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Original Article

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Time trend of congenital syphilis in Palmas, Tocantins from 2008 to 2018

Tendência temporal da sífilis congênita em Palmas, Tocantins no período de 2008 a 2018

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Abstract

Introduction: Syphilis is a global public health problem. In Palmas, the capital of Tocantins, the detection rate of congenital syphilis (CS) surpassed the average for the state and for Brazil in 2018; nevertheless, few explanations have been offered. **Objective:** To describe temporal patterns in CS incidence rates in Palmas by analyzing inflection points in data between 2008–2018. **Methods:** A time-series study based on epidemiological data from the Department of Informatics of the Unified Health System. The temporal trend analysis included Poisson regression models by inflection points (Joinpoint). **Results:** 451 cases of CS were recorded, indicating a significant detection rate increase during the 2010–2018 period (APC = 11.8 - 95% CI 3.9 to 20.3). During this period, there was a significant decrease in late CS (APC = -8.1 - 95% CI -13.3 to -2.6); CS of mothers aged 30–39 years (APC = -6.0 - 95% CI -10.4 to -1.4) and CS with appropriate treatment (APC = -23.1 - 95% CI -32.5 to -9.7). In the same period, there was a significant increase in CS in mothers aged 15–19 years (APC = 10.4 - 95% CI 4.9 to 16.2), with 10–12 years of education (APC = 3.2 - 95% CI 0.2 to 6.3) and with inadequate treatment (APC = 5.5 - 95% CI 0.2 to 11.1). Between 2011 and 2018, a significant drop was found in CS with an untreated partner (APC = -5.8 - 95% CI -10.7 to -0.5). **Conclusion:** To obtain better indicators of CS, prenatal care must be improved. For example, by greater treatment of potentially infected sexual partners and by promotion of a comprehensive early sex education.

Keywords: Congenital syphilis. Epidemiological monitoring. Time-series studies. Epidemiology.

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Resumo

Introdução: A sífilis constitui um problema de saúde pública mundial. Em Palmas, capital do Tocantins, a taxa de detecção de sífilis congênita (SC) foi superior à média do estado e do Brasil em 2018. Apesar disso, este é um assunto ainda pouco estudado no município. **Objetivo:** descrever a tendência temporal da Sífilis Congênita em Palmas, Tocantins no período de 2008 a 2018. **Métodos:** Estudo de série temporal baseado em dados epidemiológicos oriundos do Departamento de informática do Sistema Único de Saúde. A análise incluiu modelos de regressão de Poisson por pontos de inflexão *Joinpoint*. **Resultados:** Foram registrados 451 casos de sífilis congênita, cuja taxa de detecção apresentou aumento significativo no período 2010-2018 *(APC=11,8 – IC95% 3,9 a 20,3).* No período total, houve um decréscimo significativo da sífilis congênita tardia *(APC=-8,1 – IC95% -13,3 a –2,6),* sífilis congênita de mães de 30 a 39 anos *(APC= -6,0 – IC95% -10,4 a -1,4)* e sífilis congênita com tratamento adequado *(APC=-23,1 – IC95% -32,5 a –9,7).* No mesmo período, houve aumento significativo de sífilis congênita em mães de 15 a 19 anos (APC=10,4 – IC95% 4,9 a 16,2), com 10 a 12 anos de estudo *(APC=3,2 – IC95% 0,2 a 6,3)* e com tratamento inadequado *(APC= 5,5 – IC95% 0,2 a 11,1).* No período de 2011 a 2018, houve queda significativa da sífilis congênita com parceiro não tratado *(APC=-5,8 – IC95% -10,7 a –0,5).* **Conclusão:** Para indicadores aceitáveis, é necessária a melhoria da assistência pré-natal, incluindo, essencialmente, os parceiros no tratamento da doença, somada à promoção de educação sexual em escolas para a população adolescente.

Palavras-chave: Sífilis congênita. Vigilância epidemiológica. Estudos de séries temporais. Epidemiologia

Introduction

Syphilis is a treatable infectious, systemic, and sometimes asymptomatic disease caused by infection by the bacterium *Treponema pallidum*. This disease engenders substantial global, social, economic and health repercussions. It is transmitted by unprotected sexual intercourse via vertical or blood transfusion[1,2]. Disease progression can mimic those of some dermatological conditions and, if left untreated, causes systemic complications[3].

Syphilis is a global public health concern. According to the World Health Organization (WHO), approximately 11 million cases of syphilis are registered annually in adults aged 15–49 years worldwide[4]. In Brazil, 158,051 cases of acquired syphilis were reported in 2018 alone (a detection rate of 75.8 cases per 100,000 inhabitants), 62,599 cases of gestational syphilis (GS; a detection rate of 21.4 per 1,000 live births), 26,219 cases of congenital syphilis (CS; a detection rate of 9.0 per 1,000 live births), and 241 deaths from CS (a mortality rate of 8.2 per 100,000 live births)[5]. More specifically, the detection rate of CS in Tocantins (11.3 cases per 1,000 live births) exceeded the national average. In the state capital of Palmas, this rate exceeded both the state and national averages, with 9.7 cases per 1,000 live births, and 31.4 cases per 1,000 live births in pregnant women[5].

Mothers in the beginning stages of syphilis infection or who have initial secondary syphilis have a 70–100% risk of vertical transmission and if left untreated, can transmit the disease to the fetus during any gestational stage[6]. CS occurs during pregnancy through transplacental transmission, or in the vaginal canal during delivery, both of which can lead to prematurity and fetal and neonatal death[7]. The occurrence of GS—and consequently CS—is correlated to failures in prenatal care (e.g., delay in diagnosis), low socioeconomic status, difficulty accessing health services[8], and high-risk sexual activity or pregnancy during adolescence[9].

Syphilis in Palmas remains a poorly studied disease. No studies to date have assessed the best indicators and characterized the course of disease in this population despite its epidemic status in this region. Thus, this study aims to describe temporal trends in CS cases in the Tocantins capital of Palmas, by analyzing epidemiological data and inflection points during the period ranging from 2008 to 2018. The insights gained from this data serve to support healthcare administrators in identifying acceptable indicators, implementing public policies that better screen for prospective prenatal care recipients, and ultimately reduce vertical transmission rates of CS.

Materials and methods

Sample and type of study

The municipality of Palmas is located centrally within the state of Tocantins and encompasses an area of 2,218,942 km². In 2019, its population was an estimated at 299,127, with a Human Development Index (HDI) of 0.788[10]. The coverage of Primary Care in 2008 was 90% in Palmas and remained at 100% from July 2016 to April 2020[11]. The Health Care and Surveillance Network (RAVS Palmas) of the Secretariat of Health, established by Ordinance No. 457/2019, consolidated the organizational structure of the municipal health system, namely a polyarchic arrangement that encourages teamwork, coordination and longitudinally of care, information technology as a work tool, and multidisciplinary exchange and cooperation with the aim of providing comprehensive care. RAVS has three administrative districts subdivided into eight health territories, which encompass 34 Community Health Centers (CSC) and other points of care[12]. An observational descriptive study was carried out with secondary data on CS in children aged <1 year in Palmas. The study was based on secondary data from anonymized CS records in the public domain, which are available on the Datasus website. Consequently, the study did not require approval from the research ethics committee (CEP).

Research design

Data was obtained from the Department of Chronic Conditions and Sexually Transmitted Infections, Ministry of Health[13]. This data is derived from compulsory standardized notification forms, completed by healthcare professionals, that collect sociodemographic and clinically relevant information. Population data was obtained from the Brazilian Institute of Geography and Statistics (IBGE) based on population censuses (2010) within the municipality and population estimates for the inter-census years (2001–2009 and 2011–2018)[14].

The trend analysis of indicators covered the period between 2008 and 2018, and the selected indicators were those recommended by the national program for the evaluation and monitoring of syphilis: the detection rate of pregnant women with syphilis per year of diagnosis, which is the ratio between the number of cases of CS detected in children aged <1 year for every 1,000 live births in Palmas per year; the incidence rate of CS in children aged <1 year, which is the ratio between the number of cases of CS detected in children aged <1 year for every 1,000 live births in Palmas per year; the percentage of CS according to the child's age by year of diagnosis; the percentage of CS cases according to the final diagnosis per year of diagnosis; the percentage of CS cases according to the mother's age group by year of diagnosis; the

percentage of CS cases according to the mother's educational level per year of diagnosis; the percentage of CS cases according to information about the mother's prenatal care per year of diagnosis; the percentage of CS cases upon diagnosis of maternal syphilis by year of diagnosis; the percentage of CS cases according to the mother's treatment regimen per year of diagnosis; and the percentage of CS cases according to treatment information about the mother's sexual partner by year of diagnosis.

The case definition of CS has evolved in recent decades. In Brazil, the disease became a compulsory notification on December 22, 1986, through Ordinance No. 542 of the Ministry of Health (MS), concomitant with acquired immunodeficiency syndrome (AIDS). Thereafter, the syphilis case definition underwent three revisions. Most recently, in 2004 by the Epidemiology and Sexually Transmitted Diseases Advisory Committees of the National STD/AIDS Program, in collaboration with different technical areas of the MS[15]. Such an update was important to align the epidemiological surveillance of cases and operational issues of health services, resulting in the maintenance of sensitivity and increased specificity. As a result of the latest update, case records were accumulated in years prior to 2008 in the official records of the MS. In light of this accumulated data, our study included data from 2008 in order to correct for biases via Poisson regression.

Inclusion and exclusion criteria

All new cases of CS registered between 2008 and 2018 in children <1 year of age living in the municipality of Palmas were included. Cases of CS with incomplete information were excluded.

Procedures

The analysis of the temporal trends of CS indicators for the study period were performed using the Poisson joinpoint regression model (by inflection points). The geographical unit for analysis was the municipality of Palmas. The purpose of this analysis was to identify any significant change in the linear trend (on a log scale) during the study period[16]. The year of case registration was considered an independent variable, and the indicators of CS were the dependent variables. Years in which zero (0) cases were recorded were replaced by the value 0.5 in order for linear regression analysis to be possible. The analysis began with the minimum number of joinpoints (e.g., 0 joinpoints, which corresponds to a straight line), and then one or more joinpoints were tested to see whether they were significant and would consequently be included in the model, up to 2 joinpoints. Each significant joinpoint, which indicated a change in slope, was retained in the final model. To describe the linear trends by period, the Annual Percent Change (APC) was calculated for each of these trends, with a regression line adjusted to the natural logarithm of the indicators. The average APC (AAPC) was estimated as the weighted geometric average of the APCs, with the weights equal to the length of each segment within the time interval[16,17]. In the indicators, the increasing was considered when the trend was of growth and the minimum value of the confidence interval was >0. Conversely, a reduction was considered when there was a decline in the trend and the maximum value of the confidence interval was <0. A stability was defined when the confidence interval included 0 (zero). Joinpoint regression analyses were performed using the Joinpoint Regression Program version 4.1.0

(US National Cancer Institute, Bethesda, MD, USA).

Results

From 2008 to 2018, 451 cases of CS and 615 cases of GS were registered in the city of Palmas. The diagnosis of CS predominated in children aged <7 days (96.45%), recent CS (85.35%), syphilis abortion (8.86%), stillborn by syphilis (5.35%), mothers aged between 20–29 years (52.77%) and with 10–12 years of study (58.31%; Table 1). In 36.60% of these cases, syphilis was diagnosed at delivery and/or curettage, the treatment was inappropriate for mothers in 47.89% of cases, and sexual partners were not treated in 72.08% of cases (Table 1).

Table 1 – - Sociodemographic and clinical characteristics of children under one year of age with congenital syphilis in Palmas, TO, from 2008 to 2018.

Variable	N° (451)	%[b]
Child's age		
Age less than 7 days	435,00	96,45
7 to 27 days old	11,00	2,45
28 to 364 days old	5,00	1,10
Final Diagnosis		
Recent congenital syphilis	385,00	85,35
Late congenital syphilis	2,00	0,44
Syphilis abortion	40,00	8,86
Stillborn for syphilis	24,00	5,35
Mother's Age Group		
10 to 14 years old	4,00	0,88
15 to 19 years old	104,00	23,05
20 to 29 years old	238,00	52,77
30 to 39 years old	93,00	20,65
40 years or more	9,00	1,99
Ignored	3,00	0,66
Mother's Education		
0 to 4 years of study	25,00	5,54
5 to 9 years of study	101,00	22,39
10 to 12 years of study	263,00	58,31
Over 12 years of study	8,00	1,77
Ignored/blank	54,00	11,99
Prenatal Care		
Yes	374,00	82,94
No	63,00	13,96
Ignored	14,00	3,10
Moment of diagnosis of maternal syphilis		
During prenatal care	209,00	46,33
At delivery / curettage	165,00	36,60
After delivery	10,00	2,22
Unrealized	5,00	1,10
Ignored	62,00	13,75
Maternal treatment scheme		
Adequate	14,00	3,10
Inadequate	216,00	47,89
Unrealized	199,00	44,12
Ignored	22,00	4,89
Partner treatment		
Yes	51,00	11,30
No	325,00	72,08
Ignored	75,00	16,62

[a] Total participants in the analysis.
[b] Percentage.

In the temporal trend analysis, the GS detection rate showed a significant increase in the municipality of Palmas during 2010–2018 (APC: 37.8; 95% CI: 26.9–49.7) and, likewise, in the incidence rate of CS (APC: 11.8; 95% CI: 3.9–20.3; Figure 1, Table 2). Over the total study period (2008–2018), a significant decrease was found in late CS cases (APC: –8.1; 95% CI: –13.3 to –2.6), CS cases of mothers aged 30–39 years (APC: –6.0; 95% CI: –10.4 to –1.4) and CS cases with appropriate treatment (APC: –23.1; 95% CI: –32.5 to –9.7; Table 2). In the same period, a significant increase was found in CS cases in mothers aged 15–19 years (APC: 10.4; 95% CI: 4.9–16.2), with 10–12 years of education (APC: 3.2; 95% CI: 0.2–6.3), and with inadequate syphilis treatment (APC: 5.5; 95% CI: 0.2–11.1; Table 2). Between 2011 and 2018, a significant reduction was found in CS cases with an untreated sexual partner (APC: –5.8; 95% CI: –10.7 to –0.5; Table 2).

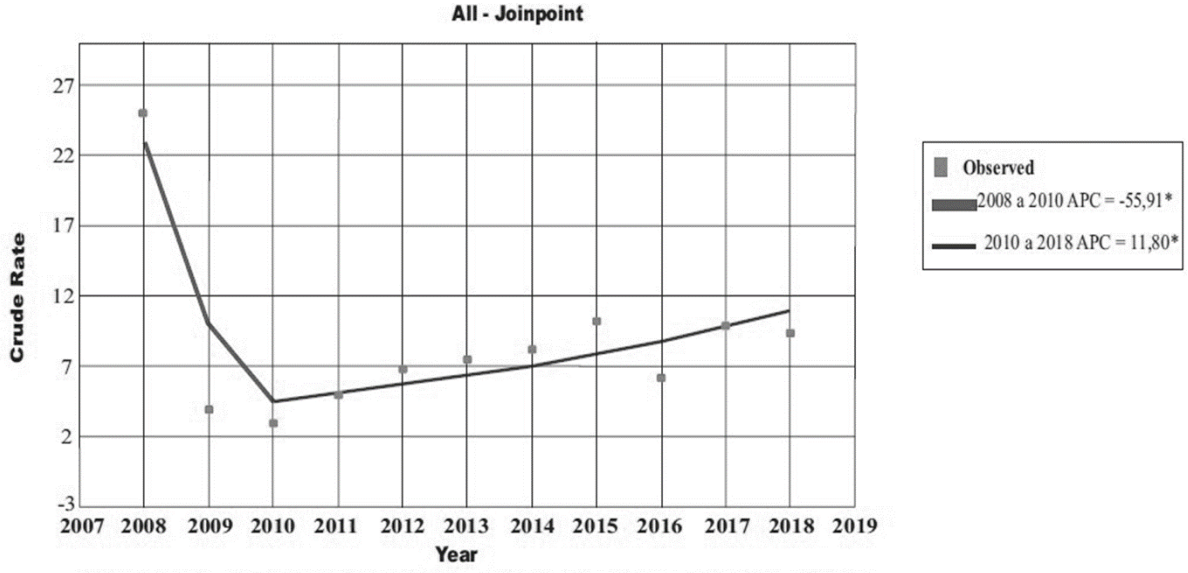

Figura 1: Tendência dos indicadores de sífilis congênita segundo análise de regressão Joinpoint em Palmas - TO, de 2008 a 2018. *Indica que a variação percentual anual é significativamente diferente de zero com alpha igual a 0,05. Seleção do modelo final: 1 Joinpoint

Table 2 - Trend of congenital syphilis indicators according to Joinpoint regression analysis in Palmas - TO, from 2008 to 2018.

Indicator	Trend 1			Trend 2			Total period	
	Período	APC[a]	IC[b]	Período	APC[a]	IC[b]	AAPC[c]	IC[b]
GS detection rate	2008-2010	-63,90*	-86,20 a -5,50	2010-2018	37,80*	26,90 a 49,70	5,40	-10,40 a 24,10
Incidence of CS	2008-2010	-55,90*	-79,10 a -7,10	2010-2018	11,80*	3,90 a 20,30	-7,20	-18,40 a 5,50
Recent CS	2008-2018	1,30	-0,00 a 2,60	-	-	-	1,30	-0,00 a 2,60
CS Late	2008-2018	-8,10*	-13,30 a -2,60	-	-	-	-8,10*	-13,30 a -2,60
Syphilis abortion	2008-2018	-7,10	-14,00 a 0,40	-	-	-	-7,10	-14,00 a 0,40
Stillborn	2008-2013	54,30	-8,50 a 160,00	2013-2018	-16,20	-41,30 a 19,50	13,70	-11,70 a 46,40
Mother's Age Group								

10 to 14 years old	2008-2018	2,00	-12,00 a 18,10	-	-	-	2,00	-12,00 a 18,10
15 to 19 years old	2008-2018	10,40*	4,90 a 16,20	-	-	-	10,40*	4,90 a 16,20
20 to 29 years old	2008-2018	-1,90	-4,60 a 0,90	-	-	-	-1,90	-4,60 a 0,90
30 to 39 years old	2008-2018	-6,00*	-10,40 a -1,40	-	-	-	-6,00*	-10,40 a -1,40
40 years or more	2008 a 2018	-5,40	-10,80 a 0,20	-	-	-	-5,40	-10,80 a 0,20
Mother's Education								
0 to 4 years of study	2008-2018	-5,40	-10,80 a 0,20	-	-	-	-5,40	-10,80 a 0,20
5 to 9 years of study	2008-2018	-3,70	-10,90 a 4,10	-	-	-	-3,70	-10,90 a 4,10
10 to 12 years of study	2008-2018	3,20*	0,20 a 6,30	-	-	-	3,20*	0,20 a 6,30
Over 12 years of study	2008-2018	9,40	-4,80 a 25,80	-	-	-	9,40	-4,80 a 25,80
Prenatal care								
Yes	2008-2018	0,70	-1,00 a 2,40	-	-	-	0,70	-1,00 a 2,40
No	2008-2018	-3,90	-10,30 a 3,00	-	-	-	-3,90	-10,30 a 3,00
Moment of diagnosis of maternal syphilis								
During prenatal care	2008-2018	5,20	-1,60 a 12,50	-	-	-	5,20	-1,60 a 12,50
At delivery / curettage	2008-2010	62,70	-47,60 a 404,90	2010-2018	-4,80	-11,40 a 2,20	6,00	-12,10 a 27,80
After delivery	2008-2010	141,30	-76,50 a 2376,80	2010-2018	-10,60	-27,50 a 10,30	9,10	-26,70 a 62,10
Maternal treatment scheme								
Adequate	2008-2010	-51,70	-79,80 a 15,40	2010 - 2018	-13,60*	-23,80 a -2,10	-23,10*	-32,50 a -9,70
Inadequate	2008-2018	5,50*	0,20 a 11,10	-	-	-	5,50*	0,20 a 11,10
Unrealized	2008-2018	-3,00	-9,10 a 3,60	-	-	-	-3,00	-9,10 a 3,60
Partner treatment								
Yes	2008-2018	-5,70	-14,90 a 4,50	-	-	-	-5,70	-14,90 a 4,50
No	2008-2011	12,50	-8,10 a 37,60	2011-2018	-5,80*	-10,70 a -0,50	-0,60	-6,20 a 5,20
Ignored	2008-2018	9,00	-3,20 a 22,70	-	-	-	9,00	-3,20 a 22,70

[a] Annual Percentage Change.

[b] 95% confidence interval.

[c] Average Annual Percentage.

* Significantly diferente from 0 (p<0,005).

Discussion

The occurrence of CS in Palmas accounted for 20% of total state cases (451 of 2,173) in the same period analyzed. This study established a correlation between the rise in syphilis cases in Palmas and the significant increase in teenage pregnancy and in mothers who received inadequate syphilis treatment. There was a significant drop in the number of untreated sexual partners between 2011 and 2018, which may have been decisive for the rise in CS rates in Palmas, given that the vast majority of these cases (nearly 75%) were untreated.

Although Palmas had a lower incidence rate of CS than the national rate in 2016, its rate grew to exceed the Brazilian incidence rate over the ensuing two years[5,18,19]. The fact that nearly 48% of mothers of children with CS have failed to receive adequate syphilis treatment and that nearly 45% have received no treatment may explain the significant increase in the detection of CS cases in Palmas; the shortage of penicillin in Brazil between 2014 and 2018 is another possible contributing factor[20]. Additionally, since 2010, a significant decrease in mothers receiving adequate syphilis treatment has been observed; possibly resulting from lack of adherence to treatment or from failures of the health system. Such as; lack of timely diagnosis, failure to perform prenatal care, inadequate or inappropriate prenatal care, and failure to treat infected sexual partners. The last of which was the main explanation for inadequate treatment of pregnant women infected with syphilis, which, in addition to contributing to the further spread of the disease, can cause reinfection[9,21].

Of all the mothers of children who had symptoms or reactivity to CS, 82.94% underwent prenatal care, a trend broadly mirrored at the national level[5]. This is since the establishment of the diagnosis does not guarantee the performance of adequate treatment[22]. In addition, this statistic indicates that despite the scope of reach of the healthcare system, it remained unable to meet the demands of the community. Given that nearly 14% of mothers did not attend prenatal consultations, a more proactive approach is clearly required.

This analysis revealed that recent CS detection rates rose significantly—especially as of 2011, which coincides with the year of publication of Ordinance No. 3242 authorizing the use of non-treponemal tests for the rapid diagnosis of syphilis by the Unified Health System (SUS)[23]. Other studies have also reported the hegemony of the recent diagnosis of CS[5,24]. The analysis also revealed a concomitant drop in the number of cases of late syphilis during the study period, which may have resulted from Ordinance No. 2012 recommending maternal testing in the first and third trimesters of pregnancy and at the time of delivery[25]. The importance of early diagnosis in maternal syphilis is supported by the finding that treatment is more effective if performed early, especially before gestational weeks 24–28[26]. Therefore, providing appropriate prenatal care is essential.

Vertical transmission of syphilis was found to be more prevalent among young mothers, predominating in the 20–29-year age cohort, which corroborates results from national and regional studies[5,24,27,28]. Vertical transmission was also found to be rising significantly among 15–19-year-olds. This data is related to the emergence of sexually active lifestyles, as detailed in other studies[29,30]. On the other hand, there was a decrease in transmission among mothers aged 30–39 years, which can be explained by age-related decreases in fertility and increased female participation

in the labor market. The latter of which, was partly driven by the enhanced reproductive control afforded by novel contraceptive methods[31,32].

Additionally, a significant increase in CS was found between 2008 and 2018 among mothers who had 10–12 years of educational attainment. Although the occurrence of GS remains higher among pregnant women with lower levels of education[33], the prominent growth of GS rates in more educated women enlighten the growth of unprotected sexual practices. This, in turn, increases the number of GS cases and other sexually transmitted infections (STIs). This is usually a reflection of the low perception of women married to vulnerability[34]. The effect of the mother's educational attainment on the incidence of CS is understood to be significant, most likely because lower levels of education reflect a probable relationship between poorer access to education and poorer understanding of STIs, which has been suggested in other studies[28,33,35]. Of note is that the maternal profile in this study comprised younger individuals with lower levels of education (15–29-year-olds), suggesting a relationship between the period since becoming sexually active and lack of access to information, which may increase the spread of STIs and their consequences.

Throughout the study period, a significant increase was found in the cases of inadequate syphilis treatment in the mother, as was a decrease in the number of pregnant women who received appropriate interventions. In other regions of Brazil, the same has been reported[24,28]. More efforts in locating potentially infected sexual partners is encouraged in order to minimize untreated cases of syphilis in the community; only a single dose of benzathine penicillin would promote the non-recurrence of infection during pregnancy[21]. The main factor of ineffective treatment, according to studies, is the lack or inadequacy of treatment of both the infected woman and her partner, an example of failure in prenatal care[9,28]. Thus, despite the reduction in the net number of untreated partners between 2011 and 2018, many cases go unreported.

Of note is the difficulty in the capacity of the healthcare system to locate the infected partner and to enforce treatment adherence[21]; this is influenced by failure to communicate news of the infection. This is either as a result of insecurity, fear of the partner's reaction, resentment, or lack of trust in the relationship; among others[36]. Thus, greater communication of news of the infection is needed. The attending physician can provide moral support and emphasize the importance of sexual partnership therapy (i.e., "couples therapy") and can schedule an appointment to provide support and additional information. Community Health Agents can also provide follow-up support to patients.

In the trend analysis by joinpoint regression in the period of 2008–2010, a considerable drop in the detection rate of GS and CS cases was found; these events coincide with the proposal of strategies by the WHO to eradicate the vertical transmission of syphilis and HIV. The campaign resulted in a 30% reduction in cases of CS between 2008 and 2012[37,38].

On the other hand, this period saw a significant increase in the incidence of CS, which may have had several precipitants. The first possible catalyst was the enactment, in 2007, of the Ministry of Health's Operational Plan for the Reduction of Vertical Transmission of HIV and Syphilis, which advocated for the distribution of rapid tests and the administration of tests during prenatal care, among other measures[39]. In December 2011, this operational plan was superseded

by Ordinance No. 3242, which authorized the use of diagnostic tests for syphilis to the general public[23]. In the same year, the Rede Cegonha (RC) was established in SUS, with the objective of improving post-partum care and minimizing maternal and child mortality[40]. In addition, in 2008 the coverage of Primary Care in Palmas was 90.56% and has grown to 100% as of 2016[11]. These circumstances stimulated the development of novel diagnostic tools affording greater accuracy and thereby increasing the number of documented CS cases. However, vertical transmission rates are important indicators of unsatisfactory quality of care[26]. Finally, between 2014 and 2018, the penicillin shortage crisis occurred, leaving several countries—including Brazil—without raw material for vaccine manufacturing[20], which may have contributed to the mal- or non-treatment of syphilis-infected pregnant women and their partners, thereby having potentially exacerbated the rise in cases of CS during this period.

This study relied on secondary data from the Ministry of Health, which brought limitations. Among them; the underreporting of cases, patient non-response, and dependence on correct completion of the notification forms. The underreporting of cases is related to the ineffectiveness at identifying pregnant women requiring prenatal care, thereby reducing the reported infection rate. Contact with patients can help educate patients about the contraction and spread of the disease and help identify appropriate solutions. In addition, the forms may contain incorrect data, or the data may be held for release for months in the National Compulsory Notification System (SINAN). Of note is that SINAN has been mirroring the results expected in several studies.

Conclusion

In summary, despite the decrease in syphilis infection in pregnant women and vertical transmission between 2008 and 2010, the trend between 2010 and 2018 was an increasing number of GS and CS cases, in keeping with the national trend. This data also demonstrates how the greater implementation of diagnostic testing better reflects the actual disease incidence rate. Augmenting the quality of prenatal care is recommended, especially as it concerns more widespread tracking and treatment of potentially infected partners and more comprehensive early sexual education in schools for adolescents; such measures can help identify better disease indicators.

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