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Rosa Maria Soares Madeira Domingues[I]

Celia Landmann Szwarcwald[II]

Paulo Roberto Borges Souza Junior[II]

Maria do Carmo Leal[III]

Prevalence of syphilis in pregnancy and prenatal syphilis testing in Brazil: Birth in Brazil study

Prevalência de sífilis na gestação e testagem pré-natal: Estudo Nascer no Brasil

ABSTRACT

OBJECTIVE: Determine the coverage rate of syphilis testing during prenatal care and the prevalence of syphilis in pregnant women in Brazil.

METHODS: This is a national hospital-based cohort study conducted in Brazil with 23,894 postpartum women between 2011 and 2012. Data were obtained using interviews with postpartum women, hospital records, and prenatal care cards. All postpartum women with a reactive serological test result recorded in the prenatal care card or syphilis diagnosis during hospitalization for childbirth were considered cases of syphilis in pregnancy. The Chi-square test was used for determining the disease prevalence and testing coverage rate by region of residence, self-reported skin color, maternal age, and type of prenatal and child delivery care units.

RESULTS: Prenatal care covered 98.7% postpartum women. Syphilis testing coverage rate was 89.1% (one test) and 41.2% (two tests), and syphilis prevalence in pregnancy was 1.02% (95%CI 0.84;1.25). A lower prenatal coverage rate was observed among women in the North region, indigenous women, those with less education, and those who received prenatal care in public health care units. A lower testing coverage rate was observed among residents in the North, Northeast, and Midwest regions, among younger and non-white skin-color women, among those with lower education, and those who received prenatal care in public health care units. An increased prevalence of syphilis was observed among women with < 8 years of education (1.74%), who self-reported as black (1.8%) or mixed (1.2%), those who did not receive prenatal care (2.5%), and those attending public (1.37%) or mixed (0.93%) health care units.

CONCLUSIONS: The estimated prevalence of syphilis in pregnancy was similar to that reported in the last sentinel surveillance study conducted in 2006. There was an improvement in prenatal care and testing coverage rate, and the goals suggested by the World Health Organization were achieved in two regions. Regional and social inequalities in access to health care units, coupled with other gaps in health assistance, have led to the persistence of congenital syphilis as a major public health problem in Brazil.

DESCRIPTORS: Syphilis Serodiagnosis. Pregnant Women. Prenatal Care. Socioeconomic Factors. Health Inequalities. Infectious Disease Transmission, Vertical.

[I] Laboratório de Pesquisa Clínica em DST e Aids. Instituto Nacional de Infectologia Evandro Chagas. Fundação Oswaldo Cruz. Rio de Janeiro, RJ, Brasil

[II] Instituto de Comunicação e Informação Científica e Tecnológica em Saúde. Fundação Oswaldo Cruz. Rio de Janeiro, RJ, Brasil

[III] Departamento de Epidemiologia e Métodos Quantitativos em Saúde. Escola Nacional de Saúde Pública Sérgio Arouca. Fundação Oswaldo Cruz. Rio de Janeiro, RJ, Brasil

Correspondence:
Rosa Maria Soares Madeira Domingues
Laboratório de Pesquisa Clínica em DST e Aids
Instituto Nacional de Infectologia Evandro Chagas
Fundação Oswaldo Cruz
Av. Brasil, 4365 Manguinhos
21040-360 Rio de Janeiro, RJ, Brasil
E-mail: rosa.domingues@ini.fiocruz.br

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RESUMO

OBJETIVO: Analisar a cobertura de testagem para sífilis durante a assistência pré-natal e estimar a prevalência de sífilis na gestação.

MÉTODOS: Coorte nacional de base hospitalar, realizada no Brasil, de 2011 a 2012, com 23.894 mulheres. Foram utilizados dados obtidos na entrevista com a puérpera, no prontuário hospitalar e nos cartões de pré-natal. Foram considerados casos de sífilis na gestação todas as gestantes com resultado de sorologia reagente no cartão ou diagnóstico de sífilis durante a internação para o parto. Prevalência de sífilis e coberturas de testagem foram analisadas segundo região de residência, cor da pele, escolaridade, idade materna e tipo de serviço de assistência pré-natal e ao parto, com utilização do teste estatístico Qui-quadrado.

RESULTADOS: Houve cobertura pré-natal de 98,7% das mulheres, cobertura de testagem para sífilis de 89,1% (um exame) e 41,2% (dois exames), bem como prevalência de sífilis na gestação de 1,02% (IC95% 0,84;1,25). Menor cobertura pré-natal foi observada na região Norte, em indígenas, em mulheres com menor escolaridade e naquelas atendidas em serviços públicos. Coberturas mais baixas de testagem ocorreram em residentes nas regiões Norte, Nordeste e Centro-Oeste, em mulheres não brancas, mais jovens, de menor escolaridade e atendidas em serviços públicos. Maior prevalência de sífilis foi estimada em mulheres com menos de oito anos de escolaridade (1,74%), que se declararam pretas (1,8%) ou pardas (1,2%), mulheres sem pré-natal (2,5%) e naquelas atendidas em serviços públicos (1,37%) ou mistos (0,93%).

CONCLUSÕES: A prevalência estimada de sífilis na gestação foi semelhante à encontrada no último Estudo-Sentinela Parturiente realizado em 2006. Houve ampliação da cobertura pré-natal e de testagem, com alcance das metas sugeridas pela Organização Mundial da Saúde em duas regiões. Desigualdades regionais e sociais no acesso aos serviços de saúde, aliadas a outras falhas na assistência, para a persistência da sífilis congênita como importante problema de saúde pública no País.

DESCRITORES: Sorodiagnóstico da Sífilis. Gestantes. Cuidado Pré-Natal. Fatores Socioeconômicos. Desigualdades em Saúde. Transmissão Vertical de Doença Infecciosa.

INTRODUCTION

Syphilis is an infectious and sexually transmitted disease caused by the bacteria *Treponema pallidum*. It is transmitted vertically from mother to the fetus during pregnancy. It can result in miscarriage, late fetal losses, neonatal death, sick or asymptomatic neonates, and lead to severe complications if left untreated.[16] A meta-analysis study reported negative outcomes in 66.5% (95%CI 58.0;74.1) of the pregnant women with syphilis and in 14.3% (95%CI 11.8;17.2) of those without diagnosis of syphilis, i.e., a higher frequency of adverse events was observed among infected pregnant women.[7]

An estimated 1.8 million pregnant women worldwide are infected with syphilis and < 10.0% are diagnosed and treated.[3] The strategy for eliminating congenital syphilis was launched by the World Health Organization (WHO) in 2007[19] and reinforced in 2012,[20] when it was associated with strategies for the prevention of vertical transmission of HIV. The Pan American Health Organization[13] aims to eliminate congenital syphilis in the Americas; elimination is defined as the occurrence of < 0.5 case per 1,000 live births. In Brazil, this goal has been adopted by the Ministry of Health.

Fifteen countries are considered high priority for the control of congenital syphilis; these include Brazil, because of its population size and prevalence of syphilis in pregnancy.[3] The sentinel surveillance study conducted in 2004 used probability sampling and blood collection for the performance of serological tests

and estimated a prevalence of syphilis in pregnancy of 1.6% (95%CI 1.3;1.9).[a] A new sentinel surveillance study was performed in 2006 using probability sampling, but used secondary data from prenatal care cards and hospital records, and estimated a prevalence of 1.1%.[17] On the basis of these studies, it is estimated that approximately 48,000 cases of syphilis occur during pregnancy per year in Brazil.[b]

Data from epidemiological bulletins of STD/AIDS from the Ministry of Health[b] show that the number of reported cases of syphilis in pregnancy increases every year. In 2011, it corresponded to 14,321 cases, but it is still lower than the estimated number of cases. This result highlights the limitations in diagnosis and/or disease notification. More than 9,000 cases of congenital syphilis were reported in Brazil in 2011, with an incidence of 3.3 cases per 1,000 live births. National studies reported deficiencies in prenatal care for the control of syphilis in pregnancy as well as missed opportunities for its diagnosis and treatment.[6,15,17] In this respect, previous studies involving postpartum women in other countries highlight the missed opportunities of testing for syphilis infection.[18] An adequate diagnosis during pregnancy is a major challenge for the control of congenital syphilis.[1,14]

The present study aimed to determine the testing coverage rate for syphilis during prenatal care and the prevalence of syphilis in pregnancy.

METHODS

A hospital-based cohort study designated "Birth in Brazil: national survey on child delivery and birth",[10] involving 23,894 women was performed between February 2011 and October 2012, and aimed to evaluate the conditions of child delivery and infant care in Brazil and the results of such care. A detailed description of the methods is available in Leal et al[10] (2012).

To calculate sample size, the rate of cesarean deliveries was calculated and estimated to be 46.6%, with a 5% significance to detect differences of 14.0% between the health care service types, using a confidence interval of 95% and design effect of 1.3. This resulted in a minimum sample of 450 women per stratum.

The sample was selected in three stages. In the first stage, hospitals with > 500 deliveries per year were stratified according to the five geographical regions of Brazil (North, Northeast, South, Southeast, and Midwest), by location (countryside and capitals) and by health care service type (public, mixed, and private), with a selection probability that was proportional to the number of births in 2007 in each stratum. In the second stage, a method of inverse sampling was used to select the number of days required (minimum of seven) to interview 90 postpartum women in each hospital. In the third stage, eligible women were selected at each day of fieldwork.

The group considered eligible for the study comprised mothers with hospital-based deliveries of a live fetus of any gestational age or weight, or dead fetus of gestational age > 22 weeks or weight > 500 grams.

Interviews with the mothers were conducted during hospitalization after a period of at least 6h after delivery. Sampling losses because of refusals or hospital discharge were replaced with postpartum women from the same hospital. Data from the medical files of the puerperal woman and newborn were obtained at the time of hospital discharge. In case of prolonged hospitalization, data from medical files were obtained at the 42nd day of hospitalization in the case of the puerperal women or the 28th day of life in the case of the newborns. Electronic forms developed specifically for this study were used for the interviews and for data extraction from the medical records. When available, prenatal care cards were digitally photographed, and data were subsequently extracted and entered into an online platform by a group of students and health professionals trained and supervised by the coordinating research team.

Data recorded on the prenatal care cards related to the two routine tests recommended by the Ministry of Health (one in the first prenatal care visit and the second early in the third trimester) were used to evaluate the testing coverage rate for syphilis. The considered serological tests comprised those that yielded reactive or non reactive results for syphilis.

For the diagnosis of syphilis in pregnancy, the occurrence of one of these situations was considered: record of a reactive serological test on the prenatal card or hospital medical file, regardless of the titration values; record of syphilis diagnosis on the prenatal card or hospital medical file; or case of congenital syphilis as an outcome from the current pregnancy.

The following variables were analyzed to assess prenatal care: health care coverage, proportion of postpartum women who reported having received prenatal care cards, proportion of postpartum women who brought the prenatal care card at admission for childbirth, proportion of postpartum women having the first

[a] Ministério da Saúde. Estimativa da prevalência de HIV na população brasileira de 15 a 49 anos, 2004. *Bol Epidemiol AIDS DST*. 2006 [cited 2013 Sep 1];3(1):11-5. Available from: http://www.aids.gov.br/publicacao/2006/boletim-epidemiologico-aids-e-dst-2006
[b] Ministério da Saúde. *Bol Epidemiol Sífilis*. 2012 [cited 2013 Sep 1];1(1). Available from: http://www.aids.gov.br/sites/default/files/anexos/publicacao/2012/52537/boletim_sifilis_2012_pdf_26676.pdf

and second syphilis serological test results recorded in their prenatal care cards.

Data related to prenatal care and syphilis infection were analyzed according to maternal characteristics: region of residence (North, Northeast, Southeast, South, and Midwest), age in years (12-19, 20-34, ≥ 35 years), education in years (≤ 7, 8-10, 11-14, ≥ 15 years), self-reported skin color (white, black, mixed, Asian, indigenous), type of prenatal care service (public or private), type of child delivery care service (public, private, or mixed). Mixed units were considered as those that assisted women with public or private funds for child delivery care.

Data weighting was calculated using the inverse of the probability of inclusion of each postpartum woman in the sample. To ensure that the distribution of the puerperal women interviewed was similar to that observed among the births in the population sampled in 2011, a calibration procedure was used in each selection stratum. In all the statistical analyses, the complex sampling design was taken into consideration. The Chi-square test was used to assess differences between proportions.

This study was approved by the Research Ethics Committee of the *Escola Nacional de Saúde Pública* (ENSP/FIOCRUZ 92/2010). All measures were taken to ensure secrecy and confidentiality of information. All participants signed a digital free and informed consent form.

RESULTS

A total of 23,894 women were interviewed. Of the postpartum women selected to participate in the study, 5.7% were not interviewed because of refusal to participate or early hospital discharge, and were replaced with other postpartum women from the same hospital.

Most postpartum women resided in the Southeast (42.5%) and Northeast (28.9%) regions, which are the most populated regions in Brazil. The lowest proportion of participants (6.5%) was located in the Midwest region. The mean age of participants was 25.7 years; 19.1% were adolescents and 10.5% were aged ≥ 35 years. Most participants self-reported their skin color as mixed, while East Asian and indigenous groups represented a small proportion of the total sample (1.1% and 0.4%, respectively). In addition, 50.0% respondents had ≤ 10 years of education and 8.9% had university education. Most women received prenatal care in public health care units and 14.5% gave birth in private health care units (Table 1).

Furthermore, 98.7% postpartum women reported having had prenatal care, 96.0% reported having received prenatal care cards during pregnancy, and 71.6% brought the prenatal card during hospital admission for childbirth. Of the prenatal cards analyzed, 89.1% contained the results of the first serological test and 41.1% contained the results of the second serological test (Table 2).

Table 1. Demographic and social profiles and the use of prenatal and child delivery care units among the postpartum women interviewed. Brazil, 2011-2012.

Maternal profile	n	%
Region of residence		
North	2,296	9.6
Northeast	6,904	28.9
Southeast	10,155	42.5
South	2,984	12.5
Midwest	1,555	6.5
Maternal age (years)		
12 to 19	4,570	19.1
20 to 34	16,807	70.4
≥ 35	2,509	10.5
Years of education		
0 to 7	6,322	26.6
8 to 10	6,085	25.6
11 to 14	9,263	39.0
≥ 15	2,109	8.9
Self-reported skin color		
White	8,079	33.8
Black	2,051	8.6
Mixed	13,403	56.1
East Asian	257	1.1
Indigenous	99	0.4
Type of prenatal care service		
No prenatal care	319	1.3
Public	17,575	73.6
Private	5,971	25.0
Type of child delivery care service		
Public	9,836	41.2
Mixed	10,596	44.3
Private	3,462	14.5
Total	23,894	100.0

The lowest coverage rates of prenatal care were observed among indigenous women, those who lived in the North region, the less educated, and those who gave birth in public health care units (Table 2).

No differences were observed in the receipt of prenatal care cards by region of residence. Women who were more educated, who self-reported as white, older, and those receiving prenatal and child delivery care in private health care units reported having received prenatal care cards to a lesser extent.

Table 2. Data from prenatal care and serological tests for syphilis according to maternal characteristics and the type of prenatal and child delivery care units. Brazil, 2011-2012.

Maternal profile	n	Prenatal care (N = 23,894)		Received prenatal care cards (N = 23,555)		Brought the prenatal card at hospital admission (N = 23,555)		Result of the first serological test for syphilis (N = 16,899)		Result of the second serological test for syphilis (N = 16,899)	
		%	p	%	p	%	p	%	p	%	p
Region			0.006				< 0.001		< 0.001		< 0.001
North	2,296	97.5		97.9	0.130	64.2		79.5		29.2	
Northeast	6,904	98.5		94.9		67.9		84.8		31.0	
Southeast	10,155	98.8		96.3		77.5		91.8		44.5	
South	2,984	99.5		97.1		79.7		94.9		56.7	
Midwest	1,555	98.7		94.2		45.1		86.1		42.8	
Maternal age (years)			0.497		< 0.001		< 0.001		< 0.001		< 0.001
12 to 19	4,570	98.5		98.7		74.7		85.8		36.8	
20 to 34	16,807	98.7		95.8		71.7		89.6		42.0	
≥ 35	2,509	98.7		92.4		65.9		92.0		44.1	
Years of education			< 0.001		< 0.001		< 0.001		< 0.001		< 0.001
0 to 7	6,322	96.9		98.9		76.2		84.8		33.3	
8 to 10	6,085	98.8		98.0		74.5		88.6		41.8	
11 to 14	9,263	99.5		95.7		71.0		91.8		45.7	
≥ 15	2,109	100		83.2		52.7		93.7		45.6	
Self-reported skin color			0.001		< 0.001		0.422		< 0.001		< 0.001
White	8,079	99.2		94.2		70.3		91.9		45.4	
Black	2,051	98.1		98.4		73.4		85.1		38.4	
Mixed	13,403	98.5		96.8		72.1		88.1		39.2	
East Asian	257	98.3		93.5		73.9		83.6		34.2	
Indigenous	99	95.0		98.2		80.1		91.3		38.4	
Type of prenatal care service					< 0.001		< 0.001		0.001		0.756
Public	17,575			99.3		76.3		88.4		41.0	
Private	5,971			86.3		58.0		91.9		41.8	
Type of child delivery care service			< 0.001		< 0.001		< 0.001		0.001		0.004
Public	9,836	97.8		99.0		73.9		86.6		36.8	
Mixed	10,596	99.1		97.8		77.0		90.6		44.6	
Private	3,462	99.9		82.2		49.2		91.8		43.2	
Total	23,894	98.7		96.0		71.6		89.1		41.1	

Chi-square test

These women, along with those from the Midwest region, were the group that least frequently presented the prenatal card at the time of hospital admission for delivery (Table 2).

Fewer results for the first serological test were observed among women in the North, Northeast, and Midwest regions; those with lower education; those who self reported as black, mixed, or East Asian; younger women; and those who received prenatal and child delivery care in public health care units. A similar pattern was observed for the second serological test result, with the exception that no significant difference was observed between public and private health care units and for indigenous people, who had fewer medical records than those who self-reported their skin color as white (Table 2).

The estimated prevalence of syphilis in pregnancy was 1.02% (95%CI 0.84;1.25). The prevalence did not differ significantly by region and varied between 0.76% in the North region and 1.1% in the South region (Table 3). A negative correlation between the prevalence of syphilis and maternal education was observed, and the prevalence

Table 3. Prevalence of syphilis in pregnancy and prevalence ratio according to the maternal profile. Brazil, 2011-2012.

Maternal profile	n	Prevalence of syphilis during pregnancy	95%CI	PR	95%CI
Region					
North	2,296	0.76	0.42;1.35	1	
Northeast	6,904	1.08	0.71;1.63	1.49	0.70;3.15
Southeast	10,155	1.03	0.75;1.41	1.44	0.72;2.89
South	2,984	1.10	0.75;1.60	1.53	0.74;3.17
Midwest	1,555	0.96	0.46;2.00	1.35	0.51;3.54
Maternal age (years)					
12 to 19	4,570	0.90	0.64;1.28	1	
20 to 34	16,807	1.06	0.83;1.35	1.16	0.77;1.76
≥ 35	2,509	1.02	0.60;1.75	1.14	0.62;2.11
Years of education					
0 to 7	6,322	1.74	1.25;2.41	3.24	1.47;7.12
8 to 10	6,085	1.09	0.83;1.43	2.01	0.96;4.21
11 to 14	9,263	0.58	0.43;0.79	1.08	0.49;2.35
≥ 15	2,109	0.54	0.26;1.12	1	
Self-reported skin color					
White	8,079	0.59	0.42;0.83	1	
Black	2,051	1.81	1.18;2.75	3.17	1.78;5.65
Mixed	13,403	1.16	0.89;1.51	1.99	1.30;3.06
East Asian	257	1.45	0.28;7.06	2.52	0.46;13.86
Indigenous	99	0.55	0.07;3.95	0.96	0.12;7.35
Type of prenatal care service					
No prenatal care	319	2.50	1.12;5.50	6.07	2.34;15.75
Public	17,575	1.20	0.98;1.47	2.85	1.75;4.64
Private	5,971	0.42	0.26;0.67	1	
Type of child delivery care service					
Public	9,836	1.37	1.03;1.81	4.24	2.07;8.69
Mixed	10,596	0.93	0.70;1.25	2.94	1.44;6.03
Private	3,462	0.32	0.17;0.61	1	
Total	23,894	1.02	0.84;1.25		

was 3.2 times larger among women with ≤ 7 years of education than those with higher education (Table 3). No significant differences were observed in the prevalence according to maternal age. Higher rates were found among women who self-reported their skin color as black (1.81%) or mixed (1.16%) when compared with those who self-reported as white (0.59%) (Table 3).

A higher prevalence of syphilis was observed among women without prenatal care (2.5%) and among those who received prenatal care in public health care units (1.2%). The prevalence among postpartum women who received child delivery care in public or mixed health care units was three to four times higher than that of women attending private health care units (Table 3).

Table 4. Relationship between the results of the first serological test and those of the second serological test for syphilis and diagnosis of syphilis performed during pregnancy and/or hospitalization for childbirth. Brazil, 2011-2012.

First serological test/Second serological test or hospitalization	Second serological test				Syphilis diagnosis (gestation + hospitalization)			
	Non reactive		Reactive		No		Yes	
	n	%	n	%	n	%	n	%
Non reacrive	6,870	99.7	18	0.3	14,799	99.6	61	0.4
Reactive	29	43.3	38	56.7	0	0	116	100.0

Among women with non reactive results for the first serological test, 0.3% had a reactive result in the second serological test. In addition, 0.4% of those with non reactive test results for syphilis early in pregnancy were diagnosed with syphilis during the second prenatal care examination or during hospitalization for childbirth, when data from the medical records of postpartum women and newborns were collected (Table 4).

DISCUSSION

The coverage of prenatal care for pregnant women in Brazil is virtually complete and reaches values > 90.0% regardless of the geographic region or maternal profile. However, slightly lower coverage rates were observed in the North region and among less educated and indigenous women, probably because of geographical, cultural, and social barriers. This result indicates that distinct strategies are required to reach populations that are more vulnerable. Women without prenatal care had the highest prevalence of syphilis in pregnancy.

The provision of a prenatal card was seen to be a well-established practice, without regional differences, similar to the results obtained in a recent national study.[c] The lowest rate of provision of the card reported by women with highest schooling level, who self-reported as white and who were attended in private units probably resulted from the care model in the private sector, in which the prenatal and delivery care are provided by the same professional.

The test results were only ascertained among the women who presented the prenatal card at the time of hospital admission for delivery. However, testing coverage rates should not be overestimated: women with highest schooling level and who were attended in private health care units presented higher test coverage, but were the ones who least often presented a prenatal card

The proportion of women who presented records of the results from the first syphilis serological test was high, and higher than that observed in the sentinel surveillance study in 2006:[17] however, the coverage of 100% of pregnant women was not reached in any region of the country. The proportion of the results from the second syphilis serological test was lower but covered > 50.0% of the pregnant women in the South region.

Women with lower schooling and who self-reported as black or mixed as well as those assisted in public health care units had the lowest testing coverage rate and the highest prevalence of syphilis in pregnancy. This result highlights the missed opportunities for diagnoses and intervention, particularly among women with increased risk of vertical transmission of syphilis.

The results of prenatal care and syphilis testing during pregnancy indicate that Brazil has achieved the goals recommended by WHO[20] for these process indicators in two regions, where coverage rates for both indicators were > 90.0%. However, it was not possible to verify the gestational age at which testing was performed. The best results for the prevention of vertical transmission of syphilis are achieved when treatment is performed between the 24th and the 28th weeks of gestation.[1] The indicator considered essential for health care by WHO[20] is the national proportion of pregnant women infected with syphilis who receive at least one dose of penicillin G benzathine until the 24th gestational week.

According to WHO,[20] delayed prenatal care is one of the barriers for the control of syphilis in pregnancy, and it is associated with fewer medical consultations and fewer routine examinations.[5] In the present study, delayed prenatal care (after the 12th gestational week), was observed in 40.0% postpartum women (data not shown). Therefore, many pregnant women may have been diagnosed and treated after the recommended gestational age.

Other aspects of the control of syphilis in pregnancy in Brazil were not assessed in this study. However, the limited implementation of control strategies needs to be addressed. Local studies[4,6,9] have reported failure in the treatment of infected pregnant women according to the recommendations established by the Ministry of Health.[d] Data from the *Sistema de Informação de Agravos de Notificação* (SINAN – Information System for Notifiable Diseases) indicate that the proportion of treated partners among the congenital cases of syphilis reported in Brazil was 11.5% in 2011.[b] By contrast, the goal of WHO[20] is the identification and treatment of > 80.0% of the partners of pregnant women with syphilis with at least one dose of penicillin G benzathine.

The treatment of the partner is important to prevent reinfection during pregnancy and serves as an opportunity to treat and prevent new cases of sexually transmitted infections in the general population. A previous study on the vertical transmission of syphilis and HIV in the Americas and the Caribbean indicated that the goal to eliminate congenital syphilis in the region will only be achieved when strategies are adopted to decrease the prevalence of syphilis among pregnant women.[e]

[c] Ministério da Saúde. Pesquisa Nacional de Demografia e Saúde da Criança e da Mulher – PNDS 2006: dimensões do processo reprodutivo e da saúde da criança. Brasília (DF); 2009.
[d] Ministério da Saúde. Programa Nacional de Controle de Doenças Sexualmente Transmissíveis e AIDS. Protocolo para a prevenção da transmissão vertical de HIV e sífilis: manual de bolso. Brasília (DF); 2007.
[e] Cerda R, Perez F, Luz PM, Grinsztejn B, Veloso VG, Freedberg KA, et al. Prenatal syphilis and HIV transmission in Latin American and the Caribbean: achieving Pan-American Health Organization elimination goals. In: 4th International Workshop on HIV Pediatrics, Washington (DC), July 2012.

In this study, the prevalence of syphilis in pregnancy was 1.02%, which is lower than that found in the sentinel surveillance studies in 2004 (1.6%) and 2006 (1.1%). However, when considering only the births that occurred in public health care units, which was the criterion used in these surveillance studies,[17] the prevalence was 1.2% (95%CI 1.0;1.5), which was an intermediate value compared with those obtained in these two studies.

In addition, the results of this study were similar to those of national studies conducted in the North[11] and Northeast regions[8]. In the Southeast region, Miranda et al[12] found a lower prevalence (0.4%) in Vitória, state of Espírito Santo, and Domingues et al[6] obtained a higher prevalence (1.9%) in Rio de Janeiro, state of Rio de Janeiro. In the South region, a lower prevalence of 0.43% was observed in Itajaí, state of Santa Catarina.[9] Botelho et al[2] found a prevalence of 2.69% in Mato Grosso do Sul, in the Midwest region.

The differences observed might be due to differences in the study scope, including geographical region (county, state, or macro-region), the definition of syphilis infection (clinical and/or laboratory), the data source (primary or secondary data), and clinical tests (nontreponemal or treponemal tests, used alone or in combination).

A high seroconversion was observed between the first and second serological test performed prenatally, and this result was previously observed in the 2006 sentinel surveillance study.[17] It is unlikely that this result reflects only the occurrence of new infections during pregnancy, because such a high incidence of syphilis would not be expected during pregnancy in an epidemiological scenario where the prevalence is practically constant. Difficulties related to syphilis testing during pregnancy are a plausible explanation, such as the lower sensitivity of nontreponemal tests in the early stages of the disease, in addition to the increased occurrence of false-positive test results during gestation.[14]

Although reactive tests do not necessarily indicate recent infection, these results reinforce the need for repeated serological tests for syphilis in late pregnancy and at admission for childbirth. This would allow the adequate diagnosis of infection, adoption of measures to prevent vertical transmission, and early treatment of newborns. The low coverage rate for the second serological test in all Brazilian regions shows the extent of missed opportunities to implement this control strategy in public and private health care units.

This study was conducted in institutions that performed > 500 deliveries per year. It is likely that pregnant women having child deliveries at home, outside hospitals, or in smaller hospitals exhibit differential access to prenatal units and routine examinations. However, considering that > 99.0% child deliveries are performed in hospitals in Brazil, and approximately 80.0% of these deliveries occur in larger hospitals,[10] significant differences in coverage rates are unlikely. In addition, syphilis prevalence may be underestimated because women with miscarriages were not assessed in this study and syphilis is a known cause of abortion.

The failure to perform standardized serological tests and the use of secondary data for the estimation of syphilis prevalence are the other limitations of the study. However, the last sentinel surveillance study conducted in Brazil used a similar methodology[17] and highlighted that it adequately reflects the actual conditions under which the tests are performed in routine health care units for diagnosis of syphilis and for the definition of the measures to be adopted.

In conclusion, the prevalence of syphilis in pregnancy found in the present study was 1.02%. Furthermore, significant improvements were observed in the expansion of coverage of prenatal care and diagnostic testing for syphilis. However, regional and social inequalities in access to health care units, coupled with other gaps in health care, such as the low coverage rate in the treatment of partners of pregnant women, contribute to the persistence of congenital syphilis as a major public health problem in Brazil.

The higher prevalence of syphilis among pregnant women who were less educated, who self-reported as black or mixed as well as among those without prenatal care and who received assistance at public health care units suggests that these groups are more exposed to infection and should receive greater attention from syphilis control programs during pregnancy.

REFERENCES

1. Blencowe H, Cousens S, Kamb M, Berman S, Lawn JE. Lives saved tool supplement detection and treatment of syphilis in pregnancy to reduce syphilis related stillbirths and neonatal mortality. *BMC Public Health*. 2011;11(Suppl3):S9.
2. Botelho CAO, Tomaz CAB, Cunha RV, Botelho MAO, Botelho LO, Assis DM, et al. Prevalência dos agravos triados no programa de proteção à gestante do estado de Mato Grosso do Sul de 2004 a 2007. *Rev Patol Trop*. 2008;37(4):341-53.
3. Klausner JD. The sound of silence: missing the opportunity to save lives at birth. *Bull World Health Organ*. 2013;91(3):158. DOI:10.2471/BLT.13.118604
4. Campos ALA, Araújo MAL, Melo SP, Gonçalves MLC. Epidemiologia da sífilis gestacional em Fortaleza, Ceará, Brasil: um agravo sem controle. *Cad Saude Publica*. 2010;26(9):1747-55. DOI:10.1590/S0102-311X2010000900008
5. Domingues RMS, Hartz ZMA, Dias MAB, Leal MC. Avaliação da adequação da assistência pré-natal na rede SUS do Município do Rio de Janeiro, Brasil. *Cad Saude Publica*. 2012;28(3):425-37. DOI:10.1590/S0102-311X2012000300003
6. Domingues RMS, Saraceni V, Hartz ZMA, Leal MC. Sífilis congênita: evento sentinela da qualidade da assistência pré-natal. *Rev Saude Publica*. 2013;47(1):147-57. DOI:10.1590/S0034-89102013000100019
7. Gomez GB, Kamb ML, Newman LM, Mark J, Broutet N, Hawkes SJ. Untreated maternal syphilis and adverse outcomes of pregnancy: a systematic review and meta-analysis. *Bull World Health Organ*. 2013;91(3):217-26. DOI:/10.2471/BLT.12.107623
8. Inagaki ADM, Oliveira LAR, Oliveira MFB, Santos RCS,Araújo RM, Alves JAB, et al. Soroprevalência de anticorpos para toxoplasmose, rubéola, citomegalovírus, sífilis e HIV em gestantes sergipanas. *Rev Soc Bras Med Trop*. 2009;42(5):532-6. DOI:10.1590/S0037-86822009000500010
9. Kupek E, Oliveira JF. Transmissão vertical do HIV, da sífilis e da hepatite B no município de maior incidência de AIDS no Brasil: um estudo populacional no período de 2002 a 2007. *Rev Bras Epidemiol*. 2012;15(3):478-87. DOI:10.1590/S1415-790X2012000300004
10. Leal MC, Silva AAM, Dias MAB, Gama SGN, Rattner D, Moreira ME, et al. Birth in Brazil: national survey into labour and birth. *Reprod Health*. 2012;9:15. DOI:10.1186/1742-4755-9-15
11. Machado Filho AC, Sardinha JFJ, Ponte RL, Costa EP, Silva SS, Martinez-Espinosa FE. Prevalência de infecção por HIV, HTLV, VHB e de sífilis e clamídia em gestantes numa unidade de saúde terciária na Amazônia ocidental brasileira. *Rev Bras Ginecol Obstet*. 2010;32(4):176-83. DOI:10.1590/S0100-72032010000400005
12. Miranda AE, Rosetti Filho E, Trindade CR, Gouvêa GM, Costa DM, Oliveira TG, et al. Prevalência de sífilis e HIV utilizando testes rápidos em parturientes atendidas nas maternidades públicas de Vitória, Estado do Espírito Santo. *Rev Soc Bras Med Trop*. 2009;42(4):386-391. DOI:10.1590/S0037-86822009000400006
13. Pan American Health Organization. Regional Initiative for the Elimination of Mother-to-Child Transmission of HIV and Congenital Syphilis in Latin America and the Caribbean: Regional Monitoring Strategy. 2. ed. Washington (DC); 2012.
14. Peeling RW, Ye H. Diagnostic tools for preventing and managing maternal and congenital syphilis: an overview. *Bull World Health Organ*. 2004;82(6):439-46. DOI:10.1590/S0042-96862004000600010
15. Rodrigues CS, Guimarães MDC, César CC. Missed opportunities for congenital syphilis and HIV perinatal transmission prevention. *Rev Saude Publica*. 2008;42(5):851-8. DOI:10.1590/S0034-89102008000500010
16. Sanchez PJ, Wendel GD. Syphilis in pregnancy. *Clin Perinatol*. 1997;24(1):71-90.
17. Szwarcwald CL, Barbosa Jr A, Miranda AE, Paz LC. Resultados do Estudo Sentinela-Parturiente, 2006: desafios para o controle da sífilis congênita no Brasil. *DST – J Bras Doenças Sex Transm*. 2007;19(3-4):128-33.
18. Trepka MJ, Bloom SA, Zhang G, Kim S, Nobles RE. Inadequate syphilis screening among women with prenatal care in a community with a high syphilis incidence. *Sex Transm Dis*. 2006;33(11):670-4. DOI:10.1097/01.olq.0000216032.52731.ea
19. World Health Organization. The Global elimination of congenital syphilis: rationale and strategy for action. Geneva; 2007.
20. World Health Organization. Investment case for eliminating mother-to-child transmission of syphilis: promoting better maternal and child health and stronger health systems. Geneva; 2012.

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