

Research Article

HIV and Pregnancy: Experience of the Center for Virology, Infectious and Tropical Diseases of the Mohammed V Military Teaching Hospital of Rabat

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Abstract

Introduction: Our work describes the clinical, virological and therapeutic characteristics of a cohort of pregnant women living with Human Immunodeficiency Virus (HIV) and assesses the Mother-To-Child Transmission (MTCT) observed within a referral center for the management of this infection in Morocco.

Methods: Descriptive retrospective study conducted at the Center for Virology, Infectious and Tropical Diseases (CVMIT) of the Mohammed V Military Teaching Hospital of Rabat, between April 2022 and April 2025, including all HIV-positive pregnant women followed during this period.

Results: Nine patients were included, with a mean age of 30.6 years. Five patients (56%) were aware of their HIV-positive status before pregnancy. All patients started triple antiretroviral therapy, predominantly based on Dolutegravir, Lamivudine and Tenofovir Disoproxil Fumarate. At 36 Weeks of Gestation (WG), eight out of nine patients had a viral load below 400 copies/mL, of whom seven were undetectable. A scheduled cesarean section was performed in six patients. All newborns were born alive at term, received appropriate antiretroviral prophylaxis and exclusive formula feeding. HIV PCR performed on day 3 and at 1, 3 and 6 months, as well as ELISA serology at 18 months, were negative in all 9 infants. No case of mother-to-child transmission of HIV was observed.

Conclusion: The results of our study, although based on a small sample size, confirm the effectiveness of prophylactic measures in preventing perinatal transmission of HIV infection.

Keywords: HIV; Pregnancy; Perinatal; Antiretrovirals; Morocco

Abbreviations

CVMIT: Center for Virology, Infectious and Tropical Diseases; HMIMV: Mohammed V Military Teaching Hospital; MTCT: Mother-To-Child Transmission; HIV: Human Immunodeficiency Virus; UNAIDS: Joint United Nations Program on HIV/AIDS; PMTCT: Prevention of Mother-To-Child Transmission; WHO: World Health

Organization; ELISA: Enzyme-Linked Immunosorbent Assay; PCR: Polymerase Chain Reaction; ART: Antiretroviral Therapy; WG: Weeks of Gestation; DTG: Dolutegravir; 3TC: Lamivudine; TDF: Tenofovir Disoproxil Fumarate; FTC: Emtricitabine ; ZDV/AZT: Zidovudine/Azidothymidine; NVP: Nevirapine; ANRS-EPF: French Perinatal Cohort (ANRS); PHACS/SMARTT: Pediatric HIV/AIDS Cohort Study / Surveillance Monitoring For ART Toxicities

Introduction

Human Immunodeficiency Virus (HIV) infection remains a major global public health issue. According to UNAIDS estimates, nearly 39.9 million people were living with HIV in 2023 [1]. In Morocco, 410 pregnant women living with HIV were recorded the same year [2]. Mother-to-child transmission of HIV can occur during pregnancy, delivery or breastfeeding, and constitutes the main route of HIV infection in children [3-9]. In the absence of antiretroviral intervention, the risk of perinatal transmission can reach 45% in breastfeeding populations in resource-limited countries [6,7,9,10]. Conversely, management based on maternal screening, initiation of antiretroviral therapy and neonatal prophylaxis considerably reduces

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this risk [3-9,11].

Although national guidelines aim to ensure HIV screening coverage in 95% of pregnant women, implementation of this objective remains confronted with difficulties, particularly in terms of accessibility to screening services in certain vulnerable populations. Furthermore, distance from healthcare facilities was one of the factors associated with the level of knowledge, underscoring the importance of simultaneously strengthening targeted awareness campaigns and geographic accessibility to screening and prevention services [10].

The present work aims to describe the clinical, virological and therapeutic characteristics of patients followed as part of PMTCT and to assess the MTCT observed in this cohort.

Materials and Methods

This is a descriptive retrospective study, conducted over a three-year period, from April 2022 to April 2025. The study population includes all HIV-positive pregnant women followed in the department during this period. Pregnant patients known to be HIV-positive before pregnancy as well as those diagnosed during pregnancy were included. Non-pregnant patients, those diagnosed after delivery, as well as those followed outside the study period or at other facilities, were excluded.

Data were collected from medical records using a standardized data collection form. The variables analyzed included clinical characteristics, immunovirological parameters (viral load and initial CD4 count), obstetric data (pregnancy follow-up, complications and mode of delivery), therapeutic data (antiretroviral regimen and time of initiation), as well as neonatal data (antiretroviral prophylaxis, virological follow-up and final serological status).

Patient management was based on an integrated multidisciplinary approach. After screening, an initial evaluation including immunovirological work-up was performed, followed by the initiation or adaptation of antiretroviral therapy in accordance with current recommendations. Follow-up was coordinated with the obstetric and pediatric teams. Perinatal management included adaptation of the mode of delivery according to the maternal and obstetric context. At birth, the newborns received antiretroviral prophylaxis. Neonatal follow-up included HIV PCR at day 3, 1 month, 3 months and 6 months, as well as ELISA serology at 18 months.

Data entry and analysis were performed using Microsoft Excel[®], using a descriptive approach, with results presented as tables and graphs. Ethical principles were strictly observed, particularly regarding data confidentiality and anonymization.

Results

Cohort characteristics

Nine patients met the eligibility criteria and were included in our study. Pregnant women living with HIV had a mean age of 30.6 years (range: 22-38 years). All patients underwent screening by ELISA serology, followed by diagnostic confirmation by positive HIV-1 PCR. Most patients (8 out of 9) were asymptomatic and classified as WHO stage I. The route of transmission was mainly sexual (7 out of 9 patients), predominantly within a marital context.

Individual virological and therapeutic profile according to the time of antiretroviral therapy initiation

The timing of antiretroviral therapy (ART) initiation (ART) and

virological status close to delivery were examined as a priority, as this pair of variables is, in international literature, the determinant most directly linked to the risk of MTCT [4-6,9,12]. Five patients were already on ART before conception; the other four started treatment during pregnancy: one in the first trimester, one in the second trimester, and two in the third trimester (Figure 1). Virological parameters and initial CD4 counts are presented in Table 1.

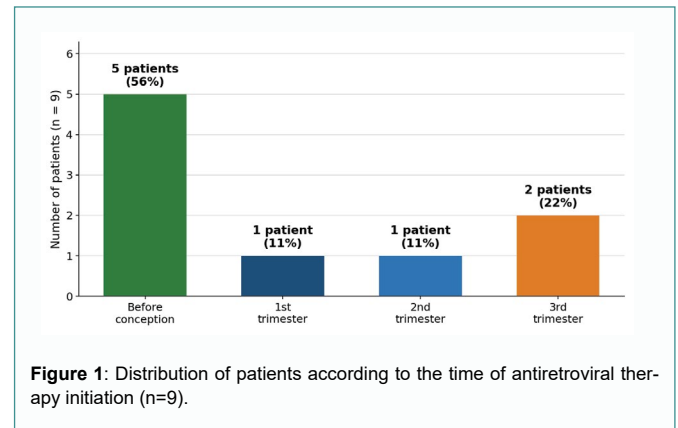


Figure 1: Distribution of patients according to the time of antiretroviral therapy initiation (n=9).

The five patients treated before conception, as well as the two patients who started treatment in the first and second trimesters, all achieved an undetectable viral load at 36 WG. The two patients diagnosed and treated in the third trimester still had a detectable viral load at 36 WG (560 and 75 copies/mL).

Obstetric follow-up of patients

Obstetric follow-up included clinical, biological and ultrasound monitoring. No major obstetric complications were observed. The indications for cesarean section identified in the cohort were either virological (high viral load at 36 WG, late discovery of HIV-positive status) or purely obstetric (poorly controlled gestational diabetes, contracted pelvis, breech presentation); they are detailed and grouped in Table 2, presented below along with delivery data.

Delivery and perinatal management

Viral load at 36 WG was measured in all patients. Eight women (89%) had a viral load below 400 copies/mL, of whom seven had an undetectable viral load (<50 copies/mL), while only one patient had a viral load above 400 copies/mL, the threshold used in our series for the indication of cesarean section [13] (Figure 2). All pregnancies were carried to term, with delivery at 38 or 39 WG. No complications were observed during labor, delivery or the postpartum period.

Neonatal follow-up and evaluation of perinatal HIV transmission

All newborns were born alive and at term. Antiretroviral prophylaxis was administered to them immediately after birth, and exclusive formula feeding was adopted in all patients. Neonatal virological follow-up, detailed in Table 3, confirmed the absence of infection at all control points up to 18 months.

No case of perinatal HIV transmission was observed in our study, including in patients who still had a detectable viral load at 36 WG.

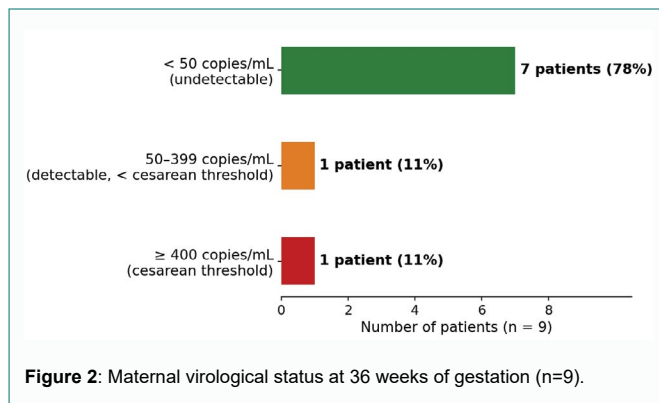
Discussion

Our study, involving nine pregnant women living with HIV, did not identify any case of mother-to-child transmission of HIV. This

Table 1: Individual summary of virological and therapeutic parameters according to the time of antiretroviral therapy initiation.

Group (n)	Initial viral load	Initial CD4	ART regimen	Viral load at 36 WG	Virological status at 36 WG
Patients 1-5: ART before conception (n=5)	Undetectable (< 50 copies/mL)	> 500/mm ³	DTG + 3TC + TDF	<50 copies/mL (undetectable)	Controlled (5/5)
Patient 6: 1st trimester (n=1)	58,000 copies/mL	512/mm ³	DTG + 3TC + TDF	<50 copies/mL (undetectable)	Controlled
Patient 7: 2nd trimester (n=1)	4,571 copies/mL	189/mm ³	DTG + 3TC + TDF	<50 copies/mL (undetectable)	Controlled
Patient 8: 3rd trimester (n=1)	11,500 copies/mL	540/mm ³	DTG + 3TC + TDF	560 copies/mL	Detectable (>cesarean threshold)
Patient 9: 3rd trimester (n=1)	6,650 copies/mL	670/mm ³	DTG + Truvada*	75 copies/mL	Detectable (<cesarean threshold)

DTG: Dolutegravir; 3TC: Lamivudine; TDF: Tenofovir Disoproxil Fumarate; Truvada*: TDF + Emtricitabine (FTC).



result must nevertheless be interpreted with caution given the small size of the cohort, which allows neither a precise estimate of the residual risk of transmission nor a conclusion of an absence of risk. Interpretation of our observations therefore requires placing them in the context of available data, in particular those from the French Perinatal Cohort (ANRS-EPF) [12], the Moroccan study conducted in Essaouira [10], the American PHACS/SMARTT cohort [15] and several studies conducted in sub-Saharan Africa [6-9,14].

HIV screening and early management

In our series, 44% of patients discovered their HIV-positive status during pregnancy, mainly in the third trimester. This proportion underscores the importance of late diagnosis as a potential obstacle to early initiation of antiretroviral therapy and achievement of virological suppression before delivery [6,9,11,15].

This issue falls within a broader context of screening and awareness. Knowledge regarding prevention varies notably according to education level, family income, distance from the healthcare facility and source of information [10].

Comparable results have been reported in certain African cohorts. In Lubumbashi, 54.1% of mothers had been screened during their pregnancy [6]. In Mali, 35% of women had been included for the first time in a PMTCT program during the current pregnancy, while 65% were already being followed and treated before conception [9]. these differences must nevertheless be interpreted with caution, given the heterogeneity of study periods, populations, screening and management strategies.

Although these data are not directly comparable to those of our clinical cohort, they highlight the importance of information, awareness-raising and improved access to screening in preventing late diagnosis.

Early treatment and virological control before delivery

In our series, individual observations suggest that the early timing of diagnosis and initiation of antiretroviral therapy was a stronger determinant of achieving virological suppression at 36 weeks of gestation than the initial virological or immunological parameters. Thus, patient 6, diagnosed in the first trimester, had a high initial viral load of 58,000 copies/mL, but achieved an undetectable viral load at 36 weeks of gestation. Conversely, patient 9, diagnosed in the third trimester and with a lower initial viral load of 6,650 copies/mL, still had a detectable viral load at that term. Similarly, patient 7, diagnosed in the second trimester with an initial CD4 count of 189 cells/mm³, achieved an undetectable viral load at 36 weeks of gestation, whereas the two patients diagnosed in the third trimester, despite having initial CD4 counts above 500 cells/mm³, still had detectable viral loads at that time.

Overall, the five patients treated before conception, as well as the two patients who started treatment in the first or second trimester, achieved an undetectable viral load at 36 weeks of gestation, whereas the two patients managed in the third trimester still had a detectable viral load at that term. These observations thus suggest that, in our cohort, the early timing of management was more determinant in achieving virological control before delivery than the viral load or initial CD4 count.

These results are consistent with data from the ANRS-EPF French Perinatal Cohort. In this cohort, no transmission was observed among the 5,482 women treated from conception and with an undetectable viral load close to delivery, whereas a residual risk of transmission persisted among women treated from conception but with a detectable viral load at delivery, with a transmission rate of 1.08% [12]. The absence of transmission observed in our cohort, including among patients whose viral load remained detectable at 36 weeks of gestation, does not, however, allow us to conclude that there is no risk, given the very limited sample size.

Antiretroviral strategy and maternal and neonatal tolerance

The regimen combining Dolutegravir, Lamivudine and Tenofovir Disoproxil Fumarate, used in 89% of our patients, corresponds to a first-line recommended regimen for pregnant women living with HIV [5,9,11,16]. The adverse effects reported in our series were limited to insomnia associated with mild transient headaches in two patients and moderate weight gain in one patient.

No neonatal complications were observed in our cohort. These results must nevertheless be interpreted in light of the small sample size, which does not allow an assessment of the neonatal safety of these treatments. For comparison, the PHACS/SMARTT cohort, including more than 3,500 children exposed in utero to antiretrovirals, reported

associations between certain antiretroviral exposures and perinatal outcomes, notably an increased risk of prematurity associated with first-trimester exposure to certain protease inhibitor-based regimens, as well as an association between Tenofovir exposure and decreased neonatal bone mineralization [4,15]. These data highlight the importance of continuous monitoring of maternal and infant tolerance to the treatments used during pregnancy.

Viral load, delivery circumstances and choice of mode of delivery

In our series, viral load at 36 weeks of gestation was assessed in all patients and contributed to the decision regarding mode of delivery. Other obstetric indications, in accordance with current international recommendations and detailed in Table 2, also influenced the choice of mode of delivery [5,11,16].

Table 2: Mode of delivery and indications identified (n=9).

Mode of delivery	Indication	n
Scheduled cesarean section (n=6)	High viral load (>400 copies/mL) at 36 WG	1
	Late discovery of HIV-positive status	1
	Poorly controlled gestational diabetes	1
	Contracted pelvis	2
	Breech presentation	1
Vaginal delivery (n=3)	Undetectable viral load, no obstetric indication	3

Data from the literature suggest that the role of mode of delivery must be interpreted according to the virological context and the circumstances of labor. Zorrilla's work notably highlighted the importance of the duration of membrane rupture in the risk of mother-to-child transmission. The protective effect of cesarean section, observed in certain analyses, appeared to diminish after accounting for this factor, suggesting that the duration of the newborn's exposure to maternal secretions could play a determining role in the risk of intrapartum transmission. These results indicate that prevention of transmission at the time of delivery depends not only on the mode of delivery but also on maternal virological control and the circumstances of labor [3,4].

In this context, achieving maternal virological suppression is the central element in preventing intrapartum transmission. When viral replication is effectively controlled, the relative influence of mode of delivery and labor circumstances on transmission risk tends to decrease, which explains the progressive shift in obstetric practices toward greater use of vaginal delivery in women with satisfactory virological control.

Evolution of obstetric practices and international comparison

The proportion of vaginal deliveries varied considerably across studies. It was particularly high in Lubumbashi, with 97.4% of

deliveries, in Guédiawaye with 88.1%, and in Bamako with 76.9%. In Lomé, vaginal delivery accounted for approximately 72.7% of deliveries [6-9].

The evolution of obstetric practices within the French cohort shows a progressive change in mode of delivery over time. Between 2000 and 2005, cesarean section was predominant, accounting for 69.0% of deliveries compared with 31.0% by vaginal delivery. Between 2011 and 2017, in parallel with improved virological control through antiretroviral therapy, the proportion of vaginal deliveries increased to reach 59.6%, while the overall proportion of cesarean sections decreased to 40.4% [12].

The proportion of vaginal deliveries observed in our series, namely 33%, thus appears lower than that reported in the various African studies and than that observed in the French cohort during the recent period. This difference could notably be explained by the substantial proportion of late diagnoses and viral loads still detectable close to delivery in our cohort, as well as by the coexistence of obstetric indications.

Absence of mother-to-child transmission and regional perspective

The absence of MTCT observed in our cohort can be placed in perspective with data reported in other African cohorts.

In Lubumbashi, a study of 157 mother-child pairs reported a vertical transmission rate of 12.7%. Transmission was notably associated with advanced WHO clinical stage, the presence of an opportunistic infection, late screening and a maternal CD4 count below 350 cells/mm³ [6]. In Lomé, a cohort of 322 children followed between 2004 and 2007 reported a transmission rate of 9% at 18 months, with premature rupture of membranes being the main risk factor identified [7].

Conversely, in the Guédiawaye cohort in Senegal, followed as part of option B+, serology was negative in all infants at 14 months of age [8]. Similarly, in Mali, a study of 160 pregnant women living with HIV reported a final mother-to-child transmission rate of zero among children who were followed up to the determination of their final serological status at 18 months [9].

Taken together, these data suggest that the absence of transmission does not depend on a single factor, but on the effectiveness of a cascade of care combining early screening, prompt initiation of effective antiretroviral therapy, good adherence, virological suppression before delivery, and adequate follow-up of mother and child. However, comparisons between the different studies must remain cautious given the heterogeneity of populations, study periods, therapeutic strategies and follow-up modalities [4,6-9,12].

Table 3: Neonatal outcome and virological status of infants (n=9). ZDV: Zidovudine (AZT); 3TC: Lamivudine; NVP: Nevirapine.

Neonatal parameter	Modality	n (%)
Neonatal ARV prophylaxis	Zidovudine (monotherapy)	7 (78%)
	Enhanced triple antiretroviral prophylaxis: ZDV + 3TC + NVP (late maternal diagnosis)	2 (22%)
Feeding	Exclusive formula feeding	9 (100%)
HIV PCR - Day 3	Negative	9 (100%)
HIV PCR - 1 month	Negative	9 (100%)
HIV PCR - 3 months	Negative	9 (100%)
HIV PCR - 6 months	Negative	9 (100%)
ELISA serology - 18 months	Negative	9 (100%)
Mother-to-child transmission of HIV	No cases	0 (0%)

Study limitations

Our study has several limitations that must be taken into account when interpreting the results. Its retrospective, single-center nature, as well as its very small sample size, limited to nine patients, reduce the scope of the conclusions and do not allow a precise estimate of the residual risk of mother-to-child transmission. The absence of a centralized information system may also have limited the completeness of the data collected.

Consequently, the absence of transmission observed in our series should be considered a descriptive observation in a small cohort and rather than as demonstrating a zero risk. Despite these limitations, this study provides data from a Moroccan reference center and highlights the importance of early diagnosis, prompt initiation of antiretroviral therapy, and achievement of virological suppression before delivery in the prevention of mother-to-child transmission of HIV.

Conclusion

Prevention of mother-to-child transmission of HIV relies on screening, initiation of antiretroviral therapy, and follow-up of mother and child. In our series, no mother-to-child transmission was observed among the 9 newborns. These results are encouraging but must be interpreted in light of the small sample size and the single-center nature of the study.

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