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## Analysis of congenital syphilis in northeastern Brazil

*Análise da sífilis congênita no nordeste do Brasil*

*Análisis de la sífilis congénita en el noreste de Brasil*

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### ABSTRACT

**Justification and Objective:** in Brazil, there was an increase in vertical transmission, making congenital syphilis a public health problem. In recent years, there has been an increase in syphilis cases in the five regions of Brazil, with the Northeast and Southeast regions standing out with the highest number of cases. Therefore, this study aimed to describe the epidemiological profile of congenital syphilis in Northeastern Brazil. **Methods:** this is a retrospective, descriptive and quantitative study based on a survey of sociodemographic, clinical and death variables in the Notifiable Diseases Information System, covering the period from 2014 to 2018. Descriptive statistics were used. **Results:** Pernambuco had the highest number of cases (25.2%), with a gradual increase in incidence. In 2018, the detection rate was 9.6/1,000 live births. A growing trend was observed in the number of deaths from congenital syphilis from 2014 to 2018. There was a predominance of pregnant women aged between 20 and 29 years (52.0%), with low education (31.3%) and mixed-race (77.1%). Most infected pregnant women underwent prenatal care (79.8%), but with an inadequate treatment regimen (59.2%) as well as without the partner's treatment (59.5%). **Conclusion:** congenital syphilis is growing in northeastern Brazil, accompanied by inadequate prenatal care. This highlights the importance of new approaches in health, with the purpose of training professionals, especially in Primary Health Care for prevention, screening and effective treatment of syphilis in pregnant women.

**Keywords:** Syphilis, Congenital. Infant, Newborn. Health Profile.

### RESUMO

**Justificativa e Objetivo:** no Brasil, houve aumento da transmissão vertical, tornando a sífilis congênita um problema de saúde pública. Nos últimos anos, houve um aumento dos casos de sífilis nas cinco regiões do Brasil, destacando-se as regiões Nordeste e Sudeste com o maior número de casos. Portanto, este estudo teve como objetivo descrever o perfil epidemiológico da sífilis congênita no Nordeste do Brasil. **Métodos:** trata-se de um estudo retrospectivo, descritivo e quantitativo baseado no levantamento de variáveis sociodemográficas, clínicas e óbitos no Sistema de Informação de Agravos de Notificação, abrangendo o período de 2014 a 2018. Foi utilizada estatística des-

critiva. **Resultados:** Pernambuco apresentou o maior número de casos (25,2%), com aumento gradativo da incidência. Em 2018, a taxa de detecção foi de 9,6/1.000 nascidos vivos. Observou-se tendência de crescimento no número de óbitos por sífilis congênita de 2014 a 2018. Houve predomínio de gestantes com idade entre 20 e 29 anos (52,0%), com baixa escolaridade (31,3%) e parda (77,1%). A maioria das gestantes infectadas realizou pré-natal (79,8%), mas com regime de tratamento inadequado (59,2%) e sem tratamento do parceiro (59,5%). **Conclusão:** a sífilis congênita está crescendo no nordeste do Brasil, acompanhada de pré-natal inadequado. Isso evidencia a importância de novas abordagens em saúde, com o objetivo de capacitar os profissionais, principalmente da Atenção Primária à Saúde, para prevenção, rastreamento e tratamento eficaz da sífilis em gestantes.

**Palavras-chave:** Sífilis Congênita. Infante, Recém-nascido. Perfil de Saúde.

## RESUMEN

**Justificación y Objetivo:** en Brasil, hubo un aumento de la transmisión vertical, convirtiendo la sífilis congénita en un problema de salud pública. En los últimos años, hubo un aumento de casos de sífilis en las cinco regiones de Brasil, destacándose las regiones del Nordeste y Sudeste con el mayor número de casos. Por lo tanto, este estudio tuvo como objetivo describir el perfil epidemiológico de la sífilis congénita en el noreste de Brasil. **Métodos:** se trata de un estudio retrospectivo, descriptivo y cuantitativo basado en una encuesta de variables sociodemográficas, clínicas y de muerte en el Sistema de Información de Enfermedades de Declaración Obligatoria, que abarcó el período de 2014 a 2018. Se utilizó estadística descriptiva. **Resultados:** Pernambuco presentó el mayor número de casos (25,2%), con un aumento gradual de la incidencia. En 2018, la tasa de detección fue de 9,6/1.000 nacidos vivos. Se observó una tendencia creciente en el número de muertes por sífilis congénita de 2014 a 2018. Hubo un predominio de gestantes con edad entre 20 y 29 años (52,0%), con baja escolaridad (31,3%) y mestizas (77,1%). La mayoría de las gestantes infectadas realizaron control prenatal (79,8%), pero con un esquema de tratamiento inadecuado (59,2%) así como sin tratamiento de la pareja (59,5%). **Conclusión:** la sífilis congénita está creciendo en el noreste de Brasil, acompañada de atención prenatal inadecuada. Esto resalta la importancia de nuevos abordajes en salud, con el propósito de capacitar a los profesionales, especialmente en la Atención Primaria de Salud, para la prevención, pesquisa y tratamiento efectivo de la sífilis en la gestante.

**Palabras clave:** Sífilis Congénita. Infantil, Recién Nacido. Perfil de Salud.

## INTRODUCTION

Syphilis is an infectious disease caused by a spirochete bacterium, named *Treponema pallidum*, transmitted mainly by sexual contact, which presents a variety of clinical manifestations with chronic evolution, and may be asymptomatic in some stages.<sup>1,2</sup>

In congenital syphilis (CS) transmission of treponemes often occurs transplacentally, and may occur during childbirth.<sup>3</sup> About 80% of pregnancies, in which the mother has syphilis, have adverse outcomes such as prematurity, low birth weight, congenital infection and fetal and neonatal death. Hutchinson's triad, composed of dental malformations, interstitial keratitis and sensorineural deafness, caused by damage to the VIII cranial nerve, constitute the CS triad.<sup>4</sup>

In recent years, there has been an increase in CS cases in the five regions of Brazil, highlighting the Northeast and Southeast regions with the highest number of cases, recording rates ranging from 2.7 to 6.9/1000 live births.<sup>5</sup> The continuous growth of CS cases is associated with the challenge of timely diagnosis and follow-up of cases, although it is a preventable and treatable disease.<sup>6</sup>

Timely and adequate care is one of the barriers to vertical transmission of syphilis. Therefore, one of the main risk factors for CS is inadequate prenatal care, which should be tracked from the first consultations and provide early and immediate treatment for pregnant

women and partner, as determined by the Ministry of Health recommendations.<sup>6</sup>

Existing inequalities in access to health, whether regional or social, in addition to other failures resulting from poor care, such as inadequate information provided by the health care team, misinterpretation of syphilis tests and non-recognition of maternal signs of syphilis contribute to CS persisting across the country.<sup>7</sup> Thus, CS is a public health problem, in which case control is directly related to the quality of health services offered to pregnant women.<sup>8</sup>

Therefore, improvements in the implementation of health services for pregnant women with syphilis can be monitored through the frequent analysis of CS cases. Therefore, this study aims to describe the epidemiological profile of CS in northeastern Brazil.

## METHODS

This is a retrospective, descriptive and quantitative study, carried out from secondary data from the Notifiable Diseases Information System (SINAN - *Sistema de Informação de Agravos de Notificação*), from the website of the Department of Informatics of the Unified Health System (DATASUS - *Sistema de Informação de Agravos de Notificação*). The Northeast Region of Brazil was adopted as the study site, as it has the largest number of states

(Alagoas, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte and Sergipe) in relation to other Brazilian regions, with an approximate area of 1.5 million km<sup>2</sup> and 57 million inhabitants.<sup>9</sup>

The population consisted of all confirmed CS cases in children under one year of age, from 2014 to 2018. This time frame was adopted, as this period is fully available for analysis in DATASUS.

Data collection took place in August 2020, by one of the authors of the study. Then, they were grouped in Microsoft Excel®, in which descriptive statistical analysis (absolute and relative frequency) was performed. It is noteworthy that the incidence rate and gross mortality coefficient per year are already calculated in DATASUS.

The variables considered were: number of cases and deaths from CS in children under one year of age; syphilis cases by state and year of diagnosis; child's age group; classification of the final diagnosis; age group, race and maternal education; prenatal care; maternal treatment scheme; and performing the partner's treatment.

This study was not submitted to the Institutional Review Board, as it uses secondary data, available on a public platform and online. Despite this, the ethical principles of Resolutions 466, of December 12, 2012, and 510, of April 7, 2016, of the National Health Council, of the Ministry of Health of Brazil, were respected.

## RESULTS

In the time frame from 2014 to 2018, there was a prevalence of cases in the state of Pernambuco (25.2%), with a gradual increase in incidence, followed by Bahia (20.0%) and Ceará (19.0%) (Table 1).

In 2018, there was a significant increase in CS with a rate of 9.6 cases per 1,000 live births, when compared to previous years, accompanied by the increasing number of deaths, reaching the gross mortality rate of 9.4 per 100,000 live births in the same period (Table 2).

In all years analyzed, there was a predominance of early CS. Maternal age ranged from 20 to 29 years (52.0%), and education between incomplete 5<sup>th</sup> and 8<sup>th</sup> grades (31.3%) and mixed color/race (77.1%). It was veri-

**Table 2.** Distribution of cases and deaths from congenital syphilis in children under one year of age, incidence rate (per 1,000 live births) and gross mortality coefficient (per 100,000 live births) from 2014 to 2018.

Variable	2014	2015	2016	2017	2018
Congenital syphilis cases	5,073	6,004	5,935	6,952	7,877
Detection rate per 1,000 live births	6.1	7.1	7.5	8.5	9.6
Deaths from congenital syphilis	48	54	66	57	77
Gross mortality coefficient per 100,000 live births	5.8	6.4	8.3	7.0	9.4

Source: Department of Informatics of the Unified Health System, 2020.

fied that women underwent prenatal follow-up (79.8%), with inadequate maternal treatment regimen (59.2%) as well as without treatment of their partner (59.5%) (Table 3).

## DISCUSSION

The Pan American Health Organization (PAHO), with support from the World Health Organization (WHO), approved the strategy and action plan for the elimination of mother-to-child transmission of syphilis. The establishment of this strategy in 2010 aimed to reduce the incidence of CS to less than 0.5 cases per 1,000 live births by 2015.<sup>10,11</sup>

In Brazil, the CS incidence rate diverges from PAHO's goals. This situation is observed with an increase of 3.8 times in CS incidence, jumping from 2.4 in 2010 to 9.0/1,000 live births in 2018. The increase in incidence is justified as a result of greater screening of syphilis.<sup>12</sup> Despite this, the number of deaths from CS has increased in recent years, as observed in the present research.

In this study, despite fluctuations, all states in the Northeast region had high rates of CS, with a predominance of cases in Pernambuco, over the years. To control the mother-to-child transmission of syphilis, it is necessary to improve the access and quality of prenatal care, promote syphilis testing in the pregnant woman's first appointment, ensure adequate and immediate treatment of the pregnant woman and partner<sup>1</sup>, training of health

**Table 1.** Distribution of congenital syphilis cases in children under one year of age, in the Northeast region, from 2014 to 2018.

State	n	2014 %	n	2015 %	n	2016 %	n	2017 %	n	2018 %	n	TOTAL %
Alagoas	413	8.1	385	6.4	320	5.4	343	4.9	440	5.6	1,901	6.0
Bahia	920	18.1	1,166	19.4	1,386	23.4	1,369	19.7	1,517	19.3	6,358	20.0
Ceará	1,091	21.5	1,147	19.1	1,146	19.3	1,300	18.7	1,350	17.1	6,034	19.0
Maranhão	293	5.8	431	7.2	440	7.4	427	6.1	842	10.7	2,433	7.6
Paraíba	252	5.0	318	5.3	85	1.4	393	5.7	383	4.9	1,431	4.5
Pernambuco	1,285	25.3	1,359	22.6	1,517	25.6	1,920	27.6	1,941	24.6	8,022	25.2
Piauí	156	3.1	394	6.6	377	6.4	433	6.2	498	6.3	1,858	5.8
Rio Grande do Norte	283	5.6	436	7.3	352	5.9	451	6.5	579	7.4	2,101	6.6
Sergipe	380	7.5	368	6.1	312	5.2	316	4.6	327	4.1	1,703	5.3

Source: Department of Informatics of the Unified Health System, 2020.

**Table 3.** Congenital syphilis cases according to the child's age, final diagnosis, age group, education, mother's race, prenatal care, mother's treatment and partner's treatment from 2014 to 2018.

Variable	n	2014 %	n	2015 %	n	2016 %	n	2017 %	n	2018 %	n	TOTAL %
<b>Child age</b>												
< 7 days	4.894	96.5	5.812	96.8	5.706	96.1	6.703	96.4	7.599	96.5	30.714	96.5
7 to 27 days	88	1.7	94	1.6	113	1.9	129	1.9	172	2.2	596	1.9
28 to 364 days	91	1.8	98	1.6	116	2.0	120	1.7	106	1.3	531	1.7
<b>Final diagnosis</b>												
Early CS	4.682	92.1	5.585	92.6	5.575	93.6	6.565	94.1	7.494	94.9	29.901	93.6
Late CS	7	0.1	17	0.3	12	0.2	10	0.1	13	0.2	59	0.2
Abortion	176	3.5	179	3.0	175	2.9	193	2.8	190	2.4	913	2.9
Stillbirth	219	4.3	249	4.1	192	3.2	206	3.0	203	2.6	1.069	3.3
<b>Maternal age group</b>												
10 to 14 years	58	1.2	72	1.2	76	1.3	83	1.2	67	0.9	356	1.1
15 to 19 years	1.185	23.3	1.412	23.4	1.361	22.9	1.656	23.7	1.869	23.7	7.483	23.5
20 to 29 years	2.654	52.2	3.075	51.0	3.113	52.3	3.655	52.4	4.125	52.2	16.622	52.0
30 to 39 years	998	19.6	1.161	19.3	1.144	19.2	1.307	18.8	1.496	18.9	6.106	19.1
40 years and older	91	1.8	121	2.0	125	2.1	149	2.1	152	1.9	638	2.0
Ignored	98	1.9	189	3.1	135	2.2	124	1.8	191	2.4	737	2.3
<b>Maternal education</b>												
Illiterate	77	1.5	84	1.4	81	1.4	68	1.0	74	0.9	384	1.2
Incomplete 1st to 4th grades	579	11.4	515	8.5	461	7.7	559	8.0	553	7.0	2.667	8.4
Complete 4th grade	238	4.7	257	4.3	264	4.4	261	3.7	297	3.8	1.317	4.1
Incomplete 5th to 8th grades	1.637	32.2	1.938	32.1	1.864	31.3	2.150	30.8	2.418	30.6	10.007	31.3
Complete elementary school	314	6.2	501	8.3	408	6.9	558	8.0	638	8.1	2.419	7.6
Incomplete high school	471	9.2	549	9.1	661	11.1	829	11.9	936	11.8	3.446	10.8
Complete high school	544	10.7	723	12.0	829	13.9	972	13.9	1.323	16.8	4.391	13.7
Incomplete higher education	35	0.7	37	0.6	57	1.0	59	0.9	70	0.9	258	0.8
Complete higher education	19	0.4	36	0.6	29	0.5	54	0.8	65	0.8	203	0.6
Not applicable	32	0.6	28	0.5	30	0.5	35	0.5	22	0.3	147	0.5
Ignored	1.138	22.4	1.362	22.6	1.270	21.3	1.429	20.5	1.504	19	6.703	21.0
<b>Maternal race/color</b>												
White	367	7.2	519	8.6	472	7.9	545	7.8	638	8.0	2.541	8.0
Black	349	6.9	390	6.5	474	8.0	484	6.9	529	6.7	2.226	7.0
Yellow	19	0.4	14	0.2	27	0.5	32	0.5	38	0.5	130	0.4
Mixed-race	3.985	78.4	4.678	77.6	4.496	75.5	5.401	77.4	6.082	77.0	24.642	77.1
Indigenous	7	0.1	5	0.1	14	0.2	13	0.2	14	0.2	53	0.2
Ignored	357	7.0	424	7.0	471	7.9	499	7.2	599	7.6	2.350	7.3
<b>Prenatal care</b>												
Yes	3.895	76.6	4.652	77.1	4.782	80.3	5.640	80.9	6.508	82.4	25.477	79.8
No	824	16.2	865	14.3	770	12.9	864	12.4	927	11.7	4.250	13.3
Ignored	365	7.2	513	8.5	402	6.8	470	6.7	465	5.9	2.215	6.9
<b>Treatment scheme Maternal</b>												
Adequate	153	3.0	178	2.9	162	2.7	235	3.4	309	3.9	1.037	3.2
Inadequate	3.021	59.4	3.550	58.9	3.666	61.6	4.097	58.7	4.586	58.0	18.920	59.2
Not performed	1.287	25.3	1.535	25.5	1.490	25.0	1.811	26.0	1.949	24.7	8.072	25.3
Ignored	623	12.3	767	12.7	636	10.7	831	11.9	1.056	13.4	3.913	12.3
<b>Partner treated</b>												
Yes	683	13.4	738	12.2	775	13.0	1.085	15.6	1.979	25.1	5.260	16.5
No	3.182	62.6	3.798	63.0	3.792	63.7	4.198	60.2	4.048	51.2	19.018	59.5
Ignored	1.219	24.0	1.494	24.8	1.387	23.3	1.691	24.2	1.873	23.7	7.664	24.0

Source: Department of Informatics of the Unified Health System, 2020.



professionals health to carry out screening and early identification of cases<sup>13</sup>. Furthermore, the data suggest a variety of factors that may be related to vertical transmission, such as maternal, socioeconomic and prenatal care indicators.

Therefore, it is necessary to consider the particularities of each municipality in order to provide actions to cope with CS.<sup>14</sup> Public policies in the Northeast region should be encouraged, with the intensification of geographic planning and the construction of maps that highlight the regions that need more effective control, including other sexually transmitted infections (STIs) and prevalent pathologies based on improvements in public health.<sup>15</sup>

With regard to the diagnosis of CS, there was a predominance of neonates younger than seven days old, corresponding to 93.6% of cases. This finding is consistent with other studies that identified a predominance of the diagnosis in the first days of life.<sup>16,17</sup>

Syphilis infection prevailed in young, mixed-race pregnant women who had completed high school, results similar to previous studies.<sup>16,18</sup> Younger women are at the beginning of their sexual lives, which can lead to early, unprotected, multiple-partner sex and a high number of STIs.<sup>12</sup> In this sense, it is important to implement actions that encourage safe sex practices to prevent unwanted pregnancies and prevent STI transmission.<sup>17</sup> Furthermore, a study shows that the aforementioned sociodemographic characteristics are predominant in pregnant women with syphilis.<sup>16</sup>

Despite the pregnant women undergoing prenatal care, their and their partner's treatment scheme was inadequate. Previous studies carried out in Maranhão<sup>16</sup> and Minas Gerais<sup>18</sup> obtained similar results. Inadequate treatment and non-performance of the partner's treatment, associated with infection in young pregnant women and with low education are determinants to prevent vertical transmission<sup>16</sup>. Until timely and solid actions are taken, syphilis will remain a health problem with adverse consequences to the maternal-fetal cycle,<sup>10</sup> which denotes a deficiency in the public health system and the need to improve the quality of prenatal care.<sup>1</sup>

Appropriate treatment is possible with penicillin G benzathine, a safe and effective option during pregnancy provided by the Unified Health System (*Sistema Único de Saúde*). Moreover, sexual partnerships of pregnant women with syphilis must be treated regardless of laboratory confirmation.<sup>19</sup> The inadequate treatment of mothers and their partners reveals the fragility, while highlighting the importance of proper diagnosis and monitoring of pregnant women during prenatal care as well as greater attention in the child's first year of life.<sup>20</sup>

By 2030, the elimination of CS as a public health problem will depend on the control of syphilis in the general population and on the treatment of partnerships of pregnant women with syphilis identified in the prenatal period.<sup>10</sup> It is considered that the efforts of primary care can contribute to the decline in vertical transmission of syphilis, as it serves as a gateway, increasing proximity to patients.<sup>20</sup> Furthermore, the partner's participation

should be encouraged from the prenatal period, as it promotes the strengthening of the bond between the couple and with newborns.<sup>21</sup>

The limitation of the study is related to the method used, since, due to the use of secondary data from official sources, there is the possibility of underreporting and incomplete information, given by failures in filling in the data.

There is an increase in CS every year in the Northeast region, accompanied by inadequate treatment of pregnant women and their partners in the prenatal period. This highlights the importance of new approaches, with the purpose of training health professionals, especially in primary care, for prevention, screening and effective treatment of syphilis in pregnant women in order to reduce CS cases. Studies that investigate the difficulties of pregnant women and partners with syphilis in adherence to prenatal care are recommended, as well as the weaknesses of health care for the screening and effective treatment of gestational syphilis.

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**Jackeline Vieira Amaral, Agostinho Antônio Cruz Araújo, Ana Karine da Costa Monteiro and Augusto Cezar Antunes de Araujo Filho** contributed to conception, design, analysis and writing of the article;

**Isabela Maria Magalhães Sales and Aline Raquel de Sousa Ibiapina** contributed to the planning and design of the article, review and final approval of the article;

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