

ORIGINAL ARTICLE

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Obstetric complications associated with HIV infection in pregnant women treated at a hospital in the Peruvian jungle

Complicaciones obstétricas asociadas a infección por VIH en gestantes atendidas en un hospital de la selva peruana

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ABSTRACT

Introduction: The prevalence of HIV infection is rising across all age groups, including the vulnerable population of pregnant women, leading to potential obstetric complications. **Objective:** To analyze the association between obstetric complications and HIV infection in pregnant women treated at the Amazónico Hospital of Yarinacocha between 2007 and 2021. **Materials and methods:** This was a quantitative, analytical, cross-sectional, and retrospective study involving a population of 563 pregnant women treated at the Amazónico Hospital between 2007 and 2019. Data were collected from medical records and subsequently analyzed using Epidat software (version 4.2) with a 95% confidence level; bivariate and multivariate analyses were performed. **Results:** A linear regression was performed Poisson with robust variance in the obstetric complications variables and the HIV infection variable, of all these variables, those who have HIV have 1.42 times the probability of having preeclampsia (CI 95% 0.67 – 2.99, $p=0.357$); 1.49 times the probability of having premature birth (CI 95% 0.65 – 3.43 $p=0.346$); 1.25 times the probability of having premature rupture of membranes (CI: 95% 0.66 – 2.38, $p=0.495$), compared to those who do not have HIV; However, this result is not statistically significant in any of the cases. A statistical association was obtained between the procedure and preeclampsia ($p=0.028$). **Conclusions:** No association was found between obstetric complications and HIV infection.

Key words: HIV, pregnant women, pregnancy complications, pre-eclampsia. Premature rupture of membrane and premature birth. (Source: MeSH NLM)

RESUMEN

Introducción: La prevalencia de infección por VIH va en aumento en todos los grupos etarios, incluyendo a la población vulnerable de gestantes y conllevando a posibles complicaciones obstétricas. **Objetivo:** Analizar la asociación entre complicaciones obstétricas asociadas a infección por VIH en gestantes atendidas en el Hospital Amazónico de Yarinacocha en los años 2007 a 2021. **Materiales y métodos:** Estudio de tipo cuantitativo, analítico, transversal y retrospectivo. Con población de 563 gestantes atendidas en el Hospital Amazónico entre 2007 a 2019. Se recolectó información de historias clínicas, luego se analizó en el programa Epidat versión 4,2 con un nivel de confianza del 95%, se realizó análisis bivariado y multivariado. **Resultados:** Se realizó una regresión lineal de Poisson con varianza robusta en las variables de complicaciones obstétricas y la variable de infección por VIH, de todas estas variables, las que tienen VIH tienen IRR: 1,42 de tener preeclampsia (IC 95% 0,67 – 2,99, $p=0,357$); IRR: 1,49 de parto prematuro (IC 95% 0,65 – 3,43 $p=0,346$); IRR: 1,25 de ruptura prematura de membranas (IC: 95% 0,66 – 2,38, $p=0,495$), en comparación a los que no tienen VIH; sin embargo, este resultado no fue estadísticamente significativo en ninguno de los casos. Se obtuvo asociación estadística entre el lugar de procedencia y la complicación obstétrica de preeclampsia ($p=0.028$). **Conclusiones:** No se encontró asociación entre complicaciones obstétricas y la infección por VIH.

Palabras clave: VIH; Embarazada; Complicaciones del Embarazo; Preeclampsia; rotura Prematura de Membranas Fetales; Parto Pretérmino (Fuente: DeCS BIREME).



INTRODUCCIÓN

Infection with the human immunodeficiency virus (HIV) is considered one of the pandemics of this century. According to the World Health Organization (WHO), the global prevalence of HIV is 39 million⁽¹⁾, and 1.4 million infected women become pregnant, with a 15% to 45% risk of transmitting the virus to their children—a transmission that can occur during childbirth or while breastfeeding—and is associated with high rates of maternal and fetal morbidity and mortality^(2–4).

One of the Sustainable Development Goals is to reduce vertical transmission of HIV by 2030⁽⁵⁾. Despite significant efforts to achieve improvements, the current pace of progress in both developed and developing countries is too slow⁽⁶⁾.

In Latin America, poverty and a lack of sexual and reproductive health education are key factors contributing to the rise in new cases of HIV infection, which has a negative impact on the health of pregnant women. The lack of access to adequate and timely prenatal care⁽⁷⁾, the lack of access to contraception^(8–10), and the fact that many women are unaware of the need to get tested for sexually transmitted infections (STIs) contribute to the persistence of this problem⁽¹¹⁾.

According to the Pan American Health Organization (PAHO), from 2010 to 2019, cases of HIV infection increased by 21%⁽¹²⁾; as is the case in Brazil, where new cases rose from 100,000 to 120,000 between 2010 and 2019; the risk of vertical transmission of HIV in these pregnant women during childbirth is 65%, while the risk during pregnancy or breastfeeding is 35% and 22%, respectively⁽¹³⁾. In Peru, from 2000 to 2021, the most common route of transmission was sexual transmission, accounting for 98.39%; followed by mother-to-child (vertical) transmission; and 0.23% via parenteral transmission. This is why many pregnant women experience greater obstetric complications due to a lack of timely detection and/or treatment⁽¹⁴⁾.

This study evaluated the demographic and clinical characteristics of pregnant women diagnosed with HIV and determined their as-

sociation with certain obstetric complications. These variables have been little studied⁽¹⁵⁾, particularly in this population group in the Peruvian Amazon.

MATERIALS AND METHODS

STUDY DESIGN AND POPULATION

This study is observational, analytical, cross-sectional, and retrospective. The study population consisted of 50,486 pregnant women treated at the Hospital Amazónico de Yarinacocha in Pucallpa, Ucayali, Peru—a Category II-2 hospital considered the referral center for the entire Pucallpa region—during the period from January 2007 to December 2021.

No sampling was performed because the sample consisted of all pregnant women diagnosed with HIV who were treated at the Yarinacocha Amazonian Hospital from January 2007 to December 2021, totaling 563 participants.

This research was conducted using medical records of pregnant women treated at the Yarinacocha Amazonian Hospital; to ensure the statistical significance of the study, statistical power was calculated. The study by Li H, Liu J, Tan D, Huang G, Zheng J, Xiao J, et al⁽¹⁶⁾ was used as a reference. That study identified preterm birth as an obstetric complication in pregnant women with HIV, with a rate of 8.9% compared to 3.7% among pregnant women not exposed to HIV.

A 95% confidence level was used, with a sample size ratio of 2; given that the study population consisted of 563 patients, statistical power was calculated using EPIDAT version 4.2, resulting in a statistical power of 70.2%.

VARIABLES AND MEASUREMENTS

The measured variables were classified as follows: demographic variables—age, educational level, marital status, and place of origin; variables related to obstetric complications, which are adverse outcomes that may occur in the early or late stages of pregnancy⁽¹⁷⁾; due to the availability of information, three of these complications were included: preeclampsia, preterm delivery, and premature rupture of



membranes; and the variable related to HIV infection. These variables were measured as follows: "age" was considered as a numerical value in years; "level of education" was categorized as illiterate, elementary school, secondary school, or higher education; "marital status" was categorized as single, married, cohabiting, or divorced; "place of origin" was classified as rural or urban; "HIV infection" was defined by the presence of Human Immunodeficiency Virus infection and measured by the result indicated in the medical record (regardless of the test used to confirm the diagnosis); "preeclampsia" was defined as a hypertensive disorder of pregnancy occurring at or after 21 weeks, "preterm delivery" was defined as delivery before 37 weeks of gestation, and "premature rupture of membranes" was defined as the loss of the integrity of the amniotic sac membranes before 37 weeks of gestation⁽¹⁸⁾; these three variables related to obstetric complications were measured based on the diagnosis reported in the reviewed medical records.

The medical records were completed by various obstetrician-gynecologists who conducted daily rounds. To collect data for this retrospective study, authorization was requested from the Research and Ethics Office of the Amazonian Hospital of Yarinacocha to obtain medical records from the period 2007 to 2021.

STATISTICAL ANALYSIS

The R software (version 3.14) was used for the analysis. For descriptive statistics, tables of absolute and relative frequencies of the qualitative variables were used; for bivariate analysis, the chi-square test and Fisher's exact test were used; and for multivariate analysis, a Poisson linear regression with robust variance was performed on the variables of obstetric complications and HIV infection, since the event of interest (obstetric complications) was frequent (10% or more); in addition, because the analysis yielded a Relative Risk (IRR) with a 95% confidence interval, a p -value < 0.05 is also considered statistically significant. For the analysis of quantitative variables, we first determined whether the data followed a normal distribution using the Kolmogorov-Smirnov test; if the data were normally distributed, they were expressed as mean $\pm$ standard

deviation, and if they were not normally distributed, they were expressed as median with interquartile range; For bivariate analysis, the Mann-Whitney U test was used for samples that did not follow a normal distribution.

ETHICAL CONSIDERATIONS

This study was reviewed by the Ethics Committee of the Institute for Research in Biomedical Sciences (INICIB). The necessary authorizations were requested from the Amazónica Hospital to conduct the study. The confidentiality of medical record data will be respected in accordance with the principles of beneficence and non-maleficence; furthermore, a fair and balanced selection of the study groups was ensured. Permission was also obtained from the Research Ethics Committee of the Faculty of Medicine at Ricardo Palma University (Committee Code: PG 001 2023-c).

RESULTS

This study included a total of 563 pregnant women treated at the Hospital Amazónico in Pucallpa from January 2007 through December 2021

Table 1 presents the demographic variables expressed as totals and percentages. The most common characteristics for each variable were: a pregnant woman with a secondary school education (60%), living with a partner (83%), and residing in an urban area (76%).

DISCUSSION

When analyzing the association between obstetric complications and HIV infection in pregnant women, no statistical association was found ($p > 0.05$); in contrast, other studies have found an association between these variables: Ganguly et al.⁽²⁾ found an association between HIV infection in pregnant women and the incidence of stillbirths (26.7/1,000), whereas the rate was lower among seronegative pregnant women (5/1,000), and much lower when the pregnant woman initiated antiretroviral therapy, with an RR of 0.09 (95% CI 0.05–0.16); Li et al.⁽¹⁶⁾ found an association between HIV infection and obstetric complications such as fetal death, preterm birth, low birth weight, and small-for-gestational-age infants ($p < 0.05$).



TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF PREGNANT WOMEN TREATED AT THE AMAZONIAN HOSPITAL IN PUCALLPA FROM JANUARY 2007 TO DECEMBER 2021

	N = 563
Age	24 (20 – 30) *
Level of education	
Illiterate	5 (0.9%)
Primary	143 (25.4%)
Secondary	341 (60.6%)
Higher	74 (13.1%)
Marital status	
Single	41 (7.3%)
Married	53 (9.4%)
Cohabiting	468 (83.1%)
Divorced	1 (0.2%)
Origin	
Rural	132 (23.5%)
Urban	431 (76.5%)
HIV infection	
No	425 (75.5%)
Yes	138 (24.5%)
Preeclampsia	
No	533 (94.7%)
Yes	30 (5.3%)
Premature birth	
No	525 (93.3%)
Yes	38 (6.7%)
Premature rupture of membranes	
No	537 (95.4%)
Yes	26 (4.6%)

n (%) *Median (Interquartile range)

For our study, we were unable to collect information related to antiretroviral therapy (ART) because the medical records did not include this information in all cases; some pregnant women only arrive at the hospital during labor, without having received prior care at the health facility; This is important because the MINSA technical guideline classifies treatment according to the specific scenario: HIV diagnosis during prenatal care; a pregnant woman with a prior HIV diagnosis who is not receiving ART; a pregnant woman receiving ART with a prior HIV diagnosis; and a pregnant woman diagnosed with HIV during labor, any of which could lead to some form of obstetric complication^(19,20).

ART is divided into three groups: nucleoside reverse transcriptase inhibitors (NRTIs), non-nu-

cleoside reverse transcriptase inhibitors (NNRTIs), and protease inhibitors (PIs)^(15,21); although most are considered non-teratogenic, an association was found between congenital heart defects and the use of zidovudine⁽²²⁾; Calvo et al.⁽²³⁾, in a descriptive study, found a considerable incidence of obstetric complications in pregnant women using ART; however, they did not perform statistical analyses of association, so the findings were inconclusive; Delicio et al.⁽²⁴⁾, in evaluating 793 pregnant women who received ART, found that 82% experienced at least one mild adverse effect, such as dyslipidemia (82%), anemia (56%), and abnormal liver enzymes (54%), and no serious obstetric adverse effects, such as congenital malformations, were found; the adverse effects observed had already been described in association with ART use. Another notable finding was that a CD4 count above 200 cells/mm³ was a protective factor against preterm birth and low birth weight.

The lack of an association between obstetric complications and HIV infection in pregnant women may be explained by unstudied variables: late initiation of ART may have increased the risk of vertical transmission but may have reduced the likelihood of ART-associated morbidity observed in other studies^(23,25). However, this information was not available for the present study.

The prevalence of pregnant women diagnosed with HIV infection from 2007 to 2021 at the Amazónico Hospital in Yarinacocha was 563, a significant number considering that by 2021, the overall prevalence of HIV in the region was 435 (26); and globally, the prevalence increased by 20% over the last decade, from 100,000 to 120,000^(27,28).

Among the demographic variables, it was found that place of origin was associated with the development of preeclampsia as an obstetric complication, a finding consistent with other studies that also associate socioeconomic status with these cases^(29–32). Access to health care services in this province is limited, primarily due to the complex demographics characteristic of the Amazon region^(32,33), which is one of the main causes of health problems in the Peruvian jungle.



TABLE 2. BIVARIATE ANALYSIS OF OBSTETRIC COMPLICATIONS ASSOCIATED WITH HIV INFECTION IN PREGNANT WOMEN TREATED AT THE AMAZÓNICO-PUCALLPA HOSPITAL FROM JANUARY 2007 TO DECEMBER 2021

TABLE 2 PRESENTS A BIVARIATE ANALYSIS OF THE RELATIONSHIP BETWEEN OBSTETRIC COMPLICATIONS AND THE DEMOGRAPHIC VARIABLES OF THE PREGNANT WOMEN. A STATISTICAL ASSOCIATION WAS FOUND BETWEEN PLACE OF ORIGIN AND THE PRESENCE OF PREECLAMPSIA ($p = 0.028$). NO OTHER ASSOCIATIONS WERE FOUND BETWEEN OBSTETRIC COMPLICATIONS AND DEMOGRAPHIC VARIABLES.

	Preeclampsia			Premature birth			Premature rupture of membranes		
	No, N = 533	Yes, N = 30	p-value	No, N = 525	Yes, N = 38	p-value	No, N = 537	Yes, N = 26	p-value
Age			0.139***			0.958***			0.209***
	24(20-30)*	27.9 ± 8.4**		24(20-30)*	23.5(19.7-34.2)*		24(20-31)*	25.5 ± 7.2**	
Level of education			0.147			0.057			0.719
Illiterate	5 (100%)	0 (0%)		3 (60%)	2 (40%)		5 (100%)	0 (0%)	
Primary	130 (90.9%)	13 (9.1%)		132 (92.3%)	11 (7.7%)		135 (94.4%)	8 (5.6%)	
Secondary	326 (95.6%)	15 (4.4%)		322 (94.4%)	19 (5.6%)		327 (95.9%)	14 (4.1%)	
Higher	72 (97.3%)	2 (2.7%)		68 (91.9%)	6 (8.1%)		70 (94.6%)	4 (5.4%)	
Marital status			0.534			0.404			0.094
Single	38 (92.7%)	3 (7.3%)		38 (92.7%)	3 (7.3%)		36 (87.8%)	5 (12.2%)	
Married	52 (98.1%)	1 (1.9%)		52 (98.1%)	1 (1.9%)		52 (98.1%)	1 (1.9%)	
Cohabiting	442 (94.4%)	26 (5.6%)		434 (92.7%)	34 (7.3%)		448 (95.7%)	20 (4.3%)	
Divorced	1 (100%)	0 (0%)		1 (100%)	0 (0%)		1 (100%)	0 (0%)	
Origin			0.028			0.105			0.367
Rural	120 (90.9%)	12 (9.1%)		119 (90.2%)	13 (9.8%)		124 (93.9%)	8 (6.1%)	
Urban	413 (95.8%)	18 (4.2%)		406 (94.2%)	25 (5.8%)		413 (95.8%)	18 (4.2%)	
HIV infection			0.112			0.15			0.22
No	406 (95.5%)	19 (4.5%)		400 (94.1%)	25 (5.9%)		408 (96%)	17 (4%)	
Yes	127 (92%)	11 (8%)		125 (90.5%)	13 (9.5%)		129 (93.5%)	9 (6.5%)	
Premature birth			0.136						0.692
No	499 (95.1%)	26 (4.9%)					501 (95.4%)	24 (4.6%)	
Yes	34 (89.5%)	4 (10.5%)					36 (94.7%)	2 (5.3%)	
PRM			0.642			0.692			
No	509 (94.8%)	28 (5.2%)		501 (93.3%)	36 (6.7%)				
Yes	24 (92.3%)	2 (7.7%)		24 (92.3%)	2 (7.7%)				
Preeclampsia						0.136			0.642
No				499 (93.6%)	34 (6.4%)		509 (95.5%)	24 (4.5%)	
Yes				26 (86.7%)	4 (13.3%)		28 (93.3%)	2 (6.7%)	

n (%). PRM: Premature rupture of membranes

Analysis performed using the Chi-square test and Fisher's exact test.

*Median (Interquartile Range) **Mean ± Standard Deviation ***Mann-Whitney U test for samples with a non-parametric distribution

TABLE 3. POISSON LINEAR REGRESSION OF OBSTETRIC COMPLICATIONS ASSOCIATED WITH HIV INFECTION IN PREGNANT WOMEN TREATED AT THE HOSPITAL AMAZÓNICO-PUCALLPA FROM JANUARY 2007 TO DECEMBER 2021

IN TABLE 3, A POISSON LINEAR REGRESSION WITH ROBUST VARIANCE WAS PERFORMED ON THE OBSTETRIC COMPLICATIONS VARIABLES AND THE HIV INFECTION VARIABLE. AMONG ALL THESE VARIABLES, WOMEN WITH HIV ARE 1.42 TIMES MORE LIKELY TO HAVE PREECLAMPSIA; 1.49 TIMES AS LIKELY TO HAVE PRETERM BIRTH; AND 1.25 TIMES AS LIKELY TO HAVE PREMATURE RUPTURE OF MEMBRANES, COMPARED TO THOSE WITHOUT HIV; HOWEVER, THIS RESULT IS NOT STATISTICALLY SIGNIFICANT IN ANY OF THE CASES.

	Preeclampsia			Premature birth			Premature rupture of membranes		
	IRR	95% IC	p-value	IRR	95% IC	p-value	IRR	95% IC	p-value
HIV infection									
No	—	—		—	—		—	—	
Yes	1.42	0.67- 2.99	0.357	1.49	0.65- 3.43	0.346	1.25	0.66- 2.38	0.495

IRR = Incidence Rate Ratio, CI = Confidence Interval

Among the study's limitations is the lack of specific clinical information, such as the gestational age at which the HIV diagnosis was made, the start of antiretroviral therapy (ART), the type of ART regimen, CD4 count, and viral

load, among others. This information could be collected in future studies, and the sample size should also be increased by extending the data collection period. Variables associated with the newborn were not examined in this



study because they fell outside the study's primary objective; however, they could be considered for future studies.

In conclusion, no association was found between HIV infection in pregnant women and the occurrence of preeclampsia, premature rupture of membranes, and preterm delivery as obstetric complications among pregnant women treated at the Hospital Amazónico-Pucallpa from January 2007 to December 2021.

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