

## BRIEF REPORT

# CHARACTERIZATION OF CHILDREN INFECTED WITH HIV DUE TO MOTHER-TO-CHILD TRANSMISSION IN HOSPITALS IN LIMA, PERU

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## ABSTRACT

Despite strategies to prevent mother-to-child transmission of the human immunodeficiency virus (HIV), infected children continue to be born. The aim of this study was to describe the status of children infected with HIV due to mother-to-child transmission. Between 2012 and 2018, 84 children were born with HIV in hospitals in Lima and Callao. Of the 68 cases included in this study, 82% of the mothers did not receive antiretroviral treatment and 25% had a negative HIV test during pregnancy. As for the children, 59% were diagnosed with HIV after one year of age, 82% had a viral load below 1,000 copies and 87% were considered healthy. Early diagnosis and treatment of the child with HIV is associated with better quality of life. It is necessary to carry out studies to identify the critical aspects of prenatal care in order to eliminate vertical HIV transmission.

**Keywords:** HIV Infections; Infectious Disease Transmission, Vertical; Newborn; Child Health (Source: MeSH NLM).

## INTRODUCTION

Mother-to-child transmission (MTCT) of human immunodeficiency virus (HIV) is the leading cause of virus transmission in children under 15. The mechanisms of MTCT are now well known, as well as the care protocols and prophylactic treatment schemes for pregnant woman with HIV and child exposed to the virus<sup>(1,2)</sup>.

Care of pregnant women with HIV and prevention of MTCT are found in Technical Standard 108 MINSAs/DGSP “Prevention of mother-to-child transmission of HIV and syphilis” of 2014. It describes the processes of early diagnosis of the disease in pregnant women, antiretroviral treatment, measures for the completion of delivery and care of the exposed child<sup>(3)</sup>. However, there is still a transmission incidence of approximately 4% according to information obtained from Dirección de Prevención y Control del VIH, ITS y Hepatitis (DPVIH) and Centro Nacional de Epidemiología, Prevención y Control de Enfermedades (CDC MINSAs), far from the goal proposed by the World Health Organization, which is less than 2%<sup>(4)</sup>.

There are national studies that measure the outcome of implementing the national standard for prevention of MTCT of HIV, as well as the number of children infected with HIV in the country<sup>(5,6)</sup>. In contrast, little is known about children’s health status in hospitals where they receive treatment with the NTS 102 - MINSAs/DGSP.V.01 “Technical Health Standard for Comprehensive Care and Antiretroviral Treatment of Children and Adolescents infected with the Human Immunodeficiency Virus (HIV)” of 2013, which describes the national protocols for care and treatment<sup>(7)</sup>. Understanding this situation would identify gaps and help propose solutions to ensure the proper management of children with HIV.

Therefore, the aim of this study is to know the characteristics of children with HIV due to MTCT born from 2012 onwards and treated until the first half of 2018 in hospitals of

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Lima and Callao; as well as to identify critical issues for the transmission of the virus to the child

## THE STUDY

Descriptive study, which included children with HIV by MTCT born between 2012 and the first half of 2018, selected from all cases reported to the DPVIH by hospitals that conduct follow up and treat children with HIV in Lima and Callao. We excluded those who died during follow-up, those who dropped out of follow-up, children who were referred to a health center outside Lima, those hospitalized at the time of the study, and those with no medical record. One of the study's researchers accessed the information thanks to the support of the members of the Committee of Experts for the Comprehensive Care of Children with HIV (appointed by Ministerial Resolution 1232-2003-SA/ DM), which is the advisory group for the DPVIH of Ministerio de Salud (MINSa).

The study researcher used a data collection sheet validated by the expert committee to collect information from the patients' medical records, their follow-up sheet, and the interview with the treating physician. Data was regarding the child's date of birth and place of origin, schooling, diagnosis date (polymerase chain reaction [PCR] results and age at diagnosis), clinical status of the child at the time of the study, HIV transmission route, characteristics of MTCT, prophylaxis received for HIV exposure, initial and last year results of CD4 and viral load, and antiretroviral treatment received (initial, salvage, and current). Also, events during prophylaxis were specified in scenario 3 according to Technical Standard 108 MINSa/DGSP (women diagnosed for the first time at the time of delivery receive antiretroviral therapy at the time; the child is given antiretroviral prophylaxis and breastfeeding is suspended).

Data was processed with IBM SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, N.Y., USA) statistical package. Qualitative variables were expressed as percentage measures, viral load at the start of treatment was expressed as ranges. Throughout the data management process, the anonymity of the participants was guaranteed, through the coding of their identity and the protection of the data to which only the study staff had access for study purposes.

This study was conducted as part of an HIV public health surveillance intervention by the DPVIH, included in its institutional Annual Operational Plan for 2018.

## KEY MESSAGES

**Motivation for the study:** To know the status of children with human immunodeficiency virus (HIV) infected via the maternal route, and to identify why transmission occurs despite the application of the national protocol.

**Main findings:** Late diagnosis of HIV is frequent in children. Antiretroviral treatment improves their quality of life. The cases of children with HIV are related to mothers without diagnosis and who did not receive timely antiretroviral treatment.

**Implications:** It is necessary to strengthen the national protocol for diagnosis and monitoring of the pregnant woman with HIV and the exposed child, and to achieve timely identification of discordant couples in order to reduce new cases of children with HIV.

## FINDINGS

During the study period, 84 children with HIV were identified, that received care in six hospitals in Lima (35 in the Instituto Nacional de Salud del Niño, 19 in the Hospital Hipólito Unanue, 11 in the Hospital Nacional Cayetano Heredia, 10 in the Hospital Docente San Bartolomé, 7 in the Hospital Nacional Daniel Alcides Carrión in Callao, and 2 in the Hospital Nacional Arzobispo Loayza). Of these, 68 children with HIV by MTCT were included, excluding 5 children who died, 4 who dropped out of follow-up, 3 who were referred to a health center out of Lima, 1 who was hospitalized, 1 who was not infected by MTCT and 1 whose medical record was not identified at the time of the study.

Of the 68 children with HIV by MTCT, 57 of them (83.8 percent) had a mother that had not received treatment during pregnancy, and 7 (10.3 percent) were considered scenario 3. The age of the children with HIV was between 1 and 3 years (28 cases, 41.2%) and less than 6 months (16 cases, 23.5%) (Table 1).

All of them were receiving antiretroviral therapy (ART), 18 children (26.5%) rotated the therapeutic scheme at some point, 59 children (86.8%) were in good health, 5 (7.3%) were malnourished, 2 (2.9%) had pneumonia, 1 had tuberculosis and another had acquired immunodeficiency syndrome (AIDS). We found that 5.9% of the children were orphans and the total number of school-age children attended school regularly (Table 2).

**Table 1.** Characteristics of mother-to-child transmission in children with HIV.

Characteristics	n	%
Mother's antiretroviral treatment		
Did not receive ARV treatment during pregnancy	57	83.8
Scenario 3	7	10.3
No data	4	5.9
HIV screening and identification		
No records of HIV testing during pregnancy were found	31	45.6
Negative test for HIV during pregnancy	17	25.0
Mother was diagnosed with HIV in a subsequent pregnancy	4	5.9
Parents were diagnosed after the child's birth	5	7.3
Children diagnosed as infants	18	26.5
Breastfeeding		
Did receive	45	66.2
Did not receive	16	23.5
No data	7	10.3
Age at diagnosis of HIV in children		
Less than 6 months old	16	23.5
From 6 months to 12 months	5	7.4
Older than 1 year and up to 3 years	28	41.2
Older than 3 years	12	17.6
No data	7	10.3

HIV: human immunodeficiency virus, ARV: antiretroviral

Data on the last viral load in the last year was obtained from 59 children (three children were diagnosed with the infection in the year previous to the study however their results were not available, and seven children were found to have no viral load control in the year prior to the study). Thirty four children (57.6%) presented an undetectable viral load in their last control, these children began treatment with loads between 30,400 and 4,006,000 copies; 14 children (23.7%) presented more than 1,000 copies in their last control, they began treatment with viral load ranges between 7,190 and 10,400,000 copies; 11 children (18.7%) presented more than 1,000 copies in their last viral load control, they began treatment with viral loads in a range of 52,100 to 10,000,000 copies (Table 3).

## DISCUSSION

This study shows that there is a high percentage (59%) of children with late diagnosis of HIV (after one year of age), even though virus transmission occurred during pregnancy or at the time of delivery. Regarding children on antiretroviral treatment, 82% had a viral load under 1,000 copies, which shows the effectiveness of their treatment; 87% were in good health at the time of completion of the study. We searched for the probable critical event that could have influenced the transmission of the virus from mother to child. We found

that in 82% of cases, the mother did not receive antiretroviral treatment during pregnancy, and 25% of mothers tested negative for HIV during pregnancy, so they did not receive any treatment to prevent MTCT of the virus.

**Table 2.** Treatment characteristics and conditions of children with HIV.

Antiretroviral schemes	n	%
Starting scheme		
AZT + 3TC + LPV/r	29	42.6
AZT + 3TC + EFV	12	17.6
ABC + 3TC + LPV/r	11	16.2
AZT + 3TC + NVP	5	7.3
Other combinations	10	14.7
Did not receive treatment	1	1.4
Scheme rotation *		
Lack of initiation ART	5	27.8
Resistance by genotyping	5	27.8
Lack of adherence	5	27.8
Severe anemia	3	16.7
Current conditions of children with HIV		
Good health	59	86.8
Malnutrition	5	7.3
Pneumonia	2	2.9
Tuberculosis	1	1.5
AIDS Stage	1	1.5
Orphaned children	4	5.9

\* The total number of children who rotated antiretroviral (ARV) treatment was 18. AZT: zidovudine; 3TC: lamivudine; LPV/r: ritonavir-reinforced lopinavir; EFV: efavirenz; ABC: abacavir; NVP: nevirapine; HIV: human immunodeficiency virus; AIDS: acquired immune deficiency syndrome; ART: antiretroviral therapy

**Table 3.** Evolution of viral load in children with HIV who received antiretroviral treatment (n = 59)

Control viral load (*)	Range of viral load at the start of treatment	n	%
Undetectable	30,400 to 4,006,000	34	57.6
Less than 1,000 copies	7,190 to 10,400,000	14	23.7
More than 1,000 copies	52,100 to 10,000,000	11	18.7

\* Three of the children were diagnosed the year before the study and their results were not available, while seven of the children were found to have no viral load control in the year prior to the study.

Since 1996, the prevention of MTCT of HIV has been part of the national policy against HIV/AIDS (Law 26626), implementing zidovudine treatment for pregnant women with HIV, cesarean sections, and suspension of breastfeeding. Since then, the program has improved alongside advances in this field<sup>(8, 9, 10)</sup>.

These strategies have focused on the following: increasing pregnant women's access to HIV testing, increasing access of pregnant women with HIV to ART, reducing the loss to follow-up of exposed children, ensure early diagnosis of HIV in children through PCR testing, and facilitate inclusion in pediatric HIV care services after diagnosis<sup>(11)</sup>.

The reports presented by MINSAs Centro Nacional de Epidemiología show a favorable decreasing trend in the number of HIV cases in children, from 140 reports in year 2000 to 40 cases or less in the last four years. However, the primary goal is to eradicate MTCT of HIV, the main cause of HIV infection in children, and it has not yet been achieved<sup>(6)</sup>.

There are several national studies on the prevention of MTCT and efficiency of such measures. Studies by Alarcón *et al.*<sup>(12)</sup>, and García *et al.*<sup>(13)</sup> identify some of the factors of HIV infection in pregnant woman, noting that the greater risk was found during pregnancy and in the barriers to timely access health facilities. Velásquez<sup>(5)</sup> compares the protocols for preventing MTCT of HIV that are applied in the country and their effect on the population treated at the Instituto Nacional Materno Perinatal, and found a reduction in MTCT from 15%, when only zidovudine was used as prophylaxis in the pregnant woman with HIV, to 4%, when highly active antiretroviral treatment or HAART was used. Huamán *et al.*<sup>(14)</sup> identified barriers to implementing MTCT prevention protocols in Amazonian populations. Other studies measure the effectiveness of rapid test diagnosis and interventions such as elective cesarean section<sup>(15,16)</sup>. Despite all these studies being conducted in the country, there is still no answer as to why children are still being born with HIV, a question that needs to be answered to eliminate MTCT in Peru.

As observed in this study, late diagnosis of HIV (over one year of age) is frequent in children, who are then treated

in referral hospitals. In many cases, there is no information regarding pregnancy and, therefore, it is not possible to specify the critical event that may influence transmission to the child. Early diagnosis and treatment in this age group is a challenge because of the high viral load. The results of systematic reviews show that it is preferable to start ART shortly after birth rather than delaying it, because infants are less likely to die or become ill. This encourages to build information systems that integrate maternal and childcare in all health networks, in order to monitor compliance with HIV diagnosis protocols in the pregnant woman, the use of ART, HIV test results, or complications during this period; these systems would also facilitate early identification of the child at risk of infection or already infected, and allow early initiation of treatment<sup>(17)</sup>.

A significant percentage of mothers tested negative for HIV during pregnancy and at delivery (25%), but subsequently seroconverted. In these cases, the child was lately diagnosed, sometimes indirectly when the parents were ill and sometimes when the child presented immunosuppression symptoms. This finding may be related to issues in the interpretation or the quality of the diagnostic tests in health facilities, or because of discordant couples where the serological status of the seronegative pregnant woman's partner is unknown. In these cases, transmission may occur after 24 weeks of gestation, at delivery or immediately after vaginal delivery. To reduce this possibility, a second HIV test should be implemented during the last trimester of pregnancy and the partner should be offered an HIV test as well, which would allow for the identification and management of discordant couples<sup>(18,19)</sup>.

Among the group of mothers who did not receive ART, some of them were diagnosed early but abandoned treatment (lack of adherence). Tejada studied the causes for lack of adherence to treatment<sup>(16)</sup> and believes that routine changes and other complex psychological and social factors might be the reason for treatment abandonment. Thus, it is necessary to strengthen follow-up programs for pregnant women with HIV to ensure adherence to treatment<sup>(20)</sup>.

Another finding of this study is the differences in the initiation of ART in children, mainly in those coming from regions other than Lima. Considering that the NTS 102-MINSA/DGSP.V.01 provides antiretroviral combinations for the initiation of ART in children nationwide, it is necessary to train health professionals to use the guidelines in order to correct this issue and ensure proper care for children across the country<sup>(7)</sup>.

The limitations of this study include the use of retrospective information from medical records, which could imply information bias. Besides, we only determined the characteristics of children with HIV by MTCT whose follow-up was available from hospitals in Lima and Callao; there may be other cases not reported in this study. Nonetheless, this study allows us to explore and describe health condition, follow-up, and characteristics of children with HIV, to identify critical points in the application of the protocol for the prevention of MTCT, and to generate specific corrective interventions.

In conclusion, most children with HIV from MTCT had mothers who did not receive antiretroviral treatment during pregnancy, most of whom had no record of HIV testing during pregnancy or had a negative result. The highest percentage of children with HIV due to MTCT are diagnosed late and are generally in good health, while a smaller percentage are found to be malnourished. On the other hand, the highest

proportion of children have an undetectable viral load and continue schooling according to their age. It is recommended to strengthen prevention and follow-up strategies for children exposed to HIV and to continue research in the child population diagnosed with HIV that will allow the identification of important factors for their development and quality of life.

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