Gestational and congenital syphilis in a municipality in Brazil between 2014 and 2018

Sífilis gestacional e congênita em um município de fronteira no Brasil entre 2014 e 2018

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ABSTRACT

Introduction: Syphilis is an infectious disease that can cause congenital syphilis when it affects pregnant women, resulting in malformation of the fetus, miscarriage, or fetal death. Unlike many neonatal infections, congenital syphilis is considered a preventable perinatal cause, because it can be diagnosed and treated early during pregnancy. **Objective:** To analyze the reports of cases of gestational syphilis and congenital syphilis registered in Foz do Iguaçu City, Paraná State, between 2014 and 2018. **Methods:** This is a time-series study on the trend of cases recorded in the Notification Diseases Information System. The simple linear regression model was adopted to verify the trend of deaths in the analyzed period. **Results:** A total of 324 reports of gestational syphilis and 137 cases of congenital syphilis were evidenced in the study period. Regarding cases of gestational syphilis, 45.9% were diagnosed during the first trimester of pregnancy, 74.6% were treated with penicillin, and 24.3% were classified as primary syphilis. Roughly 88.3% of cases of congenital syphilis were reported in children under the age of 7 days. A significant increase in the rate of detection of gestational syphilis was observed, representing an increase of 4.0 times (p=0.004) in the years analyzed, and the risk of congenital syphilis increased 5.8 times (p=0.003) in the same period. **Conclusion:** The magnitude of gestational and congenital syphilis is a warning that indicates the need for actions and strategies to reduce cases of gestational syphilis and vertical transmission of syphilis.

Keywords: syphilis; congenital syphilis; sexually transmitted diseases; pregnancy.

RESUMO

Introdução: A sífilis é uma doença infecciosa que, quando acomete gestantes, pode provocar a sífilis congênita, resultante em malformação do feto, abortamento espontâneo e morte fetal. Ao contrário de muitas infecções neonatais, a sífilis congênita é considerada como causa perinatal evitável, desde que diagnosticada e tratada precocemente na gestação. **Objetivo:** Analisar as notificações dos casos de sífilis gestacional e congênita registrados no município de Foz do Iguaçu, Paraná, entre os anos de 2014 a 2018. **Métodos:** Trata-se de um estudo de série temporal sobre a tendência de casos registrados no Sistema de Informação de Agravos de Notificação. Para verificar a tendência dos óbitos no período analisado, adotou-se o modelo de regressão linear simples. **Resultados:** Evidenciaram-se 324 notificações de sífilis gestacional e 137 casos de sífilis congênita no período estudado. Sobre os casos de sífilis gestacional, 45,9% foram diagnosticados durante o 1º trimestre de gestação, 74,6% foram tratados com penicilina e 24,3% dos casos foram classificados como sífilis primária. Cerca de 88,3% dos casos de sífilis congênita foram notificados em crianças com idade inferior a sete dias. Observou-se um aumento significativo na taxa de detecção da sífilis gestacional, representando um aumento de 4,0 vezes (p=0,004) entre os anos analisados, e o risco de sífilis congênita apresentou um aumento de 5,8 vezes (p=0,003) no mesmo período. **Conclusão:** A magnitude da sífilis gestacional e congênita é um alerta que indica a necessidade de ações e estratégias para a redução dos casos de sífilis gestacional e a transmissão vertical da sífilis.

Palavras-chave: sífilis; sífilis congênita; doenças sexualmente transmissíveis; gravidez.

INTRODUCTION

Syphilis is an important public health problem and is characterized by a systemic infection caused by *Treponema pallidum.* When not treated early, it can evolve to a chronic disease with irreversible long-term sequelae[1].

The disease is predominantly transmitted by sexual contact. However, when it affects pregnant women, syphilis can cause congenital syphilis (CS), and the risk of vertical transmission is dependent on the stage of maternal infection and the gestational age in which it occurs. The diagnosis of CS, when compared to syphilis in pregnant women (Gestational Syphilis), is more complex, mainly because approximately half of infected children do not present signs or symptoms at birth. A total of 25% of pregnancies is estimated to end in late abortion or foetal death, 11.0% in neonatal death, 13% in preterm delivery or low birth weight, and 20% in presenting clinical signs of CS[2,3].

Data from the Epidemiological Bulletin of Syphilis indicate that syphilis acquired in Brazil had its detection rate increased from 59.1 cases per 100,000 inhabitants in 2017 to 75.8 cases per 100,000 inhabitants in 2018. Also in 2018, the detection rate of GS was 21.4/1,000 live births, the incidence of CS was 9.0/1,000 live births, and mortality rate due to CS was 8.2/100.000 live births[4].

The increase in notifications of GS and CS in recent years may be related to the strengthening of prenatal services, which provided an increase in coverage of testing of pregnant women and their partners, and follow-up of cases. With the simultaneous treatment of couples, cases of CS can be minimized. However, even if they have high prenatal coverage, the measures adopted are still insufficient to promote the elimination of CS as a public health problem[5,6].

Vertical transmission of syphilis can be avoided, because the appropriate diagnosis and treatment of pregnant women and their partners are performed during the gestational period, with penicillin being the drug of choice in the treatment of syphilis, the only one indicated for pregnant women[7,8].

When notifications are verified, the records of GS and CS are alarming, given that this is a preventable problem, in which an

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epidemiological picture with high incidence persists throughout the country[9,10].

The Foz do Iguaçu City, located in a border region between Brazil, Paraguay, and Argentina, presents a complex sanitary dynamics, and the existing population mobility influences the daily life of the border, causing negative impacts to health and affecting the care system[11,12]. In this perspective, the epidemiological profile of CS and GS is relevant, so that it can subsidize public health actions.

Considering that CS and GS must be notified in Brazil and information monitoring is of fundamental importance for the elimination of CS, investigation is needed to provide subsidies to plan and define the necessary interventions[7].

OBJECTIVE

To analyze the notifications of CS and GS cases registered in Foz do Iguaçu City, Paraná State, between 2014 and 2018.

METHODS

This is an ecological study of time series on the trend of cases of GS and CS in Foz do Iguaçu City, Paraná State, Southern Brazil, from 2014 to 2018. Data were collected from the Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação* — SINAN), from compulsory notification forms filled out by health professionals[13].

All cases of GS and CS notified in the city were included in the period analyzed. Variables were studied according to the data presented in the compulsory notification forms of GS and CS, namely: maternal sociodemographic (age group, race/skin color, schooling); obstetric and therapeutic (gestational age, treatment schedule, clinical classification, time of diagnosis of GS); treatment of the partner; age of the child at the time of diagnosis, and deaths from CS in children under one year of age.

Collected data were tabulated using the Microsoft Excel program® 2010 for the construction of graphs and table, and calculation of relative frequencies. Syphilis detection rates in pregnant women were calculated with the number of cases reported by the number of live births, collected in the information base of the Information System on Live Births (*Sistema de Informações sobre Nascidos Vivos* — SINASC), multiplied by 1,000; the incidence rate of congenital syphilis was calculated with the total number of reported cases of congenital syphilis in children under one year of age by the total number of live births of mothers living in the same place, and multiplied by 1,000[14].

In order to verify the trend of deaths in the period analyzed, the simple linear regression model ($y=\beta 0+\beta 1x$) was adopted. Models were constructed based on syphilis detection rates in pregnant women and congenital syphilis (y), according to the variable year (x). Linear trend equations and model adjustment statistics (adjusted R2 value and p-value of the F model adequacy test) were obtained with the statistical software Bioestat 5.0 of Universidade Federal do Pará (UFPA). The significance level adopted was 5%.

RESULTS

Research showed a total of 324 notifications of GS, and 137 of CS in the years analyzed. When cases of GS (**Table 1**) were observed, 48.7% of the reported cases were of women between 20 and 29 years old, 33.0% had education between 0 and 8 years, 36.7% of the records had the schooling field as an ignored item, 58.3% of pregnant women reported having white skin. Regarding prenatal data, 45.9% of cases of GS were diagnosed during the first trimester of pregnancy, 74.6% of cases were treated with penicillin, and 24.3% were classified as primary syphilis.

When analyzing CS data (**Table 2**), 88.3% of reported cases were children under the age of 07 days. All of them received a final diagnosis of recent CS. Among the cases of CS reported, 87.5% of the pregnant women underwent prenatal care, and 74.4% had the diagnosis of GS during the procedure. Regarding treatment performed in pregnant women, 43.0% were reported as inadequate, and in 64.9% of the reported cases the father/partner did not undergo treatment. In the period analyzed, two deaths due to GS were recorded in children under 1 year old.

Figure 1 shows the evolution of syphilis detection in pregnant women as well as the incidence of congenital syphilis in Foz do Iguaçu City in the historical series analyzed. Regarding disease detection, there was a significant increase (R2=0.947; p=0.004) of rates from 6.7 cases/1,000 live births in 2014 to 26.5 cases/1,000 live births in 2018, which represented a 4.0 increase in detection. At the other point of analysis, there was an important increase (R2=0.942;

Table 1 – Characterization of reported cases of syphilis in pregnant women, Foz do Iguaçu City, Paraná State, 2014-2018.

Variable	2014		2015		2016		2017		2018	
	n	%	n	%	n	%	N	%	n	%
Total notifications	30	9.2	39	12.0	59	18.2	79	24.3	117	36.1
Age range										
10 to 14	0	0.0	0	0.0	1	1.7	1	1.3	0	0.0
15 to 19	7	23.3	4	10.3	16	27.1	15	19.0	29	24.8
20 to 29	18	60.0	21	53.8	23	39.0	33	41.8	63	53.8
30 to 39	5	16.7	13	33.3	17	28.8	27	34.2	23	19.7
40 or over	0	0,0	1	2.6	2	3.4	3	3.8	2	1.7
Schooling										
0 to 8 years	11	36.7	13	33.3	25	42.4	23	29.1	35	29.9
9 to 11 years	6	20.0	5	12.8	18	30.5	24	30.4	37	31.6
12 years or more	0	0.0	3	7.7	0	0.0	0	0.0	4	3.4
Ignored	13	43.3	18	46.2	16	27.1	31	39.2	41	35.0

Continue...

Table 1 – Continuation.

Variable	2014		2015		2016		2017		2018	
	n	%	n	%	n	%	N	%	n	%
Skin color										
White	16	53.3	22	56.4	34	57.6	43	54.4	74	63.2
Back	2	6.7	2	5.1	3	5.1	6	7.6	6	5.1
Yellow	0	0,0	0	0.0	0	0.0	0	0.0	0	0.0
Brown	10	33.3	12	30.8	21	35.6	25	31.6	32	27.4
Ignored	2	6.7	3	7.7	1	1.7	5	6.3	5	4.3
Gestational Age (GA)										
1st Quarter	5	16.7	10	25.6	31	52.5	40	50.6	63	53.8
2nd Quarter	9	30.0	10	25.6	15	25.4	20	25.3	27	23.1
3rd Quarter	16	53.3	17	43.6	7	11.9	13	16.5	16	13.7
GA ignored	0	0.0	2	5.1	6	10.2	6	7.6	11	9.4
Ignored	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Treatment plan										
Penicillin	0	0.0	20	51.3	46	78.0	70	88.6	106	90.6
Another treatment	0	0.0	4	10.3	1	1.7	1	1.3	0	0.0
Not accomplished	0	0.0	6	15.4	3	5.1	3	3.8	5	4.3
Ignored	0	0.0	9	23.1	9	15.3	5	6.3	6	5.1
Clinic Classification										
Primary Syphilis	3	10.0	8	20.5	15	25.4	21	26.6	32	27.4
Secondary Syphilis	1	3.3	3	7.7	2	3.4	4	5.1	4	3.4
Tertiary Syphilis	1	3.3	0	0.0	4	6.8	2	2.5	4	3.4
Latent Syphilis	2	6.7	2	5.1	3	5.1	12	15.2	16	13.7
Ignored	23	76.7	26	66.7	35	59.3	40	50.6	61	52.1

Source: Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação* — SINAN), 2019[13].

Table 2 – Characterization of reported cases of congenital syphilis, Foz do Iguaçu City, Paraná State, 2014-2018.

Variable	2014		2015		2016		2017		2018	
	n	%	n	%	n	%	n	%	n	%
Total notifications	9	6.5	15	10.9	21	15.3	41	29.9	51	37.2
Children's age										
Less than 07 days	9	100.0	14	93.3	19	90.5	39	95.1	40	78.4
07 to 27 days	0	0.0	1	6.7	2	9.5	2	4.9	0	0.0
28 to 364 days	0	0.0	0	0.0	0	0.0	0	0.0	2	3.9
Final Diagnosis										
Recent congenital syphilis										
Yes	9	100.0	15	100.0	21	100.0	41	100.0	51	100.0
No	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Prenatal care										
Yes	6	66.7	15	100.0	18	85.7	34	82.9	47	92.2
No	3	33.3	0	0.0	3	14.3	6	14.6	3	5.9
Ignored	0	0.0	0	0.0	0	0.0	1	2.4	1	2.0
Time of GS diagnosis										
During prenatal	6	66.7	13	86.7	18	85.7	27	65.9	38	74.5
Childbirth/curettage	2	22.2	1	6.7	2	9.5	8	19.5	10	19.6
After childbirth	1	11.1	1	6.7	1	4.8	4	9.8	1	2.0
Not accomplished	0	0.0	0	0.0	0	0.0	1	2.4	0	0.0
Ignored	0	0.0	0	0.0	0	0.0	1	2.4	2	3.9
GS Treatment										
Adequate	1	11.1	2	13.3	2	9.5	6	14.6	3	5.9
Inadequate	5	55.6	8	53.3	12	57.1	13	31.7	21	41.2
Not accomplished	3	33.3	1	6.7	6	28.6	17	41.5	14	27.5
Ignored	0	0.0	4	26.7	1	4.8	5	12.2	13	25.5
Partner treated										
Yes	1	11.1	2	13.3	4	19.0	9	22.0	4	7.8
No	6	66.7	9	60.0	16	76.2	24	58.5	34	66.7
Ignored	2	22.2	4	26.7	1	4.8	8	19.5	13	25.5
Obits by CS<1 year										
Cases	0	0.0	0	0.,0	0	0,0	1	100.0	1	100.0

Source: Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação* — SINAN), 2019[13].

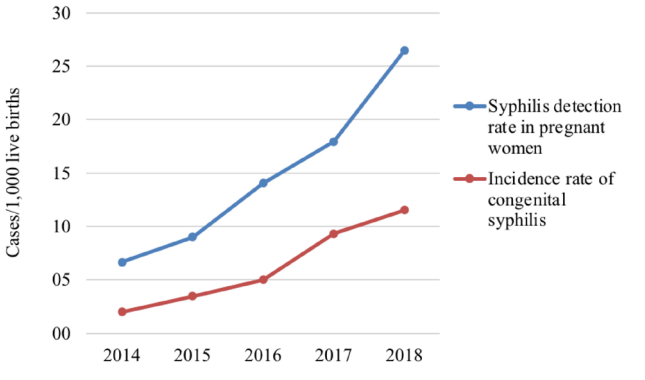
p=0.003) in the risk of congenital syphilis, with its incidence moving from 2.0 cases/1,000 live births to 11.5 cases/1,000 live births for the same period analyzed, representing an increase of 5.8 times.

DISCUSSION

Syphilis is a disease that challenges humanity for centuries. It remains a public health problem, even though it has an effective and low-cost diagnosis and treatment, if diagnosed during pregnancy. Disease should be treated promptly, considering that inadequate clinical management may eventually affect the conceptus transplacentally, and can be transmitted in any gestational phase or stage of maternal disease[5,15].

In this study, most of the registered cases of GS in the city occurred among young adult women, with up to 8 years of study and of white-skin color, which is a similar profile to that of other investigations carried out in the Northeastern (Fortaleza City, Ceará State, and Alagoas State)[3,15] and in the Southern (Maringá City, Paraná State) regions of Brazil[8]. This profile seems to portray the context of social vulnerability in which female patients are inserted, and deserves special attention from health services in prenatal care.

Similarly to other studies[3,16,17], most cases of the present study on GS were classified as primary syphilis, and treatment was performed with penicillin benzathine. The predominance of early diagnosis was evidenced in the first trimester of pregnancy, which is different from another study conducted in Montes Claros City, Minas Gerais State[18], in which detection was performed in advanced periods of pregnancy. Today, there is an epidemic of syphilis devastating the country, and it is essential that health professionals position themselves in the face of this disease in this context, because the disease is totally preventable, provided that there is early uptake and treatment of pregnant women and their partners[19].



Source: Live Birth Information System (*Sistema de Informações sobre Nascidos Vivos* — SINASC), 2019[14].
Syphilis detection rate in pregnant women
Incidence rate of congenital syphilis
Cases/1,000 live births

Figure 1 – Evolution of syphilis detection rates in pregnant women and incidence rate of congenital syphilis in Foz do Iguaçu City, Paraná State, 2014-2018.

As to CS, there was a predominance of cases reported in children under the age of 7 days, all of which had the disease in its recent phase as their final diagnosis, corroborating a study conducted in Almirante Tamandaré City, Paraná State, in which the highest occurrence of CS cases was recorded during the same period[20]. CS is the result of hematogenous dissemination of the pathogen causing the disease by transplacental route from infected pregnant women to their conceptus. Transmission can occur in any gestational phase or clinical stage of the disease. There is also the possibility of direct transmission when the child enters in contact with it in the delivery channel, if there are maternal genital lesions. In 2014, CS was considered if the mother's partner was not treated. However, in 2018, the treatment of the sexual partner no longer enters the definition of criteria to be classified as CS[21].

The present study revealed that the diagnosis of GS occurred during prenatal care, a similar fact found in a study conducted in Palmas City (Tocantins State), in which most mothers had had prenatal care and received the diagnosis of GS during follow-up consultations[6]. The most effective way to control GS is the commitment of Primary Care (PC) to offer all pregnant women quality prenatal care, ensuring early diagnosis and treatment to prevent vertical transmission of the disease[16].

Treatment performed in pregnant women was considered inadequate in most cases, when the father/partner did not adhere to treatment. Appropriate treatment is considered when it is completed 30 days before delivery, with penicillin, and the dose of medication is given according to the stage of the disease. The sexual partner is medicated concomitantly. Inadequate treatment is extremely common, and its main cause is related to the treatment of sexual partners, which can be verified in other realities, which is the main obstacle to the success of treatment[7,15,18].

Penicillin is the drug of choice for treating syphilis so far, it is the main way to fight the disease-causing bacteria and can prevent vertical transmission. Treatment effectiveness is associated to the fact that the partner is tested and treated in addition to the use of condoms during the treatment period[22].

In Brazil, adherence to treatment by partners is low, due to the existing prejudice that pregnancy and the raising of a child are entirely women's responsibility. Paternal involvement, throughout the gestational and postpartum periods, has been studied and has shown many benefits, once the approach of partners increases adherence to breastfeeding, strengthen the marital relationship, decreases domestic violence, postpartum depression, and reduces vertical transmission of infections[5,23].

During the period analyzed, two deaths from CS were registered in children under 1 year old, pointing to the severity of the problem. An evaluative study conducted in the Sobral City (Ceará State) reveals that, between 2007 and 2015, the city recorded a total of two deaths in children under 1 year of age, whose cause was CS[24]. The vertical transmission of syphilis presents different values according to the stage of maternal disease. Nonetheless, appropriate treatment can prevent 97% of cases of vertical transmission[25].

The detection rate of GS and CS is also worrying in the city, which increased in the study period. These indicators reflect the low quality of prenatal care, which, combined with barriers to access services, difficulties in addressing partners, difficulties in performing

active search and concomitant treatment, added to social, political, economic, and individual factors, make it difficult to monitor this population, besides contributing to the occurrence of new cases. Expanding access, improving prenatal care, providing early diagnosis, and timely initiating treatment are important actions to eliminate CS[26].

Because it is a city located in a border region, the oscillation migration in Foz do Iguaçu can contribute to the increase in rates of diseases and injuries, including GS. When countries have shared borders, it is natural to occur a displacement of the population in search of health care and, often, there is a preference to cross the border to seek better quality of care, which is the case of the triple frontier of Brazil, Argentina, and Paraguay. One of the most relevant problems in border regions involves organizational issues, when there is a need for active search of patients, and when they reside in another country, increasing the difficulty of contact and, consequently, management of injuries[27].

In the present study, there are limitations that should be observed in the evaluation of results. When using secondary SINAN data, insufficient notifications, and variations in the specificity of information can directly interfere with the quality and quantity of data. In addition, underreporting cases of syphilis and data that were considered ignored may hinder the construction of indicators that better represent the reality of the city to provide better prenatal care. The design adopted is an ecological study of time series that does not allow individual analyses, but aggregates of the population.

The findings show that cases of GS and CS in Foz do Iguaçu City, Paraná State, in the historical series analyzed, show a considerable increase. Results indicate a significant increase in the rate of cases detection, especially when sexual partners do not adhere to the recommended treatment, emphasizing the need for strategies that can contribute to the formulation of effective intervention proposals in family health. Besides that, there was an important increase in the risk of congenital syphilis, which may demonstrate deficiencies in prenatal care for treating syphilis in pregnant women to prevent vertical transmission of the disease to their newborns.

CONCLUSION

Given the growth in the detection rate of GS and the incidence of CS, prevention is a great challenge for professionals who perform prenatal care in the city in question. Carrying out actions that guide strategies to reduce cases of GS and vertical transmission of syphilis is of utmost importance.

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Participation of each author

The authors declare they were all active participants.

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Conflict of interests

There is no conflict of interest to be reported.

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