Revista Prevenção de Infecção e Saúde
The Official Journal of the Human Exposome and Infectious Diseases Network

ORIGINAL ARTICLE DOI: 10.26694/repis.v11i1.6954

Epidemiological outcome of gestational and congenital syphilis, Piauí, 2007 to 2024

Desfecho epidemiológico da sífilis gestacional e congênita, Piauí, 2007 a 2024

Evolución epidemiológica de la sífilis gestacional y congénita, Piauí, 2007 a 2024

José Francisco Ribeiro[1], Juliane Barroso da Silva[1], Laissa Raquel da Silva[1], Ana Beatriz Norberto Nunes Bezerra[2], Maria Gabriela de Sousa Teixeira[1], Tatiana Custódio das Chagas Pires Galvão[3], Vyrna Rebeca de Carvalho Alves[2]

How to cite this article:
Ribeiro JF, Silva JB, Silva LR, Bezerra ABNN, Teixeira MGS, Galvão TCCP, Alves VRC. Epidemiological outcome of gestational and congenital syphilis, Piauí, 2007 to 2024. Rev Pre Infec e Saúde [Internet]. 2025; 11: 01: 6954. Available from: http://periodicos.ufpi.br/index.php/repis/article/view/6954. DOI: https://doi.org/10.26694/repis.v11i1.6954.

[1] State University of Piauí. Teresina, Piauí, Brazil.

[2] Federal University of Piauí. Teresina, Piauí, Brazil.

[3] New Dona Evangelina Rosa Maternity Hospital. Teresina, Piauí, Brazil.

Check for updates✅

ABSTRACT

Objective: to analyze the socio-epidemiological outcome of gestational and congenital syphilis in the state of Piauí, from 2007 to 2024. Method: ecological study, consisting of secondary data obtained from SINAN, which were analyzed and described using the BioEstat tool, version 5.3. The chi-square test assumptions were adopted, considering the condition that up to 80% of the cells in the contingency table have an expected frequency ≥5. Results: statistical significance was obtained for: years of notification (p-value <0.001); age group (p-value <0.001); ethnicity (p-value <0.001) and prenatal care (p-value <0.001). For the socio-clinical characterization, relevance was revealed for the following outcomes: latent syphilis (33.4%); reactive non-treponemal tests (88.8%) and reactive treponemal tests (65.6%). Regarding the socio-clinical characterization of congenital syphilis notifications, the highlights were: maternal treatment during prenatal care (47%); newborn age up to 6 days (95.5%); female sex (48.5%); treatment of the partner not performed (58.6%); diagnosis of recent syphilis (94.2%); and outcome of cases being live newborns (92%). Implications: as in most Brazilian regions, gestational and congenital syphilis in Piauí is strongly linked to socio-epidemiological characteristics.

DESCRIPTORS

Congenital syphilis. Maternal syphilis. Surveillance. Syphilis epidemiology.

Corresponding Author:
José Francisco Ribeiro
Address: Quadra 28; Casa 6; setor C; Mocambinho II. Teresina, Piauí, Brasil.
ZIP Code: 64010.360.
Phone: +55 (86) 988549081
E-mail: jotafribeiro@yahoo.com.br

Submitted: 07/02/2025
Accepted: 12/10/2025
Published: 31/10/2025

INTRODUCTION

Infection caused by the etiological agent Treponema pallidum, syphilis is considered acquired if obtained through sexual contact or blood transfusion. On the other hand, it is classified as Gestational Syphilis (GS) or Congenital Syphilis (CS) when maternal-fetal transmission occurs during pregnancy. Regardless of its classification, syphilis affects various systems of the human body. When not diagnosed early, it can persist for long periods, making treatment more difficult[1].

CS is characterized by significant global responsibility, as it contributes to fetal loss, stillbirths, neonatal mortality, and congenital infection. Despite the target set in 2007 by the World Health Organization (WHO) of a numerical value below 50 cases per 100,000 live births, the global occurrence is increasing, particularly in low- and middle-income regions. Current information indicates a rate of 473 cases per 100,000 live births[2], totaling 661,000 cases of congenital syphilis, including 355,000 divergent outcomes at birth, such as early fetal deaths, stillbirths, neonatal deaths, premature or low birth weight births, and children diagnosed with clinical CS[2].

Syphilis remains a significant public health problem in Brazil, as well as globally. In 2022, statistics on new syphilis infections in adults aged 15 to 49 showed a global increase of about 1 million, resulting in a total numeric increase of 7.1 million (5.1 to 9.1 million). Therefore, it was found that, in 2020, the number of syphilis infections amounted to 8.0 million (5.6 to 10.4 million), an analysis identified in 2022. The Americas region currently has a high absolute global incidence, with 3.37 million cases in 2022, corresponding to a rate of 6.5 cases of illness per 1,000 people, constituting 42% of all new global events during the reported period (WHO, 2024)[3].

From 2005 to June 30, 2024, Brazil reported a total of 713,167 cases of gestational syphilis. The national detection rate continued to increase throughout the period, reaching 34.0 cases per 1,000 live births (LB) in 2023[4].

It was also observed that, according to the evaluation of congenital syphilis findings in Brazil, between the period of 1999 to 2024, reports highlighted a total of 344,978 occurrences in children under one year of age. Therefore, the incidence rate continued to show steady growth until stabilizing in the last three years, reaching 9.9 cases per 1,000 live births in 2023. These findings demonstrate a global concern[4].

According to the global reality, it was observed that information from the 2024 Syphilis Epidemiological Bulletin in the state of Piauí showed 6,172 confirmations of acquired syphilis, 4,364 of gestational syphilis, and 1,731 notifications of congenital syphilis over the past six decades. These findings place the state of Piauí in a situation similar to that of other states in Brazil and around the world[5].

In this context, it is essential to seek to understand and systematically requalify socio-epidemiological characteristics at the state level, as it provides a broader perspective regarding gestational and congenital syphilis. Thus, it will be possible to set comprehensive goals that connect regional, national, and international instances for the management of this infection. Therefore, the objective was established to analyze the socio-epidemiological outcomes of gestational and congenital syphilis in Piauí from 2007 to 2024.

METHODS

Ecological study conducted through additional investigations related to cases of gestational and congenital syphilis reported in the Notifiable Diseases Information System (SINAN, as per its Portuguese acronym), accessed by the Department of Informatics of the Unified Health System (DATASUS, as per its Portuguese acronym), relevant to the mandatory reporting of gestational and congenital syphilis cases in Piauí, a state located in the northeastern region of Brazil, with an estimated population of 3,375,646 inhabitants in 2022[6].

The study population was defined as all confirmed cases of gestational syphilis (N=6419) and congenital syphilis (N=3973) occurring in the state of Piauí, diagnosed between 2007 and 2024, recorded in the Notifiable Diseases Information System[7].

The data collection took place in July 2025. The variables made available were fully transferred from SINAN as follows: year of case notification, age group, education level, race/color, prenatal consultation, clinical classification of syphilis, non-treponemal and treponemal tests, age group of the newborn, maternal syphilis treatment, treatment of the partner, final classification and evolution of congenital syphilis, and ignored/blank.

The following inclusion criterion was used: all reported cases of congenital syphilis and gestational syphilis in the state of Piauí available in the Notifiable Diseases Information System (SINAN, as per its Portuguese acronym), collected from the public national database of the Department of Informatics of the Unified Health System (DATASUS, as per its Portuguese acronym). Therefore, there were no exclusion criteria.

Since this research is based on public data, there was no need for registration or submission of this study to a Research Ethics Committee (REC), as established by resolutions nº 466/12 and 510/16 of the National Health Council (CNS, as per its Portuguese acronym). Therefore, it is important to note that all precautions related to the ethical and legal aspects of scientific research of this nature were ensured.

A descriptive and inferential statistical analysis was conducted in order to compare the sociodemographic characteristics between cases of gestational syphilis and congenital syphilis. Categorical variables were described using absolute and relative frequencies (%).

In order to test the association between the type of syphilis (gestational or congenital) and categorical variables — such as year of confirmation, age group, education level, and ethnicity — Pearson's chi-square test was used. This test is suitable for checking the independence between two qualitative variables, under the null hypothesis that there is no association between them. The adopted significance level was 5% ($\alpha = 0.05$), and p-values less than 0.05 were considered statistically significant.

The analyses were performed using the BioEstat program, version 5.3, considering the assumptions of the chi-square test, including the requirement that at least 80% of the cells in the contingency table have an expected frequency of 5 or more. The results were discussed based on scientific publications from the last five years.

RESULTS

Regarding sociodemographic characteristics, the following findings were observed in Table 1: the highest incidence of notifications for gestational syphilis (GS) and congenital syphilis (CS) occurred respectively in the periods 2019 to 2024 (44%) and 2015 to 2019 (43.2%); the age group 20 to 39 years (73%) for both types of syphilis; there was a prevalence of incomplete elementary education, GS (32%) and CS (36%); mixed race, GS (71%) and CS (68%); and most attended prenatal care, GS (92%) and CS (84.5%). Thus, statistical significance was also observed for: years of notification (p-value<0.001); age group (p-value<0.001); ethnicity (p-value<0.001); and prenatal care (p-value<0.001); education level (p-value = 0.005).

Table 1. Sociodemographic distribution of confirmed cases of gestational and congenital syphilis, Piauí, 2007 to 2024.

Variables	Gestational syphilis N=6,419(100%)	Congenital syphilis N=3,973(100%)	p-value*
Year of notification			**<0.001**
2007 to 2011	439 (7.0)	138 (3.4)	
2011 to 2015	825 (13.0)	771 (19.4)	
2015 to 2019	2,311 (36.0)	1,718 (43.2)	
2019 to 2024	2,844 (44.0)	1,346 (34.0)	
Age group			**<0.001**
10 to 14	94 (1.4)	39 (1.0)	
15 to 19	1,500 (23.0)	840 (21.0)	
20 to 39	4,689 (73.0)	2,893 (73.0)	
40 to 59	135 (2.0)	86 (2.0)	
Blank	1.0 (0.6)	115 (3.0)	
Education			**0.005**
Incomplete elementary education	2,059 (32.0)	1,428 (36.0)	
Complete elementary education	593 (9.2)	340 (8.5)	
Incomplete high school	1063 (16.5)	653 (17.0)	
Complete high school	1192 (18.5)	631 (16.0)	
Incomplete higher education	105 (1.6)	60 (1.5)	
Complete higher education	96 (1.4)	42 (1.0)	
No education	59 (1.3)	39 (0.4)	
Ignored/blank	1,252 (19.5)	780 (19.6)	

Ethnicity			**<0.001**
White	584 (9.0)	480 (12.0)	
Black	716 (11.0)	136 (3.4)	
Yellow	88 (1.3)	18 (0.4)	
Brown	4,565 (71.0)	2,705 (68)	
Indigenous	18 (0.7)	3 (0.2)	
Ignored/blank	448 (7.0)	631(16.0)	
Prenatal consultation			**<0.001**
Yes	5,917 (92.0)	3,361(84.5)	
No	zero (0.0)	532 (13.3)	
Ignored/blank	502 (8.0)	80 (2.2)	

Legend: * Chi-square tests with a significance level of 5%.
Source: DATASUS/SINAN.

In order to accomplish the socio-clinical characterization, the following outcomes were highlighted as relevant: latent syphilis (33.4%); reactive non-treponemal tests (88.8%) and reactive treponemal tests (65.6%).

Table 2. Socio-clinical characterization of gestational syphilis notifications, 2007 to 2024.

Variables	N (%)
Clinical classification	
Primary	1,929 (30.0)
Secondary	358 (5.9)
Tertiary	782 (12)
Latent	2,144 (33.40)
Ignored/blank	1,206 (18.7)
Non-treponemal tests	
Reactive	5,704 (88.8)
Non-reactive	125 (2.1)
Not performed	367 (5.7)
Ignored/blank	223 (3.4)
Treponemal tests	
Reactive	4,215 (65.6)
Non-reactive	211 (3.4)
Not performed	1,638 (25.5)
Ignored/blank	355 (5.5)

Source: DATASUS/SINAN.

Regarding the results of the socio-clinical characterization of congenital syphilis notifications, the following highlights were observed: treatment of the mother during prenatal care (47%); age of the newborn up to 6 days (95.5%); female sex (48.5%); treatment of the partner not performed (58.6%); recent syphilis diagnosis (94.2%); and outcome of cases as live newborns (92%).

Table 3. Socio-clinical characterization of congenital syphilis notifications, 2007 to 2024.

Variables	N (%)
Treatment of the mother	
During prenatal care	1,866 (47.0)
At the time of delivery/curettage	1,306 (33.0)
After delivery	669 (17)
Not performed	43(0.8)
Ignored/blank	89 (2.2)
Age group of the child	
Up to 6 days	3,798 (95.5)
From 7 to 27 days	82 (2.2)
Over 28 days	93 (2.3)
Sex of the child	
Male	1,924(48.4)
Female	1,926(48.5)
Ignored/blank	123(3.1)
Treatment of the partner	
Yes	1,012(25.4)
No	2,331(58.6)
Ignored/blank	630(16.0)
Final diagnosis of cases	
Recent congenital syphilis	3,744(94.2)
Late congenital syphilis	6(0.3)
Stillbirth/miscarriage due to syphilis	97(2.4)
Ruled out cases	126(3.1)
Final outcome of cases	
Alive	3,458(92.0)
Death due to the condition	94(2.5)
Death due to other causes	58(1.5)
Ignored/blank	150(4.0)

Source: DATASUS/SINAN.

DISCUSSION

Supporting this study, an epidemiological survey conducted in São Paulo using data from the period 2011 to 2022 recorded a total of 125,776 occurrences of infections due to GS and 42,418 events of CS. Regarding sociodemographic characteristics: the age group of 20 to 29 years (n = 37,132/29.52%) with complete high school education and mixed race (n = 51,662/41.07%); it was also observed that reports of CS (n = 37,344/97.21%) were neonates less than 7 days old (n = 23,726/97.21%)[8].

In a study aimed at evaluating the spatiotemporal distribution and epidemiological aspects of reported cases of CS and GS in Brazil, the following data were found: most notifications of CS occurred in "brown" newborns diagnosed within the first 7 days of life, and whose mothers received prenatal care. Regarding GS, a large number of cases were seen among "brown" women, aged 20 to 39, with complete elementary education, and were diagnosed with primary or latent syphilis. this information is similar to that found in the current study[9].

An analysis of eight cohort studies, four cross-sectional studies, and two case-control studies was also considered, including 12,230 women with reactive results or high probability of congenital syphilis and 2,285 newborns. The studies examined risk conditions for CS, showing the following results: a strong relationship between the maternal diagnosis period and neonatal infection, a reduced number of prenatal consultations and inadequate treatment, especially of the partner, and a diagnosis of recent syphilis[10]. Among the sociodemographic aspects, young age, low education, unemployment, limited family income, and lack of permanent residence were noted, indicating a high risk for GS[10].

A retrospective review study of medical records was also added, conducted at a tertiary care center in Bangkok, Thailand, evaluating mother/baby pairs reactive for syphilis. The study included 69 pregnant women with syphilis, 30 occurrences of congenital syphilis (CS), a median maternal age of 21 (range 18-32) years, 28 (41%) with inadequate treatment linked to 13 events (19%) of late or absent prenatal care, six cases (8%) of recent infection near delivery, five cases (7%) of treatment management errors, and four

(6%) other cases. There were three premature syphilitic stillbirths from untreated mothers and 67 live births; of these, 27 showed characteristics suggestive of possible congenital syphilis (CS)[11].

In an integrative review study with nine publications, the explanatory investigation was integrated, where low education, income and maternal age, scarcity of medications, and HIV infection were linked to untimely treatment of GS, in addition to the delay or absence of prenatal care and the provision of the first administration of medication according to protocol, lack of tests or therapy less than 30 days before delivery, and low acceptance of the treatment by the father[12].

The incidence rates of gestational syphilis and congenital syphilis showed statistically significant trends, which may be linked to the increase in the former at the time of diagnosis, during the first trimester, suggesting expanded testing among this population, clinical classification at the time of diagnosis (latent syphilis), as well as the inefficiency of the relevant treatment in cases of late diagnosis[13].

In a study conducted in the state of Piauí aimed at verifying the epidemiological profile of congenital syphilis in pregnant women residing in the period from 2007 to 2017, the following findings were obtained: age range of the pregnant women, 20 to 39 years (69.9%), brown race (70.5%), elementary education (28.9%), underwent prenatal care (85.4%), diagnosed during prenatal care (46.6%), without treponemal test (46.2%), non-treponemal test reactive (86.8%), presented primary form of the disease (30.5%) and partner untreated (60.8%), thus corroborating the reality of the current study conducted in the same state[14].

Also, in the research "Analysis of the spatio-temporal distribution of syphilis in Brazil: Cases of congenital syphilis and in pregnant women from 2001 to 2017," it was observed that the epidemiological characterization of Brazil shows that many cases of congenital syphilis occurred in "brown" newborns diagnosed within seven days after birth, and that the mothers received prenatal care; however, the epidemiological profile varies according to the Brazilian macroregion. Regarding gestational syphilis, there was an emphasis on individuals of "brown" ethnicity, aged 20 to 39 years, with elementary education, and a diagnosis of primary or latent syphilis[15].

Similar information was observed in an ecological and time-series study, which included all cases and deaths from congenital syphilis registered in SINAN between 2013 and 2019. Thus, 183,171 cases and 2,401 deaths from congenital syphilis were reported in Brazil, with the highest number of cases in the Southeast region (n=82,612 [45.1%]). It was found that only 21.1% of maternal syphilis cases received timely treatment. There was an upward trend in congenital syphilis rates among mothers aged 20 to 29 years (average annual percent change [AAPC] 1.4 [95% confidence interval {CI} 1.0 to 1.7]) and among those with incomplete/complete primary education (AAPC 6.6 [95% CI 5.3 to 7.9]). The primary spatiotemporal cluster included 338 municipalities in the Southeast Region (relative risk 3.06, $p<0.001$) and occurred between 2017 and 2019[15].

Accordingly, the socioeconomic differences associated with the socio-epidemiological profile, as well as the flexibility of human resources and proximity to health services, are connected to the spatial arrangement of gestational and/or congenital syphilis in Brazil. Applications in social policies and the strengthening of primary health care are fundamental for managing these two forms of syphilis[16].

Regarding the diagnosis of syphilis, various methods can be used depending on the stage of the infection. The direct recognition of the etiological agent is obtained directly from the primary syphilis lesion, while serology is the recommended technique in other stages of the disease, allowing the use of treponemal and non-treponemal immunological tests. At the present time, it is recommended to start the tests with a treponemal test (TT), such as the rapid test or chemiluminescence, confirming with a non-treponemal test (NTT), such as the Venereal Disease Research Laboratory (VDRL) test[17].

If there is confirmation of a reactive result in both tests, a diagnosis of syphilis is established, making careful analysis of clinical findings, laboratory tests, previous infection history, and evaluation of a recent sample mandatory. The compilation of this information provides an accurate diagnosis and the achievement of the appropriate treatment. This approach can only be considered complete with the proper management of treatment, as recommended in the specific treatment protocol for this infection[18].

Supporting this study, a survey conducted at the Women's Health Reference Center of Ribeirão Preto-Mater, 2020, which included 2,675 postpartum women and their babies cared for at the aforementioned maternity hospital, found that 49 participants showed a reactive treponemal result and a non-reactive treponemal result during the course of delivery, taking serological memory into account. Therefore, information from 2,626 mother/baby pairs was evaluated. Out of the total analyses, 2,554

(97.26%) were postpartum women who, at the time of delivery, had a non-reactive treponemal test, and 72 (2.74%) showed both treponemal and non-treponemal responses, indicating a seroreactivity rate for syphilis of 2.74%[19].

Additionally, it was observed in a study conducted in a northeastern capital (Brazil), consisting of 222 parturients, where 17 research participants (7.7%) tested positive for VDRL. Thus, this investigation noted an increasing prevalence of syphilis among parturient women in the aforementioned region, highlighting sociodemographic, behavioral, and institutional factors as causes of this occurrence[20].

Regarding the treatment of the partner-pregnant mother pair, it was observed in the study aimed at calculating the dominance of GS and causes related to syphilis infection in a healthcare institution located in the South of Brazil during the period of 2018, which revealed that, among the cases of pregnant women considered treated according to the Ministry of Health protocol, there was no record in the medical chart regarding the therapy administered to the partners in 17.4% of the cases. Simultaneously, among the cases of pregnant women classified as receiving incorrect treatment, the lack of data about their partners in the medical records occurred in 60.2% of the cases[21].

It was also detected in the research entitled, 'Syphilis in pregnancy and aspects related to CS in Belo Horizonte MG, during the period of 2010-2013,' that there were errors regarding information about the treatment of the pregnant woman and her partner, showing that 28% of pregnant women and 81.1% of partners did not have information regarding the administration of the specific medication, penicillin[22].

Therefore, it is understood that gestational syphilis can progress to congenital syphilis, and this occurs when the infection is transmitted from the mother via the conceptus, generally due to the absence of appropriate treatment during prenatal care. Early detection of the disease is important to prevent disorders such as spontaneous abortion, prematurity, perinatal death, and severe implications for the newborn. This transmission can occur via the transplacental route during the gestational period or during childbirth[23]. In the case of primary and secondary syphilis, the rate of vertical transmission can reach 75 to 100%. In latent syphilis, this rate is low, but still quite significant[24].

In a way, this context shows that the relationship of syphilis with adverse socioeconomic conditions and ineffective prenatal care suggests that improving the living conditions of the population and ensuring equitable access to quality health services can significantly advance the reduction of gestational and congenital syphilis[25].

This study presents some limitations related to the notification forms that feed the renowned database. In terms of the ignored/blank variables, they would be very useful if they described the meaning they represent, given that they stand out with a rather significant numerical value.

CONCLUSION

According to the results presented in this study, it is concluded that, despite the scientific contributions through evidence-based information, gestational and congenital syphilis remain a serious public health problem worldwide. There is a need for relevant health policies aimed at economically disadvantaged populations, since, although testing and treatment are offered to pregnant women and their partners, this infection essentially progresses in less economically developed countries. Nevertheless, numerous challenges undermine the effectiveness in combating syphilis, ranging from difficulties in implementing health policies according to socioeconomic characteristics to noncompliance by the pair, pregnant woman/partner, with prenatal care. Factors such as ignorance, socioeconomic and epidemiological obstacles, and the fragmentation of comprehensive and accessible care reinforce the need for improvements in the conduct and care provided.

REFERENCES

1. Brasil. Ministério da Saúde. Boletim Epidemiológico -Sífilis 2020 —Departamento de HIV, Aids, Tuberculose, Hepatites Virais e Infecções Sexualmente Transmissíveis [Internet]. [citado 10 de out de 2025]. Disponível em: https://www.gov.br/aids/pt-br/central-de-conteudo/boletins-epidemiologicos/2020/sifilis/boletim_sifilis_2020.pdf/view.

2. Salomè S, Cambriglia MD, Montesano G, Capasso L, Raimondi F. Congenital Syphilis: A Re-Emerging but

Preventable Infection. Pathogens. 2024 Jun 6;13(6):481. doi: 10.3390/pathogens13060481. PMID: 38921779; PMCID: PMC11206692.

3. WHO. Implementing the global health sector strategies on HIV, viral hepatitis and sexually transmitted infections, 2022–2030 |report on progress and gaps 2024 [Internet]. [citado 10 de out de 2025]. Disponível em: https://www.who.int/publications/i/item/9789240094925.

4. Brasil. Ministério da Saúde. Boletim Epidemiológico de Sífilis -Número Especial | Out. 2022 - Ministério da Saúde [Internet]. [citado 10 de out de 2025]. Disponível em: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/boletins/epidemiologicos/especiais/2022/boletim-epidemiologico-de-sifilis-numero-especial-out-2022/view.

5. Brasil. Ministério da Saúde. Boletim Epidemiológico de Sífilis. Out. 2024 . Ministério da Saúde [internet]. [citado 10 de out de 2025]; (especial): 1-44. Disponível em: http://www.aids.gov.br/pt-br/pub/2024/boletim-sifilis-2024.

6. Instituto Brasileiro de Geografia e Estatística (BR). Panorama das cidades brasileiras.2025. IBGE [internet].[citado 10 de out de 2025]. Disponível em:https://www.ibge.gov.br/cidades-e-estados/pi.html.

7. Brasil. Ministério da Saúde. DATASUS [Internet]. Brasília, DF: MS; c2008 [citado 10 de out de 2025]. Disponível em: http://www.datasus.gov.br.

8. Silva BPB., Matozinhos FP., Schreck RSC., Ferreira FM., Bezerra CP., Camargo, BTS, et al. (2025). Tendência temporal da taxa de incidência de sífilis gestacional e congênita em São Paulo, 2011-2023. Epidemiol e Serv de Saúde, 33, e2024637.

9. Silva ÂAO, Leony LM, Souza WV, Freitas NEM, Daltro RT, Santos EF, et al. Spatiotemporal distribution analysis of syphilis in Brazil: Cases of congenital and syphilis in pregnant women from 2001-2017. PLoS One. 2022 Oct 6;17(10):e0275731. doi: 10.1371/journal.pone.0275731. PMID: 36201505; PMCID: PMC9536537.

10. Pascoal LB, Carellos EVM, Tarabai BHM, Vieira CC, Rezende LG, Salgado BSF, et al. Maternal and perinatal risk factors associated with congenital syphilis. Trop Med Int Health. 2023 Jun;28(6):442-453. doi: 10.1111/tmi.13881. Epub 2023 May 8. PMID: 37156513.

11. Anugulruengkitt S, Yodkitudomying C, Sirisabya A, Chitsinchayakul T, Jantarabenjakul W, Chaithongwongwatthana S, et al. Gaps in the elimination of congenital syphilis in a tertiary care center in Thailand. Pediatr Int. 2020 Mar;62(3):330-336. doi: 10.1111/ped.14132. Epub 2020 Mar 17. PMID: 31886919.

12. Torres PMA, Reis ARP, Santos ASTD, Negrinho NBDS, Menegueti MG, Gir E. Factors associated with inadequate treatment of syphilis during pregnancy: an integrative review. Rev Bras Enferm. 2022 Sep 9;75(6):e20210965. doi: 10.1590/0034-7167-2021-0965. PMID: 36102473; PMCID: PMC9728816.

13. Silva BPBE, Matozinhos FP, Schreck RSC, Ferreira FM, Bezerra CP, Camargo BTS, et al. Temporal trends of the incidence rate of syphilis during pregnancy and congenital syphilis in São Paulo, Brazil, 2011-2023. Epidemiol Serv Saude. 2025; 27;33:e2024637. doi: 10.1590/S2237-96222024v33e2024637.

14. Sales MCV, Gomes AV, Amorim FCM, Magalhães JM, Gonçalves MER, Lira RCM. Perfil epidemiológico dos casos de sífilis congênita e gestacional no Estado do Piauí, Brasil. Rev. Mundo Saúde. 2022; 46: 357-368. doi: 10.15343/0104-7809.202246357368I.

15. Dalazen CE, de Souza AS, Ribeiro CJN, Marques Dos Santos M, Probst LF, Theobald MR, et al. Space-time risk cluster and time trends of congenital syphilis in Brazil: an ecological study. Trans R Soc Trop Med Hyg. 2022; 10;116(9):822-831. doi: 10.1093/trstmh/trac014.

16. Dantas JC, Marinho CDSR, Pinheiro YT, Fernandes Ferreira MÂ, Rosendo da Silva RA. Spatial Distribution of Gestational Syphilis in Brazil: Socioeconomic and Health Services Inequalities. Am J Trop Med Hyg. 2023; 15;109(1):42-49. doi: 10.4269/ajtmh.22-0449.

17. Reis ARP, Duarte G, Menegueti MG, Reis RK, Silva ACR, Gir E. Reactive treponemal and non-treponemal tests in pregnant women and associated factors. Rev Esc Enferm USP. 2022;56:e20220146.doi.org/10.1590/1980-220X-REEUSP-2022-0146en.

18. Sousa SS de, Silva YB, Silva IML da, Oliveira HFC, Castro AG dos S, Filho ACA de A. Aspectos clínico-epidemiológicos da sífilis gestacional no nordeste do Brasil. Rev Ciênc Plur. 2022;8(1):e22522–e22522.

19. Reis ARDP, Duarte G, Menegueti MG, Reis RK, Silva ACR, Gir E. Testes treponêmicos e não treponêmicos reagentes em gestantes e fatores associados. Revista da Escola de Enfermagem da USP. 2022; 56, e20220146.doi: 10.1590/1980-220X-REEUSP-2022-0146en.

20. Araújo MAL, de Freitas SCR, De Moura HJ, Gondim APS, Da Silva RM. Prevalence and factors associated with syphilis in parturient women in Northeast, Brazil. BMC Public Health.2013; 13, 1-6.doi: 10.1186/1471-2458-13-206.

21. Roehrs MP, Silveira SK, Gonçalves HH, Sguario RM. Sífilis materna no Sul do Brasil: epidemiologia e estratégias para melhorar. Femina.[Internet]2021[acesso 2025 july 06]; 49(2), 102-8.disponible en: https://www.febrasgo.org.br/pt/femina/item/2124-revista-femina-2025-vol-53-n-4.

22. Nonato SM, Melo APS, Guimarães MDC. Sífilis na gestação e fatores associados à sífilis congênita em Belo Horizonte MG, 2010-2013. . Epidemiol Serv Saúde[Internet].2015; 24(4), 681-694.doi:10.5123/S1679-49742015000400010.

23. Figueiredo DCMM, Figueiredo AM, Souza TKB, Tavares G, Vianna RPT. Relação entre oferta de diagnóstico e tratamento da sífilis na atenção básica sobre a incidência de sífilis gestacional e congênita Cad Saude. 2020; 23;36(3):e00074519. doi: 10.1590/0102-311X00074519.

24. Costa IB, Pimenta IDSF, Aiquoc KM, Oliveira ÂGRDC. Congenital syphilis, syphilis in pregnancy and prenatal care in Brazil: An ecological study. PLoS One. 2024; 25;19(6):e0306120. doi: 10.1371/journal.pone.0306120.

25. Pascoal LB, Carellos EVM, Tarabai BHM, Vieira CC, Rezende LG, Salgado BSF, et al. Maternal and perinatal risk factors associated with congenital syphilis. Trop Med Int Health.2023;28(6):442-453. doi: 10.1111/tmi.13881.

AUTHOR CONTRIBUTIONS

Study conception or design: Ribeiro JF, Silva JB, Silva LR. Data collection: Bezerra ABNN, Teixeira MGS. Data analysis and interpretation: Ribeiro JF, Galvão TCCP. Article writing or critical review: Alves VRC, Ribeiro JF, Galvão TCCP. Final approval of the version to be published: Ribeiro JF, Silva JB, Silva LR, Galvão TCCP.

ETHICS APPROVAL

Study based on information from a public domain database.

CONFLICT OF INTEREST

The authors declare no conflict of interest.