

Prevention of Mother-To-Child Transmission of HIV in the Neonatal Intensive Care and Neonatology Department of the University Hospital of Fez: A 10-Year Retrospective Series of 32 Newborns Exposed to HIV (2010-2019)

D. Oukachou^{1*}, F. Kouzi¹, K. Skalli Houssaini¹, F. Mbarki¹, S. Rahmouni¹, F. Hmami¹

¹Department of Neonatology and Neonatal Intensive Care, Hassan II University Hospital, Faculty of Medicine and Pharmacy, Sidi Mohamed Ben Abdellah University, Fez, Morocco

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*Corresponding author: D. Oukachou

Department of Neonatology and Neonatal Intensive Care, Hassan II University Hospital, Faculty of Medicine and Pharmacy, Sidi Mohamed Ben Abdellah University, Fez, Morocco

Abstract

Original Research Article

Background: Mother-to-child transmission (MTCT) is the principal route of pediatric HIV infection. In the absence of intervention, vertical transmission occurs in 15–45% of exposures, whereas a complete prevention-of-MTCT (PMTCT) cascade reduces this risk to below 5%. We describe the characteristics, PMTCT implementation and outcomes of HIV-exposed neonates managed over ten years at a Moroccan tertiary referral center. **Methods:** Retrospective single-center descriptive series of live neonates born to HIV-positive mothers and managed at the Neonatology and Neonatal Intensive Care Department of Hassan II University Hospital, Fez, between 2010 and 2019. The applied PMTCT protocol comprised maternal antiretroviral therapy (ART), caesarean delivery when indicated by a high third-trimester viral load, neonatal antiretroviral prophylaxis, exclusive replacement feeding, deferral of BCG, cotrimoxazole prophylaxis and a virological (PCR) follow-up schedule with confirmatory serology at 18 months. Infant HIV status was the main outcome. Descriptive statistics were used. **Results:** Thirty-two live neonates were included. Maternal infection had been diagnosed before pregnancy in 16 and during pregnancy in 16. Maternal ART had been started more than one month before delivery in 29 mothers, with adherence to caesarean indications; three mothers were diagnosed late, received no treatment and delivered vaginally. All neonates received antiretroviral prophylaxis and exclusive replacement feeding. HIV transmission occurred in 3 of 32 infants (9.4%); the remaining 29 were PCR-negative. The three transmissions corresponded to the three late-diagnosed, untreated mother–infant pairs, so that no transmission was observed among pairs that received the full antenatal PMTCT package. **Conclusions:** PMTCT was highly effective when the full cascade was delivered; residual transmission occurred exclusively in mother–infant pairs missed by antenatal screening. Strengthening universal antenatal and intrapartum HIV testing, partner testing and timely maternal ART is the priority for eliminating vertical transmission in this setting.

Keywords: HIV; Infectious disease transmission, vertical; Pregnancy complications, infectious; Antiretroviral prophylaxis; Infant, newborn; Morocco.

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INTRODUCTION

The pediatric HIV epidemic is largely the result of mother-to-child transmission (MTCT), which can occur in utero, intrapartum or through breastfeeding. In the absence of any intervention, the risk of vertical transmission ranges from 15% to 45%; with a complete prevention-of-MTCT (PMTCT) cascade antenatal diagnosis, maternal antiretroviral therapy (ART), appropriate mode of delivery, neonatal antiretroviral prophylaxis and safe infant feeding

the risk falls below 2% in non-breastfeeding and below 5% in breastfeeding populations [1–3]. Globally, PMTCT strategies have averted an estimated 3.4 million pediatric infections since 2000, yet new infections in children persist, underlining the importance of a fully delivered cascade [2].

Morocco has a low-level, concentrated HIV epidemic. National estimates place the number of people living with HIV at roughly 22 000–24 000, with a general-population prevalence below 0.1%, a substantial

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proportion of women among those affected, and a large share of infections in women attributed to transmission by a regular partner [6]. The country has made steady progress and is engaged in the process toward validation of the elimination of MTCT, which makes the systematic description of local PMTCT practice and outcomes particularly relevant.

The objective of this study was to describe the maternal and neonatal characteristics, the implementation of the PMTCT cascade, and the transmission outcomes of a ten-year series of HIV-exposed neonates managed at a tertiary referral centre in Fez [7].

METHODS

Study design and setting

This was a retrospective, single-centre descriptive case series conducted at the Department of Neonatology and Neonatal Intensive Care of Hassan II University Hospital, Fez a tertiary referral centre for HIV-exposed neonates over the period 2010–2019.

Participants

All live neonates born to HIV-positive mothers and managed at the Neonatology and Neonatal Intensive Care Department during the study period were included; cases were ascertained from the departmental PMTCT register. Stillbirths and neonates transferred to another institution before the completion of the initial PMTCT protocol, for whom outcome data were unavailable, were excluded.

PMTCT protocol and variables

The following protocol was applied. Mothers received ART, with delivery by caesarean section when indicated by a high viral load in the third trimester. At birth, neonatal care included gentle aspiration if required, washing with an antiseptic solution, ocular cleansing with normal saline and clinical examination, with attention to confidentiality and the avoidance of stigmatisation. Neonatal antiretroviral prophylaxis consisted of zidovudine for four weeks when the mother had been treated and the delivery indication respected, or triple prophylaxis (zidovudine, lamivudine and nevirapine) for four weeks otherwise. All infants received exclusive replacement (formula) feeding; BCG was deferred. Cotrimoxazole prophylaxis was started from the fourth week, and hepatitis B vaccination was given within 72 hours of birth. Virological testing (HIV PCR) was performed at birth, at 6–12 weeks and at 3–4 months, with confirmatory HIV antibody serology at 18 months; BCG was administered only after HIV infection had been excluded.

Outcome

The main outcome was the infant HIV status (infected versus uninfected), defined by HIV PCR during follow-up and confirmed by serology at 18 months.

Recorded variables included the timing of maternal HIV diagnosis (before or during pregnancy), maternal ART, mode of delivery, neonatal prophylaxis, feeding mode and follow-up results.

Ethics

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Ethics Committee of the Faculty of Medicine and Pharmacy of Fez. Because the cohort is small and the condition remains stigmatised locally, all data were anonymised before analysis, no identifying information is reported, and the requirement for individual consent was waived for this retrospective review of routinely collected, de-identified clinical data.

Statistical analysis

Categorical variables are summarised as counts and percentages. Given the sample size, the analysis is descriptive; no formal hypothesis testing was undertaken.

RESULTS

Maternal characteristics and PMTCT delivery

Thirty-two live neonates born to HIV-positive mothers were included over 2010–2019. Maternal infection had been diagnosed before pregnancy in 16 mothers and during pregnancy in the other 16. Maternal ART had been initiated more than one month before delivery in 29 mothers, with adherence to the indications for caesarean delivery. Three mothers were diagnosed late, received no antenatal treatment and delivered vaginally.

Neonatal management and outcome

All 32 neonates received antiretroviral prophylaxis and exclusive replacement feeding. HIV transmission occurred in 3 of 32 infants (9.4%), while 29 infants were PCR-negative. The three infected infants corresponded to the three late-diagnosed, untreated mother–infant pairs; accordingly, no transmission was observed among the 29 pairs that received the full antenatal PMTCT package, an association confirmed against the departmental PMTCT register.

Illustrative cases

Case A successful PMTCT.

A female neonate was reviewed at birth because of maternal HIV infection. The mother's status had been identified after an older sibling was diagnosed with HIV at six months of age; her viral load was undetectable in the third trimester. Delivery was vaginal (birth weight 2600 g) with an unremarkable neonatal examination. The infant received zidovudine prophylaxis for six weeks and exclusive replacement feeding; HIV PCR was negative at birth and at 12 weeks, and serology was negative at 18 months. BCG was administered after the negative serology. The infant remained uninfected.

Table 1: Maternal and neonatal characteristics and outcomes (N = 32)

Variable	n (%)
Maternal HIV diagnosed before pregnancy	16 (50.0)
Maternal HIV diagnosed during pregnancy	16 (50.0)
Maternal ART started >1 month before delivery	29 (90.6)
Late maternal diagnosis, no ART, vaginal delivery	3 (9.4)
Neonatal antiretroviral prophylaxis	32 (100)
Exclusive replacement feeding	32 (100)
Infant HIV-uninfected (PCR-negative)	29 (90.6)
Infant HIV-infected (PCR-positive)	3 (9.4)

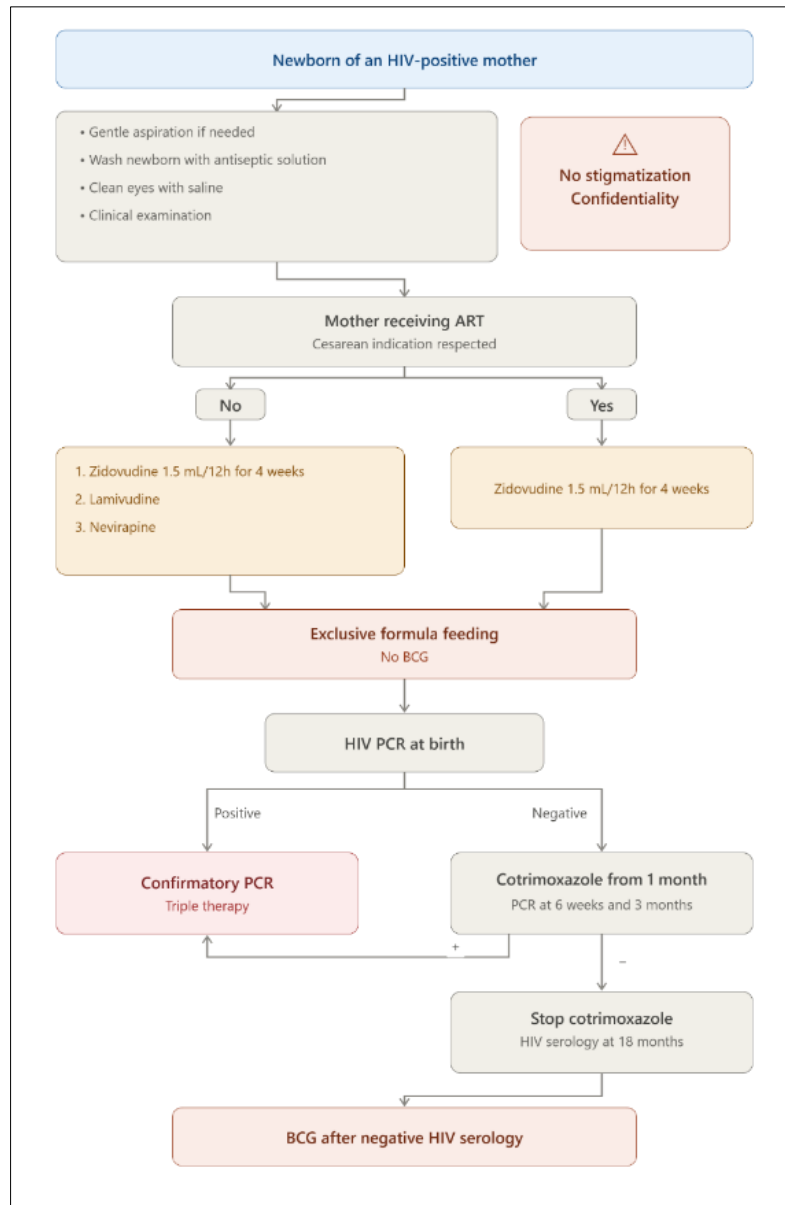


Figure 1: PMTCT management algorithm for the newborn of an HIV-positive mother applied at the centre: neonatal care and confidentiality; zidovudine four-week prophylaxis when the mother was treated and the caesarean indication respected, otherwise triple prophylaxis; exclusive replacement feeding; deferral of BCG; HIV PCR at birth with a defined virological follow-up; and initiation of triple therapy in confirmed infection

Case B late maternal diagnosis.

A newborn was delivered vaginally to a mother whose HIV infection was identified by a rapid test in the delivery room, with a very high viral load. Triple neonatal prophylaxis was started at birth, but the infant's viral load was very high at birth and infection was

confirmed. ART was initiated; the child is now seven years old and asymptomatic.

Case C undiagnosed maternal HIV, fatal presentation.

A two-month-old infant was referred with a three-day history of respiratory distress and fever. On

admission there was severe respiratory distress (oxygen saturation 20% in room air, rising to 80% on 6 L/min of oxygen) with crackles and cyanosis, requiring intubation and ventilation; inflammatory markers were only modestly raised. The infant died on the third day of hospitalisation. HIV rapid testing and Western blot were positive, and both parents were seropositive; maternal HIV had not been diagnosed antenatally. This course is

consistent with severe opportunistic pneumonia in an infant with unrecognized perinatally acquired HIV, and illustrates the consequences of a missed PMTCT cascade. This infant was not part of the 32-neonate cohort reported above, since maternal HIV infection was recognized only after the child's death; the case is presented separately as an illustrative example of a missed antenatal diagnosis.

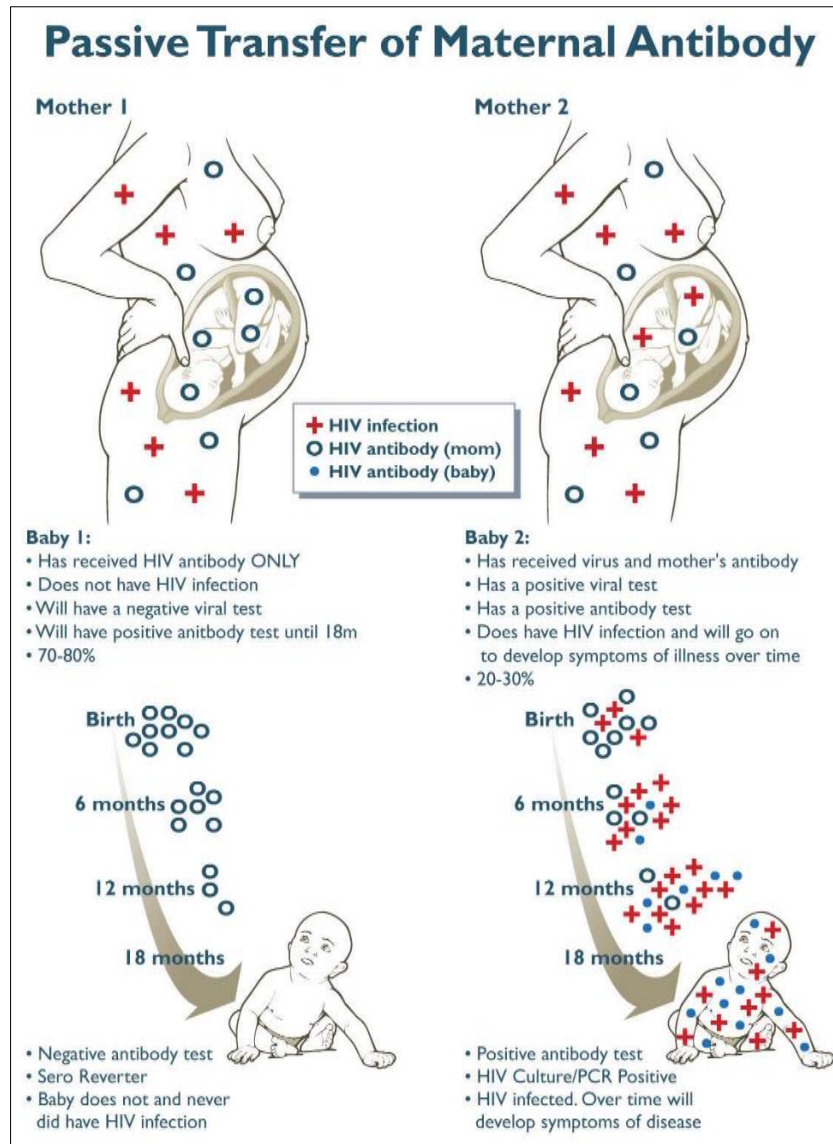


Figure 2: Follow-up calendar for the HIV-exposed

DISCUSSION

In this ten-year single-centre series, vertical HIV transmission occurred in 9.4% of exposed infants, but the transmissions were not distributed at random: they occurred exclusively in the three mother–infant pairs in which maternal infection was diagnosed late and no antenatal treatment was given, whereas none of the 29 pairs who received the full antenatal package became infected. The residual risk in this series was therefore concentrated entirely in the gaps of the PMTCT cascade rather than in its failure when applied.

This pattern is consistent with the wider literature. Without intervention, vertical transmission ranges from 15% to 45%, whereas a complete cascade reduces the risk to below 2–5% [1–3]. Studies of programme performance show that the risk rises sharply when individual steps antenatal testing, maternal ART or infant prophylaxis are missed [4]. The fatal, undiagnosed case reported here (Case C) is the clinical embodiment of that failure: an infant presenting with severe opportunistic pneumonia because maternal HIV had never been identified antenatally.

These findings point to a clear operational priority. Because maternal treatment and neonatal prophylaxis were highly effective when delivered, the decisive intervention is to ensure that no maternal infection is missed through universal antenatal HIV testing, systematic rapid testing in labour for women of unknown status, and partner testing, the latter being especially relevant where a large share of infections in women is acquired from a regular partner [6]. Exclusive replacement feeding, feasible in this setting, further limits postnatal transmission. Morocco's engagement in the process toward validation of the elimination of MTCT provides a favourable framework for closing these residual gaps.

The study has important limitations. It is retrospective, single-centre and small, which precludes formal statistical inference and limits generalisability; some data are likely to be incomplete, and the exact correspondence between the three untreated pairs and the three infections, although strongly suggested, should be verified against the primary records. Completeness of 18-month serological confirmation and of long-term follow-up should also be documented. Despite these limitations, the series provides a coherent local picture and a strong, actionable message about where transmission risk remains.

CONCLUSION

Prevention of mother-to-child transmission of HIV was highly effective in this series when the full cascade was delivered, and the residual transmission occurred solely in mother–infant pairs missed by antenatal screening. Strengthening universal antenatal and intrapartum HIV testing, partner testing and timely maternal ART together with neonatal prophylaxis and safe infant feeding is the priority for moving toward the elimination of vertical HIV transmission in this setting.

Declarations

Ethics approval and consent to participate.

This study was approved by the Institutional Ethics Committee of the Faculty of Medicine and Pharmacy of Fez. As a retrospective review of anonymised, routinely collected clinical data, the requirement for individual informed consent was waived by the committee.

Consent for publication

Written informed consent for publication of the illustrative cases and any images was obtained from the parents/legal guardians.

Availability of data: The de-identified data supporting this study are available from the corresponding author on reasonable request.

Competing interests. The authors declare that they have no competing interests.

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Authors' contributions

All authors contributed to the conception and design of the study, the acquisition and interpretation of clinical data, and the drafting and critical revision of the manuscript for important intellectual content. All authors read and approved the final version of the manuscript and agree to be accountable for all aspects of the work, in accordance with ICMJE authorship criteria.

Abbreviations

HIV, human immunodeficiency virus; MTCT, mother-to-child transmission; PMTCT, prevention of mother-to-child transmission; ART, antiretroviral therapy; PCR, polymerase chain reaction; BCG, Bacillus Calmette–Guérin.

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