

# Studies of the Risk Factors for HIV Transmission from Mothers Who are Seropositive under B+ Option to Children in the Mother-To-Child Transmission Prevention Sites of the City of Bangui

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## Research article

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## Abstract

**Introduction:** According to the 2016 program data, in pregnant women, the prevalence of HIV infection in Central African Republic was 3.8% with a mother-to-child transmission rate of 6.2%. A program to prevent the transmission of HIV from mother to child has been set up throughout the country. Despite these interventions, the number of infected infants continues to increase. It is in this context that we have proposed to study the rate prevalence of transmission of HIV from mother-to-child under the B + option and to identify the main risk factors associated with it.

**Material and methods:** This was a cross-sectional study, from 1<sup>st</sup> January to 31<sup>st</sup> December 2017 in five mother-to-child transmission prevention sites(MCTPS) in the city of Bangui. The study population consisted of all infants born to HIV-positive mothers followed under the B + option, and to whom the polymerase chain reaction (PCR) screening test was conducted between the 6th Life Week and 18 months.

**Results:** 293 infants were identified. Antiretroviral therapy was instituted in 95.6% of mothers and antiretroviral prophylaxis was 97.6% in infants. The rate of mother-to-child transmission of HIV was 4.1%. The main risk factors were the absence of antiretroviral therapy, the screening of mothers after childbirth, and maternal pathologies during pregnancy.

**Conclusion:** The rate of mother-to-child transmission is still high requiring the intensification of preventive measures.

**Keywords:** HIV-positive mothers; Prevention HIV Option B+; Bangui

## Introduction

Infection with the human immunodeficiency virus (HIV) is one of the most important public health problems in the world. In 2016, there were 2.1 million [1.7-2.6] of children under 15 living with HIV worldwide, or about 6% of the HIV-infected population. Ninety percent (90%) of these children lived in sub-Saharan Africa [1]. New HIV infections among children decreased by 47% from 300,000 [230,000 - 370,000] in 2010 to 160,000 [100,000 - 220,000] in 2016. About 76% [60 - 88%] of Pregnant women living with HIV had access to antiretroviral drugs to prevent HIV transmission to their babies, but only 43% [30-54%] of children aged 0-14 years had access to antiretroviral drugs. Thirty percent die before the age of one year and 50% die in their second year of life. Most children contracted the disease during the perinatal period and breastfeeding period [2]. In developed countries, early diagnosis, rapid discontinuation of breastfeeding, quality obstetric care, prophylactic caesarean section, broad access to tritherapies and the use of antiretroviral prophylaxis regimens (ARVs) improved since the early 2000s, have reduced the rates of mother-to-child transmission of HIV to less than 2% [3-5]. Since 2013, the national HIV program has adopted the B + Option protocol implemented in the 156 health facilities that offer Mother-to-Child transmission prevention (MCTP). According to 2015 program data, only 28% of HIV-positive pregnant women received an antiretroviral (ARV) intervention to reduce the risk of Mother-to-Child Transmission and 1,553 children were screened and treated out of 4,842 estimated in the country [6]. Despite the measures implemented by the government to scale up mother-to-child transmission, efforts still need to be made such as: avoiding recurrent antiretroviral ruptures (adult and pediatric), ensuring the availability of reagents for screening, improving the appropriate follow-up of infected mothers and their children, correct the poor practice of exclusive breastfeeding and poor adherence to treatment. All these elements expose children to the risk of contamination by the maternal route [6]. The purpose of this work was to determine the prevalence rate of mother-to-child transmission under B + option and to identify the main risk factors associated with it in transmission prevention sites in Bangui.

## Materials and Methods

This was a cross-sectional, retrospective, descriptive study from January 1<sup>st</sup> to December 31, 2017 in five MCTP sites in Bangui City, Central African Republic. The study population consisted of all infants born to HIV-positive

mothers who were followed under B + Option and received for early HIV testing in 2017 in the five selected sites in Bangui City. This was an exhaustive study. All infants born from seropositive mothers who were enrolled under B + Option in the selected sites and who met the inclusion criteria were enlisted. The sample size depended on the number of infants born to HIV-positive mothers under B + Option meeting the defined criteria. We included in the study any infants born to HIV-positive mothers, followed by B + Option who were screened by the polymerase chain reaction (PCR) between the 6th week of life and the age of 18 years. month. All infants born to HIV-positive mothers who were not tested under B + Option and who did not receive a PCR test were excluded. The variables studied were socio-demographic (age, sex, place of recruitment), clinical (birth weight), therapeutic (cotrimoxazole prophylaxis (CTM), antiretroviral (ARV), feeding method) and biological (result of the polymerase Chain reaction or serological test, date of return of results). Data collected on pre-established questionnaires were captured and analyzed using EpiData software. On the ethical front, the data collection sheets were anonymous.

## Results

We had a total of 293 infants born to HIV-positive mothers, all of whom were under the B + option in the city of Bangui during the study period. Table I shows the distribution of infants by location of follow-up.

| Sites                            | Number     | Percentage |
|----------------------------------|------------|------------|
| Community Hospital               | 151        | 51.4       |
| Health Center of Bede Combattant | 74         | 25.2       |
| Lakouanga Health Center          | 31         | 10.48      |
| Camp Izamo Infirmary             | 18         | 6.14       |
| Ouango Health Center             | 18         | 6.48       |
| <b>Total</b>                     | <b>293</b> | <b>100</b> |

Table 1: Distribution of infants by location of follow-up.

Compared to the screening period, of the 293 infants 187 were screened at 6 weeks or 63.82% and 106 were screened at more than 6 weeks or 36.18%. The distribution of infants by sex revealed that 146 (49.8%) were boys and 147 (50.2%) were girls with a sex ratio of 0.99. According to antiretroviral prophylaxis, 286 infants out of 293 (97.6%) were put on treatment. The distribution of mothers under B+ Option according to breastfeeding showed that 269 (91.8%) were under

exclusive breastfeeding, 12 (4.1%) were respectively under mixed breastfeeding and breastfeeding. According to the outcome of PCR 1, 12 out of 293 children were

positive, ie 4.1%. Table II shows the screening distribution of PCR 2.

| Risk factors   | PCR1 Positive | PCR1 Negative | Relative risk<br>IC à 95 % | P            |
|--|---------------|---------------|----------------------------|--------------|
| <b>Moment of screening of the mother</b>                   |               |               |                            |              |
| Before pregnancy   | 1             | 80            | 1                          |              |
| During pregnancy   | 6             | 108           | 0,24 [0,03-1,91]           | 0,14         |
| After childbirth   | 5             | 21            | 0,06 [0,008-0,52]          | <b>0,001</b> |
| <b>Therapeutic protocol of the mother during pregnancy</b> |               |               |                            |              |
| Triple Therapy   | 9             | 271           | 1                          |              |
| No   | 3             | 10            | 7,17 [2,20-23,42]          | <b>0,012</b> |
| <b>Maternal pathology during pregnancy</b>                 |               |               |                            |              |
| Yes  | 8             | 261           | 5,6 [1,8-17,26]            | <b>0,01</b>  |
| No   | 4             | 20            | 1                          |              |
| <b>Prolonged rupture of membranes</b>                      |               |               |                            |              |
| Yes  | 1             | 19            | 0,195 [0,93-0,98]          | 0,35         |
| No   | 12            | 262           | 1                          |              |
| <b>Prophylaxis in children</b>                             |               |               |                            |              |
| Yes  | 11            | 275           | 1                          |              |
| No   | 1             | 6             | 3,714 [0,55-24,9]          | 0,17         |
| <b>Prophylaxis in children</b>                             |               |               |                            |              |
| 6 weeks  | 5             | 182           | 1                          |              |
| More than 6 weeks  | 7             | 99            | 0,40 [0,13-1,24]           | 0,1          |
| <b>Infant feeding mode</b>                                 |               |               |                            |              |
| Exclusive breastfeeding                                    | 11            | 258           | 1                          |              |
| Mixed breastfeeding  | 1             | 11            | 2,03 [0,45-14,5]           | 0,48         |
| Alternative feeding  | 0             | 12            | 0,48 [0,31-0,73]           | 0,000        |
| <b>Episiotomy</b>  |               |               |                            |              |
| Yes  | 11            | 257           | 1                          |              |
| No   | 1             | 24            | 0,98 [0,13-7,62]           | 0,98         |
| <b>Childbirth with forceps or suction cup</b>              |               |               |                            |              |
| Yes  | 12            | 272           | 1                          |              |
| No   | 0             | 9             | 0,95 [0,93-0,981]          | 0,53         |
| <b>Sex</b>   |               |               |                            |              |
| Female   | 7             | 140           | 1                          |              |
| Male   | 5             | 141           | 1,390 [0,45-4,28]          | 0,56         |

Table 2: The distribution of the results of the PCR2 screening.

The distribution of infants according to the average time to report laboratory results showed: 1 month (13 results) either 4.4%; 2 months (93) either 31.7%; 3

months (111) either 37.9%, more than 3 months (76) either 29.9%.

| PCR2         | Number     | (% )          | rendered  |          | Not rendered |
|--------------|------------|---------------|-----------|----------|--------------|
|              |            |               | Positive  | Negative |              |
| Made         | 59         | 20,10         | 0         | 41       | 18           |
| Not made     | 234        | 79,90         |           |          |              |
| <b>Total</b> | <b>293</b> | <b>100,00</b> | <b>41</b> |          | <b>18</b>    |

Table 3: the analysis of risk factors for mother-to-child transmission.

The absence of antiretroviral therapy during pregnancy resulted in women being seven times more likely to transmit the virus to their children (RR = 7.17 [2-200-23.42],  $p = 0.012$ ) compared to who have received antiretroviral therapy. The occurrence of a pathology during pregnancy increases the risk of seropositivity in mother-to-child transmission by 5.6 times (RR = 5.6 [1.8-17.26],  $P = 0.01$ ). Mothers who were screened after delivery had a higher risk (RR = 0.06 [0.008-0.524],  $P = 0.001$ ) of transmitting the HIV virus to their children. In infant feeding, we do not differ in the percentages of seropositivity in infants according to their feeding pattern ( $P = 0.58$ : Fischer test).

## Discussion

Our study was to determine the prevalence and to identify the risk factors of HIV transmission from HIV-positive mothers under B + option to children in Bangui prevention sites. The retrospective nature of this study limits the range of certain variables. From January 1<sup>st</sup>, 2017 to December 31, 2017, two hundred and ninety-three (293) infants born to HIV-positive mothers under option B + benefited from DNA-PCR. In the study, the transmission rate was 4.1% with PCR1 over the entire study population. This rate is different from that of Nguembi [7] in 2004 which was 17.4%. This difference is justified because of the protocol used which was nevirapine alone while in our series 95.60% of pregnant women were already on triple antiretroviral therapy for their own health thus reducing the viral load and the risk of transmission. In Bangui, Diemer [8] and Ngbale [9] in 2013 who used the same protocol as ours found respectively a transmission rate a little high 7% and 8.3% in the sites of MCTP in the maternity of the Bangui Community Hospital. This would be explained by the fact that in 2013-2014 the parturients were still under option A and women were put in case-by-case treatment. In Mali [10] and Côte d'Ivoire [12] the transmission rate was 1.5% and 3.2%, respectively. This transmission rate achieved at six weeks of age may still be high because the majority of our study population had opted for exclusive breastfeeding (91.80%). This mode of breastfeeding still presents a risk of contamination. In our study, 234 children either 79.9% did not benefit from the second PCR and it was for various reasons: lost sight of after the first PCR, death, transfer to another site, late weaning, and the delay of rendering long-term results. Thus PCR2 performed at 6 weeks after complete cessation of exclusive breastfeeding should provide us with information on the normal rate of transmission [12]. There was no big gender gap in our study population. The

distribution of seropositivity is not influenced by sex. Our results are comparable to those of Sylla, et al. in Bamako [8] with a sex ratio of 1.5. Kissougle, et al. in Yaoundé [13] found a sex ratio of 0.83. This difference could be explained by the fact that during the period of our study there was more birth of girl than boy. WHO recommends that all children born to HIV-positive mothers should be put on antiretroviral prophylaxis immediately after delivery [3]. In our series, almost all infants were on antiretroviral prophylaxis. Infants who were not on antiretroviral prophylaxis were 3 times more likely to be infected than others (RR = 3.714 [0.552-24.93]  $P = 0.169$ ). This result only confirms the data in the literature. The stigmatization of people living with HIV means that some women refuse to give antiretroviral prophylaxis to newborns in order to avoid suspicions about their state of health [4,14]. Therapeutic education with mothers should be done in order to have their membership to avoid the risk of abandonment. In the absence of any intervention, the risk of transmission of HIV from mother to child through breast milk is very high [15]. This risk increases with the duration of the exposure and therefore with the age of the child. In developed countries, breastfeeding is contraindicated for mothers living with HIV [6]. In Africa, studies have shown that mortality from lack of breastfeeding is greater or equal than the risk of HIV transmission through breast milk [4,15,16]. In our study, 91.1% of children were exclusively breastfed, which corresponds to the national policy on child nutrition. In Senegal, in the Mbaye series [17], 100% of children were exclusively breastfed. In Benin, Aneth [3] had 85% exclusive breastfeeding. In addition, infants of mothers who were breastfeeding were significantly affected (RR = 2.03 [0.28-14.52];  $P = 0.000$ ) than infants of mothers who opted for exclusive breastfeeding. This study is similar to that of Ngbale [8] in a survey conducted in Bangui at the Bangui Community Hospital. In our study, the occurrence of a pathology during pregnancy was significantly associated with a risk (RR = 1.164 [0.97-1.39];  $P = 0.001$ ) of mother-to-child transmission of HIV. According to the literature, HIV-positive pregnant women at last stage (III or IV) have an increased risk of transmitting the virus to their children [10,18,19]. The same observation was made by Milogo-Traoré [18] in Burkina Faso. On the other hand, the clinical stage of the mother does not have an influence on the mother-to-child transmission, according to a survey carried out by Ngbale [8]. Our result could be justified by the fact that a good part of our population was under the antiretroviral treatment likely to reduce the viral load and thus the risk of the transmission. In the study, almost two-thirds of mothers were screened during pregnancy. This result was comparable to that of Technau,

et al. [20] in South Africa, Dainguy, et al. [17] in Abidjan, the majority of whom were screened during pregnancy. In contrast, in Mali, Fatoumata Younoussou Maiga obtained respectively 86.1% before pregnancy, 11.2% during pregnancy, 2.7% after childbirth [21] and Traoré [22] also observed 60.9 % screening before pregnancy; 19.6% during pregnancy and 19.6% after delivery. Mothers screened after delivery had a higher risk (RR = 0.06 [0.008-0.524], P = 0.001) of transmitting the HIV virus to their children in our series.

## Conclusion

The rate of mother-to-child transmission of mothers under B + option was lower than that observed in the country before this option but remains higher than those observed in West Africa. The main risk factors were lack of antiretroviral therapy, screening of mothers after delivery, maternal pathologies during pregnancy. In addition, important problems arise in the implementation of PCR and results reporting were expected to allow the early detection and management of children infected before the age of 18 months

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