8 Pregnancy and Mother to Child Transmission of HIV

2.1.8.1 Pregnancy

The gestation period, encompassing the fertilization of the embryo and its subsequent development until birth, is a highly intricate and critical phase in a woman's life.^{172,173,174,175,176,177,178,179,180}. During this time, it is imperative to ensure comprehensive follow-up of ANC (Antenatal Care) and PMTCT (Prevention of Mother-to-Child Transmission) services. The implementation of family planning programs in Sub-Saharan Africa (SSA) remains a complex task, despite the numerous advantages it offers in terms of enhancing fertility rates, promoting child health, and lowering mother-to-child transmission (MTCT) of diseases. In order to effectively address the issue of mother-to-child transmission of HIV (MTCT), it is imperative to implement a comprehensive intervention strategy, such as Prevention of Mother-to-Child Transmission (PMTCT) programs, which aim to ensure the birth of HIV-free infants¹⁷². Nevertheless, the majority of Prevention of Mother-to-Child Transmission (PMTCT) programs in Sub-Saharan Africa (SSA) have limitations due to resource constraints, challenging working conditions, as well as social and economic hurdles

that hinder access to healthcare services. According to data from the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), it has been shown that over 35% of infants who contract HIV are affected through vertical transmission, wherein the virus is transmitted from infected mothers^{173,174,175,176}. Pregnancy is influenced by a multitude of factors, encompassing various elements such as educational background, geographical proximity to healthcare facilities, lack of access to family planning support, and the preference for traditional healers as an alternative form of family planning¹⁷⁷. Hence, the expansion of Prevention of Mother-to-Child Transmission (PMTCT) programs, provision of HIV testing services (HTS), promotion of awareness regarding one's HIV status, as well as early commencement of antiretroviral therapy (ARV) and ensuring continuity of treatment, are crucial factors in the eradication of Mother-to-Child Transmission (MTCT) of HIV. This enhancement in therapy is significant as the majority of mother-to-child transmission (MTCT) infections in the pediatric population arise during the stages of pregnancy, labour, delivery, and breastfeeding^{182,178,179}. The vertical transmission rate of HIV is significantly elevated in moms who have high peak viral load, compromised immunological system, and chronic illnesses^{182,172,178,179}. PMTCT programs include comprehensive information pertaining to viral and CD4 counts, the utilization of antiretroviral medications, and various approaches to infant feeding¹⁷². These strategic methods are essential for the eradication of mother-to-child transmission (MTCT) and the enhancement of maternal health.

2.1.8.2 Prepartum/Prenatal Mother to Child Transmission of HIV

This refers to the prepartum period preceding the onset of labour and the subsequent delivery. The efficacy of interventions aimed at reducing the risk of vertical transmission of HIV during prenatal pregnancy is mostly contingent upon the HIV status of the mother and her understanding of antenatal care (ANC) and prevention of mother-to-child transmission (PMTCT) healthcare measures¹⁸³. Understanding the socioeconomic situation of mothers is a

crucial factor that can be utilized to enhance the effectiveness of early preventative efforts. Early initiation of highly active antiretroviral therapy (HCT) can facilitate the provision of appropriate counselling, prompt engagement in treatment and care, establishment of connections to comprehensive prevention of mother-to-child transmission (PMTCT) programs, and attainment of many health advantages¹⁷². In a study conducted by Drake et al., it is argued that the timely recognition of unaddressed sexual reproductive health (SRH)/HIV concerns among mothers is crucial for enhancing maternal well-being and minimizing mother-to-child transmission (MTCT) of HIV. This statement aligns with the World Health Organization's declaration for the global elimination of mother-to-child transmission (MTCT) of new HIV infections. Research indicates that a notable proportion of mother-to-child transmission (MTCT), specifically ranging from 5% to 10%, takes place during the prenatal period, which refers to the time before to childbirth, particularly in situations where interventions are not accessible or implemented^{172,184,180}. The present analysis pertains to the delayed initiation of prevention of mother-to-child transmission (PMTCT) interventions, coupled with inadequate program coverage and a notable attrition rate within PMTCT programs¹⁸³. The implementation of early novel creative preventative techniques, such as ensuring that 90% of pregnant women are aware of their status and are connected to treatment and care, has the potential to reduce the course of prenatal pregnancy and the related risk of mother-to-child transmission (MTCT).

2.1.8.3 Intrapartum and Mother to Child Transmission of HIV

The period including the process of labour and delivery. The activities that occur during the intrapartum period have a substantial impact on the likelihood of mother-to-child transmission (MTCT) of infections during the process of labour and delivery¹⁸⁵. The vertical transmission of the human immunodeficiency virus (HIV) from an infected woman to her child during the process of labour and delivery has been extensively reported in scientific

literature^{186,175,178,187,188}. Research findings indicate that in the absence of intervention strategies, around 5-10% of mothers who are infected with a certain condition are at risk of transmitting the infection to their infants throughout pregnancy, while the risk increases to 10-20% during the process of labour^{189,175}. Additional factors contributing to this phenomenon include chorioamnionitis, which refers to the inflammation of the amniotic membrane leading to its prompt rupture. Consequently, this exposes the infant to maternal blood, thereby significantly increasing the likelihood of heightened HIV virus density^{185,190}. The research conducted by Tita et al. revealed that chorioamnionitis had a twofold increased likelihood of inducing early new born mortality and other adverse health consequences in pregnant women with HIV, as compared to pregnant women without HIV¹⁹⁰. A study conducted by Minkoff et al. demonstrated that women with low CD4 counts have an increased likelihood of transmitting HIV when their fetal membranes are ruptured¹⁸⁵. Likewise, the condition known as placentitis, characterized by placental inflammation, facilitates the transmission of Human Immunodeficiency Virus (HIV) across the placenta, thereby directly exposing the new born to mother umbilical HIV fluid^{187,190,185}. Intrapartum events encompass the spread of sexually transmitted infections (STIs) and other conditions that impair the mother's immune system^{183,172}. These identified risk factors contribute to the increased transmission of mother-to-child transmission (MTCT). The vulnerabilities are particularly evident in mothers who lack awareness of their HIV status and other sexually transmitted infections (STIs) during the process of labour and delivery¹⁹¹. Incorporation of HIV testing for moms during labour should be considered as a normal technique, as suggested by the report conducted by Ekouevi et al.¹⁹². In this context, it is plausible to establish a connection between the absence of prenatal detection and subsequent implications for treatment and care¹⁹³. Furthermore, it is recommended that pregnant individuals who have received a negative test result during the previous three months undergo retesting upon

entering the labour process. This presents a chance to identify undetected instances and the window period of HIV infections¹⁹⁴.

2.1.8.4 Post-partum/Postnatal Exposure of Mother to Child Transmission of HIV

The postpartum period, which encompasses the time immediately following delivery and throughout breastfeeding. The postpartum period has emerged as a critical phase in the battle against pediatric HIV epidemics, as it presents an opportunity for the elimination and eradication of mother-to-child transmission (MTCT)^{183,195}. Despite ongoing efforts to revise and expand Prevention of Mother-to-Child Transmission (PMTCT) programs, the issue of ensuring that infants are born free of HIV remains a significant concern^{184,180}. The occurrence of mother-to-child transmission (MTCT) during the post-natal period is estimated to be around 10-20% in areas where no interventions are available, compared to 1.3-4% in settings where preventative programs are accessible^{184,180}. The transmission of HIV to infants during the post-natal period is primarily linked to many factors, including the techniques of infant feeding, the educational background of the mother, and, to a lesser degree, instances of blood transfusions and exposure to contaminated sharp objects. Additional examples of breast inflammation that can occur in mothers include mastitis, nipple sores, and abscesses^{182,172,178,179}.

The provision of adequate nutrition to newborns who have been exposed to HIV continues to provide a significant obstacle in the efforts to eliminate and control the transmission of HIV in Sub-Saharan Africa (SSA). There is a lack of clarity in certain contexts regarding the various types of baby feeding, including exclusive breastfeeding (EBF), exclusive formula feeding (EFF), and mixed feeding (MF). There is evidence to suggest that certain mothers have reported receiving inaccurate information on infant feeding practices from ANC (Antenatal Care) and PMTCT (Prevention of Mother-to-Child Transmission) programs¹⁰.

However, the dependence of MTCH on the feeding strategy employed is an important factor to consider. The majority of risk is notably connected with mixed feeding MFEFF and EBF^{183,175}. Despite the utilization of health services by moms, they continue to encounter the predicament of selecting appropriate techniques for feeding their children¹⁷⁹. Breastfeeding is widely practiced in various contexts, aligning with the World Health Organization's recommendation of exclusive breastfeeding (EBF) throughout the initial six months of an infant's life. Additionally, it is recommended that antiretroviral therapy (ARVs) be provided to all HIV-positive mothers who choose to breastfeed^{174,179,196}. Providing parents with information regarding the many feeding strategies that are most suitable for their newborns contributes to improved health outcomes. This study also encompasses an examination of the public health ramifications associated with new born feedings, an analysis of the national infant feeding policy, and an evaluation of the antiretroviral drugs (ARVs) that are accessible to support programs aimed at preventing mother-to-child transmission (PMTCT) of HIV. Socio-cultural disparities can potentially impact feeding behaviours³⁶. In the context of South Africa, certain factors have been identified as influential in shaping family decisions about baby feeding practices. These factors include maternal age, HIV stigma, economic considerations, and cultural attitudes surrounding breast milk and HIV transmission. It is worth noting that these factors exert an impact on family choices despite the existence of government policy¹⁹⁷. The selection of baby feeding strategies should prioritize the promotion of HIV-free newborns through enhanced and improved practices. According to the World Health Organization (WHO), it is imperative that preventative measures include qualities of acceptability, feasibility, affordability, sustainability, and safety¹⁹⁸. In cases when infants have already contracted HIV, optimal counselling strategies should encompass breastfeeding as well as life-saving interventions such as prompt treatment, comprehensive care, and appropriate nutritional support¹⁷⁴.

2.1.9 Child Feeding Methods Exclusive Breastfeeding (EBF) and Mother to Child Transmission of HIV

During the first period of 0-6 months, newborns are only nourished by breast milk and are not provided with any other kind of sustenance, including water. The only exceptions to this exclusive breastfeeding practice are the administration of vitamin supplements and immunizations. Breastfeeding is a traditional and widely prevalent maternal practice observed across several cultural contexts^{176,199}. The methodology employed in this study offers significant advantages and plays a crucial role in delivering vital interventions for child survival throughout the critical phase of early infant development^{186,191}. Exclusive breastfeeding (EBF) has been found to be a cost-effective, environmentally friendly, and financially accessible option in low-income contexts. According to the World Health Organization (WHO), exclusive breastfeeding (EBF) is a valuable complement to the provision of antiretroviral therapy (ARVs) and care scale-up interventions for infants who are born to HIV-positive mothers and have survived without acquiring the infection¹⁷⁵. Research has indicated that exclusive breastfeeding (EBF) during the initial six months of an infant's life significantly reduces the risk of mother-to-child transmission (MTCT) by a factor of 3-4 when compared to mixed feeding (MF22). This suggests that it is important for HIV pediatric programs to be customized in order to provide assistance for exclusive breastfeeding during the initial six months following an infant's birth. Despite the presence of these advantages, there is still a lack of awareness among mothers participating in Prevention of Mother-to-Child Transmission (PMTCT) programs in certain contexts on the health benefits associated with Exclusive Breastfeeding (EBF). For example, according to a study conducted by Ndubuka et al. in Botswana, almost 50% of mothers participating in Prevention of Mother-to-Child Transmission (PMTCT) programs shown awareness of Exclusive Breastfeeding (EBF), whereas only 19.8% were able to adhere to exclusive breastfeeding practices for their

infants¹⁷⁶. In a similar vein, Kazaura documented a prevalence of 30% of mothers engaging in exclusive breastfeeding (EBF) within a rural context in Tanzania²⁰⁰. This observation indicates that there is still a prevailing issue regarding the understanding and implementation of exclusive breastfeeding (EBF) programs, as seen by a decreasing number of women who are unable to grasp and embrace such initiatives¹⁷⁶. Research conducted on evidence-based implementation has demonstrated a strong correlation between the provision of counseling on baby feeding strategies within programs focused on preventing mother-to-child transmission (PMTCT) and the adoption of exclusive breastfeeding (EBF) practices¹⁷⁵. This phenomenon has been observed to rely on the level of knowledge and understanding of exclusive breastfeeding (EBF) and its impact on maternal health outcomes¹⁷⁶. Additional characteristics that are associated with this phenomenon include the level of education attained by the mother, her attitude towards exclusive breastfeeding, and the inadequacy of breast milk production⁹⁹. Despite the existence of research, it has been demonstrated that a significant proportion of newborns, ranging from 10% to 20%, contract HIV through the act of nursing in situations when no interventions to prevent HIV transmission are implemented^{184,175,180}. Additional research has indicated that there is an increased risk of mother-to-child transmission (MTCT) of HIV in cases when women have high viral loads, mastitis, breast abscesses, cracked nipples, low immunological response, ulcers around the nipples, and other maternal illnesses^{174,175}. There is a significant correlation observed in low-income settings between mothers with weakened immune systems and HIV-related morbidity and mortality^{174,199}. Mothers who breastfeed and possess robust immune systems tend to have infants that exhibit enhanced health and vitality in comparison to mothers with weakened immune systems. Mothers who are on antiretroviral therapy (ARVs) and practice exclusive breastfeeding (EBF) typically observe a substantial decrease in the occurrence of postnatal vertical transmission of HIV. This reduction is estimated to be below 2%^{174,184,201}. This is due

to the fact that exclusive breastfeeding (EBF) facilitates the early establishment of a healthy gut in infants and confers resistance against infectious microbial agents, including HIV¹⁸⁴. In addition, breast milk possesses antimicrobial characteristics that are absent in alternative feeding approaches¹⁸⁸. Research findings indicate that infants and young children who are breastfed exhibit a mortality rate of less than 1%, which is significantly lower in comparison to alternative feeding practices^{174,176}. Alternative feeding strategies, such as exclusive formula feeding (EFF), are typically only used when a mother who is exclusively breastfeeding (EBF) becomes unwell and is unable to nurse her infant. In addition, it is imperative to do further evidence-based research in order to gain comprehensive understanding of alternate feeding strategies that are both safer and more inexpensive, while also being less costly and easier to implement. Indeed, there is evidence to suggest that HIV-positive women who are infected and exclusively breastfeed their infants from birth to six months of age, while simultaneously receiving highly active antiretroviral medication, tend to observe more favourable health outcomes for their infants in comparison to those who choose for either exclusive formula feeding or mixed feeding practices¹⁷⁴. Numerous clinical trials have demonstrated that HIV-infected mothers who engage in breastfeeding while receiving Atripla antiretroviral therapy (ARVs) effectively reduce the risk of mother-to-child transmission (MTCT) to below 1% throughout the postnatal period²⁰². Due to the good results and health benefits associated with breastfeeding, many governments have implemented revisions to their breastfeeding policies. These revisions aim to promote exclusive breastfeeding (EBF) and gradually phase out the provision of complimentary infant formula to newborns of both HIV-positive and HIV-negative mothers¹⁸⁹.

2.2 Theoretical Framework

2.2.1 Theory of Planned Behavior

Behavioural change interventions, such as those aimed at reducing sexual risk and promoting consistent condom use, continue to play a crucial role in HIV prevention initiatives, particularly in light of the ongoing challenges associated with discovering a cure or vaccine for the virus^{203,204}. As an integral component of the HIV/AIDS preventive approach, the preventive of Mother-to-Child HIV Transmission (PMTCT) program endeavours to mitigate the vertical transmission of HIV, namely from mothers to their offspring. The recommended interventions for the prevention of mother-to-child transmission (PMTCT) encompass several strategies, such as HIV counselling and testing, administration of antiretroviral (ARV) prophylaxis, adherence to safe obstetric procedures, and provision of counselling on safe new born feeding practices²⁰⁵. The primary objective of HIV counselling and testing is to identify pregnant women who are HIV positive in order to provide them with appropriate therapies for the prevention of mother-to-child transmission (PMTCT). In resource-constrained contexts, HIV testing was exclusively provided through an opt-in strategy until the year 2004. In this particular methodology, the initiation of testing is attributed to the client and is presumed to be of a voluntary nature. Nevertheless, the acceptability and rate of HIV testing remained below ideal levels due to several social and institutional constraints^{206,207}. As a result of this occurrence, the World Health Organization (WHO) advocated for a change in the approach of HIV testing²⁰⁸. Following that, the practice of conducting routine opt-out HIV testing has been established as the prevailing standard of healthcare for pregnant women. After the introduction of the routine opt-out strategy, a notable enhancement in acceptability has been documented, with testing rates varying from 55% to 100%^{206,209,210,211}. However, there exists data suggesting that the integrity of pre-test counselling and the option to decline participation may be affected. Research conducted in Kenya and Uganda revealed that the communication of information on the option to opt-out during group pre-test counselling sessions was found to be inadequate^{212,213}. Numerous scholars contend that pregnant women

residing in resource-constrained environments exhibit lower levels of empowerment, hence diminishing their capacity to reject the influence exerted by healthcare providers in antenatal care settings^{213,214,215}. Certain women may undergo testing even if they first express an intention not to do so, as they perceive testing as a prerequisite for receiving subsequent medical attention^{214,216}. Numerous studies pertaining to routine opt-out testing generally center on the inherent conflict between enhancing testing rates and the potential infringement against ethical precepts^{212,213,215,217,218,219}. However, there is a limited body of research that has examined this matter from a cognitive-behavioral perspective. Jessor (1997) posits that the determinants of behavior, particularly those linked to HIV, can be categorized according to their conceptual proximity to the immediate experience of the specific behavior²²⁰. Cognitive processes, which serve as proximal determinants, play a significant role in mediating the effects of distal influencing elements such as cultural and socio-demographic characteristics²²¹. Based on this premise, the greater one's understanding of the cognitive determinants that impact a specific behavior, the more facilitative it becomes to modify said behaviour. The concept under consideration pertains to a theoretical framework that focuses on the cognitive factors that are in close proximity to and have a direct influence on human behavior. The theory also appears to serve as a practical instrument for examining HIV testing behavior in antenatal settings and for identifying factors that hinder or promote behavioral change. The Theory of Planned Behavior (TPB) posits that perceived behavioral control (PBC) is equally important as attitude and subjective norm in predicting behavioral intention. This suggests that these three predictors indirectly influence later behavior by influencing behavioral intention. The key proximal predictor of behavior is intention. Based on the Theory of Planned Behavior (TPB), behavioral intention is determined by attitude, which is a positive or negative assessment of the specific behavior, and subjective norm. The concept of subjective norm pertains to the individual's perception of the social pressure

exerted on them to engage in a particular behavior. Perceived behavioral control pertains to the level of ease or difficulty that is associated with the execution of a particular behavior. The constructs of attitudes, subjective norms, and perceived behavioral control are supported by the underlying factors of behavioral beliefs, normative beliefs, and control beliefs, correspondingly. Numerous studies have substantiated the efficacy of the Theory of Planned Behavior (TPB) in accurately forecasting individuals' intentions and subsequent actions pertaining to various health-related behaviors²²². Armitage and Conner (2001) conducted a meta-analysis wherein they found that attitude, subjective norms, and perceived behavioral control (PBC) collectively explained 39% of the variance in intention across a sample of 154 applications. Additionally, intention and PBC accounted for 27% of the variance in behaviors across a subset of 63 applications²²³. However, certain research have indicated that the Theory of Planned Behavior (TPB) exhibits a relatively low level of explanatory power, ranging from 13% to 7%^{223,224}. Previously, the TPB has been used in sub Saharan African settings to predict HIV preventive behaviours mostly in small scaled studies of cross-sectional design^{225,226,227,228,229}. Nevertheless, there is still a need to establish the extent of the connection between intention and behavior in the context of routine HIV testing, specifically when utilizing objectively measured behaviors in prospective research. Numerous empirical studies have demonstrated that factors beyond the Theory of Planned Behavior (TPB) framework can account for a significant percentage of the variability in describing both intention and behaviour^{203,230}. After accounting for the factors in the Theory of Planned Behavior (TPB), it was shown that past behavior and descriptive norms continued to have significant effects on both intention and behavior^{228,229,230,231}. The term "descriptive norm" in this context pertains to the perceptions held by women regarding the behaviors of other prenatal attendees, such as friends, sisters, and neighbours, in relation to HIV testing. This study aimed to investigate the factors influencing intended and actual HIV testing among a

cohort of pregnant women who were accessing antenatal care services, both public and private, for the first time in their current pregnancy. The expanded version of the Theory of Planned Behavior (TPB) was utilized to provide a comprehensive understanding of these factors.

2.3 Review of Empirical Studies

2.3.1 Studies on the Knowledge and Attitude of HIV-Positive Pregnant Women towards PMTCT of HIV

A cross-sectional study was undertaken in Mecha district during the period of July 1-30, 2016, involving a total of 853 women of reproductive age. The study was community-based in nature. The objective of this study was to evaluate the effectiveness of interventions in preventing the transmission of HIV from mothers to their children among women of reproductive age in Mecha district, located in the northwestern region of Ethiopia. Additionally, the study attempted to identify and analyze the factors related with this prevention strategy. Data were acquired using a multistage sample strategy, including a pre-tested questionnaire. The study employed bivariate and multivariable logistic regression models. Approximately 22.4% of the participants exhibited a satisfactory level of understanding regarding the prevention of mother-to-child transmission (PMTCT) of HIV. The results of the study indicate that there are several factors that are significantly associated with knowledge on Prevention of Mother-to-Child Transmission (PMTCT) of HIV. These factors include urban residence (Adjusted Odds Ratio [AOR] = 2.486, 95% Confidence Interval [CI] 1.160–5.328), education level of secondary and above (AOR = 5.445, 95% CI 2.698–10.986), history of antenatal care follow-up (AOR = 4.430, 95% CI 1.471–13.340), history of institutional delivery (AOR = 4.766, 95% CI 2.004–11.334), comprehensive knowledge on HIV/AIDS (AOR = 1.697, 95% CI 1.011–2.846), knowledge about mother-to-

child transmission of HIV (AOR = 2.203, 95% CI 1.37–3.54), and discussions with husbands regarding HIV/AIDS (AOR = 2.700, 95% CI 1.658–4.396)²³².

A study was conducted at the Federal Medical Centre in Katsina State to investigate the knowledge and attitudes of pregnant mothers towards prevention measures for mother-to-child transmission of HIV/AIDS. The study aimed to test three hypotheses and generate important recommendations based on the findings. The present study employed various methodologies to investigate the research question. The study employed a cross-sectional research design. The target population was selected using a process of sampling from the entire population, resulting in a final sample size of 67 participants. In this study, a self-constructed questionnaire on a four-point Likert scale was employed to gather data. All collected data were subjected to statistical analysis using the Chi-square test and correlation coefficient. Additionally, all hypotheses were evaluated at a significance level of 0.05²³³.

A research investigation was carried out in Tanzania, South Africa, and Malawi, focusing on the provision of group post-testing counseling for HIV-negative women. This approach raised concerns regarding the potential inadvertent disclosure of HIV status. In over 90% of healthcare facilities, antiretroviral therapy (ART) was provided to patients on the same day and in the same location as their HIV diagnosis. Concerns expressed by women regarding postpartum referral encompassed factors such as unfamiliar healthcare personnel, inadequate levels of privacy, and lengthy waiting times. The adoption and execution of policies for the integration of HIV and maternal health services exhibited variability across different contexts. The manner in which patients perceive and encounter these policies has the potential to impact their decision to engage in and maintain their involvement in healthcare services²³⁴.

2.3.2 Studies on the Acceptance of the Intervention of PMTCT of HIV

Qualitative sub-research was conducted in order to investigate the obstacles to adherence and the impact of FIs on enhancing viral suppression (VS) among participants of the HIV

Prevention Trials Network (HPTN) 065 study. These participants were classified into adherence stages related to SOC, based on the changes observed in their viral load tests from the first assessment to the follow-up. Out of a total of 73 individuals, the majority were found to be in the Maintenance stage (n = 31), which is characterized by the attainment of viral suppression (VS) throughout the duration of the HPTN 065 study. Additionally, a significant number of people were identified to be in the Action stage (n = 29), which is described as transitioning from a state of virally unsuppressed to suppressed in 50% or more of the conducted tests. A total of 13 individuals had low adherence, as they were able to attain the desired variable success in fewer than 50% of the administered tests. The second group had significant obstacles in terms of social and structural adherence. The individuals involved in the Action stage implemented constructive modifications to their adherence routines in order to attain the desired outcome of variable success. Individuals in the Maintenance department exhibited a lower level of motivation towards financial incentives, as their commitment to their tasks was already established. The findings of this sub-study indicate that the effectiveness of FI may differ depending on the stage of change continuum, with the most significant effects observed among individuals who are starting antiretroviral treatment or who do not have established adherence habits. FIs might not be adequate in addressing significant societal or structural obstacles, and they may not be essential for individuals who are inherently dedicated to maintaining adherence²³⁵.

A research investigation was undertaken at five healthcare facilities located inside the Lilongwe area of Malawi. In the period from July to August 2018, a total of 24 women presenting with postnatal depression (PND) were selected for in-depth interviews. The sample size each location consisted of the first 4-5 women. The classification of Postnatal Depression (PND) was determined by a threshold score of 10 or higher on the Edinburgh Postnatal Depression Scale (EPDS). Ten further in-depth interviews were done with

providers specializing in HIV and mental health at the five clinics. The majority of participants expressed support for the practicality of incorporating integrated prenatal and postnatal depression (PND) screening, as they held the belief that PND carried the possibility of substantial morbidity. Within the group of healthcare professionals, several obstacles to conducting screenings were discovered. These obstacles included unfavorable attitudes among staff members towards taking on extra responsibilities, insufficient staffing levels, and time limitations. Proposed strategies for addressing obstacles encompassed the provision of comprehensive health worker training, effective supervision mechanisms, and the use of a concise screening tool. The preference for patient-centered counselling procedures over medicine was observed among people living with HIV (WLHIV) as the preferred treatment option, while healthcare providers acknowledged the limited function of medication in addressing severe depression. The identification of nurses as the most appropriate healthcare professionals for delivering task-shifted interventions was underscored by providers, who also highlighted the necessity of additional training to enable the successful implementation of task shifting²³⁶.

A more research investigation The HIV testing rates during pregnancy in Sudan are said to be low. The scalability and uptake of PMTCT services are constrained by various issues within the healthcare system, one of which is the motivation of healthcare providers. This research paper outlines the process of developing, implementing, and evaluating a health promotion intervention plan within a health facility setting. The aim of the intervention was to enhance the utilization of Prevention of Mother-to-Child Transmission (PMTCT) services. The Intervention Mapping approach was employed in this study. The intervention plan incorporated determinants at both the individual and environmental levels, as previously established. Several factors influenced women's intention to undergo HIV testing during pregnancy. These factors encompassed the amount of knowledge on mother-to-child

transmission (MTCT) of HIV, the healthcare provider responsible for administering the HIV test, the emotional distress associated with contemplating HIV/AIDS, the lack of confidentiality surrounding test findings, and the individual's self-efficacy. This study offers valuable insights on the strategies involved in the development, implementation, and evaluation of a facility-based health promotion intervention. The utilization of a pre-assessment played a crucial role in informing and guiding the development of the intervention, ensuring its relevance and adherence to evidence-based practices. The utilization of the Intervention Mapping approach allowed the systematic design of the intervention and provided guidance for its implementation²³⁷.

A research investigation was undertaken, involving a sample of twenty-three pregnant women diagnosed with HIV (WWH), ranging in age from 18 to 45 years and currently undergoing antiretroviral therapy (ART). These participants were randomly assigned to either a psychosocial intervention targeting depression and adherence or a control group receiving standard treatment (TAU). The primary objectives of this study were to assess the feasibility and acceptability of the intervention, as well as to examine its initial impact on depressive symptoms and adherence to ART. Assessments were administered prior to therapy, immediately following treatment, and three months after treatment, encompassing a qualitative exit interview. A majority of eligible persons, specifically 67.6%, successfully registered in the program. Additionally, a significant proportion, 71%, completed at least 75% of the sessions. In comparison to the treatment as usual (TAU) group, the participants who received the intervention demonstrated substantially higher enhancements in their depressive symptoms both immediately after the therapy ($\beta = -11.1$, $t(24) = -3.1$, $p < 0.005$, 95% CI [-18.41, -3.83]) and at the 3-month follow-up ($\beta = -13.8$, $t(24) = -3.3$, $p < 0.005$, 95% CI [-22.50, -5.17]). There were no statistically significant variations observed in adherence to antiretroviral therapy (ART), levels of social support, or experiences of stigma. The

intervention yielded significant gains in terms of social support, self-esteem, and problem-solving adherence hurdles, as observed through qualitative analysis. Participants expressed a desire for further sessions to further enhance these outcomes²³⁸.

2.3.4 Studies on the Effectiveness of Interventions of PMTCT of HIV

The study conducted in Dar es Salaam, Tanzania involved the random assignment of twenty-three health facilities to a peer-mother intervention group, while twenty-four health facilities were assigned to a control group. Ninety-two women with HIV who had prior experience in antiretroviral therapy (ART) were selected and provided training to serve as peer educators. Their role was to offer education, support for adherence to treatment, and psychosocial assistance to women who were enrolling in prevention of mother-to-child transmission (PMTCT) care at the designated intervention facilities. The study encompassed pregnant women who were registered in Prevention of Mother-to-Child Transmission (PMTCT) programs across 47 healthcare facilities, spanning from January 1, 2018, to December 31, 2019. These women were thereafter monitored until July 31, 2021. The main objective of this study was to assess the time it took for individuals to discontinue antiretroviral therapy (ART), specifically those who did not attend their regular appointments for more than 90 days, excluding transfers. Additionally, the study aimed to determine if there were any variations in the one-year retention rates for prevention of mother-to-child transmission (PMTCT) and ART care between the institutions that received the intervention and those in the control group. The secondary outcomes assessed in this study included the achievement of maternal viral suppression, defined as having less than 400 viral copies per milliliter, and the occurrence of mother-to-child HIV transmission (MTCT) within a period of at least 12 months after childbirth. The analyses employed Kaplan Meier and Cox regression to examine ART retention and attrition, generalized estimating equations to assess viral suppression, and random effects logistic regression to investigate MTCT. The results were reported in terms of

rates, proportions, and 95% confidence intervals (CI). A total of 1957 women were included in the peer-mother group, whereas 1384 women were enrolled in the control facilities for routine prevention of mother-to-child transmission (PMTCT) care between 2018 and 2019. These women were followed for a median duration of 23 months, with an interquartile range (IQR) of 10 to 31 months. The median age of women in both groups was found to be 30 years, with an interquartile range (IQR) of 25 to 35 years. However, there were small differences seen between the two groups in terms of the proportions of women in the third trimester of pregnancy (14% vs 19%), those with advanced HIV (22% versus 27%), and those who were ART naïve (55% versus 47%). The attrition rate per 1000 person months was notably lower in peer-mother facilities compared to other facilities, with a 95% confidence interval of 14 (13, 16) versus 18 (16, 19). Additionally, the one-year ART retention was significantly higher in peer-mother facilities, with a 95% confidence interval of 78% (76, 80) versus 74% (71, 76), as observed in unadjusted analyses. However, when adjusting for other factors, the effect size was not statistically significant [adjusted hazard ratio of attrition (95%CI) = 0.85 (0.67, 1.08)]. The rates of viral suppression (95% confidence interval) were comparable in the two groups, with 92% (91, 93) in one group and 91% (90, 92) in the other. However, among women who were ART naïve, the rate of viral suppression was considerably higher in peer-mother facilities at 91% (89, 92) compared to control facilities at 88% (86, 90). The mother-to-child transmission rate (MTCT) with a 95% confidence interval (CI) was comparable across the two groups, with rates of 2.2% (1.4, 3.4) and 1.5% (0.7, 2.8) respectively. In summary, our findings indicate that the incorporation of peer-mother services into standard prevention of mother-to-child transmission (PMTCT) care resulted in enhanced adherence to antiretroviral therapy (ART) across all women and better viral suppression among ART-naïve women. However, it did not demonstrate a meaningful impact on the prevention of mother-to-child transmission of HIV (MTCT)²³⁹.

2.4 Conceptual Framework of PTMCT

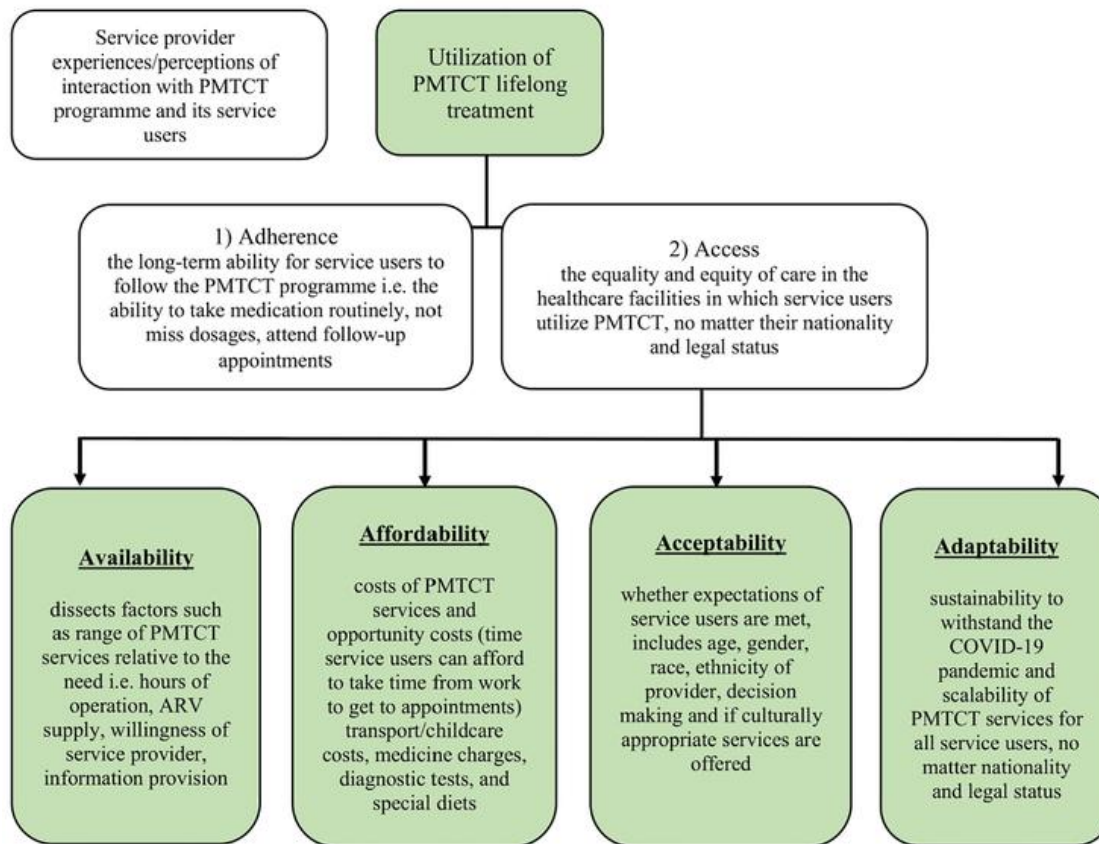


Figure 2.4: The Utilisation of PMTCT Services Conceptual Framework

Source²⁴⁰

2.5 Summary of Gap of Literature Reviewed

There is a diverse array of efficacious solutions available for enhancing access, utilization, and continuity of prevention of mother-to-child transmission (PMTCT) services. It is imperative for programmes to meticulously assess, give precedence to, and strategize interventions that are highly suitable for the specific local context and effectively target the prevailing deficiencies in PMTCT healthcare provisions. The primary mode of HIV transmission among young children is through mother-to-child transmission, which occurs when HIV is transmitted from an infected woman to her unborn baby during the stages of pregnancy, childbirth, or nursing. All pregnant or breastfeeding women who are HIV positive

are eligible for antiretroviral therapy (ART). Antiretroviral therapy (ART) has demonstrated significant efficacy in mitigating the risk of HIV transmission to the infant and safeguarding the maternal well-being throughout the course of pregnancy and postpartum. The monitoring of antiretroviral therapy (ART) efficacy during pregnancy involves the assessment of viral load, which refers to the quantification of viral particles present in the bloodstream of an individual infected with the virus. It is recommended that Antiretroviral Therapy (ART) initiation coincide with the day of HIV diagnosis for pregnant women.

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Chapter Three

Methodology

This section presents an elaboration on the research methodologies employed in the present study. The paper examines many techniques and procedures employed in this study, including the research design, sampling frame, study population, sample size, sampling procedure, study location, research instrument, and analytical method.

3.1 Research Design

The present study employed a sequential exploratory mixed-methods approach, integrating quantitative data obtained through surveys with qualitative data derived from focus group discussions (FGDs), the study specifically focused on health care providers, HIV-positive pregnant women, mother-infant pair who were seeking care at Adeoyo maternity centre, located in Ibadan, Oyo state.

3.2 Study Population

This study covered the health providers and HIV positive pregnant mothers who registered and received antenatal care (ANC) in Adeoyo maternity center, Ibadan.

Ibadan, situated in the Oyo State of Nigeria, serves as both the capital and the most populous city within the region. With a population of 3,649,000 as of 2021, this city ranks as the third most populous in Nigeria, following Lagos and Kano. Moreover, its metropolitan region accommodates almost 6 million individuals. In terms of geographical expanse, it holds the distinction of being the most expansive city within the nation. In the year 1960, Ibadan held the position of being the second most populated city in Africa, following Cairo. Additionally, it should be noted that this city holds the distinction of being both the largest and most densely inhabited metropolis in Nigeria. Ibadan, a city situated in the southwestern region of Nigeria, is positioned approximately 530 miles (330 kilometres) to the southwest of Abuja, the nation's capital. Furthermore, it is located 128 miles (80 kilometers) inland from Lagos. It serves as a pivotal junction for transportation linking the country's inland regions with its

coastal areas. Ibadan has served as the central hub of the former Western Region's administrative framework since the initial phases of British colonial governance. A number of the urban area's antiquated fortifications remain intact in the present day. The research was conducted at Adeoyo Maternity Center, located in Yemetu, Ibadan, Oyo state.

3.3 Sample and Sampling Techniques

The qualitative data study employed purposeful sampling to choose individuals who possess a specific set of characteristics, namely their expertise in delivering Prevention of Mother-to-Child Transmission (PMTCT) of HIV services. Quantitative data pertaining to survey reports of HIV positive pregnant women was gathered by the utilization of random simple sampling.

The qualitative study collected information by conducting focus group discussions (FGDs) with key healthcare professionals, including physicians, nurses, nursing assistants, midwives, and psychosocial chaperones. These professionals were involved in the implementation of HIV-related prevention of mother-to-child transmission (PMTCT) strategies or were responsible for the care of HIV-infected pregnant and breastfeeding women in the selected study. The participants' consent was necessary in order to partake in the study.

The participants for the quantitative cross-sectional survey were recruited from a pool of HIV-infected breastfeeding women who were frequently monitored in the chosen healthcare institutions. The decision to select these women was primarily influenced by their reported extensive engagement with PMTCT services, suggesting a presumed high level of familiarity with PMTCT interventions. The participants' consent was necessary in order to partake in the study. Based on the 2014 Demographic and Health Survey, which reported a regional HIV prevalence of 24.5% among pregnant women, a minimum sample size of 300 women will be determined¹.

$$n = \frac{Z^2 a^2 p q}{d^2} \quad (\text{Leslie-Kish formula})$$

d^2

(where $z^2 = 1.96^2$, $p = 0.065$, $q = 1-p$, $d^2 = 0.05^2$)

$$n = \frac{1.96^2 \times 0.245 \times 0.785}{0.05^2}$$

$$n = \frac{3.8416 \times 0.245 \times 0.785}{0.0025} = 300$$

A total of 300 questionnaires will be distributed for the survey study

3.4 Eligibility Criteria

Inclusion Criteria

Pregnant women, and nursing mothers with HIV were included to this study. Moreover, healthcare providers attending to HIV mothers were also be included in this study.

Exclusion Criteria

Pregnant women, and nursing mothers with negative HIV status were excluded in this study.

3.5 Description of Research Instrument

The data were gathered through the utilization of modified and self-designed questionnaires. The survey instrument consisted of both closed-ended and open-ended questions. The qualitative analysis of the Focus Group Discussion (FGDs) involving mother-infant pairs seeking care at Adeoyo maternity center in Ibadan, Oyo state, utilized an interview guide. The validation of the research instrument has been conducted. The study employed the following instruments:

1. Socio-Demography data questionnaire among mother-infant pair seeking care at Adeoyo Maternity center, Ibadan, Oyo state.
2. Knowledge of the Interventions to prevent mother to child transmission of HIV in Adeoyo maternity center, Ibadan, Oyo state.
3. Acceptance of the Intervention to prevent mother to child transmission of HIV in Adeoyo maternity center, Ibadan, Oyo state
4. Effectiveness of the Intervention to prevent mother to child transmission of HIV in Adeoyo maternity center, Ibadan, Oyo state.

3.6 Method of Data Collection

The process of data collecting was carried out by employing a standardized survey questionnaire. The questionnaire included in this study was derived from comprehensive national guidelines that integrate recommendations for HIV prevention, treatment, and care¹. The user's text is already academic. Prior to commencing data collection, the Chief Medical Officer of each Adeoyo maternity centre was provided with an introductory letter and obtained ethical permission. The data collection period was from June to August 2023. Following the approval, each client was provided with an explanation of the study strategy and the procedures employed to ensure privacy maintenance. The purpose of implementing this measure was to enhance the efficacy and confidentiality of the data collection process. The individuals included in the study were those who provided voluntary agreement to participate. The surveys were translated into Yoruba, the language understood by the participants, by the Research Assistants in order to facilitate effective communication.

3.7 Method of Data Analysis

Thematic analysis was used for qualitative methods.

The quantitative data was analyzed and processed using SPSS version 21. The analysis will incorporate descriptive statistics, namely frequency and percentages, to examine the data. Additionally, the impact of different interventions on mother-to-child transmission (MTCT) of HIV will be assessed by the application of the Pearson chi-square test to establish statistical significance.

3.8 Ethical Approval

The study received ethical permission from the University Research Ethics Committee (HREC) of Lead City University, Ibadan, Oyo State (NHREC/OYOSHRIEC/10/11/22), as well as from the Ibadan, Oyo State Ministry of Health Department of Planning Research & Statistics Division (NHREC/OYOSHRIEC/10/11/22). The researchers acquired official authorization from the hospitals that were involved in this study. A written information statement was distributed to all participants prior to gaining their informed verbal consent. In order to obtain informed verbal permission from participants, the information statement was orally presented in the local language, Yoruba. The research included a sample of women who possessed formal education as well as women who lacked formal education. Consequently, obtaining informed verbal agreement was deemed more suitable and received approval from both ethical committees. Furthermore, the study was conducted in the form of a survey, with the research posing minimal danger to participants. The participants were provided with the option to inquire about any concerns or seek clarification before the commencement of the interview. The process of obtaining consent was conducted in a designated private space by trained individuals responsible for collecting data, following the completion of the respondents' regular clinical care appointment. The participants were provided with information regarding the voluntary nature of their involvement and were explicitly advised of their right to decline participation or withdraw their consent at any point during the study. It was explicitly stated that engagement in this research endeavour did not

have any influence on the provision of medical treatment to the participants. The participants were moreover notified that the survey encompassed inquiries that could potentially elicit feelings of embarrassment or intrusiveness, as well as concerns around their reproductive health matters. Additionally, the participants were provided with the information that they had the autonomy to decline answering any question that they found uncomfortable, and they had the option to withdraw from the study at any point or opt out of responding to a specific topic. Female nurses were equipped to offer psychiatric assistance in the event that it became necessary. During the process of data collecting, the anonymised data was securely stored on password-protected laptops. The data were securely stored on computers that were protected by passwords.

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Endnotes

1. Federal Ministry of Health, *“Federal Government of Nigeria. National Guidelines on Prevention of Mother to Child Transmission (PMTCT) of HIV in Nigeria”*, 2017.

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Results and Discussion of Findings

The use of both qualitative and quantitative research methods yielded volume and insight to the subject matter investigated.

This chapter presents the data and outcomes derived from the investigation. This study aims to conduct an analysis to evaluate the effectiveness of interventions implemented at Adeoyo Maternity Centre in preventing mother-to-child transmission of HIV.

The chapter consists of four sections. The initial portion included a descriptive analysis of the socio-demographic characteristics of the respondents. The subsequent section provided a descriptive analysis of the participants' understanding and familiarity with interventions aimed at preventing the transmission of HIV from mother to child. Following that, the third section presented the level of acceptance towards these interventions. Lastly, the fourth section examined the effectiveness of the interventions.

4.1 Demographic Data Analysis

4.1.1 Descriptive Analysis of Respondents' Socio-demographic Characteristics.

This section provides an overview of the demographic and personal attributes of the participants included in the research. Based on the data provided in Table 4.1, it can be observed that the average age of the respondents is 31.04 years, with a standard deviation of 2.966. Furthermore, it is noteworthy that a majority of the respondents, specifically 56.3%, fall within the age range of 30-34 years. The analysis of religious affiliation indicates that 61.7% of individuals adhere to the Islamic faith, whilst 38.3% adhere to Christianity. The analysis of ethnicity distribution indicates that the majority, specifically 71.3%, of the population identifies as Yoruba. Additionally, 6% of the population identifies as Igbo, 14.7% identifies as Hausa, and the remaining 8.0% belongs to various other ethnic groups. A significant majority of 86.0% of individuals adhere to the monogamous system of marriage,

whilst the remaining 14.0% engage in the practice of polygamy. The data pertaining to the educational system indicates that a significant proportion, specifically 82.7% of the respondents, possessed a tertiary degree of education. Among the many occupational categories, traders constitute 45.7% of the population, whereas teachers make up 18.3%. Additionally, other professions like as lawyers, accountants, and healthcare workers are also represented. Approximately 35.3% of individuals possess a family size consisting of three children, while approximately 29.3% have a family size of four children. Additionally, approximately 26.3% of individuals have a family size of two children, with the remaining portion of the population having either one kid or no children.

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Table 4.1: Socio-Demographic Characteristics

Individual Characteristics	Frequency (n=300)	Percent
Age (years) 31.04±2.966		
25-29	90	30.0
30-34	169	56.3
35 & above	41	13.7
Religion		
Christianity	115	38.3
Islam	185	61.7
Marriage		
Monogamy	258	86.0
Polygamy	42	14.0
Ethnicity		
Yoruba	214	71.3
Igbo	18	6.0
Hausa	44	14.7
Others (Edo, Ibibio, Tiv, Nupe, Fulani)	24	8.0
Educational status		
Primary	8	2.7
Secondary	44	14.7
Tertiary	248	82.7
Occupation		
Accountant	10	3.3
Auditor	12	4.0
Banker	8	2.7

Dentist	12	4.0
Engineer	22	7.3
Health worker	36	12.0
Lawyer	8	2.7
Teacher	55	18.3
Trader	137	45.7
No of children		
0	15	5.0
1	12	4.0
2	79	26.3
3	106	35.3
4	88	29.3
Employment status		
Fulltime	274	91.3
Part-time	26	8.7
Age at testing for the baby		
≤ 6 weeks	200	62
6 weeks to 6 months	80	28
6- 18 months	20	10

****Values in parenthesis are in percentages****

Source: Field Result, 2023

4.2 Presentation of Data

Research Question One: What are the knowledge and awareness of HIV-positive pregnant women and HIV-positive mothers regarding the interventions to Prevent Mother to Child Transmission of HIV?

This section provides an analysis of the participants' knowledge and awareness on interventions aimed at preventing the transfer of HIV from mother to child. Based on the data shown in Table 4.2, it can be observed that all respondents possess knowledge regarding their HIV status, as well as the transmission risk of HIV from an infected woman to her unborn child. The data reveals that all respondents possess knowledge on the transmission of HIV, namely during pregnancy, labor/delivery, and nursing. All participants in the study expressed the belief that there were strategies to mitigate the transmission of HIV from mother to child. A significant majority, approximately 85.3%, reported obtaining their information from hospitals, while a smaller proportion relied on friends and family members as their sources of information. A majority of the respondents, specifically 75.0%, concur that exclusive breastfeeding is the optimal choice for preventing the transmission of HIV from mother to child. Conversely, the remaining 25.0% of respondents hold the belief that infant formula represents the superior feeding option in this regard. The statement that mother-to-child transmission of HIV is avoidable received unanimous affirmation from all respondents.

Table 4.2 Knowledge and Awareness of Interventions to Prevent Mother to Child Transmission of HIV

Statements	Yes	No
Are you aware of your status	300(100.0)	0(0)
Are you aware /do you know a mother with HIV can infect her unborn with HIV	280 (92.0)	20 (8.0)
Are you aware that/do you know that mother-to-child transmission can take place during the following:	300 (100.0)	0 (0)
i. Pregnancy	295 (98.0)	5 (2.0)
ii. Labour/delivery	100 (30.0)	200 (70.0)
iii. Breastfeeding	50 (15.0)	250 (85.0)
Do you know there are ways to prevent unborn child from being infected with HIV?	290 (95.0)	10 (5.0)
Do you know the initiation time for the antiretroviral prophylaxis for HIV positive women in pregnancy	100 (33.0)	200 (67.0)
Did you practice exclusive breastfeeding for 6 months	165 (56.5)	135 (43.5)

Do you know the mother-to-child transmission is preventable?	250 (80.0)	50 (20.0)
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****Values in parenthesis are in percentages****

Source: Field Result, 2023

Research Question Two: What extent are the interventions to Prevent Mother to Child Transmission of HIV acceptable to HIV-positive pregnant women and HIV-positive mothers?

This section provides an overview of the participants' feedback regarding their knowledge and acceptance of interventions aimed at preventing the transfer of HIV from mother to child. Based on the data provided in Table 4.3, it can be observed that all respondents, constituting 100% of the sample, have undergone HIV testing. All of the respondents in the study confirmed that their partners possess knowledge of their HIV status. A majority of the participants, specifically 87%, indicated that they are now utilizing prescribed drugs for the treatment of HIV. The findings indicate that a significant proportion (85%) of the participants actively engaged in attending routine prenatal care appointments throughout their pregnancy. A significant proportion, specifically 67% of the participants, engage in educational sessions focused on the intervention strategies aimed at preventing the transfer of HIV from mother to child. A significant majority of the participants, specifically 88%, expressed agreement with the practice of having their CD4 count assessed. Approximately 60% of the participants indicated their willingness to give birth in a healthcare facility during the course of their pregnancy. A significant proportion of the participants, approximately 56.3%, expressed their opposition to adopting replacement feeding for their infants during the initial six months. Similarly, 50.3% of the respondents indicated that they would refrain from engaging in mixed

feeding practices within the same time frame. All participants agreed to engage in postnatal follow-up of their infants at the hospital.

Table 4.3 Acceptance of Interventions to Prevent Mother to Child Transmission of HIV

S/N	Statements	Yes	No
1	Have you had HIV test done in pregnancy?	300 (100.0)	0(0)
2	Is your partner aware of your status?	300 (100.0)	0 (0)
3	Do you encourage spouse to get tested for HIV?	245 (77.0)	55 (23.0)
4	Do you engage in interventions to prevent mother to child transmission?	200 (67.0)	100 (33.0)
5	Are you on prescribed drugs for HIV?	270 (87.0)	30 (12.0)
6	Do you attend regular antenatal care consultations?	260 (85.0)	40 (15.0)
7	Do you participate in educational sessions on the intervention for prevention of HIV transmission from mother to child?	200 (67.0)	100 (33.0)
8	Do you engage in HIV screening and counselling?	200 (67.0)	100 (33.0)
9	Do you have your CD4 count measured?	269 (88.0)	31 (12.0)
10	Will you accept to deliver baby in a health facility?	180 (60.0)	120 (40.0)

11	Will you accept Caesarian section as mode of delivery?	282 (94.0)	18 (6.0)
12	Will you accept replacement feeding for your child in the first six months of birth?	131(43.7)	169 (56.3)
13	Will you practice mixed feeding in the first 6 months	149 (49.7)	151(50.3)
14	Will you accept to take the baby for follow up visit in the hospital	250 (80.0)	50 (20.0)

****Values in parenthesis are in percentages****

Source: Field Result, 2023

Research Question Three: What is the Effectiveness of the Interventions to Prevent Mother to Child Transmission in Adeoyo Maternity Centre?

This section presents respondents' responses on their Information on the effectiveness of interventions to prevent mother to child transmission of HIV. From the data gathered as presented in table 4.4 below, 44.7% of respondents have been infected with HIV for 5 years and above. 83.7% agrees that they have had a life birth after their infection with HIV, while 16.3% have not had any birth of a child since their infection of HIV. 32.2% of the respondents had given birth to 3 or more children since their infection with HIV, and majority of the respondents which is 81% affirms that the children were given birth to at Adeoyo maternity centre. 57.7% of the respondents delivered the babies with normal vaginal delivery, while 29.3% delivered through Caesareans section. 80% of the respondents actively engage in the PMTCT interventions and also engage actively in HIV counselling, antiretroviral therapy and use of antiretroviral drugs. 80.3% which shows the majority of the baby delivered after HIV infection of the respondents were negative. 88.7% of the respondents agrees that they had a good experience, while 19.3% suggest that government should encourage and improve on prevention of transmission of HIV from mothers to infant amidst other. 75.0% of the respondents affirm to the statement "do you practice exclusive breastfeeding for six months".

Table 4.4 Effectiveness of Interventions to Prevent Mother-to-Child Transmission of HIV

S/N	Statements	Yes				No
1	How long have you been infected	1	2	3	4	5years and above
		12 (4.0)	10 (3.3)	81 (27.0)	63 (21.0)	134 (44.7)
2	If yes, how many	1	2	3 and above		
		93 (31.0)	70 (23.3)	98 (32.7)		
3	What was the method of delivery	Vaginal delivery			Caesarian section	
		173 (57.7)			88 (29.3)	
4	Do you engage in PMTCT?	260 (80.0)			40 (20.0)	
5	Do you find the intervention helpful?	241 (74.3)			59(25.7)	
6	What was the baby's HIV status	Negative			Positive	
		241 (80.3)			59 (19.7)	
7	Do your baby received cotrimoxazole for prophylaxis	280 (90.00)			20 (10.0)	
8	What was your experience like?	Good			Bad	

		288 (88.7)	34 (11.3)
9	Do you practice exclusive breastfeeding for 6 months?	225 (75.0)	75 (25.0)

Values in parenthesis are in percentages*

Source: Field Result, 2023

The table 4.5 below reveals the relationship existing between selected sections ‘knowledge on HIV transmission and the selected demographic characteristics of respondents.’

A chi-square test was conducted to examine the association between Religion and the source of information. The obtained significance value for religion was found to be 0.000, indicating a statistically significant relationship. Given that the predetermined significance level (P value) was established at ≤ 0.05 , it may be inferred that there is no statistically significant relationship between the source of information and the religious affiliation of the respondents. The null hypothesis (H0) is thus deemed to be accepted.

A chi-square test was conducted to examine the association between ethnicity and the source of information. The obtained p-value for ethnicity was found to be statistically significant at 0.005. Given that the predetermined threshold for statistical significance, denoted as the P value, was established at a level of ≤ 0.05 , it may be inferred that there is no statistically significant relationship between the source of information and the ethnicity of the respondents. The null hypothesis (H0) is thus deemed to be accepted.

A chi-square test was conducted to examine the association between educational status and the source of information. The obtained p-value for educational status was found to be statistically significant at 0.0015. Given that the predetermined significance level (P value) was established at ≤ 0.05 , it can be inferred that there is no statistically significant relationship

between the source of information and the educational status of the respondents. The null hypothesis (H₀) is hence deemed to be accepted.

A chi-square test was conducted to examine the association between religion and new born feeding choices, yielding a p-value of 0.139 for the variable of religion. Given that the predetermined threshold for statistical significance, denoted as the P value, was established at a level of ≤ 0.05 , it may be inferred that there is no statistically significant correlation between the choices of infant feeding and the religious beliefs of the participants. The null hypothesis (H₀) is thus deemed to be accepted.

A chi-square test was conducted to examine the association between ethnicity and newborn feeding options, yielding a p-value of 0.210 for ethnicity. Given that the predetermined significance level (P value) was established at ≤ 0.05 , it may be inferred that there is no statistically significant correlation between the choice of newborn feeding methods and the ethnic background of the participants. The null hypothesis (H₀) is thus deemed to be accepted.

A chi-square test was conducted to examine the association between educational status and baby feeding options, yielding a p-value of 0.411 for educational status. Given that the predetermined threshold for statistical significance, denoted as the P value, was established at a level of ≤ 0.05 , it may be inferred that there is an absence of a noteworthy correlation between the various choices of new-born feeding and the educational attainment of the individuals participating in the study. The null hypothesis (H₀) is thus deemed to be accepted.

Table 4.5 The Association between Knowledge of HIV Transmission, Selected Socio-demographic Characteristics of Respondents and Effectiveness of ART Prophylaxis on the Mother and the Infant

Knowledge on HIV Transmission					
Source of information					
	Hospitals	Friends	Family	P-value	Total
			Members		
Religion				X = 32.05	
Christianity	115	0	0	P = 0.00	115
Islam	141	30	14		185
Total	256	30	14		300
Ethnic				X = 18.476	
Yoruba	180	20	14	P = 0.005	214
Igbo	18	0	0		18
Hausa	34	10	0		44
Others	24	0	0		24
Total	256	30	14		300
Educational Status				X = 12.355	
Primary	8	0	0	P = 0.015	8
Secondary	34	10	0		44
Tertiary	214	20	14		248
Total	256	30	14		300
Infant Feeding Options					

	Exclusive breastfeeding only	Infant formula	P-value	Total
Religion			X = 2.186	
Christianity	92	23	P = 0.139	115
Islam	134	51		185
Total	226	74		300
Ethnic				
Yoruba	158	56	X = 4.522	214
Igbo	12	6	P = 0.210	18
Hausa	34	10		44
Others	22	2		24
Total	226	74		300
Educational Status				
Primary	5	3		8
Secondary	36	8	X = 1.777	44
Tertiary	185	63	P = 0.411	248
Total	226	74		300
Maternal ART				
	Infant HIV Status		P-value	Total
	Negative	Positive		
ART before pregnant	180	0	X = 7.457	180
ART during	80	0	P = 0.03	80

pregnant				
ART after delivery	18	2	20	
No ART	4	16	20	
Total	300		300	
Infant ART				
	Infant HIV Status		P-value	Total
	Negative	Positive		
Infant	278	2	X = 4.974 P = 0.04	280
ART/cotrimoxazole				
No infant	4	16		20
ART/cotrimoxazole				
Total	300			300

Source: Field Result, 2023

4.2.1 Multivariate Analysis

Table 4.6 presents data on study participants who are below 20 years of age and have a secondary level education or lower. The odds ratio for this group is 1.03 (95% CI=0.81-2.95, p=4.96) for having knowledge of HIV mother-to-child transmission (MTCT). In comparison, participants aged over 30 years with a higher degree of education have an odds ratio of 1.23 (95% CI=0.251-0.470, p=<0.02) for having knowledge of HIV MTCT. Similarly, individuals who had prior experience of attending antenatal visits and receiving HIV counselling and screening exhibited odds ratios of 1.23 (95% CI=0.233-1.002, p=3.06) and 1.34 (95% CI=0.111-0.456, p=<0.01) respectively, indicating a higher likelihood of possessing

knowledge regarding HIV counselling and screening compared to those who had not attended such visits.

Furthermore, it was observed that pregnant women below the age of 20 and with a primary level education or lower, who were receiving care at Adeoyo maternity centre, exhibited a decrease in odds of 1.00 (95% CI=0.545-1.943, $p < 0.01$) and 2.30 (95% CI=0.223-0.934, $p = 0.01$) respectively, in terms of their knowledge regarding Prevention of Mother-to-Child Transmission (PMTCT). This decrease in odds was in comparison to pregnant women aged over 30 years, who had attained a secondary or higher education level.

Participants who are below 20 years of age and have a secondary level education or less exhibit odds of 2.70-8.70 (95% CI) with a p-value of 4.56 in relation to the age at first PCR. Similarly, individuals in this group show odds of 0.68-1.65 (95% CI) with a p-value of less than 0.01 compared to those aged over 30 years with a higher level of education. Similarly, individuals who engaged in exclusive breastfeeding and received HIV counseling and screening beforehand exhibited odds ratios of 0.93 (95% CI=0.65-2.56, $p = 5.67$) and 1.45 (95% CI=0.89-3.30, $p = 0.01$), respectively, indicating a higher likelihood of engaging in mixed feeding compared to those who did not attend such counselling.

Table 4.6 Multivariable Logistic Regression Analysis to Assess the Association between Participant Characteristics and Knowledge of Effectiveness of Prevention of HIV Mother-to-Child Transmission

Variable	OR	95% CI	P value
Age			
20-29	1.00	0.806-2.960	4.96
30-34	1.23	0.251-0.470	0.02*
35 above	3.30	0.162-0.641	0.03*
Education Format			
Primary	1.00	0.563-3.854	3.06
Secondary	1.34	0.342-1.456	0.06
Tertiary	1.23	0.111-0.456	0.03*
Antenna care			
Yes	5.23	0.233-1.002	0.02*
No	1.34	0.563-5.432	1.90
HIV Screening and Cancelling			
Yes	1.34	0.123-1.120	0.43
No	1.00	0.343-2.340	1.00
Knowledge of PMTCT			
Yes	2.23	0.223-0.934	0.00*
No	1.00	0.545-1.943	2.34
Age at 1st PCR test			
≤ 6 weeks	1.60	2.70-8.70	3.56

6 weeks-6 months	3.56	1.54-8.76	4.56
6-18 months	2.30	0.68-1.65	0.02*

Pharmacologic

Intervention

Mother and baby	1.10	0.66-1.70	5.90
Mother only	2.33	0.59-7.04	6.77
Baby only	1.90	0.79-6.69	5.67
None	7.67	5.50-11.50	0.01*

Infant feeding choices

at 1st PCR test

Baby Formula	1.00	0.00	0.00
Exclusive breastfeeding	0.93	0.65-2.56	8.90
Mixed feeding	1.45	0.89-3.30	0.04*

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4.2.2 Findings from the Qualitative Survey-Focus Group Discussions (FGDs)

The specifically focused on healthcare providers, HIV-positive pregnant women, HIV-positive mothers and infant pair (service users) who are seeking care at Adeoyo Maternity Centre.

4.2.2.1 Health Care Providers

4.2.2.1.1 Theme: Prevention Measures for Mother-to-Child Transmission of HIV

Sub-Theme: Counselling and Education: The commencement of the Focus Group Discussion (FGD) sessions entailed engaging in discussions and soliciting the perspectives of the participants regarding the methods implemented to mitigate the risk of Mother-to-Child Transmission (MTCT) of Human Immunodeficiency Virus (HIV). The participants held differing opinions on the matter, with a majority of healthcare providers expressing the belief that there exist preventive strategies for the mother-to-child transmission of HIV. The following excerpts are offered from exchanges with the participants:

We counsel nursing mothers on the benefits of PMTCT by testing their status including their child and counselling of all pregnant women on MTCT of HIV. F2

Another participant said, health talk about HIV infection for nursing mothers and pregnant women are consistent in their ward. Also, the participant indicated that the use of drug during pregnancy, such as, prophylaxis drug treatment for child of HIV positive mothers are procedures adopted to prevent MTCT in their ward. F4

One of the participants said, counselling and drug adherence are enough to educate the HIV mothers about MTCT F6

One respondent said, availability of testing kits and counselling of all pregnant positive women, service delivery point; antenatal care, general out patient department, antiretroviral therapy clinic, labour ward are the measures adopted to prevent MTCT of HIV

F9

4.2.2.1.2 Theme: PMTCT Care for HIV-Positive Pregnant Women for Mothers

Sub-Theme: Availability of Antiretroviral Therapy. The healthcare provider delineates various packages of care for the prevention of mother-to-child transmission (PMTCT) of HIV. They elucidate the implementation of these care packages, emphasizing that their center ensures primary prevention of HIV infection in women of reproductive age and their partners, prevention of unintended pregnancy among HIV-positive women, prevention of HIV transmission from HIV-positive mothers to their infants, and provision of appropriate treatment, care, and support to HIV-positive mothers, their infants, and families. The PMTCT procedures encompass the availability of antiretroviral therapy for all HIV-positive women, prophylaxis for their infants, health education, and follow-up of the child until 18 months of age. Some of the specific components of the care package provided by the healthcare provider are outlined below:

One of the healthcare provider participants said that the PMTCT package of care available for HIV in their ward are divided into two classes; the package services for mothers and package services for HIV exposed infant. She said the package services for mothers include; ART for all HIV positive women, TB screening, prophylaxis, infant feeding counselling and support, collection of viral load result (32-36) weeks Gestational age, sexual and reproductive health and family planning, cervical care screening, psychosocial support, pre-exposure prophylaxis. The

package services for HIV exposed infant include; ARV prophylaxis, routine immunization and growth monitoring and support, Early Infant Diagnosis, TB screening, AZT+3TC+NVP for 0-36 months, AZT+3TC+EFV for 3-10 years, Nutritional care and support, prevention and treatment of malaria, ART for HIV infected infant F1

The participant said, proper monitoring of mother and child and after delivery till 18 months, psychosocial support, Antiretroviral prophylaxis for both mothers and child, partner counselling and testing were special package available for PMTCT care in the ward F4

Another healthcare provider has provided an update regarding the package of care for the prevention of mother-to-child transmission (PMTCT) of HIV. The update emphasizes that the primary use of HIV antibody testing should be for screening infants and children below 18 months of age. This is particularly important in cases where the mother has not undergone HIV testing or is unwilling to be tested, as it helps determine the exposure status of the child. Continual provision of counseling and support for newborn feeding. The topic of discussion pertains to the screening and management of tuberculosis. The topic of discussion pertains to the prevention and treatment of malaria. The provision of nutritional treatment and support. The provision of psychological care and support. The provision of antiretroviral therapy to all children infected with HIV. The provision of symptom management and palliative care, if deemed necessary, is an essential aspect of patient care.

F7

4.2.2.1.3 Theme: Attendance Rate of HIV-Positive Pregnant Women

Sub-Theme: High turnout for routine services. The healthcare provider provides an update on the participation of HIV-positive expectant mothers in Prevention of Mother-to-Child Transmission (PMTCT) programs. It is noted that a significant proportion of HIV-positive mothers consistently attend clinics for regular check-ups, as well as to receive prescribed medications and other related resources. The responses provided by the individual are displayed below:

One of the participants said HIV pregnant positive mother are really showing up F2

Another healthcare provider participant said that majority of them showed up except those pregnant women that are unaware of being HIV positive F5

4.2.2.1.4 Theme: Duration of PMTCT Services

Sub-Theme: Continuity of Service. The majority of healthcare providers have claimed that there is no specified period for Prevention of Mother-to-Child Transmission (PMTCT) services. They enhance the quality of their talk by offering a concise overview of the services' routing. The responses provided by the individual are presented below:

One of the participants stated that there is no specific duration for the services. She said the service is continuation F5

Another participant gave clear view that the PMTCT service start from antenatal care visit to the time of delivery and child follow-up after 18 months F1

Another healthcare professional expressed a divergent viewpoint, asserting that the provision of Prevention of Mother-to-Child Transmission (PMTCT) services commences at the moment of conception and continues until the time of delivery. Additionally, she asserted that a period of 6 months postpartum and 18 months of child follow-up is sufficient for the prevention of mother-to-child transmission (PMTCT). F2

4.2.2.1.5 Theme: PMTCT Effectiveness

Sub-Theme: Positive Outcomes. A significant proportion of the respondents expressed the viewpoint that methods aimed at preventing mother-to-child transmission (MTCT) of HIV, including those related to prevention of mother-to-child transmission (PMTCT), are very efficacious. However, another participant expressed the view that there is a need for improvement in the Prevention of Mother-to-Child Transmission (PMTCT) packages in order to enhance their effectiveness. This is because, despite the implementation of these packages, there are still instances where babies are born HIV +.

One the healthcare provider said that she believes that the programme is effective due to the positive outcome it provides, it prevents MTCT. She explained further by given reason for her response; she said that the majority of the HIV positive pregnant women that detect/ aware of their status earlier were always eager to adhere to our counselling and they also adhere to HIV drugs compliance than those that does not know their status. F1

Another participant said, I think PMTCT packages need improvement to be more effective, because despite of these services, some babies were still HIV positive

tested. Maybe the pregnant mother doesn't take our advised/ counselling seriously and some of them don't take their drugs regularly the normal way they should. All these are still major setback of the programme. F10

4.2.2.1.6 Theme: HIV Testing Procedures in Infants Limitations on Childbirth

Sub-Theme: Testing the baby for HIV. All the participants said that there are standard available kit and machine/equipment for testing HIV status in the individual, particularly baby. Below is the one of the participant's responses:

There is various method adopted to test for HIV status for baby in our ward. We use HIV diagnostic testing by using dried blood spot for DNA PCR at birth between 6-8 weeks of age and 6 weeks after breastfeeding has ended. However, HIV antibody test can be used for HIV screening for children older than 9 months where virologic test is not available F5

4.2.2.1.7 Theme: HIV Positive Pregnant Women Infant Limitations on Childbirth

Sub-Theme: HIV-Positive Pregnant Women Limited Specific Number of Children.

Majority of the healthcare worker responded that HIV mother can give birth to any number of children they wish. They said no children limited for HIV mother except those with complication during pregnant or during birth that warrant them to stop subsequent pregnant. Their responses are written below:

One of the participants said that HIV positive pregnant women are not limited to the number of children they can give birth to F1

Another healthcare giver said that HIV mothers are not limited to specific number of children except those encounter complications during pregnancy and labour that warrant them to stop given birth F5

4.2.2.1.8 Theme: Testing of the Baby for HIV

Sub-Theme: Importance of PMTCT Measures. The participants expressed their intention to conduct certain tests on the infant in order to confirm their safety, well-being, and absence of HIV transmission that may have potentially occurred from the mother.

One of the participants said, we start PMTCT measures before birth. We give counselling and also carry out some test. If the test result is negative at birth, we will keep testing 6-8 weeks after birth and also after breastfeeding has ended F4

The participant said, no, baby prophylaxis drug is compulsory immediately after birth F10

4.2.2.1.9 Theme: Type of HIV Test for Babies

Sub-Theme: DNA PCR kit and Antibody Tests. The participants provided a comprehensive enumeration of the several types of HIV tests that can be utilized to assess the infant's HIV status. Below are a few examples of their responses:

This participant said, we use DNA PCR kit (PCR: Polymerase Chain Reaction) and Dried Blood spot to check for HIV status of 6-8 weeks baby F1

Another participant stated that, we use HIV anti-body test for HIV screening for children older than 9 months F3

4.2.2.1.10 Theme: PMTCT Initiation Time

Sub-Theme: Point Baby start Receiving PMTCT. The majority of participants indicated that the provision of Prevention of Mother-to-Child Transmission (PMTCT) services commences promptly upon the registration of an HIV-positive mother for antenatal care. The following statement is the response of one of the participants:

The participant responses, we will start given PMTCT services immediately after delivery of the baby and even we have already commenced immediately measure for the HIV pregnant mother from the start of their first visit before the delivery of the baby. F5

4.2.2.1.11 Theme: PMTCT service Insight

Sub-Theme: Opinions on PMTCT. Some healthcare providers expressed the viewpoint that PMTCT services are an effective measure in preventing mother-to-child transmission (MTCT) of HIV. Conversely, other participants hold the belief that there is potential for enhancing these services to better support the overall well-being of HIV-positive mothers and their children.

One of the participants said, 'it is a good process' F1

Another participant said, 'in my opinion, is a good process, but need improvement to further improving the standard of living of the mother and their children by empowering us to do follow-up' F5

4.2.2.1.12 Theme: PMTCT Service Insights

Sub-Theme: Feeding Plans for HIV-Positive Mothers

Several participants provided differing perspectives on the existence of a unique feeding plan for HIV-positive pregnant mothers. While some participants asserted the absence of such a plan, others emphasized the importance of counseling HIV-positive pregnant mothers regarding their feeding plan during pregnancy. Below are the responses provided by the participants:

We don't advise any specific feeding plan or meal plan for the HIV positive pregnant women while receiving the PMTCT services F10

Yes, we advise them on balance diet and other nutritional package that will boost their immunity as well as for good lactation F6

4.2.2.1.13 Theme: PMTCT Service Insights

Sub-Theme: Challenges Faced. The majority of participants who are healthcare providers expressed their thoughts regarding the obstacles they face in the prevention of mother-to-child transmission (PMTCT) of HIV. The variables that have been identified as affecting the provision of Prevention of Mother-to-Child Transmission (PMTCT) services include a lack of family support, societal stigmatization, inadequate nutritional support, low levels of adherence to HIV medication due to limited awareness, and insufficient support from the government.

In my opinion low nutritional support for vulnerable HIV mothers is greater factor affecting PMTCT services F1

To me I believe that stigmatization, inadequate family support, low knowledge of HIV, low feeding practices and lack of adequate support from government increasing MTCT F10

I we say some spouses are not cooperating with their spouse F5

4.2.2.1.14 Theme: PMTCT service insights

Sub-Theme: Government's Role

According to the participants, the government plays a vital role in facilitating the effectiveness of Prevention of Mother-to-Child Transmission (PMTCT) programs. This includes providing essential resources such as test kits and medications, raising awareness about PMTCT services, and ensuring the availability of trained counseling personnel to support HIV-positive individuals, particularly pregnant women. The following are diverse remarks provided by the participants:

I will say that government are trying their best in providing necessary instruments? Equipment for PMTC services. Some of the materials government provided are test kit, drugs and comprehensive information and education. F1

I will say that government encourage awareness and also campaigned against discrimination or stigmatization of people living with HIV F4

4.2.2.1.15 Theme: Feeding Mode

Sub-Theme: Infant Feeding Recommendations. The participants emphasized the mandatory nature of exclusive breastfeeding and further emphasized that after the first six months of exclusive nursing, mothers have the autonomy to choose any feeding plan for their infants. The following responses are provided below:

I will go for breast milk any time, any day F4

I will say breastfeeding for 6 weeks, after that, you can then add baby formula F8

4.2.2.1.16 Theme: Exclusive breastfeeding

Sub-Theme: Safe Exclusive Breastfeeding. The Majority of participants explained that exclusive breastfeeding is compulsory and it safer to boost the baby immunity against diseases. Here are their responses below:

Yes, exclusive breastfeeding is safe and very good to boost the baby immunity during first week of life F1

4.2.2.1.17 Theme: Duration of Breastfeeding

Sub-Theme: Exclusive Breastfeeding Practice for 6 months. The participants explained that exclusive breastfeeding is compulsory and strengthening further that after 6 months of exclusive breastfeeding, the mother can decide on when to stop breastfeeding. But they sated that it is better to stop breastfeeding at 1 year maximum. Here are their responses below:

I will say 6 months for exclusive breastfeeding and after that the mother can decide when to stop given breast, but one year is enough for breastfeeding F3

4.2.2.1.18 Theme: Infant Feeding Plans

Sub-Theme: Mixed Feeding or Exclusive Breastfeeding. Some participants are on the opined that no mixed feeding for the first 6 months. However, another participant believe that mother can be given water along the breastfeeding. Here are their responses below:

I will say no, it is not advisable to mixed the baby breastmilk with anything during first-six months. F1

Another participant said, if the nursing mother wish to mix feeding in only exceptional case, they can go ahead, no issue about that F9

4.2.2.1.19 Theme: Delivery Mode

Sub-Theme: Caesarean Section or Vaginal Birth. About half of the participants believe only vaginal birth delivery is the best delivery method while other participants no specific best method of delivery, it depends on the patient's condition before and during labour as well as patients' choice. Their responses are stated below:

I will say vaginal birth is the best method of delivery F3

I will say caesarean section is the best method of delivery if patients can afford it, if not vaginal birth is safe too as well F10

4.2.2.1.20 Theme: Family planning counselling offered during ANC

Sub-Theme: Importance of family planning. All the participants supported that family counselling is offered during antenatal care. Below is the response of one of the participants

I will say yes, we offer family planning counselling during our antenatal care service
FG5

4.2.2.1.21 Theme: PMTCT Service Insight

Sub-Theme: Charges for PMTCT related services or supplies charges. Majority of the participants reported that they don't charge for PMTCT services in their ward. Below is the response of one of the participants

I will say no, we don't charge for the PMTCT services FG5

4.2.2.2 Service Users Response

4.2.2.2.1 Theme: Experiences of Service Users

Sub-Theme: Antenatal Registration. More than half of the participants were of opinion that they register for antenatal care after their first trimester while three quarter of the participants responded that they did not attend and/ or register for antenatal during first trimester. Also, few of the participant depend on the local herb because she believes in her mother counselling about local herb for foetus care. Below is their various opinion on the questions;

Yes of course I registered for Antenatal immediately after my first trimester F3

Honestly, I initiated my enrollment in Antenatal care four months into my pregnancy due to a delayed realization of my pregnancy. F5

I registered for my Antenatal care after second trimester because I discovered I was pregnant late because I did not have early signs and symptoms F6

I registered for Antenatal Care immediately after my first trimester, but I make use of Traditional Birth method more because my mom is a Traditional Birth Attendant
F1

4.2.2.2.2 Theme: Experiences of Service Users

Sub-Theme: PMTCT Services Received: The HIV pregnant mothers outline various PMTCT package care available they received during their ANC and explained how they have been carried out. They indicated that the package of care is provision of drugs, test kit, counselling, appropriate treatment, care and support, infants' nutritional advice and families' support. Some of the care provided by the mothers are outlined below:

The PMTCT rendered to me during my Antenatal Care visit are proper counselling, adherence to antiretroviral drugs compliance and they also check my vital signs which includes, pulse rate, blood pressure, respirate rate, weight etc F1

The PMTCT services rendered to me at every antenatal visits are maternal Antiretroviral prophylaxis, vital signs as well as health education, nutritional education and personal hygienic F6

4.2.2.2.3 Theme: ANC Timing

Sub-Theme: Visiting Schedule for your ANC. The participants give different perception on their visit to antennal care units. Below are their views:

I visit the hospital for my ANC weekly, initially it was once in a month but now I visit weekly making it 4 times in a week F2

I attend Antenatal care 2 times in a week F11

I use to attend once in a month before, but now I attend once in week, that makes it 4 times in a month F6

I only visit whenever I have pregnancy related issues and compliant F1

I attend Antenatal Care weekly before my first trimester, then after my first trimester I attend ANC once in a month F5

4.2.2.2.4 Theme: Experiences of Service Users

Sub-Theme: Previous Childbirth Experience. Majority of the participants said they have given birth before while Two quarter of the participants said that they have not given birth before, this would be their first experience. The reports of the participant are stated below:

Have experienced child birth before, I am an expectant mom with 3 kids already F4

I have not given birth before, this would be their first experience F6

4.2.2.2.5 Theme: Experiences of Service Users

Sub-Theme: Mode of Delivery. Some participants have vaginal mode of delivery while other participants experience caesarean mode and some have not experienced any mode of delivery yet because they just experience pregnancy. The reports of the participant are stated below:

I gave birth through vaginal delivery mode F1

I gave birth through caesarean mode F6

I have not experienced any mode of delivery yet F3

4.2.2.2.6 Theme: Experiences of Service Users

Sub-Theme: HIV Testing of Baby Post-Delivery: Majority outlined their responses below, they stated that their baby was tested for HIV status after delivery while some of them explained their experience below:

My baby was tested for HIV immediately after delivery, when I heard the news that my baby was negative, I cried tears of joy because there is this perception that HIV positive women always give birth to HIV positive babies F5

Yes of course my baby was tested for HIV immediately after delivery, and the test result was negative, I was really happy about it, the PMTCT services is really effective honestly, to God be the glory F7

My baby was tested for HIV immediately after delivery, and the test result came out positive, i was really devastated. I had almost gone mad, if not for God's grace I just thank God. A healthcare provider counselled me and told me that wasn't the end of the world that my child be fine if I adhere with PMTCT services regularly and properly. F6

4.2.2.2.7 Theme: Experiences of Service Users

Sub-Theme: Antiretroviral Drugs given to baby immediately after Birth. Some of the participants stated that their baby was given antiretroviral drugs immediately after birth while other said that the antiretroviral prophylaxis was given after one month.

Antiretroviral prophylaxis was given to my baby immediately after child birth and my baby was given nevirapine syrup and Zidovudine because of my high viral load result F1

Antiretroviral prophylaxis was given to my baby after one month of delivery F3

4.2.2.2.8 Theme: Experiences of Service Users

Sub-Themes: PMTCT Services for Babies. Majority of the participants outlined various PMTCT services provided to them by the health care provider which includes provisions of test kit, drugs, routine immunization, nutritional care, malarial net and other palliative care. Their reports are written down below:

The PMTCT services render for my child at our ward were antiretroviral drugs, routine immunization and support. They gave my baby cotrimoxazole prophylaxis at 6 weeks, they carried out HIV testing using dried spot for DNA at 7 weeks of age and 6 weeks after breastfeeding has ended. They screening my baby for tuberculosis, they also provide mosquitoes net and ensured treatment of malaria, nutritional care and support and other palliative care F6

I will say, routine immunization, HIV testing, Early Infant Diagnosis test, nevirapine and further follow up are the PMTCT services rendered to my baby after delivery F1

4.2.2.2.9 Theme: Experiences of Service Users

Sub-Theme: HIV Antibody Tests. Majority of the participants ensure/ adhere to the healthcare provider schedule visit to ensure their baby is free from the HIV virus. Their responses are stated below:

I make sure I attend the hospital to do child follow up for my baby based on the healthcare provider schedule, I always come for routine care, immunizations, prophylaxis, infant feeding counselling and support and isoniazid preventive therapy
F2

Yes, I ensure I check my baby HIV status during 6 months and the healthcare provider do HIV testing within 8 weeks and 1 year later for the same test to ensure my baby is negative F6

I do follow up for my baby based on the healthcare provider schedule, during 6 months they do HIV test and 1 year later they do the same test to ensure my baby is negative. F5

4.2.2.2.10 Theme: Experiences of Service Users

Sub-Theme: Exclusive Breastfeeding Practice for 6 months. Some participants responded that they breastfed for 6 months while other participants are of the opinion that they added formula to their baby food due to prevention of HIV infection. Below are their various responses to the questions:

I don't practice exclusive breastfeeding, I give my baby water and food sometimes because of hiccups and I also add formula because I don't want my baby to be infected. F6

I practice exclusive breastfeeding for 6 months it is part of the instruction given to me during counselling session F5

4.2.2.2.11 Theme: Experiences of Service Users

Sub-Theme: Advised or Counselling to stop Breastfeeding child at age one. Majority of the pregnant HIV mother reported that they have been counselled by healthcare provider to stop breastfeeding when their baby at age one. Their comments are reported below:

Yes, I have been advised to stop breastfeeding when my baby gets to age one F1

I have been counselled by the health care provider to stop breastfeeding when my baby clocks one F6

4.3 Discussion of Findings (Quantitative Survey and Qualitative Survey)

This study aimed to evaluate the efficacy of PMTCT intervention among pregnant women attending antenatal care at Adeoyo Maternity Centre, Ibadan. The demographic characteristics of the participants in this study indicated that the average age was 31.04 ± 2.97 years, with a majority (86.3%) falling within the age range of 20-34 years. This finding aligns with the results reported by Sama et al. (2017), where the majority of participants (59%) belonged to the age group of 20-34 years, with an average age of 38.8 years¹. Similarly, a study conducted in Zambia by Stringer et al. (2013) observed that the ages of the participants also fell within the range of 20-34 years². Similarly, in a study conducted by Ndege et al. (2016), participants in Western Kenya were questioned, and the researchers found that the average age was 31.04 ± 2.97 years, with the majority of respondents belonging to the 26-34 age range³.

The study revealed that a significant proportion of the participants resided in monogamous households, with a majority of 86.0% being married. Additionally, the data indicated that the Muslim population outnumbered the Christian population, accounting for 61.7% of the participants. The majority (71.3%) of individuals belonged to the Yoruba-speaking tribes of Nigeria. The majority of individuals (14.7%) possessed a minimum level of education equivalent to secondary school, while a significant proportion (82.7%) had completed their study at the higher level. The study found that a significant proportion (62%) of the infants underwent testing within the first 6 weeks following birth. The remaining infants were divided into two groups: those tested between 6 weeks and 6 months (28%), and those tested between 6 months and 8 months (10%). This discrepancy in testing timelines can be attributed to the lack of awareness or negligence on the part of some mothers, who failed to promptly bring their infants to the clinic for testing after birth. This study aligns with a previous study conducted in the South-South region of Nigeria, which focused on the testing and screening of HIV-exposed infants based on their age⁴.

In order to ensure the successful prevention of vertical transmission of HIV from mother to baby, it is imperative that a pregnant woman adheres to the guidelines outlined in the Prevention of Mother-to-Child Transmission (PMTCT) programme. This entails initially accepting HIV counselling and testing, followed by the administration of antiretroviral (ARV) prophylaxis if the woman tests positive for HIV, and the adoption of safe infant feeding practices. Studies undertaken in Zambia and Ivory Coast have demonstrated that the implementation of the Prevention of Mother-to-Child Transmission (PMTCT) guideline is feasible in settings with limited resources. These studies revealed that over 80% of attendees at antenatal care (ANC) accepted the HIV test, and a significant proportion of HIV-positive women initiated antiretroviral (ARV) prophylaxis for PMTCT^{2,5}. The present study reveals that a significant proportion of pregnant women, specifically 67%, actively participated in

HIV education, counselling, and screening interventions within the Prevention of Mother-to-Child Transmission (PMTCT) cascade. The primary objective of these interventions is to mitigate the risk of HIV transmission from mother to child. The findings from the focus group discussions (FGDs) give evidence in favour of this concept, since both healthcare providers and patients (referred to as service users) expressed their approval of the Prevention of Mother-to-Child Transmission (PMTCT) program among HIV-positive pregnant individuals. It has been said that the effectiveness of the project stems from its ability to yield positive outcomes. This is achieved by the implementation of early status diagnosis, counselling, and adherence to HIV treatment compliance for both the mother and the infant, hence preventing mother-to-child transmission (MTCT). Nevertheless, this study presents findings that contradict the results of a study conducted in Nigeria. The Nigerian study reported that almost one third (58%) of the mother-baby couples did not receive any type of chemoprophylaxis for the prevention of mother-to-child transmission of HIV (PMTCT) (citation). The study provided more clarification regarding the association between patient attrition and a comparatively lower rate of attendance for antenatal care (ANC). This combination is believed to be a contributing factor to the inadequate utilization of antiretroviral (ARV) prophylaxis for the prevention of mother-to-child transmission (PMTCT), as found in their research.

In this study, majority of the respondents were aware of the intervention cascade of PMTCT. 100% of the HIV pregnant mother were aware of their status and known that a mother can infect unborn children via pregnancy (98%) and labour (30%). This current study is not in parallel with a study carried out in Arba Minch, Ethiopia, which found that HIV pregnant mother have a low understanding and awareness of HIV transmission and prevention⁶. The basis for their claim can be attributed to the difference in the study's location, with the previous study being done in a rural area and the present study being conducted in an urban

environment where individuals have access to several sources of information. The patients indicated that their primary source of knowledge regarding the PMTCT program intervention was their visits to the hospital or prenatal clinic⁷.

The findings of this study indicate that a significant proportion of patients (85%) had the belief that breastfeeding does not pose a risk of transmitting HIV to infants. However, the majority of participants in the study reported engaging in mixed feeding (46.5%), followed by exclusive breastfeeding (41%), with a smaller proportion opting for baby formula (25%). According to the 2010 guidelines issued by the World Health Organization (WHO) about HIV and new born feeding, it is advised that HIV-infected women should exclusively breastfeed their infants for the initial six months of life, as long as either the mother or the baby is getting antiretroviral therapy (ARVs) for therapeutic purposes or as a preventive measure. Following the completion of a six-month period, it is recommended to initiate complementary feeding alongside the continuation of breastfeeding until the new born reaches 12 months of age, unless other feeding methods are deemed acceptable, viable, economical, sustainable, and safe for both the mother and her child prior to that point⁸. The Prevention of Mother-to-Child Transmission (PMTCT) guidelines in Nigeria align with the World Health Organization (WHO) guidelines on infant feeding. However, pregnant women who receive a positive test result face a challenging decision regarding the feeding method for their infants. This decision is further complicated by limited access to adequate feeding counselling support and the influence of family members who adhere to culturally and socially accepted feeding practices. The outcome of this phenomenon ultimately leads to inadequate infant feeding practices, as seen by the elevated prevalence of mixed feeding observed among the HIV positive women participating in this research investigation. The provision of precise and reliable information, unambiguous instructions on infant feeding practices, and continuous assistance from healthcare professionals and family members are

crucial factors in facilitating the achievement of desired outcomes for HIV positive moms. The findings of the focus group discussion (FGD) corroborate the aforementioned assumption that a significant proportion of HIV-positive mothers do not adhere to exclusive nursing practices. These mothers expressed their inclination towards providing their infants with water and food on occasion, primarily due to concerns related to hiccups and the desire to minimize the danger of transmitting the infection to their babies.

The implementation of early infant diagnosis (EID) facilitates timely clinical assessment and connection to antiretroviral therapy (ART) care for newborns who have been exposed to HIV. The study revealed a concerning result, indicating that only 5.7% of the 59 infants who tested positive had documented proof of enrollment for pediatric antiretroviral therapy (ART) at the designated study facility. The lack of traceability and projected loss to follow-up of the majority of infants who are HIV positive contradicts the perspective of HIV-positive mothers regarding the routine screening and antiretroviral (ARV) treatment of their offspring, with approximately 80% expressing concern. Based on the observed illness progression and mortality rates among untreated newborns with HIV, it is plausible to infer that a significant proportion of the children who were lost to follow-up had succumbed to the disease. Nevertheless, this study did not provide the means to determine the exact number of infants who had perished among those who were no longer being monitored. Previous research conducted in western Malawi has also documented elevated rates of loss to follow-up among both HIV-exposed infants and their mothers^{9,10,11}.

Enhancing client monitoring and establishing a robust connection between the Prevention of Mother-to-Child Transmission (PMTCT), Early Infant Diagnosis (EID), and pediatric Antiretroviral Therapy (ART) initiatives, alongside comprehensive and efficient counselling for mothers of HIV-exposed infants prior to and following the DNA Polymerase Chain Reaction (PCR) test, will augment the probability of enrolling and maintaining HIV-exposed

infants in ART interventions. An effective approach to enhance the follow-up care for these infants involves integrating the follow-up of HIV-exposed infants with standard childhood vaccination services. The current concept is undergoing a pilot phase in Rwanda, and initial findings indicate a high level of promise¹². The exploration of an approach to enhance the accessibility of Prevention of Mother-to-Child Transmission (PMTCT) services in Primary Healthcare Centres (PHCs) involves permitting CD4 count testing through a 'hub and spoke' laboratory referral system, as well as providing short course antiretroviral drugs (ARVs) for PMTCT at PHCs. The efficacy of this approach has been evidenced in Zambia, despite encountering difficulties in conducting CD4 count evaluations at primary healthcare centers¹³. The technique being advocated also possesses the potential to mitigate patient attrition, as Primary Healthcare Centres (PHCs) typically offer greater accessibility to patients.

In the conducted study, a significant proportion of the infants who were subjected to HIV screening, specifically over 86%, were found to have been breastfed. This data aligns with a previous study conducted in Zambia, wherein it was observed that approximately 84% of newborns exposed to HIV, whose records were examined, had a history of breastfeeding¹⁴. Furthermore, our research revealed that irrespective of the pharmaceutical intervention administered to the mother-baby pairs, there was a notable rise in the age-specific transmission rates among the subgroup of infants who were exclusively breastfed and those who received a combination of breast milk and other forms of feeding. Conversely, the HIV transmission rates specific to different age groups of infants who were fed with formula exhibited marginal fluctuations during the observed period. The extended duration of nursing is expected to have influenced the rates of HIV transmission among infants who underwent the DNA PCR test at a later time, in comparison to those who underwent the test at six weeks. Furthermore, the study findings indicate that infants who were exposed to HIV and received mixed feeding had significantly higher age-specific transmission rates compared to those who

were exclusively breastfed. This implies that exclusive breastfeeding may be a safer choice for feeding HIV-exposed newborns, as opposed to mixed feeding. This finding aligns with the evidence observed in Zimbabwe, where it was shown that early mixed feeding, in comparison to early breastfeeding, was linked to a four-fold increase in the probability of HIV transmission at six months of age for infants exposed to HIV who had previously tested negative at six weeks of age¹⁵.

The study findings indicate that both healthcare providers and HIV-positive pregnant women expressed agreement that the Prevention of Mother-to-Child Transmission (PMTCT) program has significantly benefited a majority of HIV-positive mothers and their children since its initiation. However, the study also highlights the need for further improvement in certain aspects of the program, which is hindered by limited resources.

The findings from the multivariate regression analysis indicate that women aged 30-40 and older generally had a higher level of knowledge and expertise about the Prevention of Mother-to-Child Transmission (PMTCT) program compared to women in the 20-29 age range. Furthermore, a significant proportion of women within the age range of 30 and above possessed advanced educational qualifications. This feature may contribute to their heightened level of knowledge and active participation in antenatal care and counselling, in comparison to women aged 20 years and below. The infants aged less than six weeks received suitable follow-up treatment from their mothers, and a significant correlation was observed between the timing of initial treatment and the mothers' age and level of education. Moms aged 30 and above, who possess higher educational degrees, had a greater degree of adherence to the treatment of antiretroviral (ARV) therapy for infants aged zero to six weeks, in comparison to moms aged 20 and below. Nevertheless, there was a notable disparity in the adherence to exclusive breastfeeding for a duration of 6 weeks between expectant mothers aged 30 and above and those aged 20, with the former group exhibiting lower levels of

compliance. The primary motivation behind this decision was to prevent the transmission of HIV to infants. However, this precautionary measure may increase the susceptibility of newborns to early infections and hinder their ability to acquire maternal immunity at an early stage.

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Chapter Five

Conclusion

5.1 Summary of Findings

This study employed a cross-sectional design and employed a mixed-method approach to examine the acceptability and efficacy of interventions for the prevention of mother-to-child transmission (PMTCT) among pregnant women receiving antenatal care at Adeoyo Maternity Centre in Ibadan, Nigeria. The level of awareness and acceptability of the Prevention of Mother-to-Child Transmission (PMTCT) program among HIV-positive women in Adeoyo was shown to be higher compared to similar settings in another region. Additionally, it was observed that pregnant women within the age range of 30-40 exhibited a higher level of awareness of PMTCT intervention in comparison to those below the age of 20. This phenomenon can be attributed to disparities in educational attainment and experience between older adult HIV positive pregnant women and their younger counterparts. A significant proportion of the participants engaged in mixed feeding, mostly motivated by concerns regarding the potential transmission of HIV to their infants. A link was observed between the qualitative and quantitative findings, indicating a shared acceptance of various interventions for the prevention of mother-to-child transmission (PMTCT) among pregnant women in Adeoyo. These interventions include screening, counselling, education, administration of antiretroviral (ARV) medications, as well as immunization of both the exposed infants and their mothers. Nevertheless, a significant proportion of mothers have the belief that breastfeeding does not pose a risk of HIV transmission to their infants, necessitating ongoing surveillance.

5.2 Conclusion

The results of this study indicate that it is feasible to decrease the transmission of HIV from mother to child by the implementation of effective interventions for the prevention of mother-to-child transmission (PMTCT). The implementation of enhanced screening measures and the promotion of antiretroviral (ARV) prophylaxis, along with the enforcement of suitable newborn feeding practices, play a crucial role in mitigating the vertical transmission of HIV. In addition, it is crucial to develop strategies that effectively tackle the programmatic problems associated with extended turnaround time, the availability of skilled healthcare personnel, and the dissemination of accurate awareness. There is a need to promote the utilization of Prevention of Mother-to-Child Transmission (PMTCT) programs that incorporate early baby diagnosis, as they have demonstrated efficacy in reducing HIV transmission rates. Additionally, it is crucial to implement appropriate interventions to ensure the success and impact of mother-to-child transmission (MTCT) programs.

5.3 Recommendations

Based on the findings of this study, we propose the following recommendations, as suggested by the stakeholders involved, in order to enhance the provision of Prevention of Mother-to-Child Transmission (PMTCT) services and improve the quality of life for mothers living with HIV and their exposed infants.

5.3.1 Recommendations to Pregnant Women

- 1.) Adoption of healthy eating habits during pregnancy to maintain a healthy weight that would aid wellbeing
- 2.) Having a regular exercise schedule that would help in weight maintenance and boost stamina

- 3.) Adoption of positive attitudes towards counselling and education during pregnancy
- 4.) Avoidance of public stigmatization and acceptance of one body structure and image which would aid comfortability with partner/spouse before, during and after pregnancy
- 5.) Being open-minded and actively participate in health talks giving during ANC clinic session
- 6.) Exploring ways to foster greater partner bonding through using condom, display of daily affection and intimate communication to avoid spreading of the disease.

5.3.2 Recommendations to the Community

- 1.) Curbing the dissemination of myths and misconceptions
- 2.) Cancellation/rejection of harmful cultural practices such as FMG and domestic abuse
- 3.) Creation of health-promoting practices that would offer protection and adequate care to pregnant women throughout the antepartum period
- 4.) Supporting a change from the culture of coping in silence adopted by many women to a culture of safe dialogue and protection for women, especially during pregnancy.

5.3.3 Recommendations to Health Professionals

- 1.) Modification of prenatal (ANC) consultation and health talks to capture PMTCT during pregnancy.
- 2.) Health education interventions on a mass scale such as mass media adverts and programmes to create more awareness and understanding on HIV during pregnancy and its importance to help dispel fears and misconceptions of harming the unborn child(ren) on a larger scale.

- 3.) Promotion and provision of counselling sessions for couples to engender positive behaviour disposition towards embracing and increasing wellness to seek professional help/discuss HIV and its potential troubles during pregnancy and how it can be transmitted to baby when necessary.
- 4.) Inclusion of PMTCT programme in the health education changes of the HIV positive pregnant women e.g., through dissemination of messages via online platforms such as WhatsApp.
- 5.) Adoption and display of friendliness and trustworthiness traits in order to enhance interpersonal relationships between themselves and their clients.

5.3.4 Recommendations to Policy Makers

- 1.) Conduct of trainings to teach healthcare providers on interviewing and relational skills to be able to handle this issue with finesse in a professional manner, and also engender attitude dispositions that would aid openness and comfortability in handling/discussing the issue with clients
- 2.) Heightened research efforts in investigating HIV positive before, during and after pregnancy and exposed babies.
- 3.) Revision of National guidelines policy to broaden the scope of PMTCT programme, especially in regards to pregnancy.
- 4.) Inclusion of topics on HIV positive before, during and after pregnancy in health/sex education received at the secondary and tertiary education levels to correct misconceptions and myths from an early stage.
- 5.) Governmental support and investments in the creation and operation of HIV clinics

5.4 Contribution to Knowledge

The physical and psychological changes, relationships and sociocultural environment dwelt in during HIV positive infection of pregnant women cause and aggravate abnormal behaviour, depression, unserious and poor drug compliances; hence healthcare providers should consider these factors in the provision of healthcare services that would more appropriately offer coping skills for the improvement of PMTCT programme. Strategies to enhance the PMTCT programme should take into cognisance the important roles healthcare providers and spouse/partner play in assuring the psychological and mental health of HIV positive women, which is closely linked to the overall quality of their relationship and general life. The provision of research grants in this field would aid the conduct of larger/national studies for more data that would inform evidence-based practices in health promotion.

5.5 Suggested Areas to Further Research

This study focused on Assessing the Effectiveness of Interventions of PMTCT in Adeoyo Maternity Center, Yemetu, Ibadan, Oyo state; it is suggested that further studies in the field can be done:

1. Male partner involvement in HIV testing and counselling among partners of pregnant women.
2. Male involvement in prevention of mother-to-child transmission of HIV and associated factors.
3. Knowledge, Attitude and practice towards PMTCT among male partner of pregnant women.

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Thesis/Dissertation

Garrison A, *“Parasitic infections during pregnancy and their consequences on child development in Benin,”* Doctoral dissertation, Sorbonne Université 2021.

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Appendix I

Informed Consent Form

Informed consent for Assessing the Effectiveness of Interventions to Prevent Mother-to-Child Transmission of HIV in Adeoyo Maternity Center, Yemetu, Ibadan, Oyo state Nigeria.

This informed consent form is for HIV-positive pregnant women and HIV-positive breastfeeding mothers participating in the research titled “Assessing the Effectiveness of Interventions to Prevent Mother-to-Child Transmission of HIV in Adeoyo Maternity Center, Yemetu, Ibadan, Oyo state Nigeria”

Names, Affiliations and Positions of the researchers conducting the study:

a. Name: **Miss, Eniola Oyeku**

Affiliation: Lead City University, Ibadan, Nigeria.

Position: Principal Investigator

b. Name: **Dr. Folahanmi Tomiwa Akinsolu**

Affiliation: Lead City University, Ibadan, Nigeria.

Position: Supervisor

You will be given a copy of the full Informed Consent Form

Part 1: Information Sheet

My name is Miss Eniola Oyeku and presently, I am a post graduate student of the department

Of Public Health, Lead City University, Ibadan. I am conducting a study which hopes to Assess the Effectiveness of Interventions to Prevent Mother-to-Child Transmission of HIV in Adeoyo Maternity Center, Yemetu, Ibadan, Oyo state Nigeria.

The research requires a short questionnaire to fill to assess your experience and views on the PMTCT. Whenever a study is to be carried out, we ask for the permission of the participants after explaining the procedure to them.

You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research. If there happens to be any word you need clarification on, you can ask me or any research assistant around and we will definitely take our time to explain to the best of your understanding.

Purpose of the Research

This study proposes to evaluate the knowledge, attitude, and acceptance, effectiveness of the use of PMTCT services among HIV-positive pregnant women, HIV- positive mothers and infant pairs. This research work will widen their horizon on the use of PMTCT services and eliminate their fear of transmitting HIV to their unborn baby or infant. The study will provide important information and examine the factors that influence the effectiveness of interventions to prevent mother-to-child transmission of HIV, It would also identify barriers and facilitators to the implementation of interventions to prevent mother to child transmission of HIV from the perspectives of healthcare providers and HIV-positive pregnant women. In addition it would also improve the delivery of healthcare services related to interventions to prevent mother to child transmission of HIV, including communication, counselling and follow-up. Lastly, the study would identify patient-centered approaches to interventions to prevent mother to child transmission of HIV that are acceptable to HIV-positive pregnant women.

Participant Selection

We are inviting all HIV-positive pregnant women and HIV-positive mothers receiving PMTCT services at Adeoyo Maternity Teaching Hospital, Yemetu, Ibadan, Oyo state, Nigeria.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice to choose whether to participate or not. Whether you choose to participate or not, all the services you receive at this clinic will continue and nothing will change. You may change your mind later and stop participating even if you agreed earlier.

Duration

The research takes place over a period of 1 month.

Risks

There is no known risk involved in participating in this research

Benefits

There may not be any immediate and direct benefit for you but your participation is will help us find the answer to the research questions.

Confidentiality

We will not be sharing the identity of participants of this research. Any information that we collect from this research project will be kept confidential. Participant's information will be coded with numbers which only the researchers will have access to and it won't be shared except with necessary stakeholders.

Sharing the Results

Only what is permitted by law and research ethics will be shared, participants of the research will be notified through meetings in their ART centers after which results will be published in academic journals for academics.

Contact Information

Who can I contact about this study? If I have questions or concerns about this research study, whom can I call?

You can call us with your questions or concerns. Our telephone numbers are listed below. Ask questions as often as you want

Miss Eniola Oyeku Deborah,

Department of Public Health,

Lead City University, Ibadan

+2348140781766

Oyekueniola6@gmail.com

If you want to speak with someone involved in this research study, please contact:

Dr. Folahanmi Tomiwa Akinsolu

Department of Public Health,

Lead City University, Ibadan

+2347033171050

Folahanmi.tomiwa@gmail.com

You can talk to them about:

1. Your rights as a research subject
2. Your concerns about the research
3. A complaint about the research and also, if you feel pressured to take part in this research study, or to continue with it, they want to know and can help.

When you call or write about a concern, please provide as much information as possible, including the name of the researcher, the Ethics Committee number (at the top of this form), and details about the problem. This will help Ethics Committee officials to look into your concern. When reporting a concern, you do not have to give your name unless you want to.

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Informed Consent Form for Study Participants on Assessing the Effectiveness of Interventions to Prevent Mother-to-Child Transmission of HIV in Adeoyo Maternity Center, Yemetu, Ibadan, Oyo State, Nigeria.”

Certificate of Consent

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of Participant _____

Signature of Participant _____

Date _____

Day/month/year

If illiterate

A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb-print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness _____

AND

Thumb print of participant

Signature of witness _____

Date _____

Day/month/year

Statement by the Researcher/person taking Consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that participants will be asked to fill a short questionnaire to assess their experience and views on PMTCT services.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant.

Print Name of Researcher/Person taking the consent _____

Signature of Researcher/Person taking the consent _____

Date _____

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Lead City University (LCU)

Faculty of Public Health

Department of Public Health

Motto: Redefining Health

Lagos-Ibadan Express way, Toll Gate Area.

P.O. Box 30678, Secretariat, Ibadan Oyo State Nigeria. Tel: 02-7510682



Appendix II

Lead City University

Ibadan, Oyo State.

Study Questionnaire

Assessing the Effectiveness of the Interventions to Prevent Mother to Child Transmission of HIV in Adeoyo Maternity Centre, Yemetu, Ibadan, Oyo State

Dear Respondents,

I am an MPH student from the Department of Public Health, Lead City University, Ibadan. I am conducting a study to “**Assessing the effectiveness of interventions to Prevent Mother to Child Transmission HIV in Adeoyo Maternity Center, Yemetu, Ibadan Oyo state**”. All information provided within the questionnaire will be treated with the utmost confidentiality. Please kindly answer the questions appropriately. Thank you for your cooperation.

Socio Demographic Data.

Please fill in the gap and tick (✓) as appropriate response in the space provided below, each of the following provided will be kept strictly confidential.

SECTION A: Socio-Demographic Data

Please kindly tick [] in appropriate space provided.

1. Age [in years]: -----
2. Religion: [i] Christianity [] [ii] Islam [] [iii] Traditional []
3. Ethnicity: [i] Yoruba [] [ii] Igbo [] [iii] Hausa [] [iv] Others []
4. Marriage setting: [i] Monogamy [] [ii] Polygamy []
5. Educational Status: [i] Primary [] [ii] Secondary [] [iii] Tertiary []
6. Occupation []
7. Educational Status: [i] Primary [] [ii] Secondary [] [iii] Tertiary []
8. Number of Children:[]
9. Employment status: []

SECTION B: Awareness/Knowledge of Interventions to Prevent Mother- to Child Transmission of HIV in Adeoyo Maternity Centre Yemetu, Ibadan Oyo state.

10. Are you aware of your status? [i] Yes [] [ii] No []
11. Are you aware/ do you know a mother with HIV can infect her unborn with HIV?
[i] Yes [] [ii] No []
12. Are you aware that /do you know that mother to child transmission can take place during any of the following:
 - i. Pregnancy [i] Yes [] [ii] No []
 - ii. Labour/delivery [i] Yes [] [ii] No []
 - iii. Breastfeeding [i] Yes [] [ii] No []
 - iv. I don't know []

13. Are you aware/do you know there are ways to prevent the unborn child from being infected with HIV? [i] Yes [] [ii] No []
14. If YES, source of information? [i] Hospital [] [ii] Friends [] [iii] Family members []
[iv] Media []
15. Are you aware of the/ do you know the initiation time for antiretroviral prophylaxis for HIV positive women in pregnancy? [i] During early pregnancy [ii] At 14 weeks of pregnancy [iii] After delivery [iv] Don't know
16. Which of the infant feeding options is best before 6months for prevention of mother child transmission? [i] Exclusive breastfeeding only [] [ii] Mixed feeding [iii] Infant formula
17. Are you aware/do you know that mother to child transmission of HIV is preventable?
[i] Yes [] [ii] No []

SECTION C: Acceptance of the Interventions to Prevent Mother to Child Transmission of HIV

18. Have you had HIV test done in this pregnancy? [i] Yes [] [ii] No []
19. Is your partner aware of your status? i] Yes [] [ii] No []
20. Do you encourage your spouse to get tested for HIV test? [i] Yes [] [ii] No []
21. Do you engage in the interventions to prevent mother to child transmission of HIV? i] Yes [] [ii] No [] **IF I MAY ASK, are these the interventions 22-32?**
22. Are you on any prescribed drugs for HIV? [i] Yes [] [ii] No []
23. Do you attend regular antenatal care consultations? [i] Yes [] [ii] No []

24. Do you participate in the educational sessions on the interventions to prevent mother to child transmission of HIV? [i] Yes [] [ii] No []
25. Do you engage in HIV screening and counselling [i] Yes [] [ii] No []
26. Do you have your CD4 count measured? [i] Yes [] [ii] No []
27. Will you accept to deliver baby in a health facility? [i] Yes [] [ii] No []
28. Will you accept cesarean section as a mode of delivery? [i] Yes [] [ii] No []
29. Will you accept replacement feeding for your child in the first six month of birth?
[i] Yes [] [ii] No []
30. Will you practice mixed feeding in the first 6 months of birth? [i] Yes [] [ii] No []
31. Will you accept to administer prescribed HIV medication to newborn?
[i] Yes [] [ii] No []
32. Will you accept to take baby for follow up visit in the hospital? [i] Yes [] [ii] No []

SECTION D: Effectiveness of the Interventions to Prevent Mother to Child

Transmission of HIV

33. How long have you infected with HIV? []
34. Do you have any life birth/ Have you given birth since you have been infected with HIV? i) Yes [] [ii] No []
35. If yes, how many?
36. Where do you deliver the baby?
37. What was your method of delivery? **1 Cesarean Section delivery 2. Virginal/normal delivery**
38. Do you actively engaged in the PMTCT interventions? [i] Yes [] [ii] No []

39. Do you actively engaged in any of the following interventions? HIV counselling and testing, Anti-retroviral therapy, ART monitoring and follow-up, Use of Antiretroviral drugs. [i]Yes [] [ii]No []
40. Do you find the intervention useful /helpful? i] Yes [] [ii] No []
41. What was the baby's HIV status?
42. What was your experience like?
43. What is / are your perceived benefits of taking / engaging in the intervention?
44. What is/are some of the barriers / challenges encountered in the interventions to prevent mother to child transmission?
45. What will you suggest to be put in place/ improve in the interventions to prevent mother to child transmission?
46. If No to question 34, ??????? 34
47. The questions below should be addressed by the health care worker/ providers in this unit
48. Do you practice exclusive breast feeding for 6 months?

Appendix III: Interview Guide
Lead City University, Ibadan
Department of Public Health
Interview Topic Guide

Introduction to Research

Hello. My name is ----- and I am doing a study looking at how PMTCT services protect HIV-positive pregnant women, mother-infant pair for my MPH thesis at Lead city University. The information from this study will be used to help HIV-positive women have healthy pregnancies. I have a lot of questions, but I'm especially interested in what you think, so anything you say will help. This interview is casual, like a conversation, and everything you say to me will stay between us. There is no right or wrong answer; we just want to hear about your own experiences. As we discussed, our interview will be audio recorded. This way, we can speak freely and I will not forget the things you tell me. No one other than myself and my supervisor will be able to listen to the recording, and it will be deleted when we have finished the study.

FOCUS GROUP DISCUSSION (FDG) GUIDE

This FGD is aimed at obtaining subjective views on the experience of ...Please rest assured that your response will be kept confidential and your identities will remain anonymous. To this end, with your permission, only a voice recording and manual documentation of discussion during this interactive session will be taken. The interview will last approximately 25-30 minutes.

Thank you in advance for your assistance.

Agenda

1. Arrival and welcoming of discussant (10 am)
2. Introduction of project topic
3. Discussion starts
4. Appreciation

5. Distribution of incentive
6. Departure

Guide

Qualitative Research In-Depth Interview Guide

A. Health Care Providers

1. I would like to know the actual measures you carry out in your place to actually prevent the MCTCT of HIV?
2. What are the PMTCT procedures or how is it carried out?
3. Are the HIV pregnant positive women really showing up?
4. What are the durations of the PMTCT services during pregnancy?
5. How effective is the PMTCT on the HIV positive pregnant women?
6. What type of procedure is carried out to test for HIV?
7. Are HIV positive pregnant women limited to specific number of children they can give birth to?
8. Do you test for HIV in the baby after delivery before giving PMTCT?
9. What type of HIV test is used to check for the HIV status in the baby?
10. After delivery, at what point would the baby start receiving PMTCT, is it immediately after delivery or some months later?
11. What do you feel about PMTCT, is it a good process or there is a limitation?
12. Is there a specific feeding plan or meal for the HIV positive pregnant women while receiving the PMTCT services?
13. What are the challenges of PMTCT?
14. What are the roles of government in providing the PMTCT services?
15. What is the best infant feeding option?
16. Is exclusive breastfeeding safe for the baby?
17. How long or what is the duration of time a mother can breast feed their infant?
18. Can they practice mixed feeding for the first 6 months of birth?
19. What the best mode of delivery for HIV positive pregnant women receiving PMTCT?
20. Is family planning counselling offered during ANC?
21. Do you charge for your PMTCT related services or supplies?

B. Service Users

1. Did you register for Antenatal after first trimester?
2. What is the PMTCT services rendered to you during your ANC visit?
3. What is your visiting schedule for your ANC?
4. Have you had experience in giving birth before?
5. What is your mode of delivery (caesarean or vaginal birth)?
6. After delivery, do they test your baby for HIV?
7. Is Antiretroviral drugs given to your baby immediately after birth?
8. After delivery, what are the PMTCT rendered to your baby?
9. Do you do follow-up for your baby after 6month and a year to ensure they are negative?
10. Do you practice exclusive breastfeeding for 6 months?
11. Have you been advised or counselled to stop breastfeeding when your child is age one?

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Bio-data

A. Personal Data

Full Name: Eniola Deborah OYEKU

Address: No 33B, Ifesowapo Street, Ilorin, Kwara State

E-mail Address: oyekueniola6@gmail.com

Phone No: 08140781766

Date of Birth: 2nd of Nov, 1999

Place of Birth: Kwara State

Nationality: Nigeria

Marital Status: Single

Name of Next of Kin: Oyeku Bonuola

Address of Next of kin: No 33B, Ifesowapo Street, Ilorin, Kwara state

B. Educational Background

Educational Institutions Attended with Dates and Qualification:

St. Joseph Nursery and Primary School	2003 – 2008
Smith International Baptist Academy, Ogbomoso	2009 – 2014
Adeleke University, Ede, Osun State	2016 – 2020
Lead City University, Ibadan, Oyo State	2021 till date

Qualifications Obtained with Date

First School Leaving Certificate (FSLC)	2008
---	------

West African Examination Certificate (WAEC)	2014
Bachelor of Science (BSc) in Public Health	2020
Masters of Public Health (MPH) in Public Health	In-view

C. Work Experience

Nigerian Armed Forces Resettlement Centre, Lagos State 2021 till date

- Occupation safety officer, immunization, pest management and fumigation
- House-to-house inspection, water treatment, plant inspection, health education and promotion.
- Providing information and training to employers, employees and general public.
- Investigate work place accident and illnesses, collect samples of material for analysis, and inspect spills of hazardous.
- Ensure health and safety regulation and safety plans, inspect products and processing methods, prepare reports and ensure regulations are followed.

Lagos State Primary Health Care Board, Yaba (January 2020-August 2020)

Role: Public Health Practitioner Part-Time

- Meat and Abattoir inspection
- Fumigation and pest control
- Food and food premises inspection
- Environmental beautification with flowers and other ornaments
- Water sanitation

Federal Airport Authority, Lagos (January 2019- July 2019)

Role: Assurance Quality Intern (Port Health)

- Identified disease surveillance activities and measures
- Boarding and inspection of ships, aircrafts and land vehicles

- Provision of curative and preventive health care services including referral and laboratory services
- Disinfection, disinsection, decontamination of food and food products, equipment, vessels, premises, luggage, parcels and second hand goods.
- Control of food processing and screening of food handlers
- Environmental Health activities such as sanitation, pollution control and waste disposal

Nigerian Red Cross Lagos (August 2018 – December 2021)

Role: Intern

- Properly extended relief and help to victims of any calamity-fire, flood famine, earthquakes
- Procure and supply blood for the victims of war and other calamities
- Educate people in accident prevention
- Extended all possible first aid in an accident
- Look after maternal and child welfare centres

D. Publications: Nil

Dissertations

- Perception and Attitude of women of child bearing age towards caesarean delivery at Primary Health Care centres in Ede south local Government Area Osun state. (B.Sc. thesis), an unpublished B.Sc. dissertation submitted to the Department of Public Health, Adeleke University, Ede, July, 2020.

Conference Presentation

- **OYEKU D. Eniola**, BANKOLE A. Samuel, ADEWOLE E. Ifeoluwa, LAWALE A. Abisola, RASHEED Abdul Aziz, ADEOYE Enitan, BULUS-EJOGA Afiniki, ADEGBITE B. Saidat, AKINSOLU T. Folahanmi Contraceptive Use among Sexually Active Women living with HIV in Ibadan, Oyo State, Nigeria. Faculty of Natural and Applied Science Abstracts. Poster presentation delivered at the FASCON 3rd international conference, Lead City University Ibadan, Ibadan, Oyo State. November 2022.

- **OYEKU D. Eniola**, BANKOLE A. Samuel, LAWALE A. Adedamola, ADEOYE Enitan, ADEGBITE O. Zainab, ADEWOLE E. Ifeoluwa, RASHEED Abdul Aziz, BULUS-EJOGA Afiniki, AKINSOLU T. Folahanmi Psychological Well-being and Adherence to Antiretroviral Therapy Among Women Living with HIV in Ibadan, Nigeria. Faculty of Natural and Applied Science Abstracts. Poster presentation delivered at the FASCON 3rd international conference, Lead City University Ibadan, Ibadan, Oyo State. November 2022.
- **OYEKU D. Eniola**, Adedamola, BANKOLE A. Samuel, ADEOYE Enitan, ADEGBITE O. Zainab, RASHEED Abdul Aziz, BULUS-EJOGA Afiniki, ADEWOLE E. Ifeoluwa, AKINSOLU T. Folahanmi Psychological Challenges experienced by Women Living with HIV during the perinatal period in Ibadan, Nigeria. Faculty of Natural and Applied Science Abstracts. Poster presentation delivered at the FASCON 3rd international conference, Lead City University Ibadan, Ibadan, Oyo State. November 2022.

Conferences Attended

- Attended Environmental Health Officers Registration Council of Nigeria (2022)
- African Institute of Public Health Professionals Council (2021).
- Attended Effective Leadership Skills for Teachers in Dubai (2019).

Certification

- Strengthening Community Health worker programs an online course of Harvard University successfully completed with passing grade and verified certificate (January, 2021).
- World Health Organization: Introduction to Infection Prevention and Control (IPC)
- World Health Organization: Leadership and Programme Management in Infection Prevention and control (2020).

E. Extra-Curricular Activities

Volunteer works

- Organized and mobilized HIV, Hepatitis B, Hepatitis C, and Diabetes awareness as well as free screening (Jan 2022).
- Administration of World Health Organization Recommended Vaccines (Oral- polio vaccine, yellow fever vaccine and measles vaccine) to children from ages 0-5 years in Schools (Jan 2023).

- Administration of World Health Organization Vaccines (Oral Polio vaccines, MMR, Varicella, CSM, Yellow Fever, diphtheria, tetanus, Pertussis, Haemophilus influenza, Hepatitis, BCG, ROTA (Feb 2023)).

Referees:

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FIIRO, Lagos

+2348023415016

oyekuoyedele@gmail.com

Prof James Atolagbe

Dean of Public Health

Adeleke University, Ede, Osun state

+23734602974

atolagbejames@gmail.com

Signature

Date

Do Not Copy, Lead City University, Nigeria