

Completeness and characterization of gestational syphilis and congenital syphilis records in Bahia, Brazil, 2007-2017*

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Abstract

Objective: To describe the completeness and characteristics of reported gestational syphilis and congenital syphilis cases in the state of Bahia, Brazil, between 2007 and 2017. **Methods:** This was an ecological study using data retrieved from the Notifiable Health Conditions Information System (SINAN). Incidence rates at the macro-regional and state levels and percentage completeness were calculated. **Results:** 15,050 gestational syphilis cases and 7,812 congenital syphilis cases were identified. The incidence rate varied from 1.3 to 15.1 cases in pregnant women/1,000 live births and from 0.5 to 6.7 cases in infants under 1 year old/1,000 live births. Completeness of 'clinical classification' of gestational syphilis varied from 58.2% to 67.2% in the periods studied. **Conclusion:** The study showed an increase in incidence rates, flaws in report form completion and the need to implement routine information quality evaluation.

Keywords: Syphilis, Congenital; Prenatal Care; Health Profile; Epidemiology, Descriptive; Health Information Systems.

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Introduction

Syphilis, a disease caused by the bacterium *Treponema pallidum*, is classified as acquired when it is contracted through sexual contact or blood transfusion; and congenital or gestational, when mother-to-child transmission occurs during pregnancy. The disease affects almost all systems of the human body and, if left untreated, will progress for many years.¹

Knowledge of the profile and distribution of syphilis cases in a territory can contribute to building a reliable and complete information system, necessary for the adoption of effective preventive intervention and care measures.

In 2016 were estimated to be 6 million new syphilis cases worldwide. Between 2016 and 2017 the overall average congenital syphilis rate was 5.2 cases per 100,000 live births.² In Brazil there has been an increase in congenital syphilis and gestational syphilis incidence rates. Between 2010 and 2019, incidence rose from 2.4 to 8.2 congenital syphilis cases per 1,000 live births, and from 3.5 to 20.8 gestational syphilis cases per 1,000 live births.³

Congenital syphilis has been a notifiable disease since 1986, while gestational syphilis and acquired syphilis have been notifiable since 2005 and 2010, respectively.⁴ Case notification is performed by any health professional responsible for communicating the occurrence of the disease to the health authority. It is an important surveillance instrument.⁵

Input to the Notifiable Health Conditions Information System (SINAN) is also obligatory and is done by municipal, state and Federal District Departments of Health. Case notification allows the magnitude of this health condition to be known, in addition to assisting in the planning of actions, monitoring and evaluation of syphilis control programs and policies.^{6,7}

The quality of the data produced by the SINAN system is essential for health indicators to be able to fulfill their purposes.⁸ Case underreporting and

incomplete data are the main problems identified by syphilis surveillance services in several Brazilian states. A good quality database should contain all diagnosed cases, discard duplicates, and have its fields filled out consistently in order to portray epidemiological context. Full completion of notification forms is essential for a better understanding of the profile of the cases.⁶ Knowledge of the profile and distribution of syphilis cases in a territory can contribute to building a reliable and complete information system, necessary for the adoption of effective preventive intervention and care measures.

The objective of this study was to describe the completeness and characteristics of reported gestational syphilis and congenital syphilis cases in the state of Bahia, Brazil, between 2007 and 2017.

Methods

This was an ecological study of gestational syphilis and congenital syphilis cases reported in the state of Bahia between 2007 and 2017.

Bahia is located in the Northeast region of Brazil and its estimated population in 2018 was 14,812,617 inhabitants.⁹ The state is made up of 417 municipalities, organized into nine health macro-regions: East Central, North Central, Far South, East, Northeast, North, South, West and Southwest. Regarding maternal and child health, between 2000 and 2018 the fertility rate in Bahia fell, and between 2009 and 2018 there was a decrease in the proportion of mothers who did not have prenatal consultations, as well as an increase in the percentage of mothers who had seven or more prenatal consultations.¹⁰ Between 2008 and 2017, there was a significant number of cases of gestational syphilis and congenital syphilis in Bahia, besides complications caused by infection.¹¹

All cases of gestational syphilis and congenital syphilis registered on the SINAN system in Bahia state in the period selected were included in the study.

The information on gestational syphilis and congenital syphilis cases came from the SINAN system, while information on live births was taken from the Live Birth Information System. The data used in the study were imported from both information systems by accessing the website of the Brazilian National Health System Information Technology Department (DATASUS) – <http://www2.datasus.gov.br/DATASUS>¹² – between July 23 and August 6, 2019.

The variables of interest were collected considering all the years of the study period, and included:

- a) Number of gestational syphilis cases in Bahia state and in its health macro-regions, according to race/skin color (Black – sum of women of black and brown skin color – and non-Black), age group (in years: under 9, 10-14, 15-19, 20-39 and 40-59) and clinical classification (primary, secondary, tertiary and latent);
- b) Number of congenital syphilis cases in Bahia state and in its health macro-regions, according to race/skin color (Black – sum of women of black and brown skin color – and non-Black), sex (male or female), child's age group (up to 6 days, 7-27 days, 28 days to 1 year and 2-12 years), maternal schooling (no schooling, complete or incomplete 1st to 4th grade, complete or incomplete 5th to 8th grade, complete or incomplete high school and complete or incomplete higher education), prenatal care (yes or no), the time at which maternal syphilis was diagnosed (during prenatal care, at childbirth/curettage, after childbirth or diagnosis not performed), partner(s) treated (yes or no), final congenital syphilis classification (recent, late, or stillbirth/miscarriage due to syphilis) and syphilis progression in the child (alive, death due to congenital syphilis and death due to other cause);
- c) Number of live births in the state of Bahia and in its health macro-regions, used when calculating the incidence rates.

In order to describe the profile of gestational syphilis and congenital syphilis cases, relative frequencies were generated for the state for the periods 2007-2010, 2011-2014 and 2015-2017. Gestational syphilis incidence rates were calculated by dividing the number of new syphilis cases in pregnant women (numerator) by the number of live births (denominator), and multiplying their quotient by 1,000; for congenital syphilis incidence rates, the number of new congenital syphilis cases in children under 1 year old (numerator) was divided by the number of live births (denominator), and their quotient was multiplied by 1,000. The rates were calculated by year and by health macro-region.

Data completeness was calculated by dividing the number of unknown/blank data-information by the total number of reported cases for the years 2007-2010, 2011-2014, 2015-2017, and 2007-2017,

multiplying each quotient by 100⁶, and the result was classified based on the SINAN system parameters: excellent ($\geq 95\%$), good (90-94.9%), regular (70-89.9%), poor (50-69.9%) and very poor ($< 50\%$) degree of completeness.

Relative frequencies and percentages of completeness were calculated using Excel, which was also used to organize the data. StataSE12 software was used to calculate the incidence rates.

Although the data is public domain data, the project was submitted to the Research Ethics Committee of the Instituto de Saúde Coletiva, Universidade Federal da Bahia, and was approved as per Opinion No. 3.786.456, issued on December 20, 2019.

Results

Between 2007 and 2017, 15,050 gestational syphilis cases and 7,812 congenital syphilis cases were reported in Bahia. In this period, the gestational syphilis incidence rate rose from 1.3 to 15.1 cases per 1,000 live births (Figure 1), while the congenital syphilis incidence rate rose from 0.5 to 6.7 cases per 1,000 live births (Figure 2). In all the years studied, the congenital syphilis incidence rate was lower than the gestational syphilis incidence rate in the state of Bahia.

Syphilis incidence rates increased in all the state's macro-regions. With effect from 2010, the gestational syphilis incidence rates in the Far South, Southern and Eastern macro-regions were higher than those for Bahia as a whole (Figure 1). As for congenital syphilis incidence, higher rates than those for the state as a whole were found throughout the study period in the Far South macro-region; and also in most years in the Eastern macro-region. In 2007, no cases were reported in the Southern, Northeastern and North Central macro-regions (Figure 2).

Between 2007 and 2009, the congenital syphilis incidence rate was higher than the gestational syphilis incidence rate in the Far South health macro-region. This was also found in the Southwestern macro-region in 2008 and 2009, in the Eastern macro-region in 2008, and in the Western and East Central macro-regions in 2009.

As for the quality of information on gestational syphilis cases, slight variations were found in the percentages of data completion for most variables. Completeness of the 'age group' variable was excellent

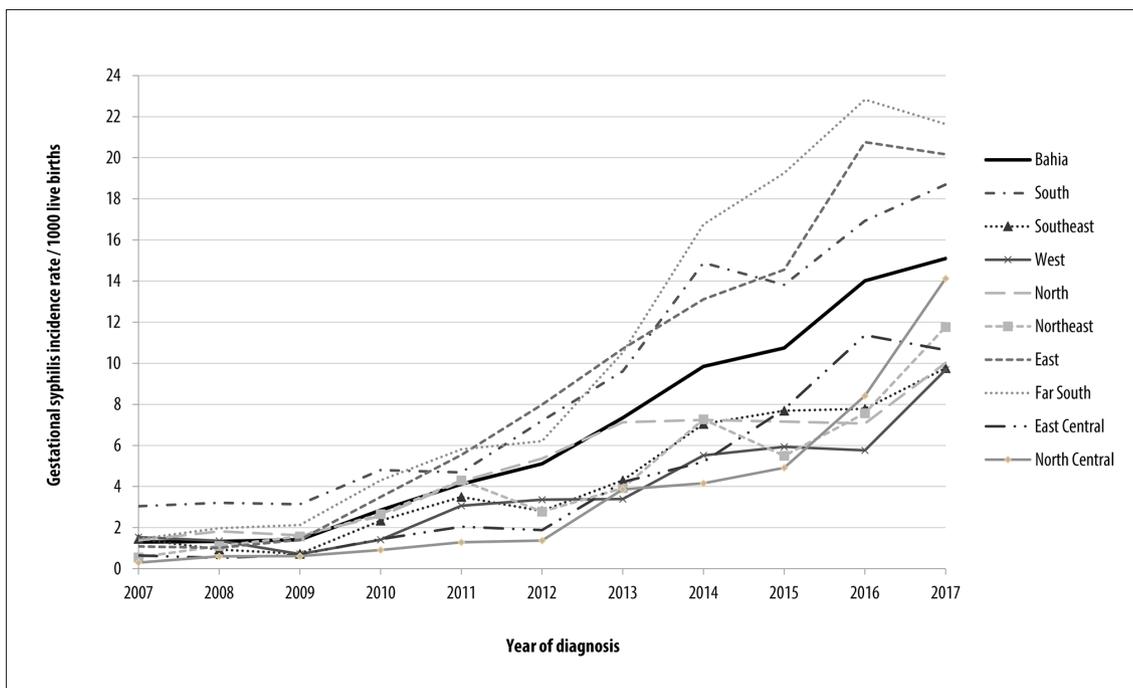


Figure 1 – Gestational syphilis incidence rate by health macro-regions, Bahia, Brazil, 2007-2017

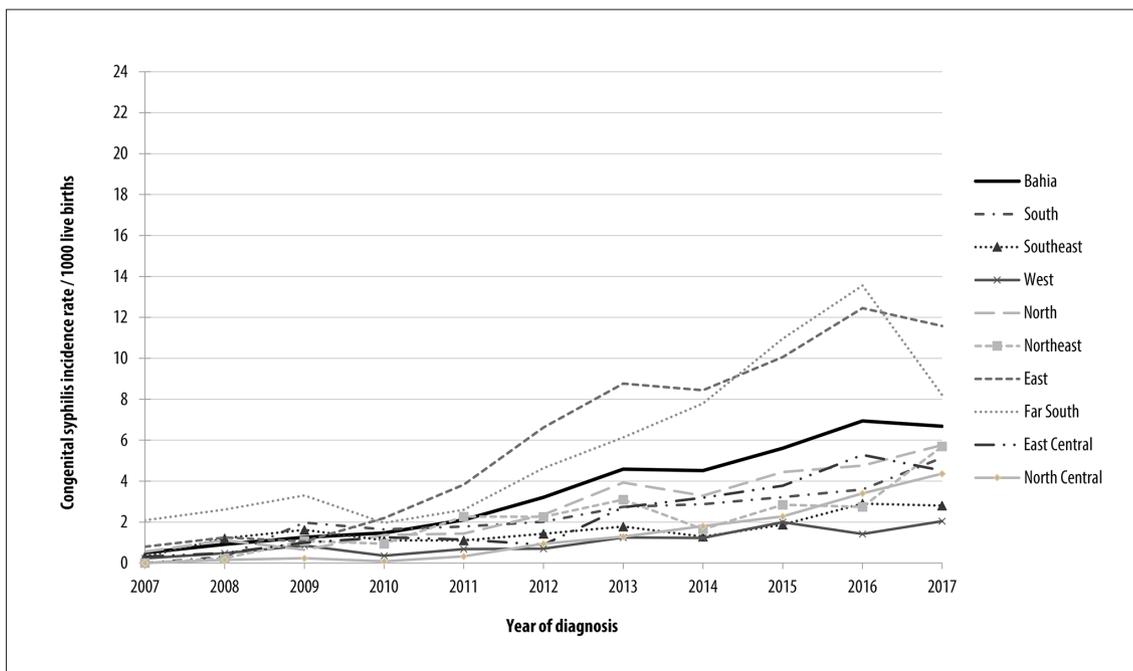


Figure 2 – Congenital syphilis incidence rate by health macro-regions, Bahia, Brazil, 2007-2017

in all periods (around 100.0% completeness), while completeness of the 'race/skin color' variable was regular in most periods (between 85.0% and 89.2% completeness), except for 2015-2017, when completeness was classified as good (90.2% completeness); completeness of the 'clinical classification' variable was poor for all periods analyzed, with between 58.2% and 67.2% data completeness (Table 1).

With regard to cases of congenital syphilis, the completeness of the child's 'age group' variable was excellent in all the periods, while for the variable 'final congenital syphilis classification', it went from good in the first two periods (2007-2010, 93.1%; and 2011-2014, 92.1%), to excellent in the final period (2015-2017), when there was no record of unknown information (100.0% completeness). Completeness was poor for 'maternal schooling' (between 57.0% and 69.8% completeness), while for the 'prenatal care' variable (between 82.4% and 88.6% completeness) and the 'case progression' variable (between 87.6% and 89.3% completeness), completeness was regular in the periods analyzed. The 'race/skin color' and 'partner(s) treated' variables were rated as having a regular or poor degree of completeness throughout the period (Table 1).

In relation to the profile of gestational syphilis cases in Bahia, most cases occurred among Black women (lowest percentage for the period 2007-2010, 87.2%) and in the 20 to 39 year age group (lowest percentage for 2011-2014, 70.9%). Syphilis infection was mainly classified as primary, with the lowest percentage of cases – 39.9% – corresponding to the period 2015-2017, while the highest – 65.8% – corresponded to the period 2007-2010 (Table 2).

Confirmed congenital syphilis cases were diagnosed mainly in newborns up to 6 days old and those of Black race/skin color. Mothers reported higher percentages in relation to having complete or incomplete 5th to 8th grade education (highest percentage for 2011-2014, 46.0%); having prenatal consultations (highest percentage for 2015-2017, 85.5%); having maternal syphilis diagnosed during prenatal care (highest percentage for 2015-2017, 52.3%); and untreated partner(s) (highest percentage for 2015-2017, 82.6%) (Table 3).

In the period 2015-2017, 97.7% of congenital syphilis cases notified in Bahia were classified as recent and remained alive. Cases classified as

'stillbirth/miscarriage due to syphilis' increased from 0.6% to 2.0% over the total study period (2007-2017), and progression to death showed similar percentages in the first two periods, 3.2% (2007-2010) and 3.4% (2011-2014), falling to 1.6% in the last period (2015-2017) (Table 3).

Discussion

The results of the study showed an increase in gestational syphilis and congenital syphilis incidence rates between 2007 and 2017, both for the state of Bahia as a whole and also for its health macro-regions. Regarding data quality, a regular or poor degree of completeness was found for some variables, thus compromising knowledge about the social distribution of the disease in population groups and the clinical and epidemiological characteristics of cases.

The increase in gestational syphilis and congenital syphilis incidence rates points to possible failures in the implementation of public health system measures to control these problems. However, it is noteworthy that the improvement of the surveillance system and the increased use of rapid tests, which enable cases to be detected and monitored, may have contributed to the increase in the number of cases, due to improved detection of the disease.^{13,14}

With regard to geographical distribution, the highest gestational syphilis and congenital syphilis incidence rates were concentrated in the Far South, Southern and Eastern health macro-regions, making the municipalities of Teixeira de Freitas, Porto Seguro, Salvador and Camaçari priority for the Rapid Response Strategy to Syphilis in Health Care Networks. These four municipalities in the state of Bahia, together with a further 96 Brazilian municipalities, account for 60% of syphilis cases in Brazil.¹⁴

In some of the years studied, the congenital syphilis incidence rate was higher than the gestational syphilis incidence rate in the Southwest, West, Far South, East and East Central macro-regions. This finding must be related to failures in the epidemiological surveillance system and prenatal care, resulting in lack of access to diagnostic tests and adequate treatment, including testing and treating partners.

Case characterization showed higher percentages of syphilis occurring among Black women, women in the 20 to 39 year age group, and women with less formal education.

Table 1 – Percentage filling out and degree of completeness of gestational syphilis and congenital syphilis case variables by period, Bahia, Brazil, 2007-2017

Variables	2007-2010		2011-2014		2015-2017		2007-2017	
	%	Degree of completeness ^a						
Gestational syphilis								
Race/skin color	89.2	Regular	85	Regular	90.2	Good	88.2	Regular
Clinical classification	58.7	Poor	58.2	Poor	67.2	Poor	63.1	Poor
Age group	99.9	Excellent	100.0	Excellent	100.0	Excellent	99.9	Excellent
Congenital syphilis								
Race/skin color	71.0	Regular	69.1	Poor	75	Regular	72.3	Regular
Age group	100.0	Excellent	100.0	Excellent	100.0	Excellent	100.0	Excellent
Sex	92.3	Good	86.2	Regular	93.9	Good	90.8	Good
Maternal schooling	69.8	Poor	57	Poor	64.2	Poor	62.1	Poor
Prenatal care	88.6	Regular	82.4	Regular	88.0	Regular	85.9	Regular
Time when maternal syphilis diagnosed	90.8	Good	88.9	Regular	93.5	Good	91.4	Good
Partner(s) treated	76.1	Regular	65.1	Poor	75.0	Regular	71.3	Regular
Final congenital syphilis classification	93.1	Good	92.1	Good	100.0	Excellent	96.2	Excellent
Progression	89.0	Regular	87.6	Regular	89.3	Regular	88.7	Regular

a) Classification of degree of completeness: excellent (≥95%), good (90-94.9%), regular (70-89.9%), poor (50-69.9%) and very poor (<50%).

Table 2 – Absolute frequency and percentage of gestational syphilis cases according to maternal race/skin color, clinical classification and age group, by period, Bahia, Brazil, 2007-2017

Variables	Gestational syphilis					
	2007-2010		2011-2014		2015-2017	
	n	%	n	%	n	%
Race/skin color						
Black (black + brown)	1,160	87.2	4,227	91.2	6,658	91.1
Non-Black	171	12.8	408	8.8	652	8.9
Clinical classification						
Primary	576	65.8	1,736	54.7	2,170	39.9
Secondary	156	17.8	354	11.2	468	8.5
Tertiary	49	5.6	464	14.6	1,233	22.7
Latent	94	10.8	619	19.5	1,572	28.9
Maternal age group (in years)						
Under 9	–	0.0	2	0.0	2	0.0
10-14	35	2.3	88	1.6	107	1.3
15-19	298	20.0	1,370	25.1	1,942	24.0
20-39	1,117	75.0	3,868	70.9	5,874	72.5
40-59	40	2.7	128	2.4	177	2.2

Table 3 – Absolute frequency and percentage of congenital syphilis cases according to child’s race/skin color, age group and sex, maternal schooling, prenatal care, time when maternal syphilis was diagnosed, partner(s) treated, case classification and progression, by period, Bahia, Brazil, 2007-2017

Variables	Congenital syphilis					
	2007-2010		2011-2014		2015-2017	
	n	%	n	%	n	%
Race/skin color						
Black (black + brown)	555	86.6	1,902	92.2	2,753	93.6
Non-Black	86	13.4	161	7.8	187	6.4
Age group of children with congenital syphilis						
Up to 6 days	827	91.6	2,797	93.6	3,714	94.7
7-27 days	46	5.1	91	3.1	99	2.5
28 days to 1 year	26	2.9	93	3.1	98	2.5
2-12 years	4	0.4	6	0.2	11	0.3
Sex of children with congenital syphilis						
Male	397	47.7	1,194	46.4	1,761	47.8
Female	436	52.3	1,381	53.6	1,922	52.2
Maternal schooling						
No schooling	17	2.7	30	1.8	30	1.2
1 st to 4 th grade, complete or incomplete	201	31.9	401	23.5	443	17.6
5 th to 8 th grade, complete or incomplete	282	44.8	783	46.0	1,149	45.6
High school, complete or incomplete	123	19.5	472	27.7	842	33.5
Higher education, complete or incomplete	7	1.1	17	1.0	54	2.1
Prenatal care						
Yes	606	75.8	1,947	79.1	2,950	85.5
No	194	24.2	515	20.9	501	14.5
Time when maternal syphilis diagnosed						
During prenatal care	334	40.7	1,172	44.1	1,917	52.3
At childbirth/curettage	287	35.0	934	35.2	1,248	34.0
After childbirth	182	22.2	522	19.7	484	13.2
Diagnosis not performed	17	2.1	27	1.0	19	0.5
Partner(s) treated						
Yes	161	23.4	492	25.3	511	17.4
No	526	76.6	1,452	74.7	2,431	82.6
Final congenital syphilis classification						
Recent congenital syphilis	827	98.3	2,723	99.0	3,833	97.7
Late congenital syphilis	9	1.1	5	0.2	11	0.3
Syphilis stillbirth/miscarriage	5	0.6	23	0.8	78	2.0
Progression						
Alive	767	95.8	2,479	95.8	3,347	97.7
Death due to congenital syphilis	26	3.2	88	3.4	54	1.6
Death due to other cause	8	1.0	20	0.8	25	0.7

This epidemiological profile was similar to that found in other studies¹⁵⁻¹⁷ and is associated with less access to quality prenatal monitoring,^{18,19} thus contributing to continuing vertical transmission. Inequalities in access and low-quality prenatal care explain to a certain extent the greater exposure of children from less privileged classes to the risk of contracting congenital syphilis.¹⁵

However, it is possible that syphilis does not only affect a specific risk group. Some studies found higher percentages of congenital syphilis cases born to mothers with more than eight years of schooling, as is the case of a survey conducted in the municipality of Montes Claros, MG, between 2007 and 2013 (44.1% gestational syphilis cases reported).²⁰ Two other studies which examined maternal race/skin color, one in the municipality of Maringá, PR, between 2009 and 2015,¹⁷ and the other in the state of Rio Grande do Sul, between 2001 and 2012,⁷ found, respectively, 53.1% and 59.6% of congenital syphilis cases among children whose mothers were White. Caution should be taken when comparing or extrapolating those results as well as the findings of this study to other realities in Brazil, given the differences in the distribution of the population according to race/skin color between the various Brazilian states.

It is important to highlight that in the first period of analysis, from 2007 to 2010, about 24% of women had no access to prenatal care. Although this percentage fell over the years studied, nevertheless it still accounted for 14% of cases in the final period, pointing to shortcomings in some municipalities in reaching pregnant women and access to prenatal care.

These results are similar to those of studies conducted in the state of Minas Gerais between 2007 and 2015,²¹ and in Porto Velho, capital city of the state of Rondônia, between 2009 and 2014.²² According to those two studies, 17.8% and 15.6%, respectively, of women went through pregnancy without having prenatal care and their children were born with congenital syphilis. However, very different percentages were found in a national study, conducted in 2011-2012, when only 3.5% of women did not have prenatal care;²³ while in Maringá, between 2009 and 2015, less than 2% of pregnant women did not have prenatal care.¹⁷

The present study found that approximately 50% of mothers who had prenatal care were diagnosed as having syphilis during prenatal care. This is considered

to be a low percentage, indicating late diagnosis for some pregnant women, considering that most mothers had prenatal care and that rapid testing is provided at the first prenatal care visit. The evaluation of the quality of SINAN data showed that there is still a large amount of incomplete or unknown information, which is a serious problem that needs to be overcome. A study carried out in Salvador, Bahia's capital city, in a period prior to the period we analyzed in this study, also drew attention to this fact, demonstrating that failure to fill in information continues to happen over time in the state's municipalities.²⁴

The amount of unknown/blank information on the notification forms is not only a reality in Bahia, or in Brazil. The main limitation of the description and analysis of the epidemiological characteristics of maternal and congenital syphilis in some Latin American countries (Argentina, Bolivia, Costa Rica, El Salvador, Honduras, Nicaragua, Panama, Paraguay and Uruguay) and the Caribbean between 2010 and 2012 was the proportion of missing data. One example was the Dominican Republic, where more than 80% of data on maternal and neonatal syphilis screening was missing on the Perinatal Information System database, resulting in its exclusion from the analysis we consulted.²⁵

It is possible that the inadequate filling out of forms is associated with the number of fields they have, the filling out of some fields not being required, and the excessive number of forms to be filled out in health services.²¹ In order to guarantee the quality of information, health workers need awareness raising and training as to the correct and complete filling out of notification forms.

Clinical classification of syphilis in pregnant women stood out with regard to unknown information as it had one of the highest percentages of incompleteness. This result may indicate health workers having difficulty in classifying syphilis in pregnancy, all the more because of the percentage of gestational syphilis classified as primary, since primary syphilis is rare among pregnant women. Syphilis sores, which are characteristic of the primary phase of the disease, appear for a limited length of time and may arise in non-visible regions; thus, for most pregnant women, diagnosis of syphilis occurs in the latent or late stage.²⁶

A high percentage of 'unknown' or 'blank' information was also found for treatment of partners. Added to this is the fact that over the years failure to

treat partners has proven to be frequent, which may contribute to pregnant women being reinfected and consequent infection of the fetus.

In October 2017, the Ministry of Health changed its definition of appropriate treatment of syphilis for pregnant women: simultaneous treatment of the sex partners is no longer considered, and only complete treatment with penicillin, according to the clinical stage of the disease, to be started at least 30 days before delivery, has come to be considered. Taking this new definition, provisionally, all congenital syphilis case investigation and notification forms must be filled out containing the information that the sex partner was treated at the same time as the pregnant woman, regardless of whether this information was collected.²⁷ Besides generating erroneous information about treatment of partner(s), these guidelines may reduce health worker efforts to trace pregnant women's partners and their awareness about the importance of their partners having prenatal care, diagnostic tests and adequate treatment, implying negative consequences for the control of syphilis transmission.

Use of secondary data was a limitation of this study, given its objective of describing the profile and progression of gestational syphilis and congenital syphilis incidence rates, in view of the possibility of case underreporting and compromised data quality. Another important fact to be highlighted is that some information contained on new case notification forms was only available when retrieved directly from the municipal or state surveillance system. The lack of information on the public domain SINAN database essential for describing the profile of gestational syphilis and congenital syphilis cases limited knowledge being gained about socioeconomic characteristics and

aspects related to clinical-laboratorial diagnosis and treatment of pregnant women and their partners.

On the other hand, the results of this study demonstrated the need for interventions aimed at improving prenatal care to ensure the prevention and blocking of vertical transmission of syphilis, in addition to the quality of information that should support decision-making regarding the implementation of these actions.

Monitoring the quality of information and the progression of the syphilis epidemic, as well as systematic analysis and dissemination of this information, need to be structured at all levels of the Brazilian National Health System network in Bahia, involving both health service managers and health workers. These steps are essential in order for the state's action against the disease to be strengthened.

We conclude that the institutional response to gestational syphilis and congenital syphilis both in Bahia and also in Brazil, must include continuing education activities, aimed at health surveillance, Primary Health Care and communication teams, as well as expanding the population's access to health care, especially pregnant women's access to prenatal care and, finally, improvement of the quality of services provided by the Brazilian National Health System.

Authors' contributions

Soares MAS and Aquino R were responsible for the concept and design of the study, data analysis and interpretation, drafting and critically reviewing the intellectual content of the manuscript. Both authors have approved the final version of the manuscript and are responsible for all aspects thereof, including the guarantee of its accuracy and integrity.

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