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Epidemiological analysis of congenital syphilis in Ceará, Brazil, from 2015 to 2024

*Análise epidemiológica da sífilis congênita no
Ceará, Brasil entre 2015 a 2024*

*Análisis epidemiológico de la sífilis congénita
en Ceará, Brasil, entre 2015 y 2024*

ABSTRACT

Syphilis, vertically transmissible, leads to severe maternal-fetal consequences. This study aimed to analyze the epidemiology of congenital syphilis in Ceará from 2015 to 2024. This is a cross-sectional, descriptive, and retrospective study conducted in January 2025 using data from the Information System for Notifiable Diseases (SINAN). Sociodemographic, clinical, and therapeutic variables were analyzed through descriptive statistics. Data were stored in Excel spreadsheets, using absolute and relative frequencies and incidence calculations to construct graphs and tables. Results evidenced a predominance of mixed-race (Pardo) individuals (10,470; 85.88%), mothers aged 20–25 (4,129; 33.7%), incomplete primary education (3,865; 31.70%), and non-treatment of the partner (7,656; 62.80%). Although most attended prenatal care (10,399; 85.3%), the data suggest inadequacy in follow-up and partner management. It is concluded that qualifying control and assistance strategies is imperative to mitigate this public health concern.

Keywords: *Congenital Syphilis; Health profile; Epidemiology.*

RESUMO

A sífilis, transmissível verticalmente, acarreta graves consequências materno-fetais. Nesse estudo objetivou-se analisar a epidemiologia da sífilis congênita no Ceará, de 2015 a 2024. Trata-se de um estudo transversal, descritivo e retrospectivo, realizado em janeiro de 2025 com dados do SINAN (Sistema de Informação de Agravos de Notificação). Analisaram-se variáveis sociodemográficas, clínicas e terapêuticas mediante estatística descritiva. Os dados foram armazenados em planilhas no Excel, usando frequência absoluta, relativa, e cálculo de incidência, para a construção de

gráficos e tabelas. Os resultados evidenciaram predomínio da raça parda (10.470; 85,88%), mães entre 20-25 anos (4.129; 33,7%), ensino fundamental incompleto (3.865; 31,70%) e não tratamento do parceiro (7.656; 62,80%). Embora a maioria tenha realizado pré-natal (10.399; 85,3%), os dados sugerem inadequação no acompanhamento e na abordagem dos parceiros. Conclui-se que é imperativo qualificar as estratégias de controle e assistência para mitigar esse agravo de saúde pública.

Palavras-chave: *Sífilis Congênita; Perfil de Saúde; Epidemiologia.*

RESUMEN

La sífilis, transmisible verticalmente, conlleva graves consecuencias materno-fetales. Este estudio objetivó analizar la epidemiología de la sífilis congénita en Ceará (2015-2024). Se trata de un estudio transversal, descriptivo y retrospectivo, realizado en enero de 2025 con datos del Sistema de Información de Agravos de Notificación (SINAN). Se analizaron variables sociodemográficas, clínicas y terapéuticas mediante estadística descriptiva. Los datos se procesaron en Excel utilizando frecuencia absoluta, relativa y cálculo de incidencia. Los resultados evidenciaron un predominio de la raza parda (10.470; 85,88%), madres de 20-25 años (4.129; 33,7%), educación primaria incompleta (3.865; 31,70%) y falta de tratamiento de la pareja (7.656; 62,80%). Aunque la mayoría realizó control prenatal (10.399; 85,3%), los datos sugieren inadecuación en el seguimiento y abordaje de las parejas. Se concluye que es imperativo calificar las estrategias de control y asistencia para mitigar este problema de salud pública.

Descriptores: *Sífilis Congénita; Perfil de Salud; Epidemiología.*

INTRODUCTION

Syphilis is an infectious disease, of chronic and sometimes asymptomatic evolution, caused by the bacterium *Treponema pallidum*. Transmission occurs through unprotected sexual intercourse, through vertical intercourse, and through contaminated blood transfusions¹. Vertically transmitted syphilis is known as congenital syphilis, when the mother transmits the disease to the baby, when she is pregnant. That is why prenatal care is highly recommended, as this disease is treatable, that is, congenital syphilis can be avoided.

Most babies with congenital syphilis do not have symptoms at birth. However, clinical manifestations can appear in the first three months, during or after the child's two years of life. Thus, the following complications can be perceived: spontaneous abortion, premature birth, malformation of the fetus, deafness, blindness, bone alterations, mental disability or death at birth².

It is emphasized that even if there is an effective treatment against congenital syphilis, there are still high incidence rates of the disease in Brazil, which means a public health problem³, with the main causes being the low adherence of mothers to treatment and poor prenatal care for the detection of the disease^{4,5}.

The eradication of congenital syphilis is one of the goals proposed by the World Health Organization (WHO)⁶, which contributes to achieving one of the Millennium Development Goals (MDGs) in maternal and child health, stipulating an incidence rate of 0.5 cases per 1,000 live births. Thus, syphilis is a disease of national compulsory notification and mandatory^{1,7}. In Brazil, the goal of eliminating mother-to-child transmission of syphilis was included in the Ministry of Health's Guide for Certification of the Elimination of Mother-to-Child Transmission of HIV and/or Syphilis⁸.

Thus, the intensification of surveillance of syphilis infection in pregnant women is fundamental, and aims to know the serological status and initiate maternal therapy early, enabling the planning and evaluation of prevention and control measures, particularly the vertical transmission of *T. pallidum*^{3,7,8}.

Between 1999 and June 30, 2025, Brazil had 369,468 cases of congenital syphilis in children under 1 year of age, with the Northeast region being the second with the highest number of cases, with 109,583 notifications, 29.7% of national cases⁹. Among the Brazilian capitals, Fortaleza had the second highest incidence rate in 2024, 24.7/1000 LB, with the region of the state of Ceará with a concentration of ^{9,10} cases. The accounting of cases of congenital syphilis may be underreported or delayed, so the high incidence rates, complications, and deaths related to this condition maintain it as one of the main causes of infant morbidity and mortality¹¹.

In the Unified Health System (SUS), prenatal care is the responsibility of Primary Health Care (PHC) and should be started by the 12th week of pregnancy. For cases of syphilis, the pregnant woman is considered adequately treated if she completes treatment with penicillin at least 30 days before delivery, according to the stage of the maternal disease, and the partner is treated concomitantly^{4,12}.

In view of this scenario, the relevance of the present study is evidenced, since congenital syphilis remains an avoidable disease, but still with a high incidence, reflecting weaknesses in access, quality of prenatal care, and health surveillance actions. The epidemiological analysis of congenital syphilis in Ceará allows the identification of temporal trends, more vulnerable groups, and possible gaps in maternal and child health care, contributing to the planning, monitoring, and strengthening of prevention and control strategies within the scope of PHC. In addition, regional studies are essential for the formulation of more targeted public policies, aiming at reducing infant morbidity and mortality and achieving national and international goals for the elimination of vertical transmission of syphilis.

From this perspective, the objective of the present study was to analyze the epidemiology of congenital syphilis in the state of Ceará, Brazil, from 2015 to 2024.

METHODS

This is a descriptive, cross-sectional and retrospective epidemiological study, carried out in January 2025. Secondary data from the TabNet platform of the Department of Information and Informatics of the Unified Health System (DataSUS) were used, based on records from the Notifiable Diseases Information System (SINAN), referring to cases of congenital syphilis in the state of Ceará, Brazil, from 2015 to 2024.

The variables used were: year of diagnosis, race, period of detection of maternal syphilis, maternal age group, prenatal care, mother's education, partner's treatment and evolution. The search was performed by selecting the option "Epidemiological and morbidity", followed by the selection option "notifiable diseases and conditions-2007 onwards (SINAN)", choosing among the selection options, "Congenital Syphilis". Soon after, the geographic coverage was selected, in this case, Ceará, in the period from 2015 to 2024. Thus, these variables were chosen, as a greater epidemiological relevance was evidenced in the context of congenital syphilis.

Eight variables were analyzed, classified as health and sociodemographic variables. The year of diagnosis was considered a discrete quantitative variable. The variables race/color, prenatal care, treatment of the partner and evolution of the case were classified as nominal qualitative. On the other hand, the period of detection of maternal syphilis, the maternal age group, and the mother's education level were considered ordinal qualitative variables. Data analysis was performed based on relative frequency, absolute frequency and incidence calculation.

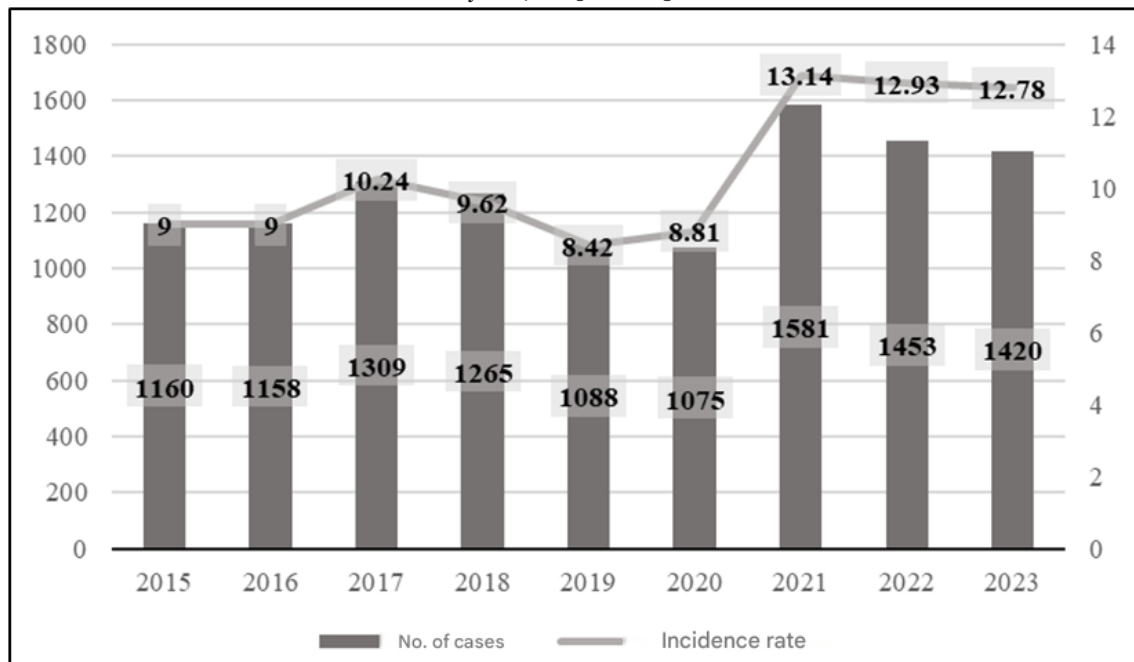
Considering that the study will use public secondary data, it is not necessary to submit it to the Research Ethics Committee, in accordance with Resolution No. 466/2012 of the National Health Council, which establishes ethical guidelines for research involving secondary data.

RESULTS

Based on the objective of the study, it was observed that there were 12,191 notifications of diagnoses in the period from 2015 to 2024 in the state of Ceará. However, for the purposes of comparative graphical analysis of the historical series, it was decided to present in Graph 01 only the complete years, from 2015 to 2023. In this cut, 11,516 notifications were counted, and it is possible to observe that the year 2021 had the highest number of cases of congenital syphilis, corresponding to 1,581 cases (13.73%).

Regarding the incidence rate, as can be seen in Graph 01, the highest rate occurred in 2021, with 13.14/1000 LB, while 2019 had the lowest rate, with 8.42/1000 LB. Using a simple average, the average incidence rate for the period from 2015 to 2023 was 10.43/1000 LB, which is still far from the goal established by the WHO.

Graph 01 – Number of cases reported per year and incidence rate of congenital syphilis in Ceará in full years, 2015 to 2023.



Source: Ministry of Health/SVSA - Notifiable Diseases Information System (SINAN) and Live Birth Information System (SINASC).

Furthermore, in relation to race/color, as can be seen in table 01, it can be seen that there is a predominance of the brown race, 10,470 cases (85.88%), this may be related to the percentage of the brown population in Ceará, which is 64.70% of the population of Ceará (IBGE)¹³. It is analyzed that in this variable there is a great incompleteness of data, after brown race/color, the second predominant category is "Ign/White", representing 9.09% (n=1,109) of the cases.

Table 01 – Number of confirmed cases of congenital syphilis, according to race/color, in Ceará in the period from 2015 to 2024.

Race/Color	Confirmed cases	
	No.	%
Ign/White	1109	9,10%
White	485	3,98%
Black	88	0,72%
Asian	18	0,15%
Brown	10470	85,88%
Indigenous	21	0,17%
Total	12191	100,00%

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - SINAN Net.

Table 2 shows the relationship between the period of maternal diagnosis in relation to syphilis and prenatal care. In 62.5% (n=7,621) of the cases, the diagnosis was made during prenatal care and in 30.1% (n=3,673) of the cases it occurred at the time of delivery/curettage. These moments follow the recommendation of the Ministry of Health, that the pregnant woman should be tested for syphilis in the 1st trimester, in the 3rd trimester and at the time of delivery or in cases of abortion.

Therefore, among the cases that did not have prenatal care, the diagnosis of maternal syphilis only occurred during delivery/curettage, corresponding to 89.06% (n=1,294) of the cases with negative prenatal care. Based on this, in view of the hypothesis of inadequate prenatal care, it is analyzed in table 2 that 85.30% (n=10,399) of the cases of congenital syphilis reported having this gestational follow-up, however there is no section in the notification form for the classification of adequate or inadequate, that is, a woman who had few consultations will have the same classification as another who had all of them.

Table 02 – Maternal clinical characteristics of diagnosed cases of congenital syphilis in Ceará from 2015 to 2024.

Maternal syphilis	Prenatal care						Total	
	Ign/White		Yes		No			
	No.	%	No.	%	No.	%	No.	%
Ign/White	92	27,14%	206	1,98%	23	1,58%	321	2,63%
During prenatal care	71	20,94%	7550	72,60%	-	-	7621	62,51%
At the time of delivery/curettage	156	46,02%	2223	21,38%	1294	89,06%	3673	30,13%
After childbirth	18	5,31%	387	3,72%	117	8,05%	522	4,28%

Not realized	2	0,59%	33	0,32%	19	1,31%	54	0,44%
			1039			100,00		100,00
Total	339	100,00%	9	100,00%	1453	%	12191	%

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - SINAN Net

Subsequently, the maternal age group was analyzed and the data collected were organized in Table 03. It can be seen, then, that the most prevalent age group was 20-24 years (n=4,129; 33.87%), followed by the 15-19 and 25-29 age groups (n=2,585; 21.20%).

Table 03 – Number of confirmed cases of congenital syphilis, according to maternal age group, in Ceará from 2015 to 2024.

Fx Age Mother	Confirmed Cases	
	No.	%
Blank	298	2,44%
10-14	145	1,19%
15-19	2584	21,20%
20-24	4129	33,87%
25-29	2585	21,20%
30-34	1469	12,05%
35-39	731	6,00%
40-44	231	1,89%
45-49	18	0,15%
50-54	1	0,01%
Total	12191	100,00%

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - Sinan Net

Another maternal sociodemographic characteristic collected was schooling. The data obtained were organized in table 04 and it was possible to see that most mothers do not complete elementary school, corresponding to 31.70% (n=3,865) of the cases.

Table 04 – Number of confirmed cases of congenital syphilis, according to maternal schooling, in Ceará from 2015 to 2024.

Maternal schooling	Confirmed Cases	
	No.	%
Ign/White	2272	18,64%
Illiterate	125	1,03%

1st to 4th incomplete grade of EF	678	5,56%
Complete 4th grade of EF	330	2,71%
5th to 8th grade incomplete EF	3865	31,70%
Complete elementary school	1014	8,32%
Incomplete high school	1474	12,09%
Complete high school	2228	18,28%
Incomplete higher education	89	0,73%
Complete higher education	78	0,64%
Not applicable	38	0,31%
Total	12191	100,00%

Source: Ministry of Health/SVSA - Notifiable Diseases Information System - Sinan Net

Analyzing the SINAN data, one of the most prevalent causes for the large number of confirmed cases of congenital syphilis is the non-treatment of the partner, accounting for 62.80% (n=7,656) of cases in the survey, while the partners who were treated accounted for 17.80% (n=2,170).

DISCUSSION

It is important to note that, although the period selected on the TabNet platform was from 2015 to 2024, 7 cases were recorded for 2014, which demonstrates that these notifications were recorded after the actual year of diagnosis. In addition, it was decided not to include the year 2024 in Chart 01, since the data were updated only until June 30, 2024, representing a partial period and not directly comparable to previous years, which correspond to 12 full months. Thus, the historical series presented in the graph was limited to the period from 2015 to 2023, in order to avoid bias in visual interpretation.

On the IntegraSUS platform, it is already possible to observe the total data recorded for congenital syphilis in 2024, in which 1,358 cases were reported in the state of Ceará. This difference between the platforms does not occur only in the year 2024, which is critical, since congenital syphilis has been mandatory notification since 1986¹⁴. That is, even if the platforms collect data in different ways, the numbers should be the same or with low deviation.

In relation to the last three years of the period covered, it is noted that there was an increase in the incidence rate compared to the initial years of the study period, this growth follows the increase in cases of syphilis in pregnant women in the Americas, which increased by 28% in the last two years⁶. In addition, the simple mean incidence in this period was 10.43/1000 LB, a number far from the WHO target of 0.5/1000 LB. Thus, raising awareness about all types of syphilis transmission is essential to combat this disease and ensure one of the Millennium Development Goals (MDGs) in maternal and child health.

Regarding the analysis of the most prevalent race/color, it is noted that there is a predominance of the brown race, therefore, even though the population of the state of Ceará is mostly identified as brown (64.70%), this can also evidence the ethnic-racial inequality in access to health and the vulnerability of the population in relation to this disease, as discussed in studies on congenital syphilis in Brazil in the period from 2018 to 2023¹⁵.

Although the analysis of the collected data highlights that brown race/color is the most prevalent, there is a certain absence of data, as the second predominant category is "Ign/White", representing 9.09% (n=1,109) of the cases. This reflects on the fight against this disease, since the complete completion of the information on the notification form is essential for the process of evaluation, planning, and institution of measures for the reduction and adequate control of this disease³.

Considering the period of detection of maternal syphilis, it is important to test at least three times: in the 1st trimester, in the 3rd trimester and at the time of delivery or in cases of abortion, as syphilis has a latency phase or asymptomatic phase, in this way, the mother has the possibility of having the disease, not being diagnosed and consequently, not performing the treatment and thus vertical transmission occurs^{2,7}.

It is also observed that even with this early diagnosis, that is, before the birth of the child, it was not possible to avoid congenital syphilis, this would be mainly related to inadequate prenatal care and treatment of mothers and partners with benzathine penicillin^{3,4,16}.

In the face of inadequate prenatal care, there is a deficiency in the systematization of relevant data for the analysis of the population profile, in which there is no section in the notification form for the classification of adequate or inadequate, that is, a woman who had few consultations will have the same classification as another who had all of them. Therefore, this deficiency in filling out the form has already been described previously¹⁶ and still hinders a more detailed analysis of the variable "prenatal care".

As in the literature researched, both nationally and regionally, the maternal age group of 20-24 years is the one with the most cases of congenital syphilis, as well as many cases still in adolescence. Thus, these results corroborate other studies carried out in Ceará, São Paulo, Maranhão and Santa Catarina, which concluded the relationship between these data and more accentuated sexual activity in the 15-29 age group, but demonstrates, above all, unprotected sexual practice regardless of age^{1,3,16,17,18}.

Regarding maternal education, it is noticeable that most mothers did not complete elementary school, which may demonstrate the perspective of young women who are unable to remain active in their own education, because they are in a situation of social vulnerability, making it difficult to understand information, such as sex education, as well as forms of gynecological care and prevention³.

From this, one of the causes that help to perpetuate congenital syphilis in the state of Ceará is the non-treatment of the partner, thus, it is visible that there is a clear correlation between previous treatment and the increase in confirmed cases, precisely because it is a sexually transmitted disease, the non-treatment of the contaminated partner facilitates the spread of the disease.

In view of this, the consequent contamination of the mother favors vertical transmission, explaining the increase in congenital syphilis. This can generate several impacts for the baby, including miscarriage, some neurological defects, deafness and blindness. In addition, this scenario represents a risk for the local health system, as it may lead to an overload of the health system and the perpetuation of a cycle of reinfections¹⁸.

According to data on the evolution of the disease, when diagnosed with congenital syphilis, the case has a good survival rate ($n=10,909$; 96.01%), given the efficiency of the current treatments, but does not exclude the possible systemic repercussions on the baby. Thus, in cases of gestational syphilis, treatment is centered on the mother, usually with penicillin type G¹². However, the efficacy of the treatment is reflected in the anticipation of diagnosis, preferably starting before the baby is born, which demonstrates the importance of prenatal care for the diagnosis and care of pre-existing diseases in the mother and child. In addition, it is also important to treat the partner, since if it is not treated correctly, it can be the source of reinfection of the mother and consequently of the child¹⁹.

FINAL CONSIDERATIONS

Based on what has been presented, it is observed that the incidence of congenital syphilis in the Ceará region remains increasing and without drastic improvements, with a higher concentration of cases from 2021 to 2024. However, there is a predominance of this disease in children of women between 20 and 24 years old, with incomplete elementary school, and whose partner did not receive adequate treatment. The affected babies, on the other hand, are mostly brown.

This scenario configures a failure in the health system, therefore, a relevant problem for the regional context, since factors such as ethnic-racial inequality, underreporting of cases and the lack of adequate prenatal care, limit a good prognosis for this scenario. From this, it is noticeable that the limitations of the present work were the disorganization and lack of clarity of the data present in the SINAN and TabNet platforms, and there is the possibility that the real statistics are broader than those identified.

Concomitantly, it is possible to evidence the perpetuation of problems common to the brown population and without access to adequate information, configuring government failures that can be minimized, based on the adversities elucidated during this study.

Thus, the need for the government to take preventive measures is highlighted, such as the institution of active partner search flows by the family health teams and the monitoring/auditing of the quality of prenatal consultations

in the Basic Health Units. In addition, information campaigns, reinforcement for the practice of prenatal care, and encouragement for the treatment of the mother and partner. In addition, constant vigilance is necessary, especially among risk groups and specific health education actions on this disease, and it is also important to revitalize the notification process, to mitigate the consequences of congenital syphilis in the state of Ceará.

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