



## Gestational and congenital syphilis: incidence and factors associated with vertical transmission

### *Sífilis gestacional e congênita: incidência e fatores associados à transmissão vertical*

Giordana Maronezzi da Silva<sup>1</sup>, Marcela de Andrade Pereira da Silva<sup>2</sup>, Débora Cristina Martins<sup>3</sup>, Giovanna Brichi Pesce<sup>4</sup>, Renata Rodrigues Mendonça<sup>5</sup>, Carlos Alexandre Molena Fernandes<sup>6</sup>

<sup>1</sup> PhD student in Nursing at the State University of Maringá (UEM). Nurse of the Family Health Strategy of the Municipal Health Autarchy of Apucarana (PR) and professor of the nursing course at the Centro de Ensino Superior de Apucarana - Cesuap/FAP - Faculdade de Apucarana, Brazil; <sup>2</sup> PhD student in Health Sciences in the Postgraduate Program in Health Sciences from the State University of Maringá (UEM), Maringá (PR) and assistant professor in the Nursing Department of the Ingá University Center/UNINGÁ, Brazil; <sup>3</sup> PhD in Nursing from the State University of Maringá (UEM), Maringá (PR). Coordinator of the Nursing Course at Centro de Ensino Superior de Apucarana - Cesuap/FAP - Faculdade de Apucarana (PR), Brazil; <sup>4</sup> PhD student in nursing at the State University of Maringá (UEM), Maringá (PR) and collaborating professor at the Health Sciences Center of the State University of Paraná (UNESPAR), Paranavaí (PR), Brazil; <sup>5</sup> Master in Nursing from the Universidade Estadual de Maringá (UEM) and collaborating professor of the Centro de Ciências da Saúde da Universidade Estadual do Paraná (UNESPAR), Paranavaí (PR), Brazil; <sup>6</sup> Adjunct professor of the Universidade Estadual do Paraná (UNESPAR) Campus de Paranavaí. Permanent Professor in the Stricto Sensu Postgraduate Program (Master and Doctorate in Nursing) from the Universidade Estadual de Maringá (UEM), Maringá (PR), Brazil.

\* Corresponding author: Carlos Alexandre Molena Fernandes - E-mail: [carlosmolena126@gmail.com](mailto:carlosmolena126@gmail.com)

#### ABSTRACT

The objective was to analyze the incidence of congenital syphilis and the factors associated with vertical transmission in the 16th Regional Health System of the State of Paraná. This is a cross-sectional survey conducted by pairing the notifications in the Sinan, Sinasc and SIM databases between 2012 and 2017. The statistical analysis was calculated using absolute and relative frequencies and the Chi-square test, with a 95% confidence level. The incidence of congenital syphilis rose from 0.41/1,000 live births to 6.07/1.000 and was associated with the diagnosis made in the third trimester of pregnancy (OR= 2.051), treponemic test not performed or ignored in the diagnosis of gestational syphilis (OD=2.339) and titrations of the non treponemic test between 1:8 and 1:16 (OD= 2.386) and between 1:32 and 1:64 (OD= 2.353). The neonatal variable associated with syphilis was a congenital anomaly (p=0.037). It was concluded that it is necessary to improve the assistance regarding early diagnosis, correct treatment and follow-up.

**Keywords:** Congenital syphilis. Gestation. Incidence. Risk factors. Syphilis.

#### RESUMO

Objetivou-se analisar a incidência de sífilis congênita e os fatores associados à transmissão vertical na 16ª Regional de Saúde do Estado do Paraná. Trata-se de uma pesquisa transversal realizada mediante pareamento das notificações nos bancos de dados do Sinan, Sinasc e SIM entre 2012 e 2017. A análise estatística foi calculada através das frequências absolutas e relativas e da aplicação do teste Qui-quadrado, com grau de confiança de 95%. A incidência de sífilis congênita passou de 0.41/1.000 nascidos vivos para 6.07/1.000 e esteve associada ao diagnóstico realizado no terceiro trimestre de gestação (OR= 2,051), teste treponêmico não realizado ou ignorado no diagnóstico da sífilis gestacional (OD=2,339) e titulações do teste não treponêmico entre 1:8 e 1:16 (OD= 2,386) e entre 1:32 a 1:64 (OD= 2,353). A variável neonatal associada à sífilis foi anomalia congênita (p=0,037). Concluiu-se que é necessário o aprimoramento da assistência quanto ao diagnóstico precoce, tratamento correto e seguimento.

**Palavras-chave:** Fatores de risco. Gestação. Incidência. Sífilis. Sífilis congênita.

Received in: June 11, 2020  
Accepted on: November 23, 2020

## INTRODUCTION

Syphilis is a sexually transmitted infection (STI) with about six million new cases a year worldwide. Estimates from the World Health Organization (WHO) point out that in 2016, there were more than half a million (approximately 661,000) cases of congenital syphilis in the world, which resulted in more than 200,000 stillbirths and neonatal deaths.<sup>1</sup>

Among the consequences of untreated syphilis in pregnant women, it is estimated that 40% will result in spontaneous abortion, 11% will result in full-term fetal death and 13% will result in premature births or low birth weight. About 20% newborns (NB) will be symptomatic at birth. Pregnant women properly treated during prenatal care (PN) are diagnosed with congenital infection in only 1% to 2% cases. In contrast, pregnant women not properly treated account for 70% to 100% of cases of congenital syphilis (SC).<sup>2</sup>

The prevalence of syphilis during pregnancy (SG) in the Americas (Canada, Latin America and the Caribbean and the United States) varies between 0.0% and 7.0%. It is estimated that more than 100,000 stillbirths per year are attributable to SC, defined as a child born to a mother who was not treated or treated inadequately for syphilis during pregnancy.<sup>3</sup>

A study carried out in Brazil in the period from 2007 to 2012 in six federative units showed that the SG detection rate grew from 21% (Amazonas) and 75% (Rio de Janeiro). The increase in the incidence of SC ranged from 35.5% (Distrito Federal) to 639.9% (Rio Grande do Sul). Of the pregnant women with syphilis, 43% had a notified outcome of SC. In these pregnant women, maternal diagnosis occurred during PN in 74% and at childbirth in 18%.<sup>4</sup>

In 2016, in Brazil, 87,583 cases of acquired syphilis were reported, 37,436 cases of SG and 20,474 cases of SC, including 185 deaths. Between 2010 and 2016, there was an increase of approximately three times in the rate of detection of syphilis in pregnant women and in the rate of incidence of congenital syphilis, from 3.5 to 12.4 per thousand live births (LB) and from 2.4 to 6.8 per thousand LB, respectively. The detection rate of 12.4 cases of syphilis in pregnant women per 1,000 LB was surpassed by the South region, which presented 16.3 cases per 1,000 LB.<sup>5</sup>

The Ministry of Health has, over the past few years, launched strategies to combat vertical transmission of syphilis, in 2006 it launched the "Pact for Health" which presents as one of the objectives the reduction of maternal and child mortality. In 2007, the National HIV/AIDS/STD Program published the Operational Plan for the Reduction of Vertical Transmission of HIV and Syphilis. Ordinance 325 GM/MS that was published in 2008 set priorities for the "Pact for Life", including reducing maternal and child mortality and strengthening the capacity to respond to emerging and endemic diseases. In 2011, the Cegonha Network was created, which aims to ensure women a care network (reproductive planning, prenatal care, childbirth and the puerperium) and the child the right to safe birth and healthy growth and development.<sup>6</sup> In the state of Paraná, in the period from 2012 to 2017, 3,566 cases of SC were notified, of which 89% (3,174) of pregnant women underwent PN. Diagnosis of syphilis during pregnancy was made during PN in 71% cases (2,526) and the partner's treatment occurred only in 18.5% (661) of the cases, progressing to 3 deaths from SC.<sup>7</sup>

Knowing the characteristics of pregnant women who transmitted syphilis through the placenta and the characteristics of children who acquired *Treponema pallidum* during pregnancy allows the public health system to identify possible failure in diagnosis, treatment and correct follow-up of the mother, sexual partner and NB. From this view, it is possible to outline strategies and public policies that control vertical transmission of syphilis.

Given this scenario, the goal was to analyze the incidence of congenital syphilis and the factors associated with vertical transmission, in the 16th Health Regional of the state of Paraná.

## METHODS

Cross-sectional, retrospective study carried out using data from notifications of gestational syphilis and congenital syphilis in the 16th Health Regional of the state of Paraná, from 2012 to 2017.

The 16th Health Regional has an estimated population of 387,316 thousand inhabitants, and is located in the northern region of the state of Paraná.

It constitutes one of the 22 Health Regionals in the state, and covers 17 municipalities, having as its headquarters, the municipality of Apucarana.<sup>8</sup>

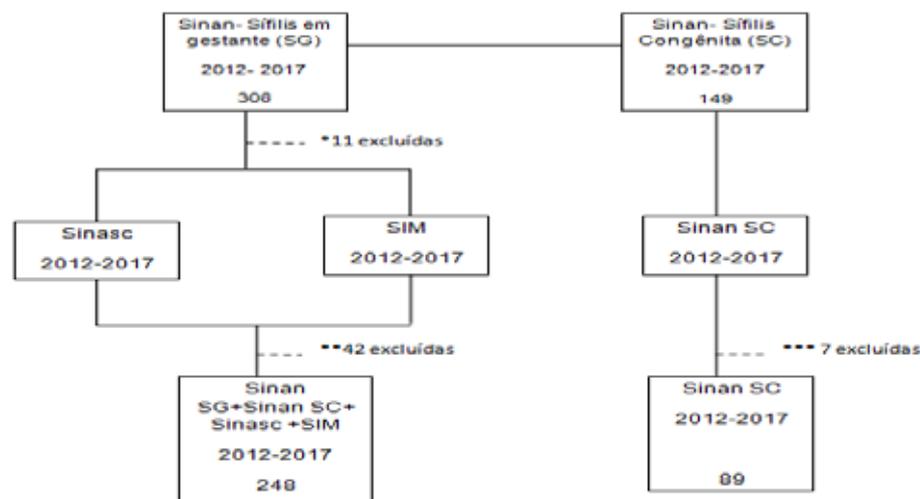
Data were collected from the databases: Information System for Notifiable Diseases (Sinan); Information System on Live Births (Sinasc) and Information System on mortality (SIM) of the Unified Health System made available with authorization from the 16th Health Regional.

To obtain the total number of notifications of syphilis in pregnant women and congenital syphilis, Sinan was used, as well as for the acquisition of other information, such as sociodemographic characteristics: - age, race, education and marital status, reproductive characteristics: - number of pregnancies, fetal loss, previous children born alive, type of delivery and care characteristics: - gestational trimester in which syphilis was diagnosed, start of prenatal care (PN), number of consultations performed in PN, treponemal test (TT) and non-treponemal test (TNT) in the diagnosis, titration in the diagnosis, clinical classification, treatment of the partner, and use of the protocol in the treatment. Information on PN care, obstetric history and newborn data were collected from the declaration

of live birth registered at Sinasc. From the data on the death certificate contained in the SIM, information was obtained on the obstetric history of the mothers who had a stillbirth or fetal death from syphilis. There is no record of abortions from syphilis, so they were excluded from the analysis.

Databases of Sinan SG and SC, SINASC and SIM were paired. For the pairing between Sinan SG and SC, the mother's name and age, and the date of diagnosis of SG prior to the newborn (NB) birth date were used as criteria. Identification of the mother at SINASC was performed through the mother's name and date of birth. In the SIM database, the date of death of the newborn was verified prior to the date of the mother's notification associated with the mother's name and date of birth.

In the period from 2012 to 2017, 308 pregnant women with syphilis were notified, of these 4 were excluded because they belong to other health regional and 7 because of duplicate register. When pairing the Sinan SG and Sinan SC databases, 42 pregnant women were excluded because they were not registered in Sinan SC, Sinasc and SIM, resulting in a final sample of 248 pregnant women and 89 cases of vertical transmission (Figure 1).



\*Data excluded due to duplication or not belonging to the 16th Health Regional.

\*\* Lack of registration of mothers at Sinan SG, Sinasc and SIM.

\*\*\* Fetal deaths without ICD or with ICD P002.

Figure 1. Pairing diagram of the Sinan, Sinasc and SIM databases for the 16th Health Regional of the state of Paraná from 2012 to 2017  
Source: Survey data (2018)

The detection rate of syphilis in pregnant women was calculated by the ratio of the number of cases of syphilis detected in pregnant women in a given year of diagnosis to the total number of live births of mothers living in the same place and year, multiplied by 1,000. The incidence rate of congenital syphilis by the ratio of the number of confirmed new cases of congenital syphilis in children under one year of age to the total number of live births to mothers residing in the same year, multiplied by 1,000.<sup>5</sup>

The absolute and relative frequencies were calculated based on the outcome (congenital syphilis). For association analysis, the Chi-square test and Fisher's exact test were applied for expected values below five, considering a 95% confidence level. The strength of association was estimated using the gross odds ratio (Odds Ratio). The analyses were run using the SPSS software, version 20.0. The research was exempt from approval by the Standing Committee

for Ethics in Research involving Human Beings of the Faculty of Apucarana, under opinion 2.833.762.

## RESULTS

In the period from 2012 to 2017, at the 16th Health Regional of Paraná, 308 women with SG and 149 children with SC were notified. There was an increase in the SG detection rate, from 1.04/1,000 LB in 2012 to 12.35/1,000 LB in 2017. The highest rate was recorded in 2016 from 17.96/1,000 LB. The incidence of SC has also increased over the years, from 0.41/1,000 LB in 2012 to 6.07/1,000 LB in 2017, the year 2016 had the highest rate of 6.65/1,000 LB (Figure 2).

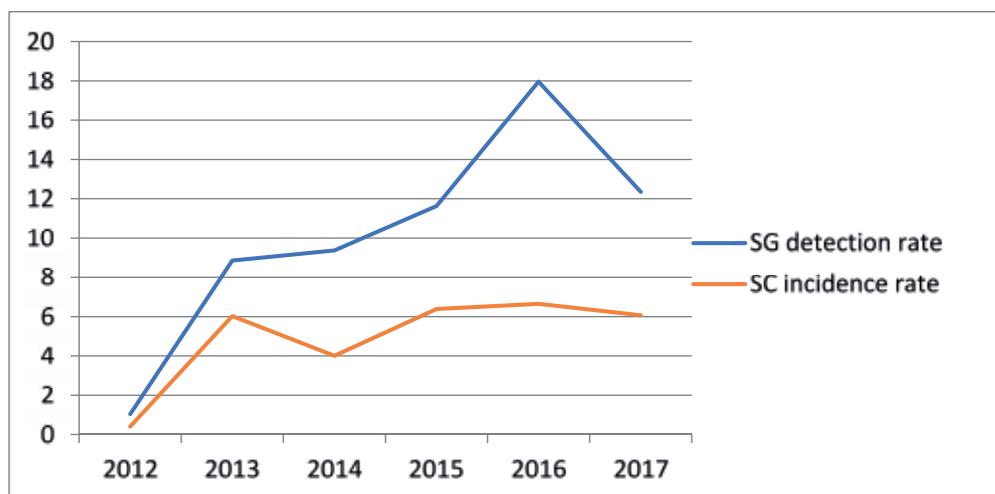


Figure 2. SG detection rate and SC incidence rate according to year at the 16th Health Regional of the state of Paraná, Apucarana, 2018

Source: Survey data (2018)

Of the pregnant women with syphilis who had congenital syphilis as an outcome, 72% were aged 20 to 34 years, 67% belonged to the white race/color, 50% had between 5 and 8 years of education and 70.8% reported marital status as single/widowed/divorced. (Table 1).

The diagnosis of syphilis during pregnancy was made in the first trimester of pregnancy in 38.6% of cases, 63.7% were multigravida, 83.5% had no fetal loss or abortion in a previous pregnancy, 57.8% had previous children born alive. Regarding the type of delivery, 61.5% had a cesarean delivery. (Table 1).

**Table 1.** Bivariate analysis of sociodemographic and reproductive characteristics, according to vertical transmission of syphilis, in pregnant women monitored at the 16th Health Regional, Apucarana, state of Paraná, Brazil, 2018

Characteristics	Vertical transmission				OR <sup>a</sup>	CI <sup>b</sup>	p-value <sup>c</sup>
	Yes	%	No	%			
<b>Maternal Age</b>							
<20	22	23.6	51	32.9	0.573	1.036 -0.317	0.065
20-34	67	72.1	89	57.4	1	-	
>34	4*	4.3	15	9.7	0.753	1.116-0.112	0.076
<b>Race/color</b>							
White	61	67.0	96	65.8	1	-	
Non-white	30	33.0	50	34.2	0.94	0.542-1.645	0.839
<b>Education</b>							
0-4 years	5	7.2	12	10.5	0.764	2.375-0.246	0.642
5-8 years	35	50.0	48	41.7	1.337	2.492-0.717	0.361
>8 years	30	42.8	55	47.8	1	-	
<b>Marital status</b>							
Married/stable relationship	26	29.2	57	37.0	1.424	0.812-2.497	0.212
Single/Widowed/Divorced	63	70.8	97	63.0	1	-	
<b>Gestational trimester in which diagnosis was made</b>							
First	34	38.6	72	49.3	1	-	
Second	23	26.1	42	28.8	1.16	0.604-2.225	0.656
Third	31	32.2	32	21.9	2.051	1.081-3.893	0.028
<b>Number of pregnancies</b>							
Primigravida	33	39.7	59	38.1	1.08	0.632-1.847	0.778
Multigravida	50	60.3	96	61.9	1	-	
<b>Fetal loss/previous abortion</b>							
Yes	15	16.5	27	17.4	0.936	0.468-1.869	0.851
No	76	83.5	128	82.6	1	-	
<b>Previous children born alive</b>							
Yes	52	57.8	87	56.1	1.07	0.633-1.808	0.802
No	38	42.2	68	43.9	1	-	
<b>Type of birth</b>							
Vaginal	35	38.5	60	38.7	1.011	0.594-1.720	0.969
Cesarean	56	61.5	95	61.3	1	-	
<b>Beginning of prenatal care</b>							
1st trimester	59	71.1	122	79.2	1.551	0.839-2.865	0.16
2nd/3rd trimester	24	28.9	32	20.8	1	-	
<b>Number of prenatal visits</b>							
<7 visits	22	25.0	126	81.3	1.448	0.772-2.717	0.247
> or = 7 visits	66	75.0	29	18.7	1	-	

a: Odds ratio; b: 95% Confidence interval; c: significance level at 5%.

\*Fisher's exact test

Source: Sinan (2018)

Regarding PN, 75% pregnant women had seven or more PN visits. The diagnosis of syphilis was obtained in the PN through the performance of TNT in 96.8% of pregnant women and by TT test in 52.7% of these.

Regarding titration, pregnant women with syphilis showed reactive results with a titre of 1: 8 or

1:16 in 47.4% reported cases. Regarding the clinical classification of syphilis, 72.9% were classified as primary syphilis. The partner treatment was not performed in 51.4% and the treatment protocol according to the clinical classification of the disease was not followed in 40%. (Table 2).

**Table 2.** Bivariate analysis of care characteristics, according to vertical transmission of syphilis, in pregnant women treated at the 16th Health Regional, Apucarana, state of Paraná, Brazil, 2018

Characteristics	Vertical transmission				OR <sup>a</sup>	CI <sup>b</sup>	p-value <sup>c</sup>
	Yes	%	No	%			
Non-treponemal test in diagnosis							
Done	90	96.8	147	94.8	1	-	
Not done/Ignored	3	3.2	8	5.2	0.613	0.158-2.369	0.544
Treponemal test in diagnosis							
Done	44	48.4	105	66.9	1	-	
Not done	37	40.6	38	24.2	2.324	1.310-4.123	0.004
Ignored	10	11.0	14	8.9	1.705	0.704-4.128	0.237
Titration in diagnosis							
1:1 or 1:4	12	13.6	35	35.4	1	-	
1:8 or 1:16	44	50.0	36	36.3	2.386	1.083-5.257	0.031
1:32 or 1:64	31	35.3	25	25.3	2.353	1.014-5.434	0.046
Clinical classification							
Primary	43	72.9	79	71.2	1	-	
Secondary	10	17.0	13	11.7	1.413	0.572-3.491	0.453
Tertiary	5	8.4	13	11.7	0.707	0.236-2.115	0.535
Latent	1*	1.7	6	5.4	0.306	0.036- 2.627	0.280
Partner treatment							
Yes	36	48.6	71	54.2	1	-	
No	38	51.4	60	45.8	1.249	0.706-2.211	0.445
Treatment protocol							
Followed the protocol	26	40.0	46	37.1	1	-	
Did not follow the protocol	28	43.1	52	41.9	0.953	0.490-1.853	0.886
Did not follow the protocol	11	16.9	26	21.0	0.749	0.319-1.757	0.506

a: Odds ratio; b: 95% Confidence interval; c: significance level at 5%.

\* Fisher's exact test

Ignored = no case of vertical transmission.

Source: Sinan (2018)

The occurrence of SC was associated with the assistance characteristics, that is, the assistance provided during the PN to the pregnant woman with regard to the diagnosis in the third trimester of pregnancy (OR = 2.051; CI = 1.081-3.893), as well as the TT not performed or ignored in the diagnosis of SG (OD = 2.339; CI = 1.379-3.966) and TNT titrations between 1: 8 and 1:16 (OD = 2.386; CI = 1.083-5.257) and between 1:32 and 1: 64 (OD =

2.353; CI = 1.014-5.434) that were also associated with vertical transmission of the disease. (Table 2).

The neonatal variable that was associated with vertical transmission of syphilis was a congenital anomaly with a p-value of 0.037. Other characteristics such as Apgar, weight, anomaly and gestational age did not show a significant association with congenital syphilis. (Table 3).

**Table 3.** Bivariate analysis of the characteristics of newborns to mothers notified with syphilis during the pregnancy at the 16th Health Regional, according to the occurrence of vertical transmission, Apucarana, state of Paraná, Brazil, 2018

Characteristics	Vertical transmission				OR <sup>a</sup>	CI <sup>b</sup>	p-value <sup>c</sup>
	Yes	%	No	%			
<b>1 min Apgar score</b>							
<7	6	6.6	8	5.2	1.3	0.43-3.83	0.648
≥7	85	55.2	146	94.8	1	-	
<b>5 min Apgar score</b>							
<7	0	-	1	0.6	0	0	0.446*
≥7	89	100	153	99.4	1	-	
<b>Weight (Kg)</b>							
<2,500	15	16.5	17	18.7	1.6	0.76-3.37	0.214
≥2,500	76	83.5	138	89.0	1	-	
<b>Anomaly</b>							
Yes	4	4.3	0	-	0	0	0.037*
No	89	95.7	155	100	1	-	
<b>Gestational age</b>							
< 37 s	16	17.8	20	12.9	1.5	0.72-2.98	0.298
≥37 s	74	82.2	135	87.1	1	-	

a: *Odds ratio*; b: 95% Confidence interval; c: significance level at 5%.

\* Fisher's exact test

Source: Sinasc (2018)

Regarding the care provided to newborns with SC, 94.38% had their diagnosis made less than 2 days after birth. TNT performed in peripheral blood was reactive in 95.50% cases. TNT at 18 months was not performed in 57.30% NB and this information was reported as not applicable in 41.57%. (Table 4).

**Table 4.** Diagnosis, treatment and follow-up of newborns notified with congenital syphilis at the 16th Health Regional in Apucarana, state of Paraná, Brazil, 2018

Characteristics of newborn care	N*	%
<b>Age at diagnosis (days)</b>		
<2	84	94.4
2 to 28	4	4.5
> 28	1	1.1
<b>Result of non-treponemal test in peripheral blood</b>		
Reagent	85	95.5
Non-Reagent	1	1.1
Not done	1	1.1
Ignored	2	2.2
<b>Result of treponemal test after 18 months</b>		
Not done	51	57.3
Not applicable	37	41.6
Ignored	1	1.1
<b>Result of non-treponemal test in liquor</b>		
Reagent	3	3.4
Non-Reagent	22	24.7
Not done	62	69.7
Ignored	2	2.2
<b>Alteration in long bones</b>		
Yes	2	2.2
No	26	29.2
Not done	57	64.0
Ignored	4	4.5
<b>Treatment Scheme</b>		
Crystalline Penicillin G 100,000 to 150.000 IU/Kg/day - 10 days	13	14.6
Procaine Penicillin G 50,000 IU/Kg/day - 10 days	5	5.6
Benzathine Penicillin G 50,000 IU/Kg/day	23	25.8
Another scheme	25	28.1
Not done	13	14.6
Ignored	10	11.2
<b>Evolution of the case</b>		
Alive	87	97.8
Death from other causes	2	2.2

N\*: Newborns notified with congenital syphilis.

Source: Sinan (2018)

TNT in cerebrospinal fluid was not performed in 69.66% NB, nor was the x-ray of long bones performed in 64.04%. As for the treatment regimen, 28.08% NB were treated with another regimen and 25.84% with Benzathine Penicillin G 50,000 IU/Kg/day, and 97.75% NB remained alive.

## DISCUSSION

In the 16th Health Regional, the detection rate of syphilis in pregnant women and the incidence of congenital syphilis increased more than ten times in the period from 2012 to 2017, corroborating the reality in the state of Paraná, which in that same period, presented a detection rate of SG in 2012 from 4.4/1,000 LB to 16.3/1,000 LB in 2017. Nevertheless, the incidence rate of SC rose from 2/1,000 LB in 2012 to 5.5 in 2017.<sup>7</sup>

Nationally, in 2016, there was a detection rate of SG at 12.4 cases for every thousand LB and the incidence rate of SC at 6.8 cases for every thousand LB, with the South Region presenting both rates above national rate. This increase in rates may have occurred due to the increase in the number of notifications in this period and not necessarily the number of cases.<sup>5</sup>

The increase in SG notifications can be justified by the fact that the Ministry of Health (MS), through Ordinance 77 of January 12, 2012, decided as a competence of Primary Care to perform rapid tests for detection of syphilis in the scope of prenatal care for pregnant women and their sexual partnerships<sup>9</sup>. The availability of tests promoted an improvement in the accessibility of pregnant women to the diagnosis of syphilis, a fact that may be associated with an increase in the number of reported cases.

Other hypotheses to be considered about the increase in cases of SG and that were presented in this study are related to the late onset of PN, which results in the late diagnosis and treatment of the disease, also contributing to the increase in vertical transmission, due to the longer time exposure to the disease. Another possibility is the incorrect diagnosis of the clinical stage of the disease, which results in

ineffective treatment. Another important factor to consider is the treatment of the sexual partner, since he may be infected and, by not treating the disease, continues to transmit to the pregnant woman.

According to MS, the partner's treatment should be carried out even with non-reactive immunological tests with a dose of benzathine penicillin IM (2,400,000 IU). When the test is reagent, treatment should be continued according to the clinical stage of the disease.<sup>2</sup>

The factors statistically associated with vertical transmission of syphilis among the studied pregnant women are related to the assistance characteristics: late diagnosis of the disease and failure to perform the tests recommended by the protocol for attending SG instituted by the Ministry of Health. The results found point to the diagnosis of syphilis performed in the third trimester of pregnancy, the failure to perform TT and TNT titrations between 1: 8 and 1:64, presenting approximately 2 times more chances of vertical transmission of the disease.

More than a third of pregnant women were diagnosed with syphilis in the third trimester. Most of them did more than seven PN visits. Although vertical transmission can occur at any gestational stage or stage of maternal disease<sup>2</sup>, the literature suggests that unfavorable outcomes for the fetus are conditioned to the development of the immune system that occurs after 18-20 weeks of pregnancy, as well as, the effectiveness of screening and treatment is lower in the third trimester than in the first and second trimester.<sup>10</sup>

Scientific document prepared by the Brazilian Society of Pediatrics on the diagnostic criteria and treatment of congenital syphilis states that the main risk factor for congenital syphilis is inadequate prenatal care, responsible for about 70 - 90% of the cases found. Among them, inadequate anamnesis stands out; syphilis serology not performed in the recommended periods (1<sup>st</sup> and 3<sup>rd</sup> trimesters); inadequate interpretation of syphilis serology; failure to recognize signs of maternal syphilis; lack of treatment of the sexual partner and failure in communication between the obstetric and pediatric teams.<sup>1</sup>

Other studies confirm that the late diagnosis of syphilis increases the risk of negative outcomes such as prematurity, abortion, stillbirth and neonatal death. Although pregnant women are monitored during prenatal care, controlling syphilis during pregnancy is still a challenge in assisting maternal and child health in the country.<sup>12,13,14,15,16,17,18</sup>

TNT was performed in the diagnosis of syphilis in almost all pregnant women, but more than half of them were not tested for *Treponema* in the diagnosis, contradicting the protocol of the Ministry of Health that recommends that the diagnosis of syphilis should be performed from a TT plus a TNT. It is recommended that whenever possible, the investigation should be initiated by a treponemal test.<sup>19</sup>

The failure to follow the current protocol established by the Ministry of Health favors the vertical transmission of syphilis.<sup>13,20</sup> A national study carried out with puerperal women showed that women diagnosed with syphilis, but without congenital syphilis outcome, had a higher proportion of serology during pregnancy (one or two tests), while those who performed a lower number of serology transmitted the disease to the newborn.<sup>18</sup>

TNT titrations between 1: 8 and 1:64 were strongly associated with vertical transmission of syphilis. Low VDRL titers should be considered in the diagnosis of maternal syphilis due to the clinical significance and the possibility of being interpreted as a predictor of SC.<sup>20,21</sup>

The Clinical Protocol and Therapeutic Guidelines for Syphilis Prevention defines the persistence of reactive results in non-treponemal tests with low titers (1: 1 to 1: 4) for one year after treatment as a serological scar for one year after treatment, when a new risk exposure is ruled out during the period analyzed.<sup>2</sup> Therefore, pregnant women with non-treponemal tests with titrations from 1: 8 without previous treatment for syphilis should be treated. The result of this study shows that possibly low titers are not being considered for treatment, contributing to the increase in vertical transmission of the disease.

As for maternal characteristics, more than half of the pregnant women whose outcome was the

occurrence of SC were between 20 and 34 years old, a result identified in other studies<sup>12,14</sup> and expected, since syphilis is a sexually transmitted disease, being more common in women active in reproductive age.<sup>19</sup>

As for race, most pregnant women reported being white and marital status as single/widowed/divorced. Half of them had between 5 to 8 years of study, low education can be seen in other studies carried out in different regions of Brazil.<sup>16,20</sup> Probably less educated mothers had little access to information on how to prevent the transmission of the disease and how to perform it proper treatment, resulting in vertical transmission of syphilis.

As for obstetric history, more than half of the pregnant women were multiparous, with no history of fetal loss or previous abortion and had a live child from the previous pregnancy. A similar result was reported by another study carried out in southern Brazil.<sup>14</sup> Regarding the type of delivery, SC was more prevalent in women who had their children by cesarean delivery.

Sexual partners of pregnant women were not treated in more than half of the cases, this result corroborates other studies<sup>13,15,20</sup>, in which the treatment of the partner is still considered one of the major challenges for the control of SC in Brazil.

Infected partners increase the risk of congenital syphilis infection by five times and the reasons for not treating are the low adherence to health services justified by employment issues, the non-indication of treatment by the health service, absence of a reference place and the lack of knowledge about the importance of treatment.<sup>14</sup> Strategies such as flexibility in the hours of service and referral to health units close to the workplace can facilitate user access to the service.<sup>20</sup>

A study carried out in Bogotá pointed out that 34% studied pregnant women had reinfection during pregnancy, which indicates the lack of control in the treatment of the couple and the lack of health education. Health education aims to strengthen the bond between professionals and users and should be carried out through the use of appropriate language for the public.<sup>22</sup> The risk behavior of the couple is

an important factor in the prevalence of gestational syphilis.<sup>21</sup>

In Brazil, in 2017, aiming at updating the definition of congenital syphilis and aligning it with the recommendations of the Pan American Health Organization (PAHO) and the World Health Organization, for the purposes of epidemiological surveillance, it is not considered as a criterion for case definition of congenital syphilis, treatment of the mother's sexual partner.<sup>5</sup>

More than two thirds of pregnant women with syphilis were notified with primary syphilis in the clinical classification, which usually manifests as a single painless nodule at the site of contact, which quickly ulcerates, forming hard wound<sup>2</sup>, that is, to be classified as primary syphilis the lesion should be viewed by the health professional during the prenatal visit.

According to the MS, the therapeutic scheme is established according to the clinical stage of the disease, this study found that the dose of Benzathine Penicillin prescribed does not match the clinical stage of the disease in more than a third of pregnant women, therefore it is concluded that these pregnant women were treated improperly. A result similar to this was also found in other studies.<sup>12,13,19</sup>

Importantly, in the case of pregnant women, the vast majority are diagnosed by serological tests recommended during prenatal and delivery, and the chronology of the time of infection is not always well determined. Therefore, when a pregnant woman has a confirmed diagnosis, in which it is not possible to infer the duration of the infection (syphilis of unknown duration), it is classified and treated as late latent syphilis.<sup>22</sup> Inappropriate treatment during pregnancy can result in fetal infection in 25% cases in the postpartum period and cause intrauterine death in the same proportion, with congenital anomalies, prematurity and abortion still occurring.<sup>15,23</sup>

A study carried out in Rio de Janeiro with prenatal professionals identified barriers related to the knowledge of protocols and professional practice. The low familiarity of professionals with the content of the protocols, difficulties in approaching sexually

transmitted diseases, barriers related to the user's adherence to the monitoring, the non-attendance of partners, and the organizational context are the difficulties most reported by health professionals.<sup>18</sup> Another study carried out with health professionals who provide assistance to pregnant women in Bolivia related as barriers to reduce the transmission of syphilis the lack of information and the short time available with the pregnant woman during the prenatal consultation.<sup>24</sup>

Anomaly was the perinatal outcome associated with congenital syphilis. It can be defined as any structural or functional change in fetal development that originated before birth. Possible causes include genetic, environmental or unknown. Congenital and perinatal disorders are often associated with infectious agents, including *Treponema pallidum*.<sup>25</sup>

In addition to prematurity and low birth weight, the main characteristics of congenital syphilis are hepatomegaly with or without splenomegaly, periostitis or osteitis or osteochondritis (with characteristic changes on radiological examination), pseudoparalysis of the limbs, skin lesions (such as palmoplantar pemphigus, flat condyloma), respiratory distress with or without pneumonia, anemia, serum-bloody rhinitis, jaundice and generalized lymphadenopathy (mainly epitrochlear). Other clinical features include petechiae, purple, perioral fissure, edema, hydrops, nephrotic syndrome, seizure and meningitis.<sup>26</sup>

In the care provided to newborns with SC, the vast majority of the diagnosis was made before two days of life, and that the non-treponemal test was reactive in most cases. The treponemal test after 18 months of life was not performed in more than half of the NB of mothers with syphilis during pregnancy, as well as the treponemal test in liquor and the x-ray of long bones.

These results contradict what is recommended by the Ministry of Health, which recommends that all NB of pregnant women with syphilis should be investigated for SC. In cases of properly treated pregnant women, only the non-treponemal test is performed, if negative, the newborn is followed-

up. If there is no follow-up, treatment with a single dose of benzathine penicillin G is performed. In all other cases, an investigation with VDRL, blood count, radiography of long bones and examination of liquor should be performed.<sup>17</sup>

A study conducted in Paraná identified an alarming proportion of abandonment of the follow-up of newborns exposed to syphilis during pregnancy, the purpose of the follow-up is to investigate signs of SC, detect neurological or other system alterations, validate the effectiveness of retreatment, estimate the need for retreatment and whether to confirm vertical transmission.<sup>27</sup>

In this research, the outcome of congenital syphilis cases differed between Sinan and SIM. It should be noted that Sinan depends on the notification made by health professionals and that SIM data are produced through the death certificate, so it was decided to describe the outcome according to SIM.

According to SIM, two fetal deaths from congenital syphilis were obtained during this period, seven fetal deaths without ICD (International Classification of Diseases) or with ICD P002 (fetus and newborn affected by infectious and parasitic diseases of the mother) and two stillbirths from SC.

This study had some limitations, including the use of secondary databases, subject to notification by health professionals. It showed a large number of missing data and a lot of information registered as ignored, in addition to not being able to estimate underreporting. Another important limitation is related to information on the treatment of the pregnant woman, as the notification only presents the clinical phase, prescribed dose and whether the partner was treated. It is not possible to check whether the treatment was carried out at the prescribed dose.

Nevertheless, the database used is considered reliable and consists of the instrument that can be used by epidemiological surveillance in order to assess the health situation and outline strategies for reaching goals. Moreover, pairing the databases allowed the delineation of the course of the disease from pregnancy to its outcome.

## CONCLUSION

This study showed an increase in the rate of detection of syphilis in pregnant women and the incidence rate of congenital syphilis. Significant associations were identified with vertical transmission of syphilis related to the characteristics of assistance intended for pregnant women in health services such as late diagnosis of the disease, treponemal test not performed or ignored in the diagnosis and low titrations between 1: 8 and 1:64.

The accessibility of pregnant women to prenatal care did not guarantee the quality of care provided, as most women had seven or more prenatal consultations, following the recommendations of the Ministry of Health, but it was not possible to avoid the outcome in congenital syphilis.

As for the assistance provided to the newborn, although the diagnosis was made quickly, the other tests for the diagnosis of neurosyphilis were not performed, the treatment prescribed does not match what was indicated and neither was the child's follow-up performed. The importance of the continuity of the follow-up of this child and the recording of actions taken are emphasized in order to achieve the integral care to the mother, the partner and the child with syphilis and thus break the chain of transmission of the disease.

Data point to the need to strengthen prenatal and hospital care through the training of professionals involved, the team awareness of the need for early detection of pregnant women to avoid late diagnosis and the strengthening of the service network in order to guarantee treatment and correct follow-up in order to fight this disease.

## REFERENCES

1. Organização Pan-Americana da Saúde (OPAS). Organização Mundial da Saúde publica novas estimativas sobre sífilis congênita [Internet]. Brasília: OPAS; 2016[citado em 2020 nov 07]. Disponível em: [https://www.paho.org/bra/index.php?option=com\\_content&view=](https://www.paho.org/bra/index.php?option=com_content&view=)

- article&id=5879:organizacao-mundial-da-saude-publica-novas-estimativas-sobre-sifilis-congenita&Itemid=812
2. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Protocolo Clínico e Diretrizes Terapêuticas para Prevenção da Transmissão Vertical do HIV, Sífilis e Hepatites Virais [Internet]. Brasília: Ministério da Saúde; 2018 [citado em 2019 nov 07]. Disponível em: <http://www.aids.gov.br/pt-br/pub/2015/protocolo-clinico-e-diretrizes-terapeuticas-para-prevencao-da-transmissao-vertical-de-hiv>
  3. Arnesen L, Serruya S, Durán P. Gestational syphilis and stillbirth in the Americas: a systematic review and meta-analysis. *Rev Panam Salud Publica*. 2015;37(6):422-9.
  4. Saraceni V, Pereira GFM, Silveira MF, Araujo MAL, Miranda AE. Vigilância epidemiológica da transmissão vertical da sífilis: dados de seis unidades federativas no Brasil. *Rev Panam Salud Publica*. 2017;41:e44. doi: <https://doi.org/10.26633/RPSP.2017.44>
  5. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Boletim Epidemiológico Sífilis 2017 [Internet]. Brasília: Ministério da Saúde; 2017 [citado em 2018 abr 07]. Disponível em: <http://www.aids.gov.br/pt-br/pub/2017/boletim-epidemiologico-de-sifilis-2017>
  6. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Transmissão vertical do HIV e sífilis: estratégias para redução e eliminação [Internet]. Brasília: Ministério da Saúde; 2014 [citado em 2018 abr 07]. Disponível em: <https://prevencaodstaidshvtb.wordpress.com/2014/12/10/transmissao-vertical-do-hiv-e-sifilis-estrategias-para-reducao-e-eliminacao/>
  7. Brasil. Ministério da Saúde. Indicadores e dados básicos da sífilis nos municípios brasileiros [Internet]. Brasília: Ministério da Saúde; 2020 [citado em 2020 abr 07]. Disponível em: <http://indicadorestifilis.aids.gov.br/>
  8. Instituto Brasileiro de Geografia e Estatística (IBGE). Cidades e Estados [Internet]. 2020 [citado em 2020 nov 15]. Disponível em: <https://www.ibge.gov.br/cidades-e-estados.html?view=municipio>
  9. Brasil. Ministério da Saúde. Portaria nº 77, de 12 de janeiro de 2012. Disponível em: [http://bvsms.saude.gov.br/bvs/saudelegis/gm/2012/prt0077\\_12\\_01\\_2012.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2012/prt0077_12_01_2012.html)
  10. Newman L, Kamb M, Hawkes S, Gomez G, Say L, Seuc A, et al. Global estimates of syphilis in pregnancy and associated adverse outcomes: analysis of multinational antenatal surveillance data. *PLoS Med*. 2013;10(2):e1001396. doi: <https://doi.org/10.1371/journal.pmed.1001396>
  11. Guinsburg R, Santos AMN. Critérios diagnósticos e tratamento da sífilis congênita [Internet]. São Paulo: Departamento de Neonatologia, Sociedade Brasileira de Pediatria; 2010 [citado em 2020 nov 15]. Disponível em: [https://www.sbp.com.br/fileadmin/user\\_upload/pdfs/tratamento\\_sifilis.pdf](https://www.sbp.com.br/fileadmin/user_upload/pdfs/tratamento_sifilis.pdf)
  12. Padovani C, Oliveira RR, Pelloso SM. Sífilis na gestação: associação das características maternas e perinatais em região do sul do Brasil. *Rev Latino-Am Enferm*. 2018;26:e3019. doi: <https://doi.org/10.1590/1518-8345.2305.3019>
  13. Mesquita KO, Lima GK, Filgueira AA, Flôr SMC, Freitas CASL, Linhares MSC, et al. Análise dos casos de sífilis congênita em Sobral, Ceará: contribuições para assistência pré-natal. *DST-J Bras Doenças Sex Transm*. 2012;24(1):20-7.
  14. Soares LG, Zarpellon B, Soares LG, Baratieri T, Lentsck MH, Mazza VA. Sífilis gestacional e congênita: características maternas, neonatais e desfecho dos casos. *Rev Bras Saúde Mater Infant*. 2017;17(4):781-89.
  15. Campos ALA, Araújo MAL, Melo SP, Gonçalves MLC. Epidemiologia da sífilis gestacional em

- Fortaleza, Ceará, Brasil: um agravamento sem controle. *Cad Saúde Pública*. 2010;26(9):1747-55.
16. Cavalcante PAM, Pereira RBL, Castro JGD. Sífilis gestacional e congênita em Palmas, Tocantins, 2007-2014. *Epidemiol. Serv. Saúde*. 2017;26(2):255-64.
17. Lafetá KRG, Martelli JH, Silveira MF, Paranaíba LMR. Sífilis materna e congênita, subnotificação e difícil controle. *Rev Bras Epidemiol*. 2016;19(1):63-74.
18. Domingues RMSM, Leal MC. Incidência de sífilis congênita e fatores associados à transmissão vertical da sífilis: dados do estudo Nascer no Brasil. *Cad Saúde Pública*. 2016;32(6):e00082415. doi: <https://doi.org/10.1590/0102-311X00082415>
19. Teixeira MA, Santos PP, Araújo RT, Santos PN, Souza AGJ. Perfil epidemiológico e sociodemográfico das crianças infectadas por sífilis congênita. *Rev Saúde Com*. 2015;11(4):371-81.
20. Nonato SM, Melo APS, Guimarães MDC. Syphilis in pregnancy and factors associated with congenital syphilis in Belo Horizonte-MG, Brazil, 2010-2013. *Epidemiol Serv. Saúde*. 2015;24(4):681-94.
21. Cerqueira LRP, Monteiro DLM, Taquette SR, Rodrigues NCP, Trajano AJB, Souza FM, et al. The magnitude of syphilis: from prevalence to vertical transmission. *Rev Inst Med Trop. S. Paulo*. 2017;59:e78. doi: <http://dx.doi.org/10.1590/S1678-9946201759078>
22. Rufino EC, Andrade SSC, Leadebal OCP, Brito KKG, Silva FMC, Santos SH. Women's knowledge about STI/AIDS: working with health education. *Cien Cuid Saúde*. 2016;15(2):304-11.
23. Cifuentes MY, Ojeda ECV. Sífilis Congênita en el Instituto Materno Infantil-Hospital la Victoria, Bogotá. *Rev Salud Publica*. 2013;15(3):434-45.
24. Tinajeros F, Ares LR, Elias V, Reveiz L, Sánchez F, Mejía M, et al. Barreras del personal de salud para el tamizaje de sífilis en mujeres embarazadas de la Red Los Andes, Bolivia. *Rev Panam de Salud Publica*. 2017;41:e21. doi: <https://doi.org/10.26633/RPSP.2017.21>
25. Mendes IC, Jesuino RSA, Pinheiro DS, Rebelo ACS. Anomalias congênitas e suas principais causas evitáveis: uma revisão. *Rev Med Minas Gerais*. 2018; 28:e-1977. doi: <http://www.dx.doi.org/10.5935/2238-3182.20180011>
26. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Programa Nacional de DST/AIDS. Diretrizes para controle da sífilis congênita: manual de bolso [Internet]. Brasília: Ministério da Saúde; 2006. Disponível em: [https://bvsm.sau.gov.br/bvs/publicacoes/manual\\_sifilis\\_bolso.pdf](https://bvsm.sau.gov.br/bvs/publicacoes/manual_sifilis_bolso.pdf)
27. Feliz MC, Medeiros ARP, Rossoni AM, Tahnus T, Pereira AVB, Rodrigues C. Adesão ao seguimento no cuidado ao recém-nascido exposto à sífilis e características associadas à interrupção do acompanhamento. *Rev Bras Epidemiol*. 2016;19(4):727-39.