

Full Length Research Paper

Outcome of infants born to HIV-positive women through the aspects of prevention of mother to child transmission in Lomé (Togo, West Africa) from 2008 to 2010

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Human immunodeficiency virus/Acquired immune deficiency syndrome (HIV/AIDS) infection in children under 15 years is mostly due to mother to child transmission. The purpose of this study was to assess the outcome of infants born to HIV-positive women through the prevention of mother to child transmission (PMTCT) aspects at Sylvanus Olympio's Teaching Hospital of Lomé. This retrospective study of 24 months (from September 1, 2008 to September 1, 2010) was performed in 232 recorded files of infants delivered in the centre and monitored in the pediatrics department. From 230 women who had given birth to 232 infants, 224 (97.4%) knew their positive HIV status before delivery and 6 (2.6%) tested positive after child birth. Low birth weight was observed in 21.5% of newborns and 12.3% were born preterm. Two hundred seven (55.0%) infants were exclusively breastfed, with abrupt weaning at 4 months in 40.2% (39). Polymerase chain reaction (PCR) test was performed at 17 and 19 weeks in the 232 infants and 13 positive cases were found (5.6% transmission rate). An assessment of the centre in 2010 identified a mother-child transmission rate of HIV that was still high. There was need to strengthen screening strategies, counselling during antenatal care, and access to ART for all pregnant women.

Key words: Prevention of mother to child transmission (PMTCT), human immunodeficiency virus (HIV) pregnant women, antiretroviral treatment, Togo, West Africa.

INTRODUCTION

Human immunodeficiency virus/Acquired immune deficiency syndrome (HIV/AIDS) infection remains a major public health problem despite the Joint United

Nations Program on HIV/AIDS (UNAIDS) report of the decrease of its incidence by 38% in the last fourteen years (UNAIDS, 2014a).

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Sub-Saharan Africa region is still the most affected by the pandemic in the world. Of the 35 million people infected with HIV worldwide in 2013, nearly 70% were living in sub-Saharan Africa. It was also reported that there was 73% of the 1.5 million AIDS deaths in this region, in 2013 (UNAIDS, 2014a). Women are the most exposed group; they represent more than half (about 58%) of the people living with HIV in sub-Saharan Africa. Approximately 700 infants per day are infected due to mother to child transmission of the virus (UNAIDS, 2014a; AIDS, 2014). The risk of this perinatal HIV transmission in developing countries varies from 2 to 35% in the absence of any intervention (UNAIDS, 2014b). In Europe, through prevention strategies involving combinations of two or three antiretroviral (ARV) drugs, mother to child HIV transmission (MTCT) rates below 1 to 2% are observed (Aebi-Popp et al., 2013). In sub-Saharan Africa, remarkable progress has been made in recent years towards the expansion of prevention of mother to child transmission (PMTCT) programs. New HIV infections among children fell by 43% in priority countries (UNAIDS, 2014b).

Due to the emphasis that has been placed on programs, including PMTCT, Togo is among the countries where the incidence of HIV has decreased. HIV prevalence in the general population in Togo was 3.4% in 2011. Between 2001 and 2011, new infections have declined in the general population by 58%, including a decrease of about 45% in children of 0 to 14 years old and almost 57% among sex workers between 2005 and 2011 (National Council Against AIDS and STIs Togo, 2012). PMTCT protocol began in 2002 in Togo and consists of a single dose of Nevirapine (NVP) and since 2008, Zidovudine (AZT) in short course was used as recommended by WHO (WHO, 2006). At the time of this study, the current protocol consists of the administration of AZT (300 mg × 2/day) in monoprophylaxis during pregnancy (from the 28th week of amenorrhea), and the administration of a single dose of NVP (200 mg) associated with AZT (600 mg) with Lamivudine (3TC, 150 mg) during labor. The same protocol allowed the administration of AZT (600 mg) + 3TC (150 mg) to the mother for 7 days post-partum and a single dose of NVP (2 mg/kg/day) + AZT (4 mg/kg × 2/day) to children for 6 weeks post-partum. The Obstetrics and Gynecology Department of Sylvanus Olympio Teaching Hospital Centre of Lomé receives and monitors HIV positive pregnant women from all peripheral health facilities where this current ARV protocol is not always fully respected.

At the time of publication of this work (2015), the ARV protocol in force in the country has upgraded into Option B+, as recommended by the World Health Organization (WHO, 2012). This Option B+ protocol uses the combination of Tenofovir (TDF 300 mg) + Lamivudine (3TC 300 mg) + Efavirenz (EFV 600 mg) which must be taken by HIV positive pregnant women in their whole life.

For better control of mother to child transmission of HIV, it is important to understand factors under each ARV regime that may influence transmission of the virus.

The aim of this study was to assess the outcome of infant born to HIV positive mothers at Sylvanus Olympio's Teaching Hospital Centre of Lomé from 2008 to 2010.

MATERIALS AND METHODS

Study design

This study was done in the PMTCT care unit of the Obstetrics and Gynecology and Pediatrics Departments of Sylvanus Olympio's Teaching Hospital Centre of Lomé. It was a retrospective cohort study of clinical files of children registered from September 1st, 2008 to September 1st, 2010. Data (socio epidemiological characteristics of mothers and children) were collected from recorded files of women who delivered and from child monitoring recorded files in both maternity and pediatrics services.

Collaboration between obstetrics and gynecology and pediatric services in PMTCT

The Obstetrics and Gynecology Department of Sylvanus Olympio's Teaching Hospital (reference Centre of Lomé) receives HIV positive pregnant women from all peripheral health facilities. Some patients followed their antenatal care in the centre, so they were screened during pregnancy, and the others came just for delivery. Children born from mothers who have never been tested during pregnancy and whose HIV positive status has been discovered during labor were also included in this study.

Newborns whose mothers have been tested positive (during pregnancy or after birth), received their prophylaxis with NVP (2 mg/kg/day) + AZT (4 mg/kg × 2/day) in the first 72 h of life during 6 weeks, even if their mothers did not receive specific interventions to reduce MTCT of HIV (such as, the application of Benzalkonium chloride with a cannula in the vaginal cavity of the parturient and the cleaning of umbilical cord and body of newborns with chlorhexidine before section and ligation).

Children are referred to the pediatrics service of the hospital, accompanied by their mothers with their obstetric recorded files. Children monitoring in the pediatrics service was undertaken, including recording the dates of vaccinations. They are seen first at birth, then after one, six, ten and fourteen weeks and six, nine, twelve, fifteen, eighteen and twenty-four months of age.

Nutritional counseling, depending on the newborn's feeding mode is done at birth. In exclusive breastfeeding option, advice is given for early cessation of breastfeeding at 6 months, to avoid the risk of HIV transmission through long exposure (WHO, 2006, 2010). If artificial feeding was opted, lactation is inhibited in the mother by Bromocriptin tablets.

The first test of the child's HIV status using polymerase chain reaction (PCR) techniques is done at 6 weeks of age and the second is done two months after the final exposure to breast milk.

Inclusion criteria

Children born to HIV-positive women who received NVP and/or AZT in the first 72 h of life and were subsequently tested for HIV by PCR, were included in this study. Whether their mothers took ARV drug prophylaxis during pregnancy and childbirth was not a criterion for inclusion or exclusion from this study. Both mothers and newborns characteristics have been reported.

Table 1. Characteristics of the mothers.

Characteristic	Number (n=230)	Frequency (%)
Age (years)		
15 – 20	10	4.4
21 – 25	58	25.2
26 – 30	98	42.6
31 – 35	45	19.6
36 – 40	18	7.8
41 – 45	1	0.4
Educational level		
Primary	93	40.5
Secondary I	76	33
Secondary II	20	8.7
High school or university	5	2.2
Unschoolled	36	15.6
CD4cell count (cells/mm³)		
[0-200]	40	17.4
[200-350]	42	18.2
[350-500]	42	18.2
[500-1500]	58	25.3
Without cell count	48	20.9
Mode of delivery		
Cesarean section	85	37
Vaginal route	145	63
Total	230	100

Exclusion criteria

All children who have not had their dose of NVP or AZT and whose mothers had not taken prophylaxis or ART were excluded from this study.

Statistical analysis

Data were processed using SPSS Version 12 software. The chi-square test (χ^2) with a threshold of 5% was used for statistical analysis.

Ethical approval

The research was approved by the ethical committee of Sylvanus Olympio's Teaching Hospital Centre of Lomé (Togo). The data were collected in confidentiality and the identity of the patients has not been revealed.

RESULTS**Study population**

In total, a cohort of 232 children was registered on the

site and selected for the study. The children ages at the beginning of the follow-up were between 0 and 12 weeks.

PMTCT protocols on mothers

From 230 women, 224 (97.4%) knew their positive HIV status before delivery and 6 (2.6%) tested positive after child birth. Among the 224 women who knew their status before delivery, 124 (55.4%) received prophylaxis with AZT, 55 (24.6%) were on ART and 45 (20%) did not receive ARV. Serological analysis had shown HIV-1 on all of the 230 women.

Mother characteristics

Two hundred thirty HIV positive women had given birth to 232 infants (there were two sets of twins among the newborns). The socio epidemiological characteristics of the mothers are shown in Table 1.

The average age of the mothers was 28.5 ± 4.9 years with extremes of 17 and 42 years. Eighty two (35.6%) women had CD4 cell count fewer than 350 mm^{-3} . Of 82

Table 2. Characteristics of the children.

Characteristic	Number (n=232)	Frequency (%)
Birth weight (g)		
< 1500	1	0.4
[1500-2500]	20	8.6
[2500 -3500]	208	89.7
> 3500	3	1.3
Sex		
Male	114	49
Female	118	51
Pregnancy's term at birth		
<37 weeks of amenorrhea	27	11.6
≥37 weeks of amenorrhea	205	88.4
Chlorhexidine disinfection at birth		
No	3	1.3
Yes	170	73.3
Not specified	59	25.4
Mode of feeding		
Artificial replacement of feeding	116	50
Exclusive breastfeeding	111	48
Mixed feeding	5	2
Prophylaxis at first 72 h of life		
AZT + NVP	231	99.6
NVP alone	1	0.4
PCR test at an average age of 17 weeks		
Positive	13	5.6
Negative	219	94.4
Outcome of the children at the age of 9 months		
Dead	3	1.3
Alive	229	98.7

women who were eligible to receive ART, 23 (28%) of them did not take it (19 received prophylaxis with AZT during pregnancy and 4 received no ARV therapy).

Children's characteristics

The characteristics of the children are summarized in Table 2. 11.6% of the children were delivered prematurely and the average birth weight was 2820 ± 540 g, with a range of 1200 to 4000 g. Almost all of the newborns received AZT prophylaxis at birth.

The average age of the children at the first PCR (PCR1) was 17 weeks. The second PCR was performed

two months after final breastfeeding. The results were identical to those of the PCR1.

Three children of the group died during the follow-up before 9 months.

Analysis of factors associated to higher risk of mother to child HIV transmission

Risk factors analysis for HIV transmission was assessed by comparing the sex, birth weight, mode of feeding, mode of delivery, ART in mother and AZT prophylaxis of positive PCR infants to negative PCR infants (Table 3). The result shows that none of the factors had influenced

Table 3. Risk factors analysis according to first PCR test results.

Factor	PCR test		Total	P values
	Positive [n (%)]	Negative [n (%)]		
Newborn sex				
Female	8 (61.6)	110 (50.2)	118 (51)	0.570
Male	5 (38.4)	109 (49.8)	114 (49)	
Prematurity (<37 weeks of amenorrhea)				
Yes	1 (7.7)	26 (11.9)	27 (11.6)	1.000
No	12 (92.3)	193 (88.1)	205 (88.4)	
Low birth weight (<2500 g)				
Yes	1 (7.7)	20 (9)	21 (9)	1.000
No	12 (92.3)	199 (91)	211 (91)	
Mode of delivery				
Vaginally route	9 (69)	138 (63)	147 (63.3)	0.772
Cesarean section	4 (31)	81 (37)	85 (36.7)	
Mode of feeding				
Artificial Replacement of Feeding	5 (38.3)	111 (50.7)	116 (50)	0.569
Exclusive Breastfeeding	7 (54)	104 (47.3)	111 (48)	0.777
Mixed feeding	1 (7.7)	4 (2)	5 (2)	0.252
Antiretroviral treatment				
No	7 (54)	145 (66.2)	152 (65.5)	0.379
Yes	6 (46)	74 (33.8)	80 (34.5)	
Prophylaxis with Zidovudine				
No	0 (0)	0 (0)	0 (0)	1.000
Yes	13 (100)	219 (100)	232 (100)	
Total	13 (100)	219 (100)	232 (100)	

significantly the outcome of the children ($p>0.05$).

One hundred sixteen children were placed under artificial feeding from birth and among them, five children had a positive PCR, giving a rate of 4.3% for perinatal transmission (in utero and during labor delivery).

Profile of the children who tested positive

The different parameters of the children that tested positive are shown in Table 4.

DISCUSSION

Mother-to-child transmission of HIV remains the largest cause of HIV infection among children under 15 years. It occurs during pregnancy, childbirth or breastfeeding. The aim of PMTCT protocols is to prevent HIV transmission

from the infected mother to her child by ARV drugs, the use of caesarean section (according to viral load) and the postnatal practices, such as infant formula milks or exclusive breastfeeding for the first 6 months (Coutsoudis et al., 2015). Pregnant women can take advantage of these measures, if they know and accept their status regarding HIV earlier.

The results of this study showed that majority of the mothers (97.4%) knew their status before childbirth. This early HIV testing results can be attributed to the counseling and testing procedures that were integrated in most antenatal care centers in the country.

Many mothers were young, with an average age of about 28.5 years. This result is similar to those found by Essomo et al. (2008) in Gabon, whose average age was 25 years, low as compared to those of Balavoine et al. (2001) in Switzerland, and the report of Yeni (2010) in France, which showed that women aged 40 to 49 were the most infected with HIV during pregnancy.

Table 4. Profile of the infant tested positive.

Characteristic	Infant 1	Infant 2	Infant 3	Infant 4	Infant 5	Infant 6	Infant 7	Infant 8	Infant 9	Infant 10	Infant 11	Infant 12	Infant 13
Newborns													
Sex	Male	Female	Female	Male	Female	Female	Female	Male	Male	Female	Male	Female	Female
Prematurity	No	No	No	No	No	No	No	No	No	Yes	No	No	No
Hypotrophis	No	No	No	No	No	No	Yes	No	No	No	No	No	No
Disinfection (chlor.)	No	Yes	Yes	NP	No	Yes	Yes	NP	NP	NP	Yes	Yes	Yes
NVP	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AZT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mode of feeding	EBF	ARF	EBF	ARF	EBF	ARF	EBF	Mixte	ARF	ARF	EBF	EBF	EBF
Viral charge 1	460 10 ⁴	29 10 ⁴	300 10 ⁴	9.2 10 ⁴	52 10 ⁴	610 10 ⁴	17 10 ⁴	160 10 ⁴	1.5 10 ⁴	5.3 10 ⁴	250 10 ⁴	36 10 ⁴	1.1 10 ⁴
Viral charge 2	ND	ND	ND	ND	13 10 ⁴	ND	ND	8.6 10 ⁴	ND	ND	ND	ND	ND
CD4	P	499	NP	1475	NS	NS	Died	2696	2072	Died	Died	NS	NS
ART	P	Yes	Yes	Yes	No	Yes	Died	No	Yes	Died	Died	Yes	No
Mothers													
Serology	DP	DP	DP	DP	AD	DP	DP	DP	DP	DP	BP	DP	BP
Period of serology	NS	2 nd Q	2 nd Q	3 rd Q	AD	1 st Q	1 st Q	NS	2 nd Q	1 st Q	BP	2 nd Q	BP
CD4	131	569	NP	380	553	364	242	NP	86	280	23	749	194
ART BP	No	No	No	No	No	No	No	No	No	No	No	No	Yes
ART DP	No	No	No	No	No	No	No	No	Yes	No	No	No	No
Duration	No	No	No	No	No	No	No	No	3 months	No	No	No	1 year
AZT prophyl.	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	Yes	No
Duration	No	No	NS	No	No	2 weeks	2 months	No	No	No	NP	2 months	No
PP prophyl.	No	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No
Mode of delivery	VR	VR	VR	CS	VR	CS	CS	VR	VR	VR	VR	CS	VR
Rupture AC	Yes	No	No	No	No	No	NS	NS	NS	NS	NS	NS	No
Use of CI B	No	Yes	Yes	No	No	No	NS	NS	NS	NS	NS	NS	Yes
Episiotomy	Yes	No	No	No	No	No	No	NS	NS	NS	NS	No	No

NP: Not specified; EBF: exclusive breastfeeding; ARF: artificial replacement feeding; ND: not done; DP: during pregnancy; BP: before pregnancy; AD: after delivering; Q: quarter; VR: vaginal route; CS: cesarean section.

Eighty two women (35.6%) had their CD4 cell count fewer than 350 mm⁻³. Of 82 women who were eligible to ART, 23 (28%) did not start it; of these, 19 received only AZT and 4 received no therapy. The initiation of ART during pregnancy was low in the country due to the unavailability of

the drugs at the time of this study. According to the statistics of the National Program Against HIV, only 59.8% of persons living with HIV and eligible for treatment, have had access to ART in Togo in 2011 (National Program Against AIDS and STIs Togo, 2011). WHO recommended option B⁺,

Highly Active Antiretroviral Therapy (HAART) for all HIV-positive pregnant women regardless of the CD4 count (WHO, 2015a). All studies agree that the combination of ARV drugs reduces the rate of transmission to 1% and prevents the emergence of resistance (Chi et al., 2007; Shekelle et al.,

2007; McIntyre et al., 2009), but having extremely high cost, it was discouraged in use in countries with limited resources some years ago (Shah et al., 2011). The caesarean section represents 37% of deliveries in this study. This rate was significantly higher than that found by Traoré et al. (2010) in Mali who noted 17.3%. The use of cesarean section was opted even at low maternal viral loads to prevent MTCT (European Collaborative Study, 2010), but in the absence of obstetrical risk factors, HIV-infected women on ARV therapy with low viral loads can safely opt for vaginal delivery (Briand et al., 2013). The high rate of caesarean section registered in this study could come from the fact that the Obstetrics and Gynecology Department of the Sylvanus Olympio's Teaching Hospital was the national reference centre and thus received several cases of dystocia labour which generally led to surgical delivery. In the particular case of parturient living with HIV, caesarean delivery decision was further recommended due to the fact that the viral loads of the pregnant women were not known.

Of births in this study, 9% were low birth weight and 11.6% were preterm. HIV did not seem to be responsible for a lot of low birth weight and prematurity. Toumalala et al. (2002) showed that the incidence of preterm delivery in women with HIV in the United States was not consistently associated with HIV status. It was reported that, maternal CD4 level below 200/mm³, maternal body mass index less than 18.5, maternal eclampsia during pregnancy and HAART before pregnancy were factors associated with preterm delivery and low birth weight (Kebede et al., 2013). Half of the mothers (116) opted for artificial feeding. This could be explained by a grant or donation of milk from some NGOs which, sometimes, came to help mothers living with HIV that delivered in the center. This artificial feeding rate, however, remains below those observed in the sub-region (Leroy et al., 2007; Cames et al., 2010). Traoré et al. (2010) in Mali noted that infants were fed with milk replacers in 96% of cases and Dickotraoré et al. (2010) in 89.2% of cases. These data showed that mothers could easily understand modes of transmission and opted for artificial feeding (if all conditions were fulfilled) despite peer pressure and stigma usually found in black Africa and other places (UNAIDS, 1999).

The first PCR was done at 17 weeks (average age) showing the HIV perinatal transmission rate of 5.6%. This rate is higher than those found in other studies rates: 1.1 and 2.3% in Mali (Traoré et al., 2010; Dickotraoré et al., 2010), 0.6% in Cambodia (Kruy et al., 2010), 4.3% in Cameroon (NjomNlend et al., 2010). This high percentage in our series can be explained by the fact that it was not all the mothers who undergone the PMTCT protocol before birth. This was not the case for other series (prospective cohort studies) where mothers were followed up from the beginning of pregnancy till the end.

In this series, the risk factors analysis for HIV transmission related to sex, birth weight, mode of

feeding, mode of delivery, ART, and AZT prophylaxis were assessed by comparing positive PCR infant to negative PCR infant. None of the factors had influenced significantly the outcome of the children ($p>0.05$). Several authors have observed through their studies that many factors were associated with a high risk of transmission (John and Kreiss, 1996; Mofenson et al., 1999; Abrams 2004; da Cruz Gouveia et al., 2013). Contrary, in our study, none of the factors studied showed an effect on the transmission of infection. By combining maternal characteristics with those of infected newborns, the profile of mothers whose infant were infected were noted. The results showed that although mothers of children number 2, 5 and 12 have CD4 cell counts superior than 350 mm⁻³, children were infected at birth.

This confirms the fact that many other factors are often involved in the transmission of HIV/AIDS from mother to child. CD4 lymphopenia is the characteristic of HIV infection, but it is not specific for this infection. The intensity of CD4 lymphopenia was the first predictive marker of disease progression; but to date, the focus is on the viral load of the mother at the time of delivery. The viral load makes reference to the number of virus particles per milliliter of blood; the increase of this number causes destruction of CD4 T cells leading to the severity of the disease (WHO, 2015b). At the time when this study took place, the viral load testing of mothers was not performed in the centre, because of technical and economical inaccessibility.

Conclusion

This retrospective study has assessed the impact of PMTCT in a black Africa, specifically the Sylvanus Olympio's Centre of Lomé in 2010. A significant number of HIV-positive mothers were not under ARV treatment before delivery; however, strategy management implementation services in Obstetrics and Gynecology and Pediatrics of the centre has reduced the rate of transmission of HIV from mother to child. Fair results could have been obtained with a better screening test for HIV during pregnancy, a good prenatal care, a delivering route decision sustained by the determination of viral load and safer feeding practices of infants. The type and adherence of ARV therapy for seropositive pregnant and lactating women in this study could have also accounted for this transmission rate.

Conflict of Interests

The authors have not declared any conflict of interests.

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