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Research Article

Evaluation Of The Prevention Of Mother-To-Child Transmission (Pmtct) Of The Human Immunodeficiency Virus (Hiv) In Children Born To Hiv-Positive Mothers In Two Medical Centers In Ouagadougou (Burkina Faso).

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Abstract

Introduction: Mother-to-child transmission is a major route of HIV transmission among children. Despite various prevention programs, Burkina Faso is recording cases of mother-to-child transmission of the human immunodeficiency virus (HIV). This study aims to evaluate measures to prevent mother-to-child transmission at the Kossodo Medical Center with Surgical Unit (MSU) and the Samandin Urban Medical Center (UMC) from 2021 to 2023.

Methodology: This was a descriptive cross-sectional study with retrospective data collection that took place from January 2021 to December 2023 at the Kossodo MSU and the Samandin UMC. The sample consisted of all children born to HIV-positive mothers. HIV testing in these children was carried out using the Polymerization Chain Reaction (PCR) technique and HIV serology at the laboratory of the Charles De Gaulle Pediatric University Hospital (CDG PUH). The determinants of the PMTCT programme in force in Burkina Faso were assessed.

Results: The study involved 57 children born to HIV-positive mothers. The population was predominantly male (50.87%) with a sex ratio of 1.03. The average age of the children was 14.14 months. The majority (92.89%) of the children received ARV prophylaxis. DNA PCR was mostly performed at 3 and 6 months and, among the children who underwent this examination, 9.43% were positive. Serology was mostly performed at the age of 18 months and among those who performed it, 10% were positive. The overall transmission rate was 15.78%.

Conclusion: The study revealed that the rate of vertical transmission of HIV is high in these two health centers in Ouagadougou. The PMTCT program guidelines were insufficiently implemented. Thus, in view of this observation, it is necessary to challenge the authorities responsible for the effective implementation of PMTCT programs in order to effectively reduce the risk of HIV transmission among exposed children.

Keywords : PMTCT, early diagnosis, HIV monitoring in children, mother-to-child transmission of HIV.

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INTRODUCTION

Despite progress in the fight against HIV infection, it remains one of the major pandemics worldwide [1]. Although a significant decline in transmission has been observed, there are still populations that do not benefit from appropriate prevention and support services, particularly in sub-Saharan Africa. This inadequacy is believed to contribute to maintaining transmission among adolescents, particularly among young girls and expectant mothers [2]. In 2023, more than 300 children aged 0 to 14 were infected every day worldwide, and nearly 130,000 adolescents aged 15 to 19 were estimated to have been infected with HIV, including 7 out of 10 adolescent girls [2]. According to the World Health Organization (WHO), approximately 1.3 million women and girls living with HIV become pregnant each year [3, 4]. This situation favors mother-to-child transmission of HIV (MTCT), which represents more than 90% of HIV infections in infants and young children and more than 10% of all HIV infections worldwide [5]. Transmission rates are variable and remain high in the absence of adequate care, with 25% during childbirth and 20% during pregnancy or breastfeeding [5, 6].
In Burkina Faso, the actions of the National Prevention of Mother-to-Child Transmission (PMTCT) of HIV Program have improved treatment coverage, increasing from 15% coverage of health facilities between 2001 and 2005 to 92% between 2006 and 2010, and then to 98.2% between 2011 and 2015 [7]. Despite these achievements, there are still cases of mother-to-child transmission of HIV. This situation could be due to inadequacies in the implementation or monitoring of protocols for the prevention of mother-to-child transmission. It is in this context that this study was initiated to evaluate the effectiveness of the PMTCT strategy in two health facilities in the city of Ouagadougou in Burkina Faso

METHODOLOGY

Study Setting

The survey was conducted at two medical centers in the city of Ouagadougou, Burkina Faso. Specifically, the Kossodo MSU and the Samandin UMC. These health centers have functional PMTCT services that are easily accessible to pregnant women. These sites also offer demographic diversity and strong community involvement. The CDG PUH medical biology analysis laboratory analyzed blood samples from children born to HIV-positive mothers at both study sites as part of the PMTCT programme.

Study Type and Period

This was a cross-sectional, descriptive and analytical study with retrospective data collection conducted in two public health facilities in the city of Ouagadougou over a two-year period, from January 2021 to December 2023.

Study Population

The survey involved children born to mothers living with HIV, registered and monitored at the study sites during the study period. Study participants were selected based on information properly recorded as part of the PMTCT program. A comprehensive sample of all children born to HIV-positive mothers was conducted.

Data Collection

Data were collected from blood collection records and clinical record registers at the two medical centers. The results of PCR tests for the search for proviral Deoxyribonucleic Acid (DNA) in children and serological tests for the search for anti-HIV antibodies were collected from the CHUP-CDG laboratory records.

PMTCT performance criteria in force in Burkina Faso [8]

All infants born to HIV-positive mothers must receive an initial PCR test using a dried blood spot (DBS) within 6 weeks of birth to detect possible HIV infection at birth;
A second PCR test is indicated at 3 months to confirm initial results and detect any new infections. A third PCR test is indicated at 6 months to ensure continuous monitoring and detect any late infections.
At 18 months: Diagnosis is indirect and based on serology, as is the case for adults.
Infants of HIV-positive mothers must receive prophylaxis with Nevirapine and/or Zidovudine (AZT)
Data processing and analysis: Data were processed using Epi Info software version 7.2.6.0. The graphs and figures were created using Excel software in its 2019 version.

Ethical and Professional Conduct Considerations

The study protocol received approval from the ethics committee and authorization from health officials in the Central Region (the health region that hosts the two study sites). Confidentiality of data relating to patients and staff at the various health facilities was maintained.

RESULTS

Socio-demographic Characteristics of the Children

A total of 57 children born to HIV-positive mothers following the PMTCT program were included in the study for the period 2021 to 2023.
The majority of the children came from the Kossodo MSU (71.93%) compared to 28.07% for the Samandin UMC. The average age was 14.14 months, with extremes of one (01) month and 22 months. Among these infants, 29 (50.87%) were male and 28 (49.12%) were female, with a sex ratio of 1.03.

PMTCT Results at Both Sites

Among the 57 children of HIV-positive mothers, fifty-three (53%) children received antiretroviral (ARV) prophylaxis, including 41 (77.36%) with Nevirapine (NVP) and 12 (22.64%) with Zidovudine, and four (4%) children did not receive ARV prophylaxis at birth. Among these children, 9 (15.8%) were HIV-positive, as shown in the table below (**Table I**):

Table I. PMTCT Results at Both Sites

ARV	Number (%)	Test Results of biological diagnosis	
		Positive (%)	Negative (%)
NVP	41 (77.36)	5 (12.19)	36 (87,80)
AZT	12 (22,64)		
Total	53 (93)		
Aucun ARV	4 (7)	4 (100%)	0
TOTAL	57	(100)	

Regarding the viral load of mothers at the birth of the newborn, 48 (84.2%) children were born to mothers who had a viral load below 1000 copies/mL and 5 (8.8%) with a viral load above 1000 copies/mL.

In relation to the age of carrying out biological tests (PCR and serology) / PCR and serology in children are indicated in the table below (**Table II**)

Table II. Biological tests (PCR and serology VIH) according to the child's age.

Test type	Age at the moment of the test	Number (%)
HIV PCR	Day birth	2 (3.77)
	1 month	7 (13.20)
	2 month	5 (5.66)
	3 months	38 (71.69)
	6 month	39 (73.5)
VIH serology	< 18 months	2 (5)
	18 months	29 (72.50)
	> 18 months	9 (22.50)

According to the results of the biological tests, among the 53 PCRs carried out, 5 (9.43%) were positive and 4 (10%) of the 40 serological tests carried out were positive as presented in **Table III**.

Table III. Results of molecular and serological HIV tests in children monitored

Test type	Result	Number (%)
HIV PCR	Positive	5 (9.43)
	Negative	48 (90.57)
	Not carried out	4 (7)
HIV Serology	Positive	4 (10)
	Negative	36 (90)
	Not carried out	29.90

Proportion of infected children according to PCR-DNA test as a function of ARV prophylaxis.

Among the children who received ARV prophylaxis, the 4 who were not on prophylaxis were HIV positive (100%) as shown in **Table IV**

Table IV. Distribution of cases according to ARV treatment intake and according to the biological tests results

	HIV PCR + N (%)	HIV PCR - N (%)	Total ARV	HIV Serology + N (%)	HIV Serology- N (%)	Total ARV
Oui	3 (5.88)	48 (94.11)	51	2 (5.26)	36 (9.73)	38
Non	2 (100)	0 (0)	2	2 (100)	0 (0)	2

DISCUSSION

This study was conducted among infants monitored as part of the PMTCT program in two health centers in the city of Ouagadougou. Using a descriptive survey, the collected data were analyzed to assess the effectiveness of the strategy implemented to reduce or even interrupt the chain of HIV transmission from mother to child.

The study involved a total of 57 children aged 1 to 22 months from 2021 to 2023 at both sites. Over two years, this number appears low compared to the results of studies conducted in other countries such as Mali (n = 112) and Cameroon (n = 138) [9, 10]. This low number could be due to the improvement of PMTCT actions in the city of Ouagadougou. The age range of the participants exceeds the limit recommended by the Prevention of Mother-to-Child Transmission (PMTCT). program, which recommends monitoring exposed children between 0 and 18 months. For comparison, the study by Telly and al. in Mali in 2023 reported extreme ages of 0 to 18 months [11]. The inclusion of children beyond this range may reflect an inadequacy in the implementation of the mother-to-child transmission monitoring system. There was no significant difference in the number of boys compared to that of girls. These data are superimposable with the results reported in Mali by Gadio and al. in 2022 and by Dembélé and al. in 2023 [12, 13].

In total, 93% of children received antiretroviral (ARV) prophylaxis at birth, mainly based on nevirapine (77.36%) or zidovudine. This rate remains below the standard recommended by the Prevention of Mother-to-Child Transmission (PMTCT) program, which advocates coverage of greater than 95% of exposed newborns. However, our results corroborate those reported by Tall et al. in Mali in 2019, in which 94.4% of the children included received this prophylaxis [9]. This suboptimal coverage could be explained by deliveries occurring at home or outside of health facilities or by ARV supply disruptions.

The overall rate of mother-to-child transmission of HIV observed in this study was 15.7%, a figure higher than the estimated national average of 9.7% in 2020. It also exceeds the results of the study conducted by Achwoka and al. in Kenya in 2018, which reported a rate of 8.7% [14]. This very high rate, which is not in line with the objectives set by PMTCT, could be justified by the incomplete coverage of prophylaxis in newborns and the insufficient adherence to antiretroviral treatment by HIV-positive mothers.

Among the 53 (93.0%) children who received a PCR-DNA test, only nearly 17% did so within the first six (06) weeks of life, 72% at 3 months, and 74% at 6 months. These results are well below the level recommended by the PMTCT program. This program recommends performing the first virological test within the first six weeks of the infant's life to detect possible in utero contamination. It is recommended to perform a second test at 3 months of life to confirm the status, and a third at 6 months to identify possible late contamination. In Mali, Gadio and al. reported in 2022 that 90.6% of children had received a PCR-DNA test between 0 and 6 months [12].

The observed differences compared to the present study could be explained by inadequacies in postnatal pediatric follow-up and the difficulty of tracing newborns in the first weeks after birth. Of the 40 children tested for serology, 2 (5%) received a serological test before the age of 18 months, 29 (72.5%) at 18 months, and 9 (22.5%) beyond this age. These data are also not consistent with PMTCT guidelines, which recommend systematic serological testing at 18 months of age for all exposed children.

Inadequate postnatal follow-up and irregular maternal consultations could be the main causes of these insufficient results compared to PMTCT programme guidelines. Furthermore, the 93.0% success rate of the PCR technique for proviral DNA research is relatively high, but remains lower than that recommended by the PMTCT program in force in Burkina Faso. These results are higher than those reported by Ouédraogo/Yugbare and al. in 2010 in Burkina Faso which were 76.85% [15].

Of the five (9.43%) children who had a positive PCR-DNA result, three (3) were born to mothers whose viral load at the time of delivery exceeded 1000 copies/mL, and the other two (2) had not received antiretroviral prophylaxis at birth. This positivity rate is low compared to that reported by Kanteng and al. in 2013 in Lubumbashi (11.8%) but higher than that of Yénan and al. in 2020 in Bouaké in Ivory Coast, which was 6.8% [16,17]. This level of transmission could be attributed to the inadequacy of neonatal prophylaxis applied to these children and to high maternal plasma viral loads.

These two elements are recognized as increased risk factors for vertical transmission of HIV. Of the 40 (70%) children tested for serology, 4 (7.0%) had a positive result. This serology completion rate is lower than the expectations of the PMTCT program, which recommends systematic serological testing at 18 months. This insufficient coverage may be explained by the fact that some children had not yet reached the required age at the time of the study. Among the 4 positive cases, one child had been tested at 12 months, and two had not received postnatal ARV prophylaxis. These results could be partially influenced by the early performance of the serological test (12 months of the infant's life). The presence of circulating maternal antibodies could make the test positive, leading to a false interpretation. Furthermore, the absence of ARV prophylaxis is a key factor which increases the risk of mother-to-child transmission of HIV.

Analysis of DNA PCR results by antiretroviral prophylaxis indicates that, among the 51 children who received ARV prophylaxis at birth, 3 (5.8%) tested positive. This rate is

almost identical to that reported by Sontié et al. in 2010 in Burkina Faso, who found a positivity rate of 5.9% among children who received ARV prophylaxis [18]. This residual transmission rate could be explained by a delay in the initiation of prophylaxis, which is a key factor influencing the effectiveness of preventing mother-to-child transmission of HIV.

Regarding serological results, 2 (5.26%) of the 38 children who received ARV prophylaxis tested positive. This rate is lower than that reported by Kanteng and al. in 2013 in Lubumbashi, Democratic Republic of Congo, where 14.3% (4/28) of children who received prophylaxis had a positive serological result [16]. This difference could be partly due to the performance of the serological test before the recommended age of 18 months in some children, a period during which maternal antibodies may still be present, leading to false positive or difficult to interpret results.

CONCLUSION

The assessment of the prevention of mother-to-child transmission (PMTCT) of HIV conducted at the Kossodo MSU and the Samandin UMC over a two-year period revealed a high transmission rate compared to national and international PMTCT targets. Inadequate neonatal antiretroviral prophylaxis was a determining factor in mother-to-child transmission.

Furthermore, adherence to the recommended schedule for early diagnosis by DNA PCR (at 6 weeks, 3 months, and 6 months) was not systematic. Similarly, serological tests were not always performed at the indicated age, compromising the reliability of results and exposing the patient to misdiagnosis. These shortcomings highlight the need to strengthen efforts to monitor and adhere to ARV treatment among HIV-positive pregnant women, as well as the systematic administration of ARV prophylaxis to newborns. It is imperative to scale up existing interventions, including improving access to antiretrovirals, continuous patient awareness, training of healthcare staff and rigorous implementation of postnatal monitoring for improved PMTCT.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Bibata Yanogo: Wrote the body of the article. Absatou BA/ KY: Principal Investigator who edited the article. Issa Tondé: Edited the article. Marcel Sawadogo: Edited the article. Thierry Djiguemdé: Edited the article. Arnaud Diendere: Edited the article. Idriss Traoré: Edited the article. Salimata Diallo: Participated in the data collection. Issoufou Ouédraogo: Participated in the data collection. Idrissa Sanou: Edited the article.

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