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Syphilis and HIV-1 among parturient women in Salvador, Brazil: low prevalence of syphilis and high rate of loss to follow-up in HIV-infected women

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ABSTRACT

Background: The occurrence of syphilis and HIV-1 infections during pregnancy are major risks to the fetus due to mother-to-child transmission (MTCT).
Objectives: To determine peripartum seroprevalence and risk factors of syphilis and HIV-1 infection among pregnant women in Salvador, Brazil, and the rate of HIV-1 MTCT.
Methods: Cross-sectional study of pregnant women who were admitted for delivery in a reference maternity hospital between May 2008 and March 2009 was conducted. Women were screened for HIV-1 infection and syphilis, and interviewed regarding demographic, behavioral and obstetric data. Newborns to HIV-infected mothers were tested by b-DNA and DNA-PCR to detect HIV-1.
Results: A total 3300/8516 women were evaluated. Mean age was 25.8 ± 7.3 years. HIV-1 and syphilis seroprevalence rates were 0.84% (28/3300) and 0.51% (17/3300), respectively. HIV-1 infection was associated with: low education ($p = 0.04$), having a partner with known HIV infection ($p < 0.0001$) or with previous sexually transmitted infection ($p < 0.0001$), blood transfusion ($p = 0.003$), or accidental exposure to blood ($p = 0.003$). Syphilis was associated with being Caucasian ($p = 0.02$), having no steady partner ($p = 0.02$), being a housewife ($p = 0.01$), having an intravenous drug user (IVDU) sexual partner ($p = 0.04$) or a sexual partner with previous STI ($p < 0.001$). Higher education ($p = 0.04$) was protective against HIV-infection. Attending a prenatal care program was protective against syphilis ($p = 0.008$) and HIV-1 ($p = 0.02$). No case of HIV-1 MTCT was detected, but 25% of children born to HIV-infected mothers were lost to follow up.
Conclusions: In Salvador, peripartum prevalence of syphilis and HIV-1 infection among pregnant women were low, and associated with classic risk factors for both infections. The great proportion of very late diagnosis of HIV infection, and the high rate of loss of follow-up among positive mothers and their infants are of high concern.

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Introduction

Despite all the achievements in the fight against AIDS, the epidemic is still spreading in Brazil and the distribution varies among the different regions of the country. While the epidemic is leveling off in some South and Southeast Brazilian states, there is a clear trend toward increasing incidence of HIV-1 infection in the poorer areas of the country, specially in the North and Northeast regions.[1] Recent epidemiologic trends indicate that the infection is leaving the larger cities and reaching small towns and villages, affecting primarily women, and individuals with low levels of education.[1] The increasing prevalence among women raises the risk of mother-to-child transmission (MTCT), since most pregnant women in remote areas do not know their HIV status and may have suboptimal access to prenatal care.[2,3]

In recent years, there has been a notable rise in the prevalence of syphilis in developing and industrialized countries, especially primary and secondary syphilis in women of childbearing age, with a consequent increase in the rate of neonatal syphilis.[4,5] In Brazil, syphilis in adults and neonates remains a public health concern. Maternal syphilis may result in fetal and neonatal death, fetal hydropsy, intrauterine growth restriction, as well as preterm birth.[6,7]

The risks of syphilis and HIV-1 MTCT are quite distinct: while HIV transmission occurs in approximately 25% of cases,[8] transmission of syphilis ranges from 70% to 100% during the primary and secondary phases, falling to approximately 30% in the later phases of maternal infection (latent and tertiary).[9] The reduction of HIV-1 MTCT and the elimination of congenital syphilis can be achieved through proper treatment of infected women during pregnancy.[8,9] While the transmission risk of HIV-1 during and after delivery can be reduced to levels of less than 2%,[10] congenital syphilis can be completely eliminated if the mother is diagnosed and treated during the prenatal period.[9,11,12]

Current recommendations for the prevention of MTCT include HIV testing during pregnancy and peripartum period and, for HIV-infected mothers, the initiation of combination antiretroviral therapy during pregnancy coupled with the use of intravenous zidovudine during labor. The optimal prophylaxis also requires that the newborn uses at least zidovudine during the first six weeks of life, and avoids breastfeeding.[13,14]

Thus, despite advances/availability of testing and treatment modalities for both infections, HIV-1 and syphilis MTCT continue to be major public health challenges which demand strategic approaches to combine medical interventions with population-based behavioral modification.[15–19] It is important to understand the main risk factors putting pregnant women at risk for acquisition of HIV-1 and syphilis in order to design successful preventive strategies for their elimination. In this study we evaluated a large sample of women in the peripartum period aiming at determining the risk factors for acquiring HIV-1 and syphilis, the prevalence of these infections among this population, and to estimate the rate of MTCT of HIV-1.

Methods

Study design and population

Cross-sectional study was conducted to estimate the peripartum prevalence of HIV-1 and syphilis in pregnant women who looked for care at Maternidade de Referência Professor José Maria de Magalhães Neto (MRPJMMN), the main public maternity hospital of Salvador. The city of Salvador is the capital of the state of Bahia, located in northeast Brazil. The city's population is approximately 2,800,000 inhabitants.

Each year, around 40,000 pregnant women give birth in Salvador, and in 2008, 42,763 pregnant women delivered in the city, of whom, around 30,000 (70%) in the state's public maternity hospitals.[20] The MRPJMMN provide care for 35% of all deliveries that occur in public hospitals in the city, and during the study period, 8516 pregnant women gave birth there.

Peripartum pregnant women who came to MRPJMMN between May 2008 and March 2009 were invited to participate in the study. Infants born to HIV-infected women were also included.

Sampling

The MRPJMMN has an average of 900 deliveries per month, 10,000 deliveries per year. We estimated HIV-1 prevalence between 0.5% and 0.7%. Considering the total admissions to the maternity per year (10,000), a power of 80%, and a confidence interval of 95%, a total sample of 3233 women would be required to enter the study.

All women admitted to labor and delivery are routinely tested for HIV-1 (by rapid test) and syphilis (by VDRL) on admission, except in cases of emergency delivery, were the tests are performed postpartum, before breastfeeding.

The day after delivery, a random sample of postpartum women were invited to answer a structured questionnaire. The interviewers (medical students) visited the maternity in different hours and days every week, during the study period, to enroll study participants. At each visit all eligible women were invited to answer the questionnaire. Eligibility was based on the following criteria:

- Women in good clinical condition;
- Availability of HIV-1 rapid test and VDRL test results, at admission;
- Providing a written informed consent.

The exclusion criteria were:

- Women clinically unstable;
- No available documentation on HIV-1 and VDRL tests;
- Refusal to participate in the study.

After obtaining written consent, interviews were conducted to obtain demographic (age, lifestyle, education level, family income), behavioral (including risk factors for acquisition of sexually transmitted infections – STIs) and obstetric data (previous gestational history, gestational age, type of delivery, use of proper prophylaxis for HIV-1 MTCT, and data

on infant's health conditions at birth). Infants born to women who tested positive for HIV-1 were also tested for HIV-1 RNA by b-DNA method at least two times (at 30 and 120 days of age) to define HIV infection status.

Data collection tools and laboratory methods

During admission for delivery, several tests including rapid HIV test (HIV Rapid Test, Bio-Manguinhos, RJ, Brazil) and VDRL test for syphilis (Bioclin, Quibasa, Belo Horizonte, MG, Brazil) were performed by the MRPJMMN staff according to the manufacturer's recommendations. Samples testing positive for HIV-1 by rapid tests were retested by an Enzyme-linked immunosorbent assay (Vironostika Uniform HIV1/2 plus O, bioMerieux, Boxtel, Netherlands) and those positive by VDRL were confirmed by a treponemal test (Trepanostika TP recombinant, bioMérieux, Boxtel, Netherlands). Infants born to HIV-infected women were tested for HIV by molecular testing (Versant HIV-b-DNA 3.0 assay, Siemens, Berkeley, CA) at 30 and 120 days of life to assess MTCT of HIV. HIV-1 and syphilis serology were performed at the Retrovirology Laboratory of the Hospital Universitário Professor Edgard Santos, at Universidade Federal da Bahia. To evaluate seropositivity for syphilis (including past exposure), we blindly tested (by EIA) 2369 blood samples, collected at the maternity's routine laboratory.

Statistical analysis

All collected data were stored in a data bank and analyzed by using the SPSS version 17 statistical package (SPSS Brasil, São Paulo, SP, Brazil). We calculated frequencies and proportions for the main variables, as well as the associations between them, by univariate analysis. Multivariate analysis was not performed due to the small number of infected women, which did not allow us to build a consistent model to perform the analysis. Associations of categorical variables were evaluated by univariate analysis through chi-square test with Yates correction or Fisher's exact test, when appropriate, and expressed through *odds ratio* and 95% confidence intervals. Continuous variables were compared by Kruskal–Wallis test or Student's *t*-test. Prevalence of syphilis and HIV-1 infection were defined by reactivity of samples to two different tests.

The study was approved by the Research Ethics Committee of Maternidade Climério de Oliveira (CEP MCO - UFBA).

Results

Among the 8516 pregnant women who gave birth during the study period at the MRPJMMN, 3475 women were invited and interviewed, but 175 were excluded due to unavailability of data in the medical charts. Thus, 3300 women were enrolled in the study. Mean age was 26.7 ± 6.8 years. The great majority (92.9%) of women declared themselves as non-white. Most women (77.6%) had no steady partner and had more than eight years of formal education (63%). Almost 80% lived in Salvador and 84.6% were housewives or had other informal job. Mean family income was less than three minimum wages for 89.1% of participants. Their previous obstetric history revealed a mean of 2.2 ± 1.7 gestations and 0.4 ± 0.8 abortions.

The prevalence for HIV-1 infection was 0.8% (28/3300) by rapid test and EIA. Of note, eight out of 28 (28.6%) women were already diagnosed as HIV-infected before pregnancy and were in regular care in a public HIV referral center. The remaining 20 (61.4%) were diagnosed during pregnancy: 10/28 (35.7%) during prenatal care, 9/28 (32.1%) by rapid testing during admission to labor and delivery, and 1/28 (3.5%) after emergency delivery. However, only 13/28 (46%) received any antiretroviral regimen during pregnancy. Among HIV-infected women, 7 (25%) reported having only one lifetime sexual partner, while among HIV-negative women, this proportion was 39.6% ($p = 0.16$, Fisher exact test). In this group, only 2 (7.1%) reported to have a steady partner. Prenatal care during the current pregnancy was significantly less frequent among HIV-infected than among HIV-negative women (78.5% vs. 92.1%, respectively, OR = 0.31, 95% CI: 0.12–0.86, $p = 0.02$, Fisher exact test). In addition, women who could not remember the number of prenatal visits made during pregnancy had a significantly greater likelihood of being infected by HIV-1 (251/3272 vs. 6/28, for HIV-negative and HIV-positive women, respectively, OR = 3.28, 95% CI: 1.18–8.63, $p = 0.01$, Yates corrected).

No difference was observed for HIV-1 serology by ethnicity or family income. Having no steady partner was marginally associated with HIV-positivity (OR = 3.81, 95% CI: 0.88–23.24, $p = 0.08$, Yates corrected).

A known HIV-positive sexual partner was the main detected risk factor for HIV-1 infection among study participants (5/28 vs. 2/2272, for infected and non-infected women, respectively, OR = 246.74, 95% CI: 39.42–1952.13, $p < 0.0001$, Fisher exact test). In addition, having a sexual partner with previous history of STI was also significantly associated with HIV infection (OR = 9.28, 95% CI: 2.97–27.09, $p < 0.0001$, Fisher exact test). Other prominent risk factor associated with HIV-seropositivity was lower level of education: among HIV-infected women, 57.1% had less than 8 years of formal education as compared to 36.8% of the HIV-negative women (OR = 2.29, 95% CI: 1.02–5.17, $p = 0.04$, Yates corrected). Interestingly, our study did not demonstrate an association between intravenous drug use (IVDU) or having a sexual partner who used IVDU and HIV-1 infection.

For syphilis, we found a positive VDRL test in 20 women (0.6%) and all but 3 cases (85%) were confirmed by a treponemal test (EIA). Therefore, the prevalence for syphilis infection was 0.5% (17/3300). However, in 2369 blindly tested samples for syphilis by EIA, 82 women (3.5%) were reactive for syphilis by EIA, indicating a higher rate of previous exposure to *Treponema pallidum*. Only one patient was co-infected by syphilis and HIV-1.

The main detected risks for syphilis infection were being Caucasian (OR = 4.10, 95% CI: 1.12–13.62, $p = 0.02$, Yates corrected), not having a steady sexual partner (all positive patients, $p = 0.001$, Fisher exact test), having a sexual partner with history of IVDU (OR = 6.7, 95% CI: 11.52–28.00, $p = 0.04$, Yates corrected) or who had previous STIs (OR = 34.57, 95% CI: 10.89–106.14, $p < 0.0001$, Fisher exact test). Receiving regular prenatal care was also protective for syphilis (OR = 0.20, 95% CI: 0.07–0.67, $p = 0.008$, Fisher exact test). Other characteristic significantly associated with syphilis was being a housewife (OR = 24.47, 95% CI: 3.43–495.68, $p < 0.0001$, Fisher exact test).

Table 1 – Selected socio-demographic characteristics and associations with HIV-1 infection and syphilis among parturient in Salvador, Brazil, 2008/2009.

Variables	All women ($n = 3300$)	HIV (+) women ($n = 28$)	HIV (–) women ($n = 3272$)	Odds ratio (CI 95%)	p-Value	Syphilis (+) women ($n = 17$)	Syphilis (–) women ($n = 3283$)	Odds ratio (CI 95%)	p-value
Age in years	25.8 ± 7.3	26.6 ± 5.7	25.8 ± 7.3		0.39	25.3 ± 6	25.8 ± 7.3		0.78
Mean ± SD (CI 95%)		(24.43–28.86)	(25.47–25.93)			(22.22–28.27)	(25.48–25.94)		
Race/skin color									
White	233	2	231	1.01	0.7	4	229	4.10	0.02
	(7.1%)	(7.1%)	(7.0%)	(0.24–4.24)		(23.5%)	(7.0%)	(1.12–13.62)	
Non-white	3067	26	3041			13	3054		
	(92.9%)	(92.9%)	(93.0%)			(76.5%)	(93.0%)		
Marital status									
Single/widow/divorced	2557	26	2531	3.81	0.08	17	2540	8.20	0.02
	(77.5%)	(92.9%)	(77.3%)	(0.88–23.24)		(100.0%)	(77.4%)	(1.16–165.74)	
Married/common law	743	2	741			0	743		
	(22.5%)	(7.1%)	(22.7%)			(0.0%)	(22.6%)		
Education in years									
≤8	1219	16	1203	2.29	0.04	9	1210	1.93	0.26
	(37.0%)	(57.1%)	(36.8%)	(1.02–5.17)		(52.9%)	(36.9%)	(0.68–5.49)	
>8	2081	12	2069			8	2073		
	(63.0%)	(42.9%)	(63.2%)			(47.1%)	(5.49%)		
Mean ± SD	4.6 ± 1.6	3.96 ± 1.73	4.68 ± 1.62			4.1 ± 1.4	4.6 ± 1.6		
Occupation									
Unemployed	510	5	505	1.19	0.79	1	1985		
	(15.4%)	(17.9%)	(15.4%)	(0.40–3.32)		(64.7%)	(60.5%)		
Homemaker/other	2790	23	2767			16	1298	0.08	0.004
	(84.6%)	(82.1%)	(84.6%)			(35.3%)	(39.5%)	(0.00–0.59)	
Family income									
Minimum wage									
≤3	2941	25	2916	1.02	1	16	2925	1.96	1.00
	(89.1%)	(89.3%)	(89.1%)	(0.29–4.25)		(94.1%)	(89.1%)	(0.27–39.74)	
>3	359	3	356			1	358		
	(8.6%)	(10.7%)	(10.9%)			(5.9%)	(10.9%)		
Mean ± SD	1.1 ± 0.4	1.1 ± 0.4		1.1 ± 0.4		1.1 ± 0.5	1.1 ± 0.4		
Home municipality									
Salvador	2614	24	2590	1.58	0.53	15	2599	1.97	0.55
	(79.2%)	(85.7%)	(79.1%)	(0.52–5.39)		(88.2%)	(79.2%)	(0.43–12.52)	
Other	686	4	682			2	684		
	(20.8%)	(14.3%)	(20.9%)			(11.8%)	(20.8%)		

Table 1 shows the socio-demographic characteristics of these women, according to HIV-1 and syphilis infection status.

Regarding obstetric history, number of previous pregnancies, mean gestational age, number of live births in previous pregnancies and the mean time of rupture of membranes were similar for positive and negative women for both infections, but we detected a trend toward association of lower gestational age among HIV-infected women (OR = 2.28, 95% CI: 0.95–5.40, $p = 0.06$, Yates corrected). Cesarean section was significantly less frequent in HIV-negative women (OR = 0.30, 95% CI: 0.12–0.71, $p = 0.004$, Yates corrected). Obstetric and behavioral characteristics of women and their association with HIV-1 and syphilis infection are displayed in Tables 2 and 3.

Discussion

The prevalence of syphilis (0.5%) and HIV-1 infection (0.8%) among pregnant women in a referral public maternity hospital in Salvador, Brazil, was low and no cases of MTCT were detected. A great proportion (36%) of HIV infections were detected only on admission to labor and delivery. Of concern, after discharge from the hospital, 25% of these women (and their newborns) were lost to follow-up. In addition, only 13/28 (46%) of women known to be infected by HIV-1 received antiretroviral therapy during prenatal care.

Despite universal availability of prenatal and peripartum HIV testing and prophylactic medication in Brazil, infants are still becoming infected. Data from the Brazilian National STD/AIDS Program demonstrate that HIV-1 MTCT accounted for 92.1% of AIDS cases among children under 13 years of age in 2010.[1] Despite the 36% reduction (from 5.4 to 3.5 cases per 100,000 inhabitants) in the incidence rates of pediatric AIDS cases in children under five years of age, between 1999 and 2010, the number of reported new cases among children under 13 years in 2010 was still of concern ($n = 482$).[1] In addition, a surveillance study based on sentinel maternity hospitals conducted in five regions of Brazil still showed an HIV infection prevalence of 0.6%.[15]

The Brazilian Ministry of Health (BMOH) recommends that syphilis test must be offered to all pregnant women in the first stages. Toward this end, the BMOH has launched information campaigns throughout the country to eliminate congenital syphilis.[16] However, syphilis remains a common problem during pregnancy, despite the availability of cheap and accurate diagnostic testing, definitive treatment and the persistent penicillin sensitivity of *T. pallidum*.[17–19] In 2004, a study conducted in our country among peripartum women showed a prevalence of active syphilis infection of 1.6%.[2]

Recent studies in Brazil have demonstrated greater prevalence of syphilis and similar rates of HIV-1 infection in pregnant women.[21–25] The lower syphilis prevalence rate found in this study suggests that Salvador has a different epidemiological profile in comparison with other states. An identical prevalence was shown in a neighboring state (Espírito Santo, Brazil) by a study with similar design, which suggests this can be a common pattern in these two states.[26] Bahia is one of the largest Brazilian states, and has several socio-demographic characteristics that distinguish it from other states in Northeast region.

The main risk factors detected for both HIV-1 and syphilis were: low socioeconomic status, past history of blood transfusion, and having a sexual partner with history of STI. Other risks associated with HIV-1 infection (but not with syphilis) were: low education level (less than eight years of schooling), having no steady sexual partner, accidental exposure to blood, and a known HIV-infected sexual partner. For syphilis, being white, housewife/having no formal employment, and having an IVDU sexual partner were the main risk factors. Regular prenatal care was a protective factor for both infections. Higher level of education appeared to be protective against HIV infection. These characteristics indicate that barriers to access to health services and health information may play an important role in the persistent transmission of these infections.

The role of previous exposure to blood products in HIV-1 infection is not clear. Currently, blood transfusion is an unlikely cause of HIV-1 infection in Brazilian larger cities, since blood banks routinely test their products for infectious pathogens. However, routine nucleic acid testing was only recently introduced in our blood banks, and we cannot rule out the possibility that some people were infected due to contaminated blood transfusion, especially if such event occurred in the first years after mandatory tests were introduced in the country. We did not collect information on dates or places of blood transfusion; thus, drawing conclusions based on this information would be difficult.

Pregnancy outcomes were similar for HIV-infected and non-infected mothers, although we have detected a trend for lower gestational age among HIV-infected women. However, this finding could be confounded by the fact that HIV-infected women are counseled to have elective cesarean section at the gestational age of 38 weeks.[27] Health outcomes for infants born to HIV-infected or non-infected women were similar.

A cause for concern is the high rate of women who were previously aware of their HIV-1 infection, but did not receive proper antiretroviral therapy during prenatal care. It is well established that suppression of HIV-1 viremia at the time of delivery is the most important action to prevent MTCT, and introduction of antiretroviral therapy by the 28th week is a crucial step in that process.[27] In addition, we found 10/28 (36%) women were diagnosed only at hospital admission, which implies in a higher risk of MTCT, even if all recommended interventions for women in labor are timely implemented.

Finally, we observed that no action was taken to notify, identify and trace the women diagnosed in the hospital setting. We tried to find the newly diagnosed women after hospital discharge, in order to test their newborns after four weeks. In 25% of them, the phone numbers recorded in the medical charts did not exist, and the home addresses they had provided were not identified, even after an extensive search in all available surveillance databases. Moreover, the State of Bahia Health Surveillance System was not aware of these new diagnoses and made no effort to trace these women and their infants. This failure of the health system may contribute to higher number of post-partum MTCT of HIV-1 through breastfeeding.

Brazil has one of the most acclaimed AIDS program in the world. The Brazilian Government provides free of costs, universal access to antiretroviral drugs, and offer laboratory tests

Table 2 – Selected behavioral and risk characteristics and associations with HIV-1 infection and syphilis among pregnant women in Salvador, Brazil, 2008/2009.

Variables	All pregnant women ($n = 3300$)	HIV (+) women ($n = 28$)	HIV (–) women ($n = 3272$)	Odds ratio (CI 95%)	p-Value	Syphilis (+) women ($n = 17$)	Syphilis (–) women ($n = 3283$)	Odds ratio (CI 95%)	p-value
Sexual partner									
Single	1305 (39.5%)	7 (25.0%)	1298 (39.6%)	0.51 (0.20–1.26)	0.16	4 (23.5%)	1301 (39.6%)	0.47 (0.13–1.54)	0.26
Multiple	1995 (60.5%)	21 (75.0%)	1974 (60.3%)			13 (76.5%)	1982 (60.4%)		
HIV+	7 (0.2%)	5 (17.8%)	2 (0.06%)	3.77 (0.91–15.56)	<0.001	0 (0.0%)	7 (0.2%)	0.00 (0.00–165.94)	1.00
IVDU	66 (0.2%)	2 (7.1%)	64 (1.9%)	3.77 (0.91–15.56)	0.1	2 (11.8%)	64 (1.9%)	6.71 (1.52–28.00)	0.04
Previous STI	57 (1.7%)	5 (17.8%)	52 (1.6%)	13.46 (4.30–39.28)	<0.0001	6 (35.3%)	9 (0.3%)	198.42 (51.96–760.72)	<0.001
Parenteral exposure									
Blood transfusion	100 (3.0%)	4 (14.2%)	96 (3.0%)	5.51 (1.59–17.17)	0	3 (17.6%)	97 (3.0%)	6.15 (1.40–22.90)	0.01
Accidental exposure to blood	38 (1.2%)	3 (10.7%)	35 (1.0%)	11.1 (2.54–41.1)	0	1 (5.9%)	37 (1.1%)	5.48 (0.73–39.44)	0.17
IVDU	9 (0.3%)	0 (0.0%)	9 (0.3%)	0.00 (0.00–72.81)	1.00	0 (0.0%)	9 (0.3%)	0.00 (0.00–124.59)	1.00

Table 3 – Obstetric characteristics of pregnant women in Salvador, Brazil, according to their serological status for HIV and syphilis.

Variables	All pregnant women (*n* = 3300)	HIV (+) women (*n* = 28)	HIV (−) women (*n* = 3272)	Odds ratio (CI 95%)	*p*-Value	Syphilis (+) women (*n* = 17)	Syphilis (−) women (*n* = 2283)	Odds ratio (CI 95%)	*p*-value
Number of gestations									
1	1487 (45.1%)	7 (25.0%)	1480 (45.3%)	0.40 (0.16–1.00)	0.05	7 (41.2%)	1480 (45.1%)		
2	824 (25.0%)	5 (17.8%)	819 (25.0%)			5 (29.4%)	819 (24.9%)		
3	500 (15.2%)	8 (28.6%)	492 (15.0%)			2 (11.8%)	498 (15.2%)		
>3	489 (14.7%)	8 (28.6%)	481 (14.7%)	0.43 (0.18–1.07)	0.06	3 (17.6%)	486 (14.8%)	0.81 (0.22–3.56)	0.73
Previous abortion									
No	2358 (71.5%)	17 (60.7%)	2341 (71.5%)	0.61 (0.27–0.41)	0.29	11 (64.7%)	2347 (71.5%)	0.72 (0.25–2.20)	0.58
Yes	942 (28.5%)	11 (39.3%)	931 (28.5%)			6 (35.3%)	936 (28.5%)		
Outcome of previous pregnancy (n = 7388)									
Live child	5827 (78.9)	63 (75.0%)	5764 (78.9%)	0.63 (0.19–2.54)	0.44	29 (78.4%)	5798 (78.9%)	0.97 (0.43–2.31)	0.89
Stillbirth	176 (2.4%)	3 (3.6%)	173 (2.3%)			1 (2.7%)	175 (2.4%)		
Spontaneous abortion	1385 (18.7%)	18 (21.4%)	1367 (18.8%)			7 (18.9%)	1378 (18.7%)		
Current gestation									
Prenatal care									
Yes	3038 (92.1%)	22 (78.5%)	3016 (92.1%)	0.31 (0.12–0.86)	0.02	12 (70.6%)	3026 (92.2%)	0.20 (0.07–0.67)	0.008
No	262 (7.9%)	6 (21.4%)	256 (7.9%)			5 (29.4%)	257 (7.8%)		
Prenatal care site									
Salvador	2458 (74.5%)	21 (75.0%)	2437 (74.5%)	1.03 (0.41–2.67)	0.87	11 (64.7%)	2447 (74.5%)	0.63 (0.21–1.90)	0.40
Other	842 (25.5%)	7 (25.0%)	835 (25.5%)			6 (35.3%)	836 (25.5%)		
Number of prenatal visits									
≥7	1109 (33.5%)	4 (14.3%)	1106 (33.8%)	0.38 (0.11–1.20)	0.11	3 (17.7%)	1106 (33.7%)	0.42 (0.10–1.56)	0.25
4–6	1654 (50.2%)	15 (53.6%)	1639 (50.1%)	1.01 (0.69–4.9)	0.27	6 (35.2%)	1648 (50.2%)	0.49 (0.17–1.34)	0.19
1–3	272 (8.3%)	3 (10.7%)	268 (8.2%)	1.63 (0.38–5.85)	0.41	2 (11.8%)	270 (8.2%)	0.65 (0.10–2.91)	0.75

– Table 3 (*Continued*)

Variables	All pregnant women ($n = 3300$)	HIV (+) women ($n = 28$)	HIV (–) women ($n = 3272$)	Odds ratio (CI 95%)	*p*-Value	Syphilis (+) women ($n = 17$)	Syphilis (–) women ($n = 2283$)	Odds ratio (CI 95%)	*p*-value
None	8 (0.2%)	0 (0.0%)	8 (0.2%)	0.00 (0.00–99.17)	1.00	1 (5.9%)	7 (0.2%)	18.13 (2.76–119.06)	0.05
Ignored	257 (7.8%)	6 (21.4%)	251 (7.7%)	3.28 (1.18–8.63)	0.01	5 (29.4%)	252 (7.7%)	2.61 (0.86–7.33)	0.06
Gestational age (weeks)									
<37	687 (20.8%)	10 (35.7%)	677 (20.7%)	2.28 (0.95–5.40)	0.06	4 (23.5%)	683 (20.8%)	1.23 (0.33–4.20)	0.75
≥37	2330 (70.6%)	15 (53.6%)	2315 (70.8%)			11 (64.7%)	2319 (70.6%)		
Ignored	283 (8.6%)	3 (10.7%)	280 (8.5%)			2 (11.8%)	281 (8.6%)		
Type of delivery									
Vaginal	1998 (60.5%)	9 (32.1%)	1989 (60.8%)	0.30 (0.12–0.71)	0	10 (58.8%)	1988 (60.6%)	0.93 (0.33–2.71)	0.91
Non-elective cesarean section	1145 (34.7%)	17 (60.8%)	1128 (34.5%)			7 (41.2%)	1138 (34.7%)		
Elective cesarean section	157 (4.8%)	2 (7.1%)	155 (4.7%)			0 (0.0%)	157 (4.8%)		

like CD4/8 counts, viral load measurement, and resistance tests without any cost for the patients. The AIDS epidemic is considered stable in the country, but in some areas there are specific problems, with greater number of infected women being reported, especially in poorer regions.[1] Although the reported number of children infected by MTCT is gradually decreasing in Brazil,[1] the problems we detected in our study are a matter of concern. They suggest the urgent need of a better attention to HIV-1 infection during pregnancy, and a deep review of the strategies to diagnose, include, and retain HIV-infected pregnant women in the Brazilian public health system.

In 2010 a total of 10,084 cases of syphilis in pregnant women was reported to BMOH, and 6667 cases of congenital syphilis were detected.[1] Testing for syphilis was performed during routine prenatal care in 43.6% of women, but in only 23.6% of infected cases the sexual partner was also treated.[23] This suggests that these women had a high risk of re-infection by their sexual partners which greatly increased the risk of transmission of syphilis to their fetuses. This also indicates that the public health system failed to prevent MTCT of syphilis even when the diagnosis was made during pregnancy. On the other hand, the high rate of positive samples we found in the random *T. pallidum* serology suggests that most of these women have received any sort of treatment in the past, and were cured. However, it is not possible to know when and how they were diagnosed.

One interesting finding of our study was the higher risk for syphilis we detected in Caucasian women. Salvador's population is predominantly (80%) black or racially mixed. In our sample, 92% of women fit this ethnic profile although the risk of acquiring syphilis was significantly higher for white women. Women reporting no steady partner were also at higher risk for syphilis. These findings suggest that these characteristics may act as markers for a higher number of high-risk sexual partners among these subpopulations, indicating a greater risk of sexual exposure. Another intriguing finding was the higher incidence of syphilis infection detected among women declaring themselves as housewives, who do not work outside home and are economically dependent on their partners. The majority of these women also reported having only one sexual partner, suggesting that infections were brought into the relationship by their steady partner. The association between syphilis and having a sexual partner with previous STI or reporting IV drug use is a clear indication of a high-risk sexual exposure. History of previous STI indicates unprotected sex in the past, and probably in routine life. IVDU is commonly associated with sex exchange, and also a recognized risk factor for acquiring STI (including HIV infection). The strong association between having a sexual partner with a previous history of STI and syphilis reinforces the potential role of high-risk sexual partners in syphilis transmission to these women.

Syphilis is related to sexual vulnerability: unemployed women, economically dependent on their partners, having more difficulties in negotiating condom use, for instance. In our study, there is evidence indicating that women with syphilis were infected by their steady partners. However, our survey did not address such specific points. It is not clear the association between higher risk for syphilis among recipients of blood transfusion. Although we cannot rule out the use of contaminated blood by *T. pallidum*, it seems unlikely, due to the routine screening for syphilis in all donated blood. Again, we had no information on time and conditions when the transfusions were done.

One potential limitation of our study is the evaluation of only one site in Salvador. However, since MRPJMMN is the main public referral center for peripartum care in Salvador, caring for the majority of laboring mothers, we believe our sample is quite representative of Salvador's pregnant women population. The lack of information on the risk factors for women exposed to syphilis (positive EIA, but negative VDRL) is also a limitation since such information could be useful to confirm the present findings, or to provide a different epidemiological profile for past infection. However, the sample size in our study is large enough to provide a real epidemiological picture of such infections in Salvador. The lack of information on blood transfusion also limits the scope of our conclusions regarding this specific point. Nevertheless, it would be very difficult to identify the factors potentially involved in such procedures, based only in verbal information of women at time of delivery. Finally, due to the small sample number of infected women for both infections, we were not able to perform a multivariate analysis.

One of the main goals of our study was to estimate the rate of MTCT of HIV-1. However, the loss of follow up of a quarter of exposed children considerably limits our conclusions. We did not have any detected case of MTCT among the children with available HIV tests, but they may represent the less vulnerable infants, since their mothers were properly followed and cared after delivery. The mother/child pairs who were lost to follow up are probably under a higher risk for MTCT, due to the likely absence of sequential prophylaxis for the children and the likelihood of breastfeeding.

Taken together, our results suggest the need for improvement in prenatal care coverage in Salvador, and the urgency in providing better care and more stringent follow-up for women diagnosed with HIV-1 or syphilis during pregnancy, as well as for those diagnosed only at the time of delivery. These women and their infants need to be tracked down and ensure adequate health care access for mother and infant, and to reduce further risk of HIV-1 MTCT.

Conflict of interest

All authors declare to have no conflict of interest.

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