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Maternal risk factors for HIV infection in infants in northeastern Brazil

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SUMMARY

Introduction—While the rate of vertically transmitted HIV infection has fallen in most regions of Brazil, there have been no similar decreases in northern and northeastern Brazil.

Objective—The objective of this study was to evaluate the risk factors associated with vertical transmission in the state of Sergipe in northeastern Brazil.

Methods—This was a retrospective cohort study. We recorded clinic and registry data for all HIV-infected pregnant women and exposed children diagnosed in Sergipe from 1990 to 2011.

Results—We identified 538 deliveries and 561 HIV-exposed infants (23 sets of twins). One hundred one (18.9%) infants were HIV-infected. In the multivariate analysis, infant antiretroviral prophylaxis was a significant protective factor (adjusted odds ratio (aOR) 0.07, 95% confidence interval (CI) 0.01–0.41, p=0.003). Breastfeeding was marginally associated with an increased odds of perinatal transmission (aOR 4.52, 95% CI 0.78–26.17, p = 0.092). The attributable risk percentage for breastfeeding over the study period was 91.0%. Transmission decreased from 91 per 100 live births before 1997 to 2 per 100 in 2011 following the adoption of the prevention protocol.

Conclusion—Transmission declined over the study period. The screening of pregnant women and timely initiation of prophylaxis and therapy are issues that require further attention.

Keywords

HIV; Vertical infectious disease transmission; Pregnancy; Breastfeeding

1. Introduction

Mother-to-child transmission of HIV (MTCT) is the main route of transmission through which children acquire HIV-1 infection worldwide. Approximately 390 000 children

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worldwide were newly infected with HIV in 2010, and the vast majority were in Sub-Saharan Africa.[1] In Brazil, 85.8% of AIDS cases in individuals aged younger than 13 years were found to be due to MTCT, corresponding to an incidence rate in children 0–5 years old in 2010 of 3.5 per 100 000. HIV prevalence in pregnant women was most recently estimated to be 0.41%.[2] HIV infection in Brazil is distributed unevenly, both geographically and socioeconomically.[3] The southern region, which is more developed and populous and where the first cases were detected in Brazil, has had the greatest cumulative number of infections, but more recently the less well developed north and northeastern regions have experienced increased levels of heterosexual and perinatal transmission.[4,5]

The annual number of reported AIDS cases in children aged less than 5 years fell 40.7% between 1998 and 2010 in the south, southeast, and west of the country. There was, however, no similar decrease in the north and northeast. These rates are important indicators for monitoring HIV transmission in infants.[6]

Known risk factors for MTCT include maternal variables (elevated viral load, symptomatic disease, failure to use antiretroviral drugs during pregnancy, smoking), obstetric variables (vaginal delivery, rupture of membrane >4 h), and neonatal variables (low birth weight, breastfeeding, prematurity).[7–11] Primary strategies to reduce MTCT include maternal and infant use of antiretrovirals (ARV) to suppress viral replication, caesarean section before onset of labor or rupture of membranes, and avoidance of breastfeeding.[12,13] Where these combined interventions are available, the risk of MTCT is as low as 1–2%.[13–16]

Brazil introduced interventions to prevent MTCT in 1996, beginning with zidovudine prophylaxis, which was subsequently recommended nationally in 1997 for women who did not meet clinical, virological, or immunological criteria for the initiation of antiretroviral therapy (ART).[12,17] Starting in 2007, short-term triple-drug ART was used for prophylaxis in women with CD4 cell counts of >200 cells/μl and plasma viral loads of >1000 copies/ml. In 2010 national guidelines were changed to recommend ART for all pregnant women regardless of CD4 count or other criteria.[18] Under all guidelines, in addition to ART or antepartum ARV prophylaxis, mothers received intrapartum zidovudine, and babies received oral zidovudine for 6 weeks. Mothers were also counseled to avoid breastfeeding, and infant formula has been freely available for replacement feeding since 2002.[19]

MTCT rates in Brazil were evaluated in a large multicenter study in 2001, and were found to be between 8.6% in 2000 and 7.1%.[14] Subsequent reports have found these rates to vary substantially across regions and over time, ranging from 12.3% in the northeastern region to 5.5% in the south in 2004.[20] More recently, rates have been particularly low in areas where effective screening, prophylaxis, and treatment are available and have recently been reported to be less than 2% in centers in Porto Alegre and Rio de Janeiro.[5,11] The use of ARV prophylaxis, in particular, has evolved over the last two decades from zidovudine monotherapy to combination ARV prophylaxis for women not meeting the criteria for the initiation of life-long ART.[11,13,16,21]

We studied the incidence and maternal risk factors associated with HIV infection in infants in the state of Sergipe in northeastern Brazil, from 1990 to 2011.

2. Methods

2.1. Overall design

This was a retrospective cohort study of infants born to HIV-infected women in Sergipe from 1990 to 2011. The start date corresponds to the diagnosis of the first case of HIV in a pregnant woman in Sergipe.

2.2. Setting

Sergipe is one of nine states in northeastern Brazil, with a population of 2068017 and 34016 births in 201 0.[22] Approximately a third of births occur within the maternity services of Aracaju, the capital city. Almost all (99.3%) deliveries are in the hospital setting.[23] From 1987 to 2011 there were 2930 AIDS cases reported in adults, an incidence rate of 12.19 per 100 000 per year, and 62 reported in children less than five years old, corresponding to an AIDS incidence of 3.4 per 100 000 per year. Among Brazilian states, Sergipe ranks twentieth in the AIDS incidence for adults and fourteenth for children under 5 years of age.[6]

In all Brazilian states, antenatal care is universal and free of charge. Antenatal testing for HIV is common in Brazil, and recent estimates are that 62.3% of women attending antenatal care are tested.[2] In Sergipe, all identified cases of HIV infection during pregnancy are referred to receive free ART/prophylaxis for HIV at CEMAR (the Center of Medical Specialties for HIV/STD/AIDS) in Aracaju.

2.3. Study subjects

We included all HIV-infected pregnant women and exposed children diagnosed in Sergipe through December 31, 2011. We compiled data reported to the national Information System for Reportable Diseases (SINAN), the national Mortality Information System (SIM), the state laboratory database (serological and viral load tests), the ambulatory medical records at the Federal University of Sergipe and CEMAR, and records from the maternity services where the majority of HIV-infected women deliver. There were no other sources from which individuals with HIV infection could be identified.

2.4. Variables

Maternal demographic and clinical predictor variables included area of residence (urban or rural), age, education, vital status, employment status, salary expressed in multiples of the Brazilian minimum national salary, type of sexual partner (married or steady partner only, non-marital or steady (i.e., casual) partner only, or both), number of sexual partners in the past 10 years, having a child who had previously died of AIDS, transmission category (current sexual partner with HIV, previous sexual partner with HIV, lifetime history of injection drug use, or recipient of HIV-infected blood transfusion), and when HIV was diagnosed (prior to the current pregnancy, during the current pregnancy, at delivery or postpartum). We also recorded infant socio-demographic variables, including sex, birth weight dichotomized as <2500 and ≥2500 g, birthplace (Aracaju, other part of Sergipe, or other state), and details of antenatal care and labor, including having received ARV prophylaxis, having been followed up in the medical system, and how the diagnosis of HIV was made (virological test, serological test, postmortem examination). Because our cohort

spanned 22 years, antenatal ARV prophylaxis and treatment regimens became increasingly effective. We classified these regimens as monotherapy, dual therapy, and triple therapy.

Our principal outcome variable was confirmed HIV infection in children. We defined infection in accordance with the Brazilian Ministry of Health guidelines as two detectable viral loads or two positive serological tests and a confirmatory indirect immunofluorescence assay or Western blot test by 18 months of age or 1 month after weaning, whichever came later.

2.5. Laboratory tests

Testing protocols were derived from Brazilian national standards.[24] In Sergipe pregnant women are screened with dried blood spots using an enzyme immunosorbent assay (EIA) (S&S 903, Symbiosis Diagnostics Ltda, São Paulo, Brazil) or immunochromatographic rapid tests (Determine® HIV-1/2, Abbott Diagnostic Division, Hoofddorp, The Netherlands; Rapid Check®, Biomanguinhos, Rio de Janeiro, Brazil; or UniGold Recombigen® HIV, Trinity Biotech plc, Bray, Ireland). Positive tests are confirmed with two commercial third-generation assays from different manufacturers using venous blood samples (Abbott-Axym®, Abbot Diagnostics Division, São Paulo, Brazil; Murex®, Murex Biotech Ltd, Dartford, England, UK; GENSCREEN® HIV ag-b, Marnes-la-Coquette, France; or Q-Prevent HIV 1+2-DBSTM®, Symbiosis Diagnóstica Ltda, São Paulo, Brazil), or, in earlier years, by indirect immunofluorescence assays (IFA, Biomanguinhos®, Bio-Manguinhos, Fiocruz Institute, Rio de Janeiro, Brazil) or Western blot (HIV-Blot 2.2®, Genelabs Diagnostics Pte Ltd, Singapore; or Biorad®, Cambridge Biotech Corporation, Cambridge, MA, USA). HIV infection in children less than 18 months of age is determined by testing for HIV RNA with a lower limit of detection of 50 copies/ml (Chiron Quantiplex® version 3bDNA assay, Bayer Corporation, Emeryville, CA, USA). All the tests are validated and licensed for commercial use in Brazil, in accordance with local regulations (Decree #151 of 10-4-2009).

Infants are defined as infected if they have detectable viral loads in two consecutive tests, one of which must be done after 4 months of age, or in the case of breastfed infants at 4 months after breastfeeding ceases. Children ≥18 months of age are considered infected if they have two positive antibody tests with a confirmatory Western blot or IFA. Infants with negative HIV nucleic acid amplification tests and with no symptoms of HIV infection are considered uninfected, but are followed until two HIV antibody tests are negative.

2.6. Data analysis

We collected all data on a standard form and then entered them into a database created using Epi Info 3.5.2 (CDC, Atlanta, GA, USA). We did not attempt to impute missing values. We conducted descriptive analyses using SPSS version 13 (SPSS Inc., Chicago, IL USA) and bivariate analyses using STATA 8.0 (STATA Corp., College Station, TX, USA). We calculated the relative risk (RR) and 95% confidence interval (CI). We controlled for possible confounding variables using a backward Poisson regression, retaining variables that had a p-value less than 0.05.

2.7. Ethical considerations

We conducted this study in accordance with the principles of research in Brazil (Resolution 196/96). In the majority of cases, there was no direct patient contact. In a small number of cases, we interviewed participants to complete data collection. In these cases, we obtained informed consent. We did not retain patient names or medical record numbers in the final data sets. The Ethics and Research Committee of the Federal University of Sergipe approved the study (registered number 0183.0.107.000-10).

3. Results

Between 1990 and 2011, there were 538 deliveries resulting in 561 HIV-exposed infants (23 sets of twins). Of the 526 infants with known sex, 247 (47.0%) were male and 279 (53.0%) female. The mean birth weight was 2994 g (standard deviation (SD) ±573 g). Three hundred fourteen (79.8%) were born in Aracaju. One hundred twenty-nine (24.3%) were evaluated using virological tests, 94 (17.7%) using serological tests, 242 (42.7%) using both, and 2 (0.3%) by death certificate listing HIV as the cause of death. Of the 561 infants, we were able to ascertain the outcome for 534 (95.1%) children. Of these, 101 (18.9%) had a confirmed HIV infection, 61 (11.4%) were still under investigation as of December 31, 2011, and 6 (1.1%) had been stillborn with no further diagnostic work-up (Table 1).

Thirty-three (5.9%) mothers had died, and three (0.5%) were not locatable. The majority (89.2%) of mothers lived in urban areas. The median maternal age was 26 years (interquartile range (IQR) 23–31 years). Two hundred twenty-one (49.4%) mothers had completed fewer than 8 years of education, 152 (67.3%) were unemployed, and 118 (67.8%) had no income. Of the 538 mothers, 267 (91.3%) had been infected sexually; 332 (73.6%) had a single partner. One hundred seventy-two (35.0%) had been diagnosed before the current pregnancy, 134 (27.3%) during the current pregnancy, 100 (20.4%) at delivery, and 85 (17.2%) in the postpartum period (Table 2). The mean number of pregnancies was 1.69 (SD ±0.93).

In the bivariate analysis, significant protective factors associated with infant infection were antenatal care (RR 0.22, 95% CI 0.14–0.33), the number of antenatal visits (1–6 visits versus none, RR 0.29, 95% CI 0.18–0.45; and ≥6 versus none, RR 0.12, 95% CI 0.05–0.26), HIV testing during antenatal care (RR 0.19, 95% CI 0.11–0.30), receiving the results of HIV testing during antenatal care (RR 0.16, 95% CI 0.05–0.53), ARV prophylaxis or therapy during the antenatal period (RR 0.14, 95% CI 0.08–0.25), initiation of ARV prophylaxis or therapy in the seventh month of gestation or earlier (RR 0.13, 95% CI 0.06–0.25), having a syphilis test during antenatal care (RR 0.29, 95% CI 0.18–0.46), caesarean delivery (RR 0.42, 95% CI 0.25–0.69), receiving intrapartum ARV prophylaxis (RR 0.12, 95% CI 0.07–0.20), and the baby receiving ARV prophylaxis (RR 0.09, 95% CI 0.06–0.16). Breastfeeding histories were available for 396 infants. Overall 66 (16.8%) had been breastfed, including 48 (72.7%) of 77 who were diagnosed with HIV infection but only 18 (5.6%) of 319 who were not (RR 8.28, 95% CI 5.67–12.07) (Table 3).

We examined if any of the 66 breastfed children or their mothers had ever received ARV prophylaxis. Of the 48 breastfed infants who were HIV-infected, only two had received

postpartum ARV prophylaxis, and one mother had received intrapartum prophylaxis. Of the 18 uninfected breastfed children, eight had received ARV prophylaxis, and four of their mothers had received prophylaxis (four antepartum and three intrapartum). The risk of infection for breastfed children who had not received prophylaxis was 5.6 times higher than for those who had (RR 5.63, 95% CI 1.99–15.84).

In the multivariate analysis, only breastfeeding was marginally associated with an increased adjusted odds of perinatal transmission (adjusted odds ratio (aOR) 4.52, 95% CI 0.78–26.17, $p = 0.092$). The use of infant ARV prophylaxis was independently associated with a lower odds of infection (aOR 0.07, 95% CI 0.01–0.41, $p = 0.003$) (Table 4), and maternal antepartum prophylaxis was marginally associated with a decreased odds of transmission (aOR 0.13, 95% CI 0.01–1.39, $p = 0.092$). The attributable fraction for breastfeeding over the study period was 91.0%. The proportion of HIV-infected women who breastfed their infants fell over the study period from 91% before 1997 to 2% in 2011, and its decline narrowly paralleled the decline in HIV-infected infants ($r = 0.96$). At the same time, the use of ARV also increased (Figure 1).

4. Discussion

In general, we found a high rate of MTCT in Sergipe, Brazil over the 22-year study period. This was marginally associated with breastfeeding, which most likely represents a type II error. However, when analyzing MTCT over time, we observed a drastic reduction in rates from 91% to 2% associated with the adoption of prevention measures, which included not breastfeeding and using ARV.

The rate of MTCT is high when compared with other Brazilian studies[25,26] and studies done in other countries,[27,28] except one study in three African countries that found a rate of 20.4%.[29] In our study, among infants who were not breastfed, the risk of transmission was 5.6%, much more in line with the national experience. However, given that antenatal screening did not become widespread in Sergipe until 2000 and at delivery only in 2003,[18,30] we have likely under-ascertained HIV-infected mothers who did not transmit HIV to their infants and thus overestimated transmission rates, especially in earlier years. Thus, in Brazil, where formula has long been provided free of charge to HIV-infected mothers, breastfeeding may, in fact, be more of a marker of poor access to health care in general. In fact, among infected children who had breastfed, the mother of only one of 48 had received ARV intrapartum prophylaxis and none had received antepartum prophylaxis, suggesting that transmission may well have taken place antepartum or intrapartum.

The risks of postpartum transmission have been well described.[31,32] Extended breastfeeding is responsible for 14% of cases of HIV-1 in chronically infected mothers, and MTCT may be as high as 29% if the acute phase of maternal infection occurs during breastfeeding.[10] Another study in a breastfed population showed that 6.9% of infants who were uninfected at 6 weeks of age acquired HIV infection by 12 months of age.[29] The World Health Organization (WHO) recommends that HIV-infected women do not breastfeed in areas where supplemental formula is available.[33] In Brazil, infant formula is available to HIV-infected mothers free of charge.[34] It is reassuring to note that while breastfeeding was a

clear risk factor over the 22 years of our study, its importance as a mode of transmission has declined substantially with fewer than 2% of infected women since 2007 choosing to breastfeed.

We also found that the rate of MTCT declined over the study period coincident with changes in preventing MTCT (PMTCT) recommendations. Again, in the earlier years of our cohort, before antenatal testing became more or less routine in Brazil, infants with HIV were largely identified as they became symptomatic. As a result, there is likely under-ascertainment of exposed but ultimately uninfected infants, which leads to overestimation of rates of transmission in the early years of the cohort. Since 2010 when definitive ART became offered to pregnant women regardless of CD4 count,[19] the rate has fallen to 4%.

Our study has several limitations. First, because our data were collected from clinical records, registries, and surveillance sources, there were missing values. We believe that these missing values occurred randomly, and hence the principal consequence of missing data was loss of power. A second limitation, as discussed above, is under-ascertainment of exposed but ultimately uninfected infants in the years before routine antenatal screening. A third limitation is that 11.4% of infants were still being evaluated at the time we closed the data set and had to be excluded from the analysis. Results from these additional infants could potentially affect some of our results.

Nonetheless, we believe our data are compelling. Breastfeeding in this population is a marker of either poor access to or utilization of antenatal care, consistent with the poorer, less educated population included in our cohort. Vieira et al. found that the prevalence of HIV infection among pregnant women and the incidence of vertical transmission were associated with lower urban quality of residential neighborhood in Brazil.[35]

Opportunities for PMTCT may be lost at each step of care, from presentation for antenatal care, through HIV testing and counseling, to ARV adherence and breastfeeding. These failures may be on the part of health professionals or local health policy. To improve engagement, PMTCT programs may need to target this group for incentives and additional services, including enhanced education about the value of PMTCT and maternal risk factors for HIV infection in children. Interventions that improve the engagement of pregnant women in HIV care and treatment programs are necessary to achieve the WHO goal of zero mother-to-child HIV transmission.[36]

Postpartum transmission remains a risk in Brazil, and the effects of policy changes such as distributing infant formula for HIV-exposed infants until 6 months of age with counseling for mothers[18,31] and universal treatment for infected pregnant women need to be continuously monitored, especially in poorer parts of the country where significant morbidity may accompany formula feeding if clean water is less available.[15] Recent studies from Africa have demonstrated the protective effect of both long-term maternal ART and medium-term ARV prophylaxis of mothers or infants in preventing postpartum transmission,[37,38] although at least one study[39] has found an increased risk of adverse pregnancy outcomes associated with ART in pregnant women.

To eliminate disparities in pediatric HIV infection in Sergipe and the rest of northeastern Brazil, continued emphasis needs to be placed on screening pregnant women, facilitating their transition into HIV care and treatment, providing infant formula or appropriate prophylaxis through the postpartum period, and careful monitoring of trends over time.

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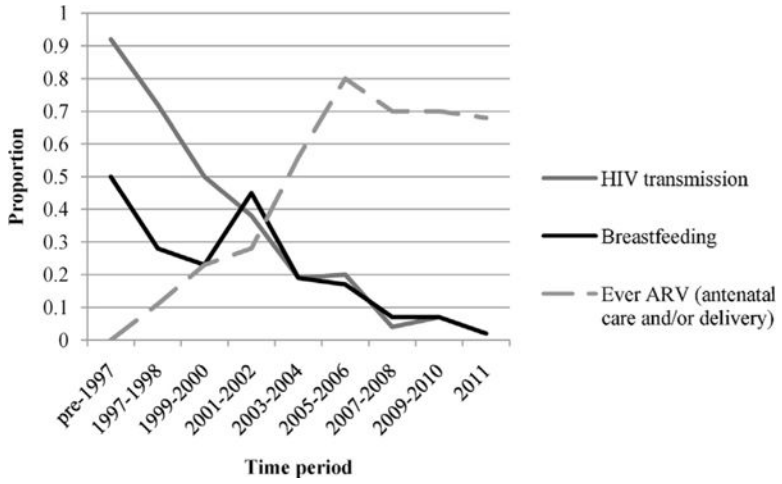

Figure 1.

Trends in antiretroviral usage and breastfeeding among HIV-infected mothers and in HIV transmission to infants, Sergipe, Brazil, 1993–2011.

Table 1

Characteristics of HIV-exposed children, Sergipe, Brazil, 1990–2011

Characteristic	N[a]	n	%
Sex	526		
Male		247	47.0
Female		279	53.0
Birth weight, g	323		
<2500		52	16.0
≥2500		271	84.0
Birthplace	393		
Aracaju		314	79.8
Interior		76	19.3
Other state		3	0.7
Received infant antiretroviral prophylaxis	397		
Yes		322	81.1
No		75	18.9
Follow-up	556		
Yes		512	92.0
No		44	8.0
Outcome	534		
Infected		101	18.9
Not infected		366	68.5
Still under investigation		61	11.4
Stillborn		6	1.1
Diagnosis	529		
Virological		129	24.3
Serological		94	17.7
Both		242	42.7
At death[b]		2	0.3
Missing		62	11.7

[a] The number of infants in each category may not add up to 561 due to missing information.

[b] Among the criteria of the Brazilian national case definition for AIDS, there is one termed the ‘exceptional death criterion’. This is used when AIDS is diagnosed after the death of the individual and has been reported on the death certificate.

Table 2

Characteristics of HIV-infected pregnant women, Sergipe, Brazil, 1990–2011

Maternal characteristics	N[a]	n	%
Area of residence	468		
Urban		417	89.2
Rural		51	10.8
Age, years	526		
<21		22	4.1
21–30		220	41.9
31–50		283	53.8
>50		1	0.2
Education, years	448		
None		62	13.9
<8		221	49.4
8		71	15.8
9–10		37	8.2
11		54	12.0
College		3	0.7
Vital status	561		
Dead		33	5.9
Alive		525	93.6
Disappeared		3	0.5
Professional status	226		
Employed		47	20.8
Unemployed		152	67.3
Self-employed		25	11.0
Retired		2	0.9
Mother's income, minimum salary units[b]	174		
None		118	67.8
<1		9	5.2
1–2		39	22.4
>2		8	4.6
Type of partner	451		
Married or steady partner only		332	73.6
Casual partners only		72	16.0
Steady and casual partners		47	10.4
Number of partners in last 10 years	246		
1 partner		75	30.5
2–4 partners		121	49.2
>4 partners		50	20.3
Child died of AIDS previously	311		
Yes		14	4.5

Maternal characteristics	N[a]	n	%
No		207	66.5
Unknown		90	29.0
Transmission category	288		
Current partner with HIV		152	52.8
Previous partner with HIV		115	39.9
Injection drug user		21	7.3
When HIV infection was diagnosed	491		
Prior to current pregnancy		172	35.0
During current pregnancy		134	27.3
At delivery		100	20.4
Postpartum		85	17.2

[a]The number of pregnant women in each category may not add up to 561 due to missing information.

[b]Brazilian minimum salary units, US $3732 per year.

Table 3

Cases of perinatally transmitted HIV infection by maternal risk factors, Sergipe, Brazil, 1990–2011

Maternal risk factor	Infected, *n* (%)	Uninfected, *n* (%)	Risk ratio	95% confidence interval
Antenatal care (*N* = 358)				
No	40 (46.0)	47 (54.0)	Referent	
Yes	27 (0.10)	244 (0.90)	0.22	(0.14, 0.33)
Number of visits (*N* = 358)				
None	40 (46.0)	47 (54.0)	Referent	
1–6	21 (13.2)	138 (86.8)	0.29	(0.18, 0.45)
≥6	6 (5.4)	106 (94.6)	0.12	(0.05, 0.26)
HIV tested during prenatal care (*N* = 397)				
No	51 (38.6)	81 (61.4)	Referent	
Yes	19 (7.2)	246 (92.8)	0.19	(0.11, 0.30)
Results of HIV test during antenatal care (*N* = 265)				
HIV-uninfected	2 (40.0)	3 (60.0)	Referent	
HIV-infected	17 (6.5)	243 (93.5)	0.16	(0.05, 0.53)
Antiretroviral prophylaxis or therapy during antenatal period (*N* = 393)				
No	59 (38.1)	96 (61.9)	Referent	
Yes	13 (4.9)	225 (95.1)	0.14	(0.08, 0.25)
Gestational age at antiretroviral initiation, months (*N* = 314)				
1–7 months	6 (4.0)	144 (96.0)	0.13	(0.06, 0.29)
8–9 months	52 (31.7)	112 (68.3)	Referent	
Syphilis test during antenatal care (*N* = 314)				
No	37 (35.6)	67 (64.4)	Referent	
Yes	21 (10.1)	186 (89.9)	0.29	(0.18, 0.46)
Mode of delivery (*N* = 406)				
Vaginal	39 (21.4)	143 (78.6)	Referent	
Caesarean	20 (8.9)	204 (91.1)	0.42	(0.25, 0.69)
ARV prophylaxis at delivery (*N* = 377)				
No	58 (50.9)	56 (49.1)	Referent	
Yes	16 (6.1)	247 (93.9)	0.12	(0.07, 0.20)
Infant ARV prophylaxis (*N* = 347)				
No	43 (64.2)	24 (35.8)	Referent	
Yes	17 (6.1)	263 (93.9)	0.09	(0.06, 0.16)
Infant breastfed (*N* = 396)				
No	29 (8.8)	301 (91.2)	Referent	
Yes	48 (72.7)	18 (27.3)	8.28	(5.67, 12.07)
Ever received ART (*N* = 337)				
Never	39 (58.2)	28 (41.8)	Referent	
Prenatal care only	2 (9.5)	19 (90.5)	0.08	(0.01, 0.54)
Delivery only	5 (8.3)	55 (91.7)	0.13	(0.06, 0.31)
Delivery and PNC	11 (5.8)	178 (94.2)	0.09	(0.05, 0.17)

ARV, antiretroviral; ART, antiretroviral therapy; PNC, prenatal care.

Table 4

Independent risk factors for perinatal HIV infection, Sergipe, Brazil, 1990–2011

Maternal risk factor	aOR	95% CI	*p*-Value
Breastfed infant	4.52	(0.78, 26.17)	0.092
Infant received ARV prophylaxis	0.07	(0.01, 0.41)	0.003
Mother received ARV prophylaxis during antenatal care only	0.13	(0.01, 1.39)	0.092

aOR adjusted odds ratio; CI, confidence interval; ARV, antiretroviral.