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Impact of Biological Monitoring of HIV-Positive Pregnant Women on the Serological Status of Infants: The Case of the Lualaba Provincial Health Division

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Abstract

Introduction: Pediatric HIV infection emerged in our region in 1997, when the first HIV-infected child was reported in the Lualaba referral zone. Our study aims to determine the impact of biological monitoring of HIV-positive pregnant women on the serological status of their infants in 2023. **Method:** We conducted a descriptive cross-sectional study with retrospective data collection. We utilized the validated 2023 PNLS BPC Lualaba database. Data collection was exhaustive. Information regarding 484 HIV-positive pregnant women was analyzed. Serological testing of the children and mothers was performed using GeneXpert as well as Western Blot. **Results:** In 2023, 321,868 pregnant women were registered at various prenatal care (PNC) clinics under the Lualaba Provincial Health Division (DPS). Of these, 48,655 received HIV counseling and testing, with 484 testing positive—results confirmed via GeenExpert. This yielded an overall seroprevalence of 1.0%. There were 372 infants born to HIV-positive mothers; 301 of them were immediately placed on antiretroviral therapy, representing a pediatric coverage rate of 81.7%. Among the 372 infants born to HIV-positive mothers, 17 tested positive for HIV between 4 and 6 weeks of age, resulting in a recorded mother-to-child transmission rate of 4.6% which is the result of 17 children born and testing positive for HIV out of the 372 HIV-positive mothers followed in this study. The highest rate of pediatric transmission was recorded in the Mutshatsha Health Zone (35.3%), followed by Bunkeya (11.1%), and then Dilolo and Fungurume (5.0%

each). Among the 301 children born to mothers receiving antiretrovirals and achieving viral load suppression, 17 children was tested positive for HIV at 6 weeks. Only one was born to a mother with an undetectable viral load (1.5%) against (6.8%) who born to a mother with a detectable viral load. Pregnant women in health zones with less than 50% PMTCT coverage (HIV-positive pregnant women placed on antiretrovirals) faced an estimated risk of HIV transmission to their children (OR = 4.95 [1.8; 13.4]). This risk is statistically significant. Compared to HIV-positive pregnant women who started antiretroviral (ARV) treatment before the pregnancy, those who started ARV treatment during the pregnancy faced an estimated risk of HIV transmission to their children (OR = 3.2053 [1.1058; 9.2911]). This risk is statistically significant. Regarding the treatment regimens, all children born to HIV-positive mothers had been placed on the same treatment regimen. **Conclusion:** Our study demonstrated that rigorous biological monitoring of HIV-positive pregnant women had a direct, beneficial impact on the serological status of infants born to HIV-positive mothers. It helped reduce vertical HIV transmission, improve infection management for both mothers and children, and ensure better health for future generations. The government must increase its involvement in implementing this activity throughout the provincial division in order to save lives.

Keywords

Biological Monitoring, HIV, Infants, Serological Status

1. Introduction

1.1. Background

Contemplating pregnancy begins, therefore, with moving past the desire not to conceive. Having a child prompts a re-examination of one's own family ties and reflection on the bonds one wishes to pass on to one's own children; this can in part, explain the psychological upheavals associated with pregnancy [1].

Pediatric HIV infection emerged in our region in 1997, when the first HIV-infected child was reported in the Lualaba referral zone. Since then, the number of cases has been rising. The condition remains poorly understood by community-based practitioners, and diagnosis is frequently delayed. Given this steadily increasing number of cases, we undertook this study on HIV-infected pregnant women to improve our understanding of the issue and to devise an effective management strategy—encompassing screening, monitoring, and assessment—to achieve our objectives.

UNAIDS (2023) estimated that 40.8 million [37.0 - 45.6] people worldwide were living with HIV. 1.3 million [1.0 - 1.7] people were newly infected with HIV in 2024. 630,000 [490,000 - 820,000] people died from AIDS-related illnesses in 2024. 31.6 million people [27.8 - 32.9 million] had access to antiretroviral therapy in 2024. 91.4 million [73.4 million - 116.4 million] people have been infected with HIV since the start of the epidemic. 44.1 million [37.6 - 53.4] people have died

from AIDS-related illnesses since the start of the epidemic [2].

According to Baah *et al*., 84% of pregnant women living with HIV received antiretroviral therapy (ART) to prevent perinatal HIV transmission (PMTCT), potentially averting up to 220,000 new HIV infections among newborns [3].

However, despite the expanded rollout of prevention of mother-to-child transmission (PMTCT) services, approximately 160,000 children were infected with HIV in 2022 alone. This highlights the urgent need to refocus efforts on PMTCT-related challenges to ensure sub-Saharan Africa meets global targets for eliminating new infections via perinatal transmission [4] [5].

Antiretroviral therapy (ART) coverage during pregnancy rose from 32.98% to 69.46% between 2010 and 2019. During the same period, the rate of mother-to-child HIV transmission in sub-Saharan Africa fell from 27.18% to 16.90% [3] [6] [7].

In a study conducted in Mali, 71.1% of HIV-positive pregnant women had been diagnosed prior to pregnancy, with 38.9% having an undetectable viral load. All were on antiretrovirals (ARVs), with 92.2% demonstrating good adherence. Among the infants, 98.3% underwent a first PCR test (PCR1) before the age of two months, and 90.0% underwent a second PCR test (PCR2) after six months; nearly 99% received ARVs at birth and the same proportion received cotrimoxazole after four weeks, yet 91.7% developed a neonatal infection. The PCR1 result was positive in only 2.8% of cases. We recorded a 2.2% loss to follow-up [8].

Furthermore, it is necessary to highlight the role of technology and to involve male partners in programs for the prevention of HIV transmission (PPT-HIV) in order to enhance their effectiveness and achieve the expected outcomes [3].

A study conducted by Carine Jasseron and her colleagues, published in the journal *AIDS*, revealed important data regarding pregnant women living with HIV in France. According to the study, approximately 1500 pregnant women tested positive for HIV each year in France. These data were drawn from the French national surveillance cohort for HIV in pregnant women, which aimed to monitor the course of the HIV epidemic and the effectiveness of strategies to prevent mother-to-child transmission. The study highlighted the importance of prenatal HIV screening and access to antiretroviral treatments in reducing the risk of mother-to-child HIV transmission. Thanks to these measures, the rate of mother-to-child HIV transmission in France has been significantly reduced. For further details, you can consult the original study publication.

Her research indicates that a high percentage of HIV-positive pregnant women adhere to the treatments prescribed to prevent HIV transmission to their children. For instance, a study she co-led in France showed that more than 90% of pregnant women living with HIV correctly followed their antiretroviral treatment during pregnancy. This high rate is crucial for reducing the risk of vertical (mother-to-child) HIV transmission. These findings underscore the importance of prevention and support programs for pregnant women living with HIV, which help maintain high levels of adherence to antiretroviral treatments. According to the GAM report, which aimed to "eliminate new HIV infections among children by 2020 and

ensure access to HIV treatment for 1.6 million children by 2018," 357 pregnant women were placed on antiretrovirals (ARVs) in Bas-Uélé province in 2018, and 352 in 2019; in Lualaba province, 360 pregnant women were placed on ARVs in 2018, and 624 in 2019 [9].

Tshikwej Ngwej D. (2015) conducted a study on risk factors for mother-to-child HIV transmission under the "Option A" strategy in Lubumbashi, Democratic Republic of the Congo; regarding the vertical transmission rate, out of 157 children enrolled in the study, 20 were infected with HIV, representing a mother-to-child transmission (MTCT) rate of 12.7% [10].

Mwembo-Tambwe A.N.K. reported on HIV screening in the labor ward in Lubumbashi, Democratic Republic of the Congo—a catch-up strategy within the framework of preventing mother-to-child transmission. Among the 433 women tested during labor, 21 were HIV-positive, a prevalence of 4.8% (95% CI: 3.1 - 7.4). Prevalence was 3.1% among young women aged 15 to 24. All women who tested positive received the necessary prophylactic measures as part of the PMTCT program, tailored to the stage of labor and the postnatal period, until they were successfully linked to care [11].

In their study on mother-to-child HIV transmission in Lubumbashi (Democratic Republic of the Congo)—drawing lessons from results across six referral maternity units—J. Kimbala (2012) found that the MTCT rate remains high in the city. While it is possible to significantly reduce this rate through lifelong antiretroviral therapy (ART) for all HIV-positive pregnant women, major challenges must first be overcome, such as the high number of HIV-positive pregnant women who do not access PMTCT services and instances of loss to follow-up (LTFU) after delivery. A study examined the maternity experiences of women from West and Central Africa who had given birth at least once in their home country and subsequently in France. It sought to identify the practices followed in their home countries and those adopted in France. A qualitative study based on semi-structured interviews was conducted with eight women. The patients appeared satisfied and reassured by the medicalization of childbirth. Perinatal care professionals—particularly midwives—play a pivotal role in these women's care. The women maintain certain rites and customs throughout pregnancy and the postpartum period while abandoning others [12].

Aliou Bagayoko in his study about, "Management of HIV-infected pregnant women in the Obstetrics and Gynecology Department of Gabriel Touré Hospital: A study of 72 cases." The author views HIV infection as a serious public health issue, noting that its management involves dealing with a chronic condition. The combination of HIV and pregnancy remains a high-risk situation due to potential maternal and fetal complications. The author deemed it necessary to assess the risks associated with the course of pregnancy in HIV-positive women in order to improve their care. This descriptive study covered 72 women treated at Gabriel Touré Hospital, where maternal morbidity was approximately 30%. Various maternal and fetal complications are more frequently observed in patients with low

CD4 counts who do not receive antiretroviral therapy during pregnancy and the postpartum period. Prenatal consultations and routine screening are key strategies in the fight against this pandemic (7).

According to Astaw, the prevention of mother-to-child transmission (PMTCT) remains a WHO priority in the fight against HIV [6].

A study helped improve understanding of the issue and facilitated the planning of effective care including screening, monitoring, and assessment of these patients to enhance the quality of PMTCT services [13].

Unlike previous studies, our research aims to demonstrate the impact of biological monitoring of HIV-positive women on the serological status of their infants. The goals of this study are to raise awareness regarding the expansion of early HIV screening for pregnant women across both public and private health sectors; to improve the quality of care for HIV-positive pregnant women in a stigma-free environment; and to reduce—or even eliminate—mother-to-child transmission of HIV, in alignment with national recommendations.

1.2. Objective

General objective

To determine the impact of biological monitoring of HIV-positive pregnant women on the serological status of their infants within the health zones of the Lualaba Provincial Division in 2023.

Specific objectives

- To determine the prevalence of HIV among pregnant women;
- To determine the prevalence of HIV infection among women who gave birth within the health zones of the Lualaba Provincial Health Division (DPS);
- To determine the rate of seropositivity resulting from mother-to-child transmission;
- To assess the impact of biological monitoring on HIV prevention in children born to HIV-positive mothers.

2. Methodology

This is an analytical cross-sectional epidemiological study conducted among all pregnant women who received care for HIV prevention under the PMTCT Option B+ program.

The study was carried out within the Lualaba Provincial Health Division (DPS) during 2023. All fourteen health zones within the Lualaba DPS were included in the study.

The records of HIV-positive mothers were examined via the DRC's SNIS (National Health Information System) platform, covering the period from January 2023 to December 2023. Epi Info software was used to perform bivariate analyses.

2.1. Materials

We used the following materials: the validated 2023 PNLS BPC Lualaba database,

a computer, a pen, and paper.

The study population comprised all women who were pregnant during 2023.

An exhaustive sampling method was used, covering all 484 HIV-positive pregnant women. These 484 HIV-positive pregnant women were divided into two groups to assess the impact of biological monitoring on mother-to-child HIV transmission. Health zones where fewer than 50% of pregnant women were placed on antiretrovirals (ARVs) were classified as high-risk zones for mother-to-child HIV transmission, whereas those where more than 50% were placed on ARVs were classified as lower-risk zones.

2.2. Study Type

We conducted an analytical cross-sectional study. The analysis involved comparing mother-to-child HIV transmission rates between health zones with low PMTCT coverage (less than 50%) and those with coverage considered sufficient (more than 50%).

Inclusion criteria

Our study included all HIV-infected pregnant women who attended prenatal consultations in the health zones of Lualaba Province during 2023.

Ethical considerations

All information obtained from HIV-positive pregnant women remained confidential, in accordance with established procedures. Patient records were analyzed anonymously to uphold human dignity. Approval from the ethics committee (see appendix) ensured adherence to the ethical standards governing this study.

3. Results

This chapter presents the results regarding the impact of biological monitoring of pregnant women on the serological status of their infants.

In 2023, 321,868 pregnant women were registered at various prenatal care (PNC) clinics under the Lualaba Provincial Health Division (DPS). Of these, 48,655 received HIV counseling and testing, with 484 testing positive—results confirmed via GeenExpert. This yielded an overall seroprevalence of 1.0%, with the highest rates recorded in the Kapanga Health Zone (2.1%), followed by Mutshatsha (1.9%), and Dilala and Fungurume (1.2% each) (Table 1).

There were 372 infants born to HIV-positive mothers; 301 of them were immediately placed on antiretroviral therapy, representing a pediatric coverage rate of 81.7%. Among the 372 infants born to HIV-positive mothers, 17 tested positive for HIV between 4 and 6 weeks of age, resulting in a recorded mother-to-child transmission rate of 4.6% which is the result of 17 children born and testing positive for HIV out of the 372 HIV-positive mothers followed in this study.

The highest rate of pediatric transmission was recorded in the Mutshatsha Health Zone (35.3%), followed by Bunkeya (11.1%), and then Dilolo and Fungurume (5.0% each) (Table 2).

Table 1. Prenatal care and monitoring of pregnant women, and serological status of newborns following serological testing 4 - 6 weeks after delivery.

Health zones	Pregnant women receiving prenatal care	Counselled and tested (ANC)	Tested positive (ANC)	Sero prevalence (%)	% Viral load tested before delivery	% Viral load tested 6 months post-treatment	Viral load suppression	Infants born to HIV-positive mothers	Placed on PMTCT ARVs at birth	% placed on PMTCT ARVs at birth	Tested HIV-positive at 4 - 6 weeks	% HIV-positive infants at 4 - 6 weeks
	a	b	c	d = c/b	e	f		h	i	j = i/h	k	l = k/i
Mutshatsha	7900	1343	26	1.9	6.8	2.1	20	17	8	47.1	6	35.3
Fungurume	51,097	5038	60	1.2	20.3	18.8	42	40	16	40.0	2	5.0
Sandoa	25,202	1326	7	0.5	0.0	0.0	0	5	2	40.0	0	0.0
Manika	55,688	9152	79	0.9	12.2	4.2	65	52	32	61.5	0	0.0
Kapanga	16,463	3753	77	2.1	1.3	4.2	0	81	76	93.9	2	2.5
Dilala	38,303	7518	87	1.2	50.0	70.8	77	66	65	98.5	2	3.0
Bunkeya	6870	2383	22	0.9	0.0	0.0	14	18	12	66.7	2	11,1
Kalamba	12,112	1268	3	0.2	0.0	0.0	0	3	3	100.0	0	0.0
Kanzenze	14,706	2197	21	1.0	0.0	0.0	12	16	13	81.2	1	6.3
Kasaji	13,209	3469	29	0.8	0.0	0.0	0	17	17	100.0	0	0.0
Dilolo	18,410	2213	24	1.1	1.3	0.0	0	20	20	100.0	1	5.0
Lualaba	21,979	3508	34	1.0	1.3	0.0	32	26	26	100.0	1	3.8
Kafakumba	13,212	3923	7	0.2	2.7	0.0	0	6	6	100.0	0	0.0
Lubudi	8717	1564	8	0.5	4.1	0.0	5	5	5	100.0	0	0.0
Total	321,868	***48,655***	***484***	***1.0***	***####***	***####***	***267***	***372***	***301***	***81.7***	***17***	***4.6***

Table 2. Pregnant women with Viral load.

Viral load	Infants Tested HIV positive at 4 - 6 weeks	Total of Infants Tested HIV at 4 - 6 weeks	% Infants Tested HIV positive at 4 - 6 weeks
Pregnant women with Viral load not suppression	16	235	6.8
Pregnant women with Viral load suppression	1	66	1.5
Total	17	301	5.6

Among the 301 children born to mothers receiving antiretrovirals and achieving viral load suppression, 17 children was tested positive for HIV at 6 weeks. Only one was born to a mother with an undetectable viral load (1.5%) against (6.8%) who born to a mother with a detectable viral load (Table 3).

Pregnant women in health zones with less than 50% PMTCT coverage (HIV-positive pregnant women placed on antiretrovirals) faced an estimated risk of HIV transmission to their children (OR = 4.95 [1.8; 13.4]). This risk is statistically significant (Table 4).

Table 3. Health zones with less than 50% of pregnant women on ARVs versus mother-to-child HIV transmission rates.

Health zone categories	Infants Tested HIV positive at 4 - 6 weeks	Infants Tested HIV negative at 4 - 6 weeks	Total infants born to HIV positive mothers
Health zones with fewer than 50% of pregnant women started on ARVs (***High-risk Health zone***)	8	54	62
Health zones with more than 50% of pregnant women started on ARVs (***Lower-risk Health zone***)	9	301	310
Total	17	355	372

$$OR = a*d/b*c = 49{,}547$$

$$\text{IC OR 0.95 of 49,547} = OR*e^{\pm u\alpha*}\sqrt{\left(\frac{b}{a*E1}\right)+\left(\frac{d}{c*E0}\right)} = [1.83; 13.40]$$

$$KHI2MHdll = \frac{(ad-bc)^2*(T-1)}{M_1*M_0*E_1*E_0} = 11{,}8473 \quad p < 0.00057$$

Table 4. Mothers started on ARVs prior and during the current pregnancy versus mother-to-child HIV transmission rates.

Initial period of ART initiation	Infants Tested HIV positive at 4 - 6 weeks	Infants Tested HIV negative at 4 - 6 weeks	Total infants born to HIV positive mothers
Started on ARVs during the current pregnancy	12	152	162
Started on ARVs prior to the current pregnancy	5	203	208
Total	17	355	372

$$OR = a*d/b*c = 32053$$

$$\text{IC OR 0.95 of 32053} = OR*e^{\pm u\alpha*}\sqrt{\left(\frac{b}{a*E1}\right)+\left(\frac{d}{c*E0}\right)} = [1.1058; 9.2911]$$

$$KHI2MHdll = \frac{(ad-bc)^2*(T-1)}{M_1*M_0*E_1*E_0} = 5.0758 \quad p < 0.02 \text{ NS}$$

Compared to HIV-positive pregnant women who started antiretroviral (ARV) treatment before the pregnancy, those who started ARV treatment during the pregnancy faced an estimated risk of HIV transmission to their children (OR = 3.2053 [1.1058; 9.2911]). This risk is statistically significant.

Regarding the treatment regimens, all children born to HIV-positive mothers had been placed on the same treatment regimen.

4. Discussions

4.1. Discussions of Results

This study aimed to determine the impact of biological monitoring on the outcomes of children born to HIV-positive mothers within the Lualaba Provincial Health Division (DPS) during 2023.

To achieve this, a descriptive, cross-sectional evaluative study was conducted by analyzing the Lualaba PNLS (National Program for the Fight against AIDS) database.

Following the analysis and impact assessment, the following results were obtained:

During 2023, 321,868 pregnant women were registered at various prenatal care (PNC) clinics within the Lualaba DPS.

The seroprevalence across the entire DPS was 1.0%; the highest rates were recorded in the Kapanga Health Zone (2.1%), followed by the Mutshatsha Health Zone (1.9%), and the Dilala and Fungurume Health Zones (1.2% each).

In a study by Kacou Bouani Colombe (2020), the overall HIV prevalence among pregnant women was 9.2% [14].

According to Sama Carlson-Babila (2017), the prevalence of maternal HIV infection was 5.0%. All (100%) of the pregnant women surveyed were aware of HIV infection, and the majority (76.7%) had access to adequate care. However, only 79.3% (119/150) were aware of mother-to-child transmission (MTCT), and just over a third (37.0%) possessed adequate knowledge regarding the periods of transmission [15].

Regarding the number of HIV-positive pregnant women, the Dilala Health Zone recorded 87 cases, followed by the Manika Health Zone (79) and the Kapanga Health Zone (77).

The majority of the pregnant women tested were informed of their results (78.7%). The score ranges from 93.1% for the Sandoa health zone to 100% for the Kasaji, Lualaba, Manika, and Fungurume health zones.

Screening acceptability in our study was reasonably high and exceeded the rate observed in a study conducted at the Kenya General Referral Hospital (HGR) maternity ward in Lubumbashi; in that study, 50.8% of women accepted pre-test counseling, and 80% actually underwent the test, yet only 83% of the latter group collected their results. Test acceptability was significantly higher among pregnant women with low levels of education (adjusted odds ratio [aOR] = 6.8; 95% CI: 3.5 - 13.35) and among those attending their first prenatal care (PNC) visit (aOR = 2.3; CI: 1.2 - 4.4). Adherence to care was observed in 22.4% of mother-child pairs. The Nevirapine coverage rate was 11.4%. [16]

Out of 474 women in labor, 433 (91.4%; 95% CI: 88.4 - 93.7) underwent voluntary HIV screening in the delivery room following counseling. Rapid HIV screening acceptability was significantly higher when counseling lasted five minutes or less (adjusted odds ratio [aOR] = 5.8; 95% CI: 2.6 - 13), among women who reported not having undergone screening during prenatal care (aOR = 3.8; 95% CI: 2 - 7.8), and among those in the early stages of labor (aOR = 2.3; 95% CI: 1.2 - 4.7). In contrast, it was lower among adolescent girls than among adults (aOR = 0.1; 95% CI: 0.0 - 0.7) [11].

In comparison to the WHO findings—where approximately 1.4 million pregnant women worldwide were HIV-positive (a rate not specified but much higher than our 0.15% rate)—and the study by Moseholm [12]—where 692 pregnant women were diagnosed as HIV-positive, representing a seropositivity rate of 0.2% (slightly higher than in our study)—the study by Martine Ilunga found that among

302 pregnant women tested for HIV, 8% were positive (significantly higher than our figure). Furthermore, a study by Technau *et al.* [17] identified 338 women as HIV-infected (a seroprevalence of 20.2%, much higher than the rate in our study), and a study by Carine Jasseron and colleagues [18] reported 84% (extremely higher than our rate). Regarding the study by Baah *et al.*, significant data were revealed concerning pregnant women living with HIV in France; the study indicated that approximately 1500 pregnant women were HIV-positive annually in France, showing a higher prevalence compared to our study. These data originated from the French national surveillance cohort for HIV in pregnant women, which aimed to monitor the evolution of the HIV epidemic and the effectiveness of strategies to prevent mother-to-child transmission. The study highlighted the importance of prenatal HIV screening and access to antiretroviral treatments in reducing the risk of mother-to-child HIV transmission. Thanks to these measures, the rate of mother-to-child HIV transmission in France has been significantly reduced [3].

A proportion of 52.5% (95% CI: 48.4 - 56.4%) of women who had given birth did not know their HIV serostatus.

Among those who knew their status, the circumstances surrounding HIV testing were as follows: in 19 cases (6.6%), the test was imposed on the pregnant woman by the prenatal care (PNC) provider; in 24 cases (8.4%), it was requested by the women themselves during PNC; and in 243 cases (85%), it was proposed by the provider and accepted by the pregnant woman. According to the women's statements, the main reasons preventing HIV testing were: HIV testing not being proposed by providers during PNC (26.2%), lack of information (16.5%), the couple's mutual fidelity (13.6%), and lack of interest in the test (12.3%) [4] [19].

A study by Ouédraogo Youggbale O.S. *et al.* reported a seroprevalence of 4.86% [20].

The Dilala Health Zone benefited from local biological monitoring of viral load and recorded a low rate of pediatric HIV transmission (4.4%), in contrast to the Mutshatsha, Dilolo, and Fungurume Health Zones, which showed the highest pediatric transmission rates (75%, 14.4%, and 6.3%, respectively).

According to Mnyan, among a total of 360,751 pregnant women who visited health facilities during the study period, HIV prevalence remained high, hovering around 30%. The proportion of pregnant women living with HIV (PWLHIV) who knew their HIV status rose from 14.3% in 2009—the year data collection for this indicator began—to 45% in 2015 ($p < 0.001$). In 2006, fewer than 10% of PWLHIV had started antiretroviral therapy (ART), a proportion that reached 88% in 2011. The mother-to-child transmission (MTCT) rate declined from 6.9% in 2007 to less than 1% between 2013 and 2015 ($p < 0.001$) [4]. According to Mbou, 82.7% of the women surveyed did not have a known HIV status. For 78% of them, the test had not been prescribed; 18.6% refused to undergo it; while 41% had already been tested, primarily (54%) during previous pregnancies. Knowledge regarding PMTCT was rated as "acceptable" in only 14.7% of the women; this knowledge

was linked to education level and history of HIV testing [7].

Among the 244 infants exposed to HIV, 10 (4.1%) were diagnosed as HIV-positive. HIV positivity was associated with preventive cotrimoxazole treatment {adjusted OR 0.89; 95% CI (0.02 - 0.79)} and birth in a health facility {adjusted OR 0.088; 95% CI (0.01 - 0.58)} [21] [22].

In similar studies, such as that by Njuguna A.G. *et al*., emotional and nutritional support, combined with ongoing health education, were deemed essential for improving adherence to protocols for preventing mother-to-child transmission [3] [23].

However, initiating antiretroviral (ARV) therapy in infants born to HIV-positive mothers immediately after birth reduced the mother-to-child HIV transmission rate to 4.6% across the entire DPS.

According to some authors, patients and healthcare professionals identified a lack of male involvement as a barrier to retention in care and expressed concerns regarding the rapid pace of the "test and treat" process, which prevents patients from "processing" a positive diagnosis before starting antiretroviral therapy (ART). Fears regarding privacy and confidentiality were also identified as factors contributing to the loss to follow-up of women receiving care under Option B+. Disclosure of HIV status remains a challenging step within families and couples. Furthermore, lifelong antiretroviral therapy was viewed as an opportunity to plan future pregnancies [24]-[26].

The highest rate of pediatric transmission was recorded in the Mutshatsha Health Zone (35.3%), followed by Bunkeya (11.1%), and then Dilolo and Fungurume (5.0% each).

Among the 301 children born to mothers receiving antiretrovirals and achieving viral load suppression, 17 children was tested positive for HIV at 6 weeks. Only one was born to a mother with an undetectable viral load (1.5%) against (6.8%) who born to a mother with a detectable viral load.

Three main themes emerged regarding the improvement of access to PMTCT services: care delivery strategies, community-based initiatives, and support systems aimed at enhancing access to PMTCT services [27].

At a medical center in Nigeria, the mother-to-child transmission (MTCT) rate dropped from 1.2% in 2018 to 0% in 2019, resulting in an overall rate of 0.7%. Early prenatal care and adherence to antiretroviral (ARV) treatment played a crucial role in reducing MTCT. Vaginal delivery under ARV treatment showed lower MTCT rates compared to emergency Caesarean sections [19].

Regarding the therapeutic protocols implemented in the health zones studied, all children born to HIV-positive mothers benefited from "Option B+", which was rolled out across all these health zones. Under this approach, every child born to an HIV-positive mother was placed directly on antiretroviral (ARV) treatment.

Pregnant women in health zones with less than 50% PMTCT coverage (HIV-positive pregnant women placed on antiretrovirals) faced an estimated risk of HIV transmission to their children (OR = 4.95 [1.8; 13.4]). This risk is statistically sig-

nificant.

A study conducted in Togo found an overall HIV MTCT rate of 3.6% (95% CI: 1.4 - 7.0); two-thirds (66.67%) of the infants who tested positive were diagnosed at 6 weeks of age [28]. The mother-to-child transmission rate was 2.1%, with no difference in transmission rates between 2019 and 2020. Infants born to mothers on antiretroviral therapy (ART) had a 93% lower risk of testing positive by PCR compared to those whose mothers were not receiving ART (OR = 0.07; 95% CI: 0.031 - 0.178; $p < 0.05$) [15] [29].

4.2. Study Limitations

In this study, we relied solely on data already recorded in DHIS2. All reported data underwent rigorous analysis without any direct contact with HIV-positive pregnant women or their children. It should also be noted that some pregnant women were not fully monitored due to their late arrival at healthcare facilities—either at the time of delivery or just one or two months before their due date.

For the next study, we suggest implementing close monitoring of pregnant women to capture all aspects of diagnosis and care both before and after delivery.

5. Conclusions

This study examined the impact of biological monitoring of HIV-positive pregnant women on HIV transmission to their infants within the Lualaba Provincial Health Division (DPS) during 2023.

The analysis yielded the following findings:

Among the 321,868 pregnant women registered at various prenatal care (ANC) clinics in the Lualaba DPS, HIV seroprevalence was 1.0%; the highest rates were recorded in the Kapanga Health Zone (2.1%), followed by Mutshatsha (1.9%), and Dilala and Fungurume (1.2% each).

Regarding the caseload of HIV-positive pregnant women, the Dilala Health Zone recorded 87 cases, followed by Manika (79) and Kapanga (77).

The majority of tested pregnant women were informed of their results (78.7%). This figure ranged from 93.1% in the Sandoa Health Zone to 100% in the Kasaji, Lualaba, Manika, and Fungurume Health Zones.

Initiating antiretroviral (ARV) therapy for infants born to HIV-positive mothers immediately after birth reduced the mother-to-child HIV transmission rate to 4.6% across the entire DPS.

The Dilala Health Zone had the highest proportion of HIV-positive pregnant women who underwent viral load (VL) testing both before delivery (50%) and six months after treatment initiation (70.8%) in 2023.

In this study, we observed that pregnant women who received antiretroviral treatment prior to prenatal care had a reduced risk of transmitting HIV to their children. However, those who underwent treatment and achieved viral suppression were even less likely to transmit HIV to their children.

However, not all maternity units within the Lualaba Provincial Health Division

(DPS) are fully covered by PMTCT activities. It is therefore crucial to expand these activities to all health zones and maternity units in order to effectively reduce the rate of mother-to-child HIV transmission.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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