

Original Research Article

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## Trends in HIV Prevalence Among Pregnant Women and Children Under 18 Months of Age from 2019 to 2022 at Hospital Saint Camille in Ouagadougou, Burkina Faso

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### ABSTRACT

Vertical transmission of the human immunodeficiency virus (HIV) remains a major concern in sub-Saharan African countries such as Burkina Faso, despite the implementation of various prevention and elimination programs. This study aimed to determine the prevalence of HIV infection in pregnant women and children under 18 months of age in the context of the elimination of mother-to-child transmission of HIV in Burkina Faso. Methods: This was a retrospective study with a collection period from 2019 to 2022. Data were collected at Hôpital Saint Camille de Ouagadougou and the study population was pregnant women received at antenatal consultations (ANC) and children 18 months of age borned to HIV-positive mothers. The most represented age group was over 25. The overall prevalence of HIV among all pregnant women seen at antenatal clinics who tested positive fell from 3.0 % in 2019 to 1.50% in 2022. HIV prevalence among those seen at antenatal clinics who did not know their HIV status beforehand also fell, from 1.22% in 2019 to 0.42% in 2022, a reduction of 2.90%. HIV prevalence in children under 18 months of age by PCR changed from 5.56% (06/108) in 2017 to 0.0% (0/57) in 2022. The number of partners of pregnant women who received an HIV test fell from 51 partners in 2019 to 16 partners in 2022. Conclusion: This study shows a significant reduction in the prevalence of HIV infection among pregnant women and children. Elimination programs must reinforce efforts for a considerable reduction in MTCT/HIV.

#### Keywords

HIV, MTCT, prevalence, early diagnosis, ANC

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### Introduction

In 2021, an estimated 38.4 million people were living with HIV. Sub-Saharan Africa is most affected, with around 26 million people living with HIV, and 20.9 million people receiving antiretroviral therapy in 2022

(WHO, 2023). Among children, new HIV infections have fallen by 50%, from 320,000 in 2010 to 160,000 in 2021 (UNAIDS, 2022). In Burkina Faso, the evolution of HIV prevalence in the general population over the last ten years shows a downward trend. According to Global AIDS Monitoring estimates, the number of adults and

children living with HIV/AIDS fell from 110,000 in 2009 to 94,000 in 2019, including 9,400 children under the age of 15. HIV prevalence among adults was estimated at 0.80% in 2019, and HIV prevalence among young pregnant women (15-24 years) was 0.51% in 2018 (UNAIDS, 2019). Vertical transmission (mother-to-child) remains the most important route of pediatric HIV acquisition (Amin *et al.*, 2021). In the absence of any intervention, the risk of transmission of the virus from an infected mother to her child varies from 25% to 45% (5-10% during pregnancy and 20-35% at the time of delivery and during breastfeeding) for HIV-1 (CNLS-IST, 2021).

Since 2002, Burkina Faso, like other countries, implemented programs to prevent mother-to-child transmission of HIV (PMTCT), to significantly reduce mother-to-child transmission of HIV. Indeed, the first PMTCT program was initiated in 2002 at the Centre Medical Saint Camille and then expanded to the country's other health centers thereafter (Soubeiga *et al.*, 2015). But since 2017, Burkina Faso adopted a program for the elimination of mother-to-child transmission of HIV (eMTCT/HIV) (Ministry of Health, 2017). As a low-prevalence country, all pregnant women are screened for HIV at the first prenatal consultation (ANC). Those infected with HIV are integrated into the eMTCT/HIV program and put on antiretroviral (ARV) treatment without delay and for life, according to the management protocol. Partners of pregnant women are also screened for HIV when accompanied. Unfortunately, the number of partners tested for HIV remains low, as very few accompany their wives to ANC. Barriers to testing male partners include stigma, fear of prognosis, lack of HIV risk awareness, inconvenience, perceived lack of confidentiality, transportation costs, opportunity costs such as work time, and behavioral factors (Bogart *et al.*, 2021). Yet their adherence remains crucial to achieving the UNAIDS goal of eliminating MTCT/HIV by 2030.

Pregnant women who test positive for HIV are cared for right up to delivery. Infants born to pregnant women with HIV also benefit from early diagnosis of HIV by PCR from 4 weeks up to 18 months (CNLS-IST, 2021). Since the implementation of the eMTCT program in 2017, few data exist on the situation of HIV infection among pregnant women and children. This study aimed to determine the prevalence of HIV infection among pregnant women and their partners, and children attending ANC in Burkina Faso.

## Materials and Methods

### Study setting

This study was carried out in Ouagadougou, Burkina Faso. Hospital Saint Camille in Ouagadougou (HOSCO) was used as a data collection site for pregnant women attending antenatal clinics (ANC) and for children. This health facility is located in the Bogodogo health district. It was the first pilot site to implement the program of mother-to-child transmission of HIV in Burkina Faso in 2002 (Ghoma Linguissi *et al.*, 2019).

### Study design

This was a retrospective cross-sectional study, with data collected over the period 2017-2022 in the ANC service. Our study population consisted of all pregnant women and their partners attending ANC and children under 18 months of age born to HIV-positive mothers who had received an early HIV diagnostic test at 4 weeks.

### Inclusion criteria

Any pregnant woman and their partners attending for ANC services; Any child born to an HIV-positive mother who has undergone a PCR test for early diagnosis of HIV

### Non-inclusion criteria

Non-pregnant women and their partners attending other services in the hospital than ANC; Children tested whose mothers were not HIV-infected.

### Data collection and HIV testing

Convenient sample was based on the register maintained at the ANC service. A structured questionnaire was used to collect information on sociodemographic, clinical/pregnancy and laboratory data through ANC records and registers. Data related to pregnant women and their partners during the period of 2017 to 2018 were missing.

For data collection from infants, a structured questionnaire was also used to collect sociodemographic and laboratory data through electronic and manual bases. Data were available from 2017 to 2022. An HIV serological test was performed on every pregnant woman and her partner who came for the first ANC. A first test was performed

with the non-discriminatory Determine™ HIV ½ test, followed by a second discriminatory test with the OnSite HIV 1/2 Ab Plus Combo test. For early diagnosis of HIV in children under 18 months, a PCR test was performed using a Dried blood spot (DBS) on the Abbott m2000rt thermocycler.

### Statistical analysis

Data were analyzed using IBM SPSS version 21.0 software. Fisher test was used for comparison and any value was considered statistically significant for  $p < 0.05$ .

### Ethical approval

All authors hereby declare that the study was approved by the institutional ethics committee of HOSCO (deliberation N°2023-07-027) and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

## Results and Discussion

### Pregnant women and their partners by year and age

Overall, in our study, majority of pregnant women were more than 25 years of age. The number of pregnant women who already knew their HIV-positive status coming to ANC decreased from 51 in 2019 to 13 in 2022. HIV prevalence among pregnant women not previously knowing their HIV status seen in ANC has dropped considerably, from 1.2% (34/2,790) in 2019 to 0.4% (5/1,184) in 2022 (Fig.1).

Among these pregnant women, we also observed a high prevalence by age group depending on each year: 1.6% among pregnant women with an age  $\leq 19$  years in 2019, 1.9% for pregnant women with an age between 20-25 years in 2020, 1.0% for those between 20-25 years in 2021 and 0.6% for those between 20-25 years in 2022. The difference was statistically significant ( $p < 0.001$ ). Each year, the number of partners receiving an HIV test has fallen, from 51 partners in 2019 to 16 partners in 2022 (Table 1).

### Distribution of pregnant women and their partners by HIV status and type of HIV by year

HIV prevalence among all pregnant women tested for HIV was 3.0% in 2019 and 1.5% in 2022. Among them,

98.0% were infected with HIV-1, compared with just one case of HIV-2, i.e. 2.0% (1/51) in 2019. The difference was statistically significant ( $p < 0.001$ ). Those seen in 2020, 2021, and 2022 were all HIV-1 positive. HIV prevalence among pregnant women tested and not knowing their HIV status beforehand fell, from 1.2 % in 2019 to 0.4 % in 2022, a reduction of 2.90%. The difference was statistically significant ( $p < 0.001$ ). Among them, 2 cases of HIV-2 or 15.4% (2/13) were detected in 2020, 2 cases of HIV-2 or 20% (2/10), and 1 case of HIV-1/2 co-infection or 10% (1/10) in 2021. HIV-1 was in the majority, i.e. 100% in 2019; 84.6% in 2020; 70% in 2021, and 100% in 2022. Finally, HIV prevalence among partners who received an HIV test increased from 9.8% (5/51) in 2019 to 18.8% (3/16) in 2021, before declining to 6.67% in 2022 (Table 2).

### Results of early HIV diagnosis in children under 18 months of age

HIV prevalence in children under 18 months of age by reverse transcriptase PCR (RT-PCR) has risen sharply from 5.6 % (6/108) in 2017 to 12.20 % (5/41) in 2021, before dropping to 0.0 % (0/57) in 2022 (Table 3).

Overall in our study, the most represented age group was over 25, this predominance of age group corresponds to the age of marriage for many young girls, and the age of childbearing as the best time to bear children is between the ages of 20 and 35 (Konaté *et al.*, 2017). Globally, the total number of pregnant women attending ANC decreased from 2 892 in 2019 to 1 215 in 2022. This could be due to the COVID-19 pandemic that contributed to reduce the attending of hospitals. The number of pregnant women coming to ANC who already knew their HIV-positive status fell from 51 in 2019 to 13 in 2022. Our results differ from those of Simporé *et al.*, in 2006, who found 126 ANC attendees who already knew their HIV-positive status (Simporé *et al.*, 2006). This drop could be explained by the intervention packages of MTCT/HIV prevention programs and WHO strategies over the last few years, aimed not only at reducing HIV prevalence in general but also among pregnant women. The WHO's main actions advocate primary prevention of HIV among women of childbearing age, and prevention of unwanted pregnancies among women living with HIV (WHO, 2013).

HIV prevalence among pregnant women not previously knowing their HIV status seen in ANC has dropped considerably, from 1.2% (34/2,790) in 2019 to 0.4%

(5/1,184) in 2022. This drop could be explained by the fact that the prevalence of HIV infection in the adult population of Burkina Faso is low (0.80%), but also by the intervention strategies of the eMTCT program (Ghoma Linguissi *et al.*, 2019).

There is also a high age-specific prevalence among pregnant women, depending on the year: 1.6% among pregnant women aged  $\leq 19$  in 2019, 1.9% among pregnant women aged 20-25 in 2020, 1.0% among pregnant women aged 20-25 in 2021 and 0.6% among pregnant women aged 20-25 in 2022. A study conducted by Chant *et al.*, showed that at this age, young girls and teenagers are sexually active and these girls have little knowledge of the vertical transmission of HIV (Chant *et al.*, 2017). Indeed, the incidence of sexually transmitted infections (STIs) among adolescents is the highest of all age groups (WHO, 2019).

Each year, the number of partners receiving an HIV test has fallen, from 51 partners in 2019 to 16 partners in 2022. This number of partners is still very low compared with the number of pregnant women. This shows that partners are not willing enough to accompany them to ANC's and get tested. Simporé *et al.*, in 2006 also observed very low partner participation in voluntary counseling and testing, with the low percentage motivated by fear of discovering HIV-positive status, being abandoned by one's wife, or being expelled from one's family (WHO, 2023). Other studies reveal reasons such as stigma, fear of prognosis, lack of awareness of HIV risk, inconvenience, perceived lack of confidentiality, transportation costs, opportunity costs such as work time, and behavioral factors (Bogart *et al.*, 2021). As part of the drive to eliminate MTCT/HIV, and in anticipation of the UNAIDS 95-95-95 targets, action must be taken to improve the participation of pregnant women's partners in ANC sessions, to offer them prevention and care services. Overall HIV prevalence among all positive pregnant women decreased from 3.0% in 2019 to 1.5% in 2022.

This drop could be explained by WHO's eMTCT strategies, which recommend preventing HIV infection among women of childbearing age, including pregnant women and their sexual partners, and promoting a healthy fertile life (WHO, 2023). Our results differ from those reported in previous studies by Simporé *et al.*, and Tani Sagna *et al.*, who reported prevalences that moved up and down; 6.9% in 1997 to 4.4% in 2002 and 21.43% in 2009 versus 10.46% in 2013 (Simpore *et al.*, 2006;

Sagna *et al.*, 2015). These variations may be due to the evolution and consolidation of the programs. PMTCT has evolved into eMTCT, and the early days of PMTCT were marked by a lack of support from pregnant women and a lack of knowledge about PMTCT (Zongo and Ouattara, 2008). Among HIV-positive pregnant women attending ANC, 98.0% were infected with HIV-1, compared with just one case of HIV-2, i.e. 2.0% (1/51) in 2019. Those seen in 2020, 2021, and 2022 were all HIV-1 positive. The high HIV-1 rate could be explained by the fact that HIV-1 is the cause of most HIV infections worldwide, as it is the most virulent (Edward, 2021).

HIV prevalence among pregnant women attending ANC who did not know their HIV status beforehand also decreased from 1.2 % in 2019 to 0.4 % in 2022. Among these pregnant women, 2 cases of HIV-2 or 15.4% (2/13) were detected in 2020, 2 cases of HIV-2 or 20% (2/10), and 1 case of HIV-1/2 co-infection or 10% (1/10) in 2021. HIV-1 was in the majority, i.e. 100% in 2019; 84.6 % in 2020; 70% in 2021, and 100% in 2022. These results are close to those of Sagna *et al.*, in 2015, who obtained an overall prevalence of HIV-positive pregnant women from 2009 to 2013 of 7.3% (227/3,127); i.e. 97.4% (221/227) were infected with HIV-1; 1.8% (4/227) were infected with HIV-2 and 0.9% (2/227) had mixed HIV-1/HIV-2 infections. The predominance of HIV-1 reported by Sagna *et al.*, may be explained by the fact that HIV-1 is more widespread, more virulent, and more transmissible than HIV-2, while co-infection is still rare (Sagna *et al.*, 2015). Finally, HIV prevalence among partners who have received an HIV test increased from 9.8 % (5/51) in 2019 to 18.8% (3/16) in 2021 before experiencing a reduction to 6.7 % in 2022. This reduction could be explained by compliance with PMTCT recommendations involving male partners in HIV testing, but it remains very low, with an adherence rate of 2.91% (UNAIDS, 2019).

The number of children born to HIV-positive mothers who received a PCR test decreased from 2019 to 2022. This may be related to the decline in HIV prevalence in pregnant women over the years. HIV prevalence in children under 18 months of age born to PCR HIV-positive mothers has risen considerably, from 5.6 % (6/108) in 2017 to 12.2 % (5/41) in 2021. This high rate could be explained by the fact that the mothers of these children may not have benefited from a PMTCT program or correctly followed PMTCT protocols. By 2022, HIV prevalence among children under 18 months of age born to PCR-positive mothers was 0.0% (0/57).

**Table.1** Pregnant women and their partners by year and age

Characteristics	2019 (years)					2020 (years)					2021 (years)					2022 (years)				
	≤ 19	20-25	≥ 25	Total	p-value	≤ 19	20-25	≥ 25	Total	p-value	≤ 19	20-25	≥ 25	Total	p-value	≤ 19	20-25	≥ 25	Total	p-value
<b>Total number of pregnant women attending ANC</b>	135 (4.7)	790 (27.3)	1 967 (68.0)	2 892	<0.001	144 (10.8)	322 (27.2)	866 (65.0)	1 332	<0.001	41 (2.7)	309 (20.3)	1 173 (76.9)	1 525	<0.001	34 (2.8)	185 (15.2)	996 (82.0)	1 215	<0.001
<b>Number of HIV-positive pregnant women who attended ANC</b>	4 (7.84)	7 (13.7)	40 (78.4)	51	<0.001	0 (0)	0 (0)	20 (100)	20	-	0 (0)	2 (14.3)	12 (85.7)	14	-	0 (0)	0 (0)	13 (100)	13	-
<b>Number of pregnant women received HIV test</b>	131 (4.6)	783 (27.6)	1 927 (67.8)	2 841	<0.001	144 (11.0)	322 (24.5)	846 (64.5)	1 312	<0.001	41 (2.7)	309 (20.5)	1 161 (76.8)	1 511	<0.001	34 (2.8)	185 (15.4)	983 (81.8)	1 202	<0.001
<b>Number of pregnant women tested HIV positive</b>	6 (4.6)	13 (1.7)	66 (3.4)	85 (3.0)	-	0 (0)	6 (1.9)	27 (3.2)	33 (2.5)	-	0 (0)	5 (1.6)	19 (1.6)	24 (1.6)	-	0 (0)	1 (0.5)	17 (1.7)	18 (1.5)	-
<b>Number of pregnant women unaware of their HIV status attended ANC and received an HIV test</b>	127 (4.6)	776 (27.8)	1 887 (67.6)	2 790	<0.001	144 (11.2)	322 (24.9)	826 (63.9)	1 292	<0.001	41 (2.7)	307 (20.5)	1 149 (76.8)	1 497	<0.001	34 (2.9)	185 (15.6)	970 (81.6)	1 189	<0.001
<b>Number of pregnant women unaware of their HIV status attended ANC tested HIV positive</b>	2 (1.6)	6 (0.8)	26 (1.4)	34 (1.2)	-	0 (0)	6 (1.9)	7 (0.8)	13 (1.0)	-	0 (0)	3 (1.0)	7 (0.6)	10 (0.7)	-	0 (0)	1 (0.5)	4 (0.4)	5 (0.4)	-
<b>Number of partners of pregnant women tested for HIV</b>	0 (0)	7 (13.7)	44 (86.3)	51	<0.001	0 (0)	6 (14.3)	36 (85.7)	42	0.001	0 (0)	0 (0)	16 (100)	16	-	0 (0)	1 (6.3)	15 (93.7)	16	-
<b>Number of partners tested HIV positive</b>	0 (0.0)	0 (0.0)	5 (11.4)	5 (9.8)	-	0 (0.0)	0 (0.0)	8 (22.2)	8 (19.0)	-	0 (0.0)	0 (0.0)	3 (18.8)	3 (18.8)	-	0 (0.0)	0 (0.0)	1 (6.7)	1 (6.2)	-



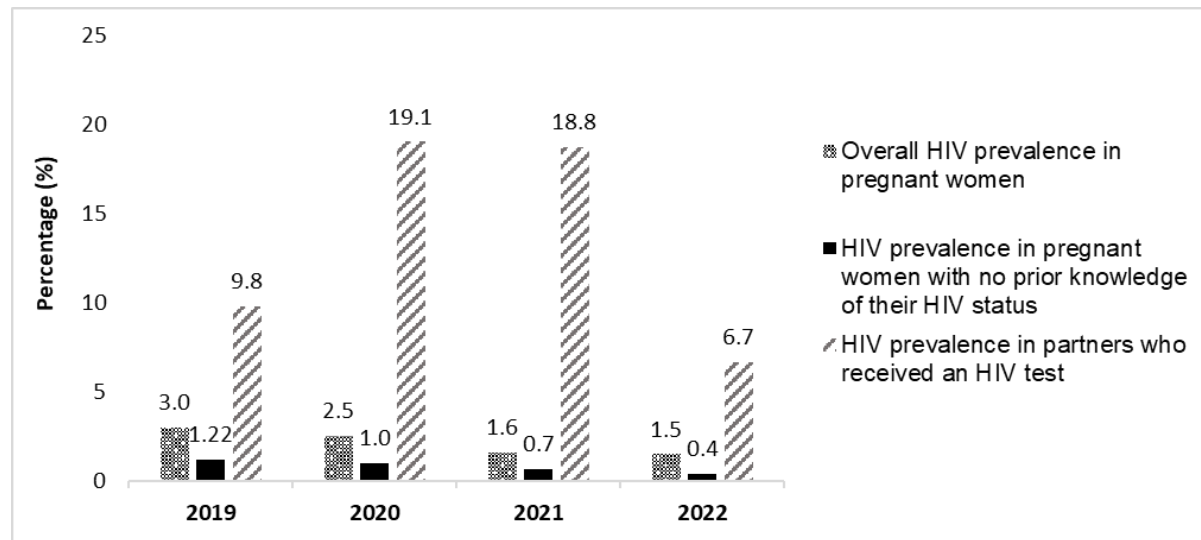
**Table.2** Distribution of pregnant women and their partners by HIV status and type of HIV

Characteristics	2019							2020							2021							2022						
	HIV status			p-value	Type of VIH			HIV status			p-value	Type of VIH			HIV status			p-value	Type of VIH			HIV status			p-value	Type of VIH		
	Neg	Pos	Total		HIV-1	HIV-2	HIV-1/2	Neg	Pos	Total		HIV-1	HIV-2	HIV-1/2	Neg	Pos	Total		HIV-1	HIV-2	HIV-1/2	Neg	Pos	Total		HIV-1	HIV-2	HIV-1/2
Number of HIV-positive pregnant women who attended ANC	0	51	51		50	1	0	0	20	20	-	20	0	0	0	14	14	-	14	0	0	0	13	13		13	0	0
Overall HIV prevalence in pregnant women	2 756 (97.0)	85 (3.0)	2 841	<0.001	84 (98.8)	1 (1.2)	0 (0)	1 279 (97.5)	33 (2.5)	1 312	<0.001	31 (93.9)	2 (6.1)	0 (0)	1 487 (98.4)	24 (1.6)	1 511	<0.001	21 (87.5)	2 (8.3)	1 (4.2)	1 184 (98.5)	18 (1.5)	1 202	<0.001	18 (100)	0 (0)	0 (0)
HIV prevalence in pregnant women with no prior knowledge of their HIV status	2 756 (98.8)	34 (1.2)	2 790	<0.001	34 (100)	0 (0)	0 (0)	1 279 (99.00)	13 (1.0)	1 292	<0.001	11 (84.6)	2 (15.4)	0 (0)	1 487 (99.3)	10 (0.7)	1 497	<0.001	7 (70)	2 (20)	1 (10)	1 184 (99.6)	5 (0.4)	1 189	<0.001	5 (100)	0 (0)	0 (0)
HIV prevalence in partners who received an HIV test	46 (90.2)	5 (9.8)	51	-	5 (100)	0 (0)	0 (0)	34 (80.9)	8 (19.1)	42	0.005	8 (100)	0 (0)	0 (0)	13 (81.3)	3 (18.7)	16	-	3 (100)	0 (0)	0 (0)	14 (93.3)	1 (6.7)	15	-	0 (0)	1 (100)	0 (0)

**Table.3** Residual rate of HIV transmission in children under 18 months of age born to HIV-positive mothers by PCR

Sex	2017			p-value	2018			p-value	2019			p-value	2021			p-value	2022			P-value
	HIV-	HIV+	Total		HIV-	HIV+	Total		HIV-	HIV+	Total		HIV-	HIV+	Total		HIV-	HIV+	Total	
Male	56 (93.3)	4 (6.7)	60	0.690	50 (89.3)	6 (10.7)	56	0.036	9 (81.8)	2 (18.2)	11	0.476	17 (94.4)	1 (5.6)	18	0.141	32 (100)	0 (0)	32	-
Female	46 (95.8)	2 (4.2)	48		42 (100)	0 (0)	42		10 (100)	0 (0)	10		10 (71.4)	4 (28.6)	14		25 (100)	0 (0)	25	
Missing	0 (0)	0 (0)	0		8 (80)	2 (20)	10		0 (0)	0 (0)	0		9 (100)	0 (0)	9		0 (0)	0 (0)	0	
<b>Residual rate of HIV</b>	102 (94.4)	6 (5.6)	108	-	100 (92.6)	8 (7.4)	108	<0.001	19 (90.5)	2 (9.5)	21	-	36 (97.8)	5 (12.2)	41	-	57 (100)	0 (0.0)	57	-

**Figure.1** Trends of HIV prevalence among pregnant women and partners



This transmission rate remains low given the objective of MTCT elimination initiatives, which is to reduce mother-to-child transmission of HIV to a very low level so that it no longer constitutes a public health problem. The elimination of mother-to-child transmission (eMTCT) is defined as the reduction of new pediatric HIV infections by 90% and the reduction of the MTCT rate to less than 2% (WHO, 2015).

Our results are comparable to those of Soubeiga *et al.*, who showed that the vertical transmission rate was 0.0% (0/160) in children whose mothers were on Highly Active Antiretroviral Therapy (HAART) (AZT/3TC/NVP) or prophylaxis (AZT/3TC) (Soubeiga *et al.*, 2015).

Either way, offering HIV testing to couples reveals a benefit as it enables safer sexual behavior among couples (Masters *et al.*, 2016; Chibango *et al.*, 2023), better adherence to ART for HIV-positive partners (Rodger *et al.*, 2011), and pre-exposure prophylaxis (PrEP) for HIV-negative partners in serodiscordant relationships, as well as greater uptake and adherence to the prevention of mother-to-child transmission (PMTCT) intervention (Medley *et al.*, 2013; Audet *et al.*, 2021). It would therefore be vital to step up efforts to improve the availability of HIV testing to partners in resource-limited countries if the chain of HIV transmission between couples is to be broken. Our study has a few limitations. Data of pregnant women and their partners attending ANC from 2017 to 2018 were not available at the time of data collection. This impact the interpretation of the evolution of HIV prevalence among pregnant women since the beginning of the program of eMTCT/VIH in 2017.

In this study, the main objective was to determine the evolution of HIV infection in pregnant women and children under 18 months of age. The overall results showed a reduction in HIV prevalence from 2017 to 2022. Overall HIV prevalence in all positive pregnant women decreased from 2019 to 2022.

HIV prevalence in children under 18 months of age by PCR decreased to 0.0% in 2022. This demonstrates the effectiveness of the new eMTCT/HIV program in Burkina Faso. To maintain the reduction of mother-to-child transmission of HIV in Burkina Faso, it is very important that all HIV-positive pregnant women follow the eMTCT/HIV protocol, and that eMTCT/HIV programs reach women's partners in antenatal care.

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## Author contribution

STS, JS : study design and manuscript drafting ; TMZ : supervision ; JPYJ : data collection and analyses ; JS : All author : reviewing and approval of the manuscript.

## Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Research Funding:** Not applicable

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**Consent to Participate:** Not applicable.

**Consent to Publish:** Not applicable.

**Conflict of Interest:** The authors declare no competing interests.

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