

Factors associated with vertical transmission of syphilis in a city in the State of São Paulo

Fatores associados à transmissão vertical de sífilis em um município do Estado de São Paulo

Factores asociados a transmisión vertical de sífilis en una ciudad del Estado de São Paulo

<https://doi.org/10.17058/reci.v13i2.18097>

Received: 13/01/2023

Accepted: 20/02/2023

Available online: 28/06/2023

Corresponding Author:

Marília Jesus Batista
marilijbatista@yahoo.com.br

Adress: Rua Francisco Teles, 250, 13202-550,
Jundiá, SP, Brazil.

Natália Caroline Serra Santana¹ 

Carolina Matteussi Lino² 

Andréa Tenório Correia da Silva¹ 

Marília Jesus Batista¹ 

¹ Faculdade de Medicina de Jundiá, Jundiá, SP, Brazil.

² Universidade Estadual de Campinas, Piracicaba, SP, Brazil.

ABSTRACT

Background and Objectives: Syphilis is a sexually transmitted infection with low-cost and accessible treatment; however, it is considered a public health problem. Further studies are needed to improve knowledge about the factors that may contribute to the mother-to-child transmission of syphilis. Given its high detection rate in pregnant women and the possible adverse events of syphilis in Brazil, the objective was to evaluate the association of individual and clinical characteristics of syphilis with the incidence of congenital syphilis in pregnant women. **Methods:** This retrospective study was performed in a medium-size municipality in the State of São Paulo. Notification forms from the Notifiable Diseases Information System were used and the occurrence of congenital syphilis was the outcome of the study. Bivariate analyses and logistic regression were performed with variables that obtained *p* values <0.25. **Results:** Most pregnant women were 20-34 years old (62.2%) and had white skin (63.2%) and incomplete elementary schooling (35.4%). The occurrence of congenital syphilis was associated with the maternal syphilis diagnosis ($p < 0.001$) and with not performing the treponemal test during the prenatal examination ($p = 0.014$). There was a greater risk for the occurrence of congenital syphilis in cases with late diagnosis during pregnancy (OR=16.48; 95%CI 3.22-84.26) and tertiary/latent clinical classification (OR=7.62; 95%CI 1.40-41.54). **Conclusion:** Maternal diagnosis in the third trimester of pregnancy and tertiary/latent clinical classification were the main risk factors for the occurrence of congenital syphilis, reinforcing the importance of a quality prenatal examination performed timely.

Keywords: Sexually transmitted infections. Pregnancy. Congenital syphilis. Risk Factors. Public Health..

RESUMO

Justificativa e Objetivos: A sífilis é uma Infecção Sexualmente Transmissível, com tratamento de baixo custo e acessível; porém, ela é considerada um problema de saúde pública. Para aprimorar o conhecimento sobre os fatores

que podem contribuir para transmissão vertical da sífilis, mais estudos são necessários. Diante da elevada taxa de detecção em gestantes e dos possíveis eventos adversos da sífilis no Brasil, o objetivo foi avaliar a associação das características individuais e clínicas de sífilis com a incidência de sífilis congênita em gestantes. **Métodos:** Este estudo retrospectivo foi realizado em um município de médio porte no Estado de São Paulo. Foram usadas as fichas de notificação do Sistema de Informação de Agravos de Notificação e o desfecho do estudo foi a ocorrência de sífilis congênita. Foram realizadas análises bivariadas e regressão logística com as variáveis que obtiveram valores de $p < 0,25$. **Resultados:** A maioria das gestantes tinha 20-34 anos (62,2%), era branca (63,2%), com escolaridade fundamental incompleta (35,4%). A ocorrência de sífilis congênita esteve associada ao diagnóstico de sífilis materno no terceiro trimestre de gestação ($p < 0,001$) e com a não realização de teste treponêmico durante o pré-natal ($p = 0,014$). Houve maior risco para a ocorrência de sífilis congênita nos casos com diagnóstico tardio na gestação (OR=16,48; IC95% 3,22-84,26) e classificação clínica terciária/latente (OR=7,62; IC95% 1,40-41,54). **Conclusão:** Os principais fatores de risco para ocorrência de sífilis congênita foram o diagnóstico materno no terceiro trimestre de gestação e classificação clínica terciária/latente, reforçando a importância de um exame pré-natal de qualidade e em tempo oportuno.

Palavras-chave: Infecções sexualmente transmissíveis. Gravidez. Sífilis Congênita. Fatores de Risco. Saúde Pública.

RESUMEN

Justificación y objetivos: La sífilis es una Infección de Transmisión Sexual con tratamiento accesible y de bajo coste, sin embargo, es considerada un problema de salud pública. Se necesitan más estudios para mejorar el conocimiento sobre los factores que pueden contribuir a la transmisión maternoinfantil de la sífilis. Dada su alta tasa de detección en gestantes y los posibles eventos adversos de la sífilis en Brasil, el objetivo fue evaluar la asociación de las características individuales y clínicas de la sífilis con la incidencia de sífilis congénita en gestantes.

Métodos: Estudio retrospectivo realizado en una ciudad de mediano porte del Estado de São Paulo. Fueron utilizados formularios de notificación obligatoria del Sistema de Información de Enfermedades de Declaración Obligatoria y el desenlace fue la ocurrencia de sífilis congénita. Se realizaron análisis bivariados y regresión logística con las variables que obtuvieron p -value $< 0,25$. **Resultados:** La mayoría de las mujeres embarazadas tenían entre 20 y 34 años (62,2%), eran blancas (63,2%), con instrucción primaria incompleta (35,4%). La aparición de sífilis congénita se asoció con el diagnóstico de sífilis materna en el tercer trimestre del embarazo ($p < 0,001$) y con la no realización de prueba treponémica durante el prenatal ($p = 0,014$). Hubo un mayor riesgo de sífilis congénita en los casos diagnosticados tardíamente en el embarazo (OR=16,48; IC95% 3,22-84,26) y clasificación clínica terciaria/latente (OR=7,62; IC95% 1,40-41,54). **Conclusiones:** Los principales factores de riesgo de aparición de sífilis congénita fueron el diagnóstico materno en el tercer trimestre de gestación y la clasificación clínica terciaria/tardía, lo que refuerza la importancia de una atención prenatal de calidad y oportuna.

Palabras clave: Enfermedades de Transmisión Sexual. Embarazo. Sífilis Congénita. Factores de Riesgo. Salud Pública.

INTRODUCTION

Syphilis is a sexually transmitted infection (STI) caused by the bacterium *Treponema pallidum*; when syphilis affects pregnant women, vertical transplacental transmission can occur if it is inadequately treated or not treated.^{1,2} Vertical transmission can occur throughout the gestational period; however, the more recent the infection, the greater the chances of transmission.² Syphilis in pregnant women (SPW) can result in adverse effects such as miscarriage, prematurity, stillbirth, and congenital syphilis (CS).^{1,2}

In addition to the problem of treating patients with CS, late prenatal care or inadequately performed, failure to perform the indicated diagnostic tests, and non-treatment (or inadequate treatment) of sexual partners are risk factors.³⁻⁵ Social and behavioral determinants of maternal health (such as low schooling, social exclusion, drug use, early initiation of sex life, early pregnancy, high number of sexual partners, presence of other STIs, and non-use of condoms during sexual practice) are also considered risk

factors for the occurrence of CS.⁶ In women smokers, an increase in the chance of vertical transmission of syphilis may occur because smoking affects the placental barrier.⁷

Syphilis is considered an infection that can be controlled in Primary Health Care (PHC); therefore, early access of pregnant women to prenatal care and preventive measures against CS are necessary. According to the Ministry of Health (MH), the serological screening for syphilis should be carried out with rapid treponemal and non-treponemal tests (VDRL) in the first and third trimesters of pregnancy and before delivery or curettage.⁸ Although treatment for syphilis is inexpensive, the incidence and transmission rates of the disease remain high and increasing and CS is a serious global public health problem.⁶

A study evaluated the global prevalence of SPW and CS based on data from the World Health Organization and identified that in 2016 the total number of CS cases was 661,000, and 355,000 (53.7%) of them resulted

in adverse events.⁹ In this scenario, Brazil also has a large number of cases, being among the countries considered a high priority for the control of CS.¹⁰ According to the Health Surveillance Department in MS (2021), Brazil accounted for 74,095 notifications of SPW and 27,019 of CS, which resulted in 192 notifications of death from the infection.⁸ Of this total, the State of São Paulo was responsible for 14,957 notifications of SPW and 3,926 of CS, which resulted in 28 death notifications.⁸ As for the epidemiological profile, a higher incidence of CS occurred in babies whose mothers were mostly 20-29 years old and had incomplete primary education and brown skin.⁸

More studies are needed to improve knowledge about the factors that can contribute to vertical transmission of syphilis. Given the high detection rate of SPW and possible adverse events in Brazil, the objective of this study was to evaluate the association between individual and clinical characteristics of syphilis during pregnancy and the incidence of congenital syphilis.

METHOD

This retrospective study was performed based on secondary data found in SPW and CS notification forms available in the Notifiable Diseases Information System (SINAN).

This study was performed in a medium-size city in the State of São Paulo, whose health system was composed of 36 Health Units of APS (four Family Health Units and 32 Basic Health Units), divided into four Health regions. In addition, this city is equipped with a Test and Follow-up Center and eight outpatient services, including the Women's Health Outpatient Clinic and two public hospitals. According to a study performed, an increase in the number of reported cases of SPW and CS occurred in the period 2013-2017;¹¹ according to DATASUS, the city notified 19 cases of SPW and 20 of CS in 2021.¹²

The study population consisted of all cases of SPW and CS (including abortions, deaths from CS, and stillbirths) reported in the city from January 2013 to December 2017, and the presence/absence of CS notified by SINAN was considered as the outcome. In this period, notification of abortion due to syphilis did not occur in the city. All patients living in the city confirmed by an investigation by the Epidemiological Surveillance (ES) and registered in the SINAN database were included. Patients who did not live in the city, those discarded by the ES after investigation, and/or without final classification/evolution were excluded from the sample. Figure 1 shows the database composition and the final sample size after applying the exclusion criteria.

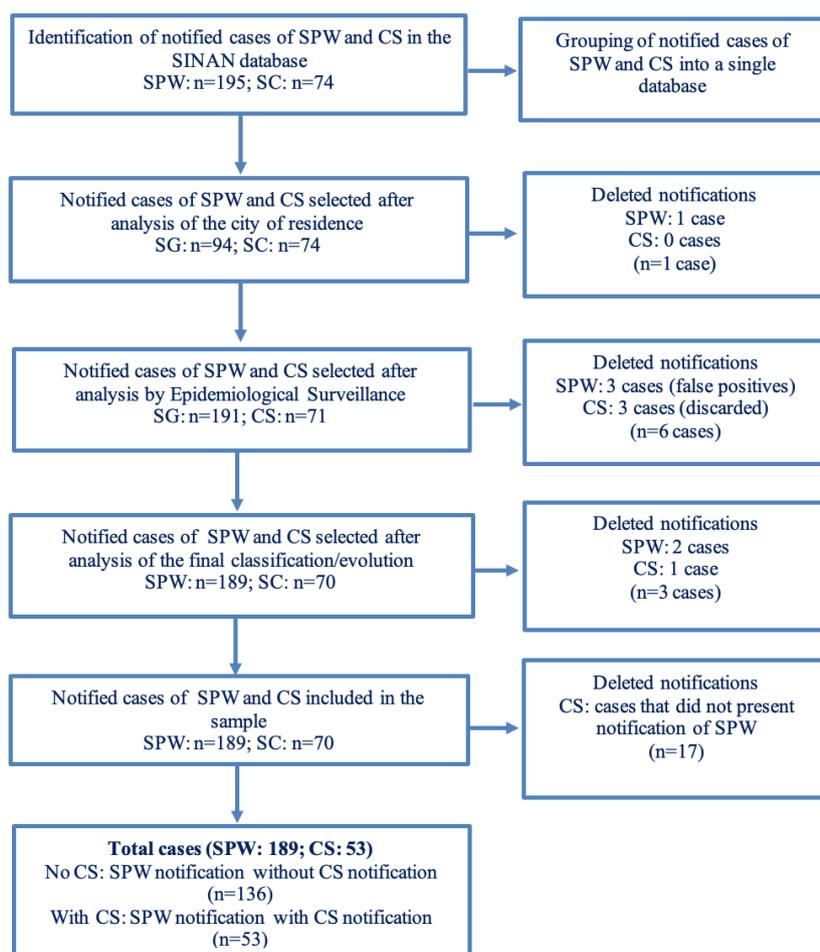


Figure 1. Flowchart of composition of the database used in the study from the SINAN notification forms and final sample size after applying the exclusion criteria (2022).

Data were collected by a researcher at the Department of Epidemiological Surveillance of the city. To facilitate data collection from the notification forms, Microsoft Access® forms were used with sociodemographic information referring to the diagnosis and follow-up of the reported cases of SPW and CS. Based on the CS cases notification forms, we sought maternal data that would allow us to merge the notification information into a single database, containing the SPW cases that had resulted in a CS case notified to the ES. To ensure the confidentiality of participants, merging was carried out in the same place of data collection; personal information that made it possible to identify the cases was not collected.

The presence of CS (dependent variable) was considered as an outcome of the study. According to the MH, the following items were considered CS cases: (i) infant, miscarriage, or stillbirth of a mother with clinical evidence and/or non-treponemal serology reactive for syphilis (under any titration, in the absence of confirmatory treponemal testing performed prenatally, curettage, or delivery) that has not been treated or the treatment has been inadequate; (ii) children under 13 years of age who presented a reactive non-treponemal test after six months of age and/or with ascending titers and/or non-treponemal test with a titer higher than the maternal titer, and (iii) evidence of *Treponema pallidum* in the placenta, umbilical cord and/or lesion sample, biopsy, or necropsy from the miscarriage, stillbirth, or infant.⁸

The independent variables used are presented in table 1.

For logistic regression analysis, the independent variables were grouped into (i) sociodemographic (ma-

ternal age and race/skin color of the pregnant woman) and (ii) clinical (gestational age, clinical classification, treponemal test in the pre-birth period, and partner treatment) variables.

Initially, descriptive analyzes were performed to identify the epidemiological profile of the reported cases of CS and SPW. Then, bivariate analysis was performed between the study outcome and the independent variables related to reported cases of SPW (chi-square and Fisher's exact tests). In the bivariate analysis, variables with $p \leq 0.25$ were included in the logistic regression model. For regression modeling, the sociodemographic and clinical blocks were considered; however, the literature^{6,11} highlights that skin color (brown or black) is part of the cases of syphilis in pregnant women; therefore, we considered this variable in the analyzed models, even when it did not show statistical significance in the crude regression analysis.

The odds ratio (OR) was the measure of association obtained; a confidence interval of 95% (CI 95%) and a significance value of 5% were adopted. All analyzes were performed using the *Statistical Package for the Social Sciences* (SPSS, v.20.0) software. The 17 cases of CS without notification of SPW were excluded from the other (bivariate and logistic regression) analyses and the notification data were considered only for the epidemiological profile of CS.

Following the Ethical Norms and Guidelines of the National Health Council (Resolution 466/2012) of the MH, the study was approved by the Research Ethics Committee (09/27/2017; opinion 2,301,436; CAAE 74247317.5.0000.5418).

Table 1. Independent variables of reported cases of syphilis in pregnant women (SPW) and congenital syphilis (CS) used in the statistical analysis.

Variables	Categories	Notification sheets
Maternal age (years)	14-19, 20-34, ≥35	Pregnant woman
Gestational period	1st, 2nd, and 3rd trimesters	Pregnant woman
Pregnant woman's skin color	White and Non-White (Brown/Black/Yellow/Indigenous)	Pregnant woman
Schooling	Incomplete elementary school (1st-4th grades incomplete, 1st-4th grades completed, and 5th-8th grades incomplete); complete elementary school (5th-8th grades completed and incomplete secondary education), and completed secondary education (complete secondary education, incomplete higher education, and completed higher education)	Pregnant woman
Clinical classification	Primary, secondary, tertiary, latent	Pregnant woman
Non-treponemal test in the prenatal period	Reactive, non-reactive	Pregnant woman
Titer	< 1/8, 1/8 - 1/32, >1/64	Pregnant woman
Treponemal test in the prenatal period	Reactive, non-reactive, not performed	Pregnant woman
Treated partner	Yes, no	Pregnant woman
Age as reported (days)	0-2, 3-10, >10	Congenital
Sex	Male, female	Congenital
Child' skin color	White and Non-white (Brown/Black/Yellow/Indigenous)	Congenital
Mother underwent prenatal examination	Yes, no	Congenital
Diagnosis of maternal syphilis	During the prenatal period, at delivery/curettage	Congenital
Maternal treatment	Adequate, inadequate, not performed	Congenital
Evolution of the case	Alive, death due to congenital syphilis, stillbirth	Congenital

Source: Ministry of Health⁹

RESULTS

The epidemiological profile of reported cases of SPW was composed of women aged 20-34 years, white race/skin color, incomplete primary education, and diagnosed with syphilis in the first trimester of pregnancy. A large number of cases was observed with tertiary/latent clinical classification, reactive non-treponemal test in prenatal examination (with titer up to 1/32), and reactive treponemal test in prenatal examination. Partner treatment was not performed in 43.0% of cases.

In the bivariate analysis, the occurrence of CS was associated with maternal diagnosis performed in the third trimester of pregnancy ($p < 0.001$) and non-performance of the treponemal test in the prenatal period ($p = 0.014$)

(Table 2).

During the study period, the city had 70 cases of CS; however, SPW reports were not identified in 17 cases. Of the 189 SPW cases notified during the study period, 53 pregnant women had CS notification as the outcome.

The epidemiological profile of reported cases of CS was composed of white male children and mothers who underwent prenatal care diagnosed with syphilis during the prenatal period and were inadequately treated (Table 3).

From the adjusted logistic regression, it was possible to observe that diagnosis of syphilis in the third trimester and tertiary/latent clinical classification in reported cases of SPW presented a higher risk for the CS outcome (Table 4).

Table 2. Profile distribution of syphilis in pregnant women cases notified in a city in the State of São Paulo and factors associated with congenital syphilis (CS) outcome in the period 2013-2017.

Variables	Total* n (%)	Without CS n (%)	With CS n (%)	p
Maternal age (years)				
14-19	50 (26.6)	36 (26.7)	14 (26.4)	0.101 ¹
20-34	117 (62.2)	88 (65.2)	29 (32.9)	
≥35	21 (11.2)	11 (8.1)	10 (18.9)	
Gestational Period				
First trimester	78 (48.1)	69 (58.5)	9 (20.5)	<0.001 ¹
Second trimester	35 (21.6)	25 (21.2)	10 (22.7)	
Third trimester	49 (30.2)	24 (20.3)	25 (56.8)	
Skin color				
White	96 (63.2)	72 (66.1)	24 (55.8)	0.238 ¹
Non-white	56 (36.8)	37 (33.9)	19 (44.2)	
Education				
Incomplete Elementary	29 (35.4)	21 (33.9)	8 (40.0)	0.808 ¹
Complete Elementary	28 (34.1)	21 (33.9)	7 (35.0)	
Complete medium or higher	25 (30.5)	20 (32.3)	5 (25.0)	
Clinical classification				
Primary	42 (40.4)	35 (44.9)	7 (26.9)	0.113 ²
Secondary	13 (12.5)	11 (14.1)	2 (7.7)	
Tertiary/Latent	49 (47.1)	32 (41.0)	17 (65.4)	
Non-treponemal test in the prenatal period				
Reactive	184 (97.9)	130 (97.0)	54 (100.0)	0.580 ²
Non-reactive	4 (2.1)	4 (3.0)	0 (0.0)	
Non-treponemal test titre (prenatal)				
≤1/32	96 (52.2)	69 (53.1)	27 (50.0)	0.704 ¹
>1/32	88 (47.8)	61 (46.9)	27 (50.0)	
Treponemal test (prenatal)				
Reactive	122 (78.2)	95 (84.1)	27 (62.8)	0.014 ²
Non-reactive	8 (5.1)	4 (3.5)	4 (9.3)	
Not performed	26 (16.7)	14 (12.4)	12 (27.9)	
Treated partner				
Yes	81 (57.0)	61 (61.6)	20 (46.5)	0.095 ¹
No	61 (43.0)	38 (38.4)	23 (53.5)	

Source: survey data. *Some variables did not total n=189 due to ignored (9: notification form) or incomplete information 1 Independent chi-square test; 2 Fisher's exact test ($p < 0.05$).

Table 3. Sociodemographic and clinical characteristics of congenital syphilis (CS) cases notified in a city in the State of São Paulo in the period 2013-2017 (n=70).

Variables	Frequencies *	%
Child's age (days)		
0-2	24	35.3
2-10	16	23.5
>10	28	41.2
Child's gender		
Masculine	36	51.4
Feminine	34	48.6
Child's skin color		
White	28	62.2
Black	3	6.7
Yellow	1	2.2
Brown	13	28.9
Mother performed prenatal		
Yes	59	92.2
No	5	7.8
Maternal diagnosis		
During prenatal exam	52	82.5
Childbirth/curettage	11	17.5
Maternal treatment		
Adequate	2	3.2
Inappropriate	48	76.2
Unrealized	13	20.6
Case evolution		
Alive	54	83.1
Death from syphilis	5	7.7
Stillbirth	6	9.2

Source: survey data. * Some variables did not total n=70 due to missing information (9: notification form) or not completing it.

DISCUSSION

The epidemiological profile of SPW was composed of pregnant women aged 20-34 years, incomplete primary education, and white skin color; the CS profile was composed of white children, with mothers who underwent prenatal care, and had treatment considered inadequate. The occurrence of CS was associated with maternal diagnosis performed in the third trimester of pregnancy and presence of a reactive treponemal test during pregnancy; from the adjusted analysis, however, late maternal diagnosis (third trimester of pregnancy) and tertiary/latent clinical classification were the main associated factors.

In this study, sociodemographic variables (age group, education, and skin color) were not statistically associated with the occurrence of CS. Even so, the predominant age group was similar to that found in other Brazilian studies;¹³⁻¹⁵ this may reflect vulnerability related to "age and emotional immaturity" (especially with 20-24 years old), influence of social groups, early onset of sexual life, and not using condoms during sexual intercourse.¹⁶ As for education, the lack of association with

the outcome may be a consequence of the number of forms without information (or with ignored information), as well as the sample size. Data from the study "Born in Brazil"¹⁵ point to low education as a risk factor for CS; according to a study performed in Rio de Janeiro,¹⁷ the risk of having a baby with syphilis doubled among women with incomplete primary education. Furthermore, a lower educational level is related to lower access to information and understanding of IST prevention measures during pregnancy.¹⁶

In the bivariate analysis, an association between non-white skin color and the occurrence of CS was observed. Data presented by the MH,⁸ studies conducted in Itapeva,¹⁸ and national studies¹⁴ identified that the profile of women affected by syphilis during pregnancy was predominantly composed of women with black or brown skin color. These data reinforce the importance of considering racial inequalities and their influence on health determinants, which may reflect racial inequalities in health along with schooling. In this context, both health professionals responsible for prenatal care and managers should pay attention to these variables, as well as to their impact on health, especially in the CS outcome.

Most of the notified pregnant women were diagnosed with syphilis in the first trimester of pregnancy, but the occurrence of CS was associated with the maternal diagnosis in the third trimester of pregnancy. These results agree with a study conducted in Joinville (SC), which used data from the Informatics Department of the Unified Health System (DATASUS) and identified a high percentage of pregnant women with diagnosis and notification of SPW in the third trimester of gestation.¹⁹ According to the authors, this situation may be related to greater demand by pregnant women for health services at this stage of pregnancy and often in the late start of prenatal care or an insufficient number of consultations in the prenatal period.¹⁹ Although the delineation of the present study does not allow inferring that the late diagnosis identified is related to the late start of prenatal care (information such as date of start of the prenatal examination, gestational age at the first consultation, and number of consultations performed are not present in the SPW and CS notification forms), we reinforce the importance of a quality prenatal exam at the beginning of pregnancy to avoid cases of CS. Furthermore, this finding reinforces the importance of planning and adopting strategies by health services not only for uptake and early diagnosis of syphilis during pregnancy but also for adequate treatment and follow-up, thus reducing the risk of vertical transmission and the occurrence of adverse events.^{16,20}

Many pregnant women were notified with tertiary/latent clinical classification followed by the primary classification, as occurred in the study performed in Campo Grande;²¹ this study also identified that most women had this clinical classification. A study performed in Goiás²² found a high percentage of cases classified as primary cases; their authors highlighted that their data suggest a possible failure in the classification due to the difficulty in performing the primary diagnosis of syphilis, especially

Table 4. Logistic regression of sociodemographic and clinical factors for the congenital syphilis outcome in a city in the State of São Paulo in the period 2013-2017.

Variables	Not adjusted OR (IC 95%)	p	Adjusted (Model 1) OR (IC 95%)	p	Adjusted (Model 2) OR (IC 95%)	p	Adjusted (Model 3) OR (IC 95%)	p	Adjusted (Final model) OR (IC 95%)	p
AGE (years)										
14-19	2.11 (0.53-8.35)	0.288	0.79 (0.13-4.62)	0.794	-	-	-	-	-	-
20-34	2.29 (0.63-8.34)	0.207	0.59 (0.11-3.11)	0.532	-	-	-	-	-	-
≥35	1	-	-	-	-	-	-	-	-	-
AGE (years)										
1st trimester	1	-	1	-	-	-	1	-	1	-
2nd trimester	2.99 (1.09-8.18)	0.034	7.96 (2.15-29.45)	0.002	-	-	2.54 (0.45-14.23)	0.290	2.12 (0.46-9.80)	0.335
3rd trimester	8.10 (3.32-19.76)	0.000	19.70 (5.36-72.40)	0.000	-	-	8.04 (1.27-50.91)	0.027	16.48 (3.22-84.26)	0.001
MOTHER'S SKIN COLOR										
White	1	0.253	1	-	-	-	1	-	1	-
Brown/Black/Indigenous	1.52 (0.74-3.11)	-	3.11 (1.17-8.30)	0.023	-	-	5.64 (1.23-25.84)	0.026	3.04 (0.85-10.89)	0.088
CLINICAL CLASSIFICATION										
Primary	1	-	-	-	1	-	-	-	1	-
Secondary	0.90 (0.16-5.03)	0.913	-	-	0.91 (0.12-6.87)	0.924	17.08 (0.89-328.68)	0.060	3.87 (0.41-36.51)	0.237
Tertiary/Latent	2.65 (0.97-7.24)	0.056	-	-	2.27 (0.59-8.75)	0.234	15.46 (1.40-169.79)	0.025	7.62 (1.40-41.54)	0.019
PRENATAL TREPONEMIC TEST										
Non-reactive	1	-	-	-	1	-	-	-	-	-
Reactive	0.35 (0.09-1.41)	0.142	-	-	0.38 (0.06-2.22)	0.281	-	-	-	-
Not performed	1.07 (0.23-4.92)	0.929	-	-	1.03 (0.13-8.24)	0.980	-	-	-	-
TREATED PARTNER										
Yes	1	-	-	-	1	-	-	-	-	-
No	1.80 (0.87-3.70)	0.111	-	-	0.89 (0.29-2.79)	0.848	0.73 (0.16-3.36)	0.691	-	-

Source: survey data

OR: Odds Ratio adjusted for variables with $p < 0.25$

Model 1: maternal age, gestational age, and maternal skin color ($p < 0.05$)

Model 2: clinical classification, antenatal treponemal testing, and partner treatment ($p < 0.05$)

Model 3: gestational age, maternal skin color, clinical classification, and partner treatment ($p < 0.05$)

Final model: gestational age, maternal skin color, and clinical classification ($p < 0.05$)

in pregnant women. The diagnosis of primary syphilis during pregnancy is rare because this clinical classification depends on the presence of hard chancre, which has a short duration;²³ thus, we believe that most diagnoses occur in the latent or late phase.^{19,23,24} In the present study, 38.8% of the notification forms had the clinical classification field “no information or ignored” (data not shown). This lack of information on the clinical classification was also evidenced in the literature,^{13,19,21,22} showing the importance of adequate classification and correct completion of the notification forms, thus contributing not only to the treatment definition but also to research and follow-up of reported cases.

A high proportion of untreated partners was observed; although the above association was not statistically significant, the adoption of strategies in health services to welcome and monitor partners during the prenatal period is fundamental. Some studies^{13,19,20} observed considerable percentages (41, 61, and 83%, respectively) of untreated partners. Although the percentage found in the present study was lower than that found in the literature, our data reinforce that the treatment of sexual partners is an important obstacle to the reduction of CS cases, as there is a risk of reinfection in those who were not treated (or treated inappropriately) even with early diagnosis and treatment of pregnant women.¹⁶

The maternal epidemiological profile data present in the CS notification forms showed that 90% of the women underwent prenatal care and the diagnosis was made at that time; however, most of them presented a treatment considered inadequate. This fact conflicts with the studies carried out in Joinville (SC)¹⁶ and Goiás²² and draws attention, as it was not effective in preventing the CS outcome even when the diagnosis was made during the prenatal period. It is worth remembering that the CS outcome is a prenatal care marker; thus, further studies in the city to assess the quality of care and identify the reasons and/or gaps in this assistance are necessary.

This study presented the identification of the CS outcome only from the notifications made to the ES and the use of secondary data obtained from the SPW and CS notification forms as limitations; they presented many unfilled fields or fields with ignored information, reducing the number of information important for the study. Despite these limitations, the results obtained evidenced the need to identify the risk factors and health conditions, and determinants of pregnant women, so that planning actions involving the population, health professionals, and managers be possible, especially in APS.

The findings pointed to the diagnosis of syphilis in the third trimester of pregnancy and the tertiary/latent clinical classification as the main risk factors for the occurrence of CS. Therefore, investment in actions and policies that include not only early diagnosis and treatment during pregnancy but also actions that involve investigations even during pregnancy and/or maternity is essential to reduce cases of CS so that possible gaps and points for improvement in prenatal care are better understood and can be discussed with teams and managers.

REFERENCES

1. Bezerra MLMB, Fernandes FECV, de Oliveira Nunes JP et al. Congenital Syphilis as a Measure of Maternal and Child Healthcare, Brazil. *Emerg Infect Dis*. 2019; 25(8):1469-1476. doi: 10.3201/eid2508.180298.
2. Tsai S, Sun MY, Kuller JA et al. Syphilis in Pregnancy. *Obstetrical & gynecological survey*. 2019; 74(9): 557–564. doi: 10.1097/OGX.0000000000000713
3. Silva ÂAO, Leony LM, Souza WV et al. Spatiotemporal distribution analysis of syphilis in Brazil: Cases of congenital and syphilis in pregnant women from 2001-2017. *PLoS One*. 2022;17(10):e0275731. doi: 10.1371/journal.pone.0275731
4. Benedetti KCSV, Ribeiro ADDC, Queiroz JHFS et al. High Prevalence of Syphilis and Inadequate Prenatal Care in Brazilian Pregnant Women: A Cross-Sectional Study. *Am J Trop Med Hyg*. 2019;101(4):761-766. doi: 10.4269/ajtmh.18-0912
5. Rodrigues DC, Domingues RMSM. Management of syphilis in pregnancy: Knowledge and practices of health care providers and barriers to the control of disease in Teresina, Brazil. *Int J Health Plann Manage*. 2018;33(2):329-344. doi: 10.1002/hpm.2463
6. Medeiros J, Yamamura M, da Silva ZP et al. Spatiotemporal dynamics of syphilis in pregnant women and congenital syphilis in the state of São Paulo, Brazil. *Scientific reports*. 2022; 12(1): 585. doi: 10.1038/s41598-021-04530-y
7. Yang WJ, Hu HH, Yang Y et al. Unusual erythematous plaque with white scales, a case of acquired syphilis in a child and literature review. *BMC Infect Dis*. 2021;21(1):528. doi: 10.1186/s12879-021-06114-7
8. Ministério da Saúde (BR). Boletim Epidemiológico – Sífilis. Secretaria de Vigilância em Saúde – Departamento de DST, AIDS e Hepatites Virais. 2021. https://www.gov.br/saude/pt-br/media/pdf/2021/outubro/14-1/boletim_sifilis-2021_internet.pdf
9. Korenromp EL, Rowley J, Alonso M et al. Global burden of maternal and congenital syphilis and associated adverse birth outcomes—Estimates for 2016 and progress since 2012. *PLoS One*, 2019; 14(2):e0211720. doi: 10.1371/journal.pone.0211720
10. Benedetti K, Ribeiro A, Queiroz J et al. High Prevalence of Syphilis and Inadequate Prenatal Care in Brazilian Pregnant Women: A Cross-Sectional Study. *The American journal of tropical medicine and hygiene* 2019; 101(4): 761–766. doi: 10.4269/ajtmh.18-0912
11. Lino CM, Sousa M, Batista MJ. Epidemiological profile, spatial distribution, and syphilis time series: a cross-sectional study in a Brazilian municipality. *Journal of infection in developing countries* 2021; 15(10): 1462–1470. doi: 10.3855/jidc.13780
12. Ministério da Saúde (BR). Departamento de Informática do Sistema Único de Saúde. Doenças e Agravos de Notificação - 2007 em diante (SINAN). 2022. <https://datasus.saude.gov.br/aceso-a-informacao/doencas-e-agravos-de-notificacao-de-2007-em-diante-sinan/>
13. Pires CP, Fernandes CO, Oliveira EF et al. Syphilis notifications among pregnant women in Campo Grande, state of Mato Grosso do Sul, Brazil, 2011 to 2017. *Rev Soc Bras Med Trop* 2020. 11;53:e20200024. doi: 10.1590/0037-8682-0024-2020

14. Ayala ALM, Jasko BGD, Biliski MJB. Análise da sífilis em gestantes nos anos de 2010 a 2019 em Joinville/SC. *Espac Saúde*. 2021; 22:e762. doi: 10.22421/1517-7130/es.2021v22.e762
15. Pereira AL, Silva LR, Palma LM et al. Impacto do grau de escolaridade e idade no diagnóstico tardio de sífilis em gestantes. *Femina*. 2020; 48(9): 563-7. <https://docs.bvsalud.org/biblioref/2020/10/1122585/femina-2020-489-563-567.pdf>
16. Reis GJD, Barcellos C, Pedroso MM et al. Diferenciais intraurbanos da sífilis congênita: análise preditiva por bairros do Município do Rio de Janeiro, Brasil. *Cad Saude Publica*. 2018; 34(9):e00105517. doi: 10.1590/0102-311X00105517
17. Cavalcante PAM, Pereira RBL, Castro JGD. Syphilis in pregnancy and congenital syphilis in Palmas, Tocantins State, Brazil, 2007-2014. *Epidemiol Serv Saude* 2017; 26(2):255-264. doi: 10.5123/S1679-49742017000200003
18. Oliveira IM, Oliveira RPB, Alves RRF. Diagnóstico, tratamento e notificação da sífilis durante a gestação em Goiás, de 2007 a 2017. *Rev saúde pública* 2021; 55:68. doi: 10.11606/s1518-8787.2021055003122
19. Cardoso ARP, Araújo MAL, Cavalcante MS et al. Análise dos casos de sífilis gestacional e congênita nos anos de 2008 a 2010 em Fortaleza, Ceará, Brasil. *Cien Saude Colet* 2018; 23(2): 563-574. doi: 10.1590/1413-81232018232.01772016
20. Ministério da Saúde (BR). Protocolo Clínico e Diretrizes Terapêuticas para Atenção Integral às Pessoas com Infecções Sexualmente Transmissíveis. Ministério da Saúde, 2015. https://bvsms.saude.gov.br/bvs/publicacoes/protocolo_clinico_diretrizes_terapeutica_atencao_integral_pessoas_infeccoes_sexualmente_transmissiveis.pdf
21. Domingues RMSM, Leal MC. Incidência de sífilis congênita e fatores associados à transmissão vertical da sífilis: dados do estudo Nascer no Brasil. *Cad Saúde Pública*. 2016; 32(6):e00082415. doi: 10.1590/0102-311X00082415
22. Nascimento MI, Cunha AA, Guimarães EV et al. Gestações complicadas por sífilis materna e óbito fetal. *Revista Brasileira de Ginecologia e Obstetrícia*. 2012; 34(2): 56-62. doi: 10.1590/S0100-72032012000200003
23. Silva Neto SED, Silva SSBED, Sartori AMC. Syphilis in pregnancy, congenital syphilis, and factors associated with mother-to-child transmission in Itapeva, São Paulo, 2010 to 2014. *Rev Soc Bras Med Trop*. 2018; 51(6):819-826. doi: 10.1590/0037-8682-0377-2017
24. Ribeiro CF, Silva MN, Araújo LC et al. Fatores associados à sífilis congênita em um hospital público no estado do Rio de Janeiro, Brasil. *Rev Ped SOPERJ*. 2018; 18(4):2-9. doi: 10.31365/issn.2595-1769.v18i4p2-9

AUTHOR CONTRIBUTIONS

Natália Caroline Serra Santana and **Carolina Matteussi Lino** contributed to the conception, design, analysis, writing, and final acceptance of the manuscript. **Andréa Tenório Correia da Silva** contributed to the design, review, and final acceptance of the manuscript. **Marília Jesus Batista** contributed to the planning, design, review, and final acceptance of the manuscript.

All authors approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.