Epidemiological profile of gestational syphilis and congenital syphilis in a reference center in Northeast Brazil: risk factors and trend from 2019 to 2021

Perfil epidemiológico de sífilis gestacional e sífilis congênita em centro de referência no Nordeste do Brasil: fatores de risco e tendência de 2019 a 2021

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ABSTRACT

Introduction: Syphilis is an infectious systemic disease caused by the bacterium *Treponema pallidum*. The Amaury de Medeiros Integrated University Health Center in Recife is a reference maternity hospital for high-risk pregnancies and the management of the most common Sexually Transmitted Infections during prenatal care, including Gestational Syphilis and Congenital Syphilis. **Objective:** To determine the epidemiological profile of the population exposed to these conditions, the rate of Gestational Syphilis detection, the incidence of Congenital Syphilis, and the associated unfavorable outcomes in Amaury de Medeiros Integrated University Health Center between January 2019 and December 2021. **Methods:** This retrospective cohort study included pregnant women and neonates diagnosed with syphilis at Amaury de Medeiros Integrated University Health Center. Data were collected from the Notification/Investigation Forms for Gestational Syphilis and Congenital Syphilis, between January 2019 and December 2021. **Results:** At Amaury de Medeiros Integrated University Health Center, 463 cases of Gestational Syphilis and 296 of Congenital Syphilis were reported. During the three-year study, 4444, 4360, and 4265 live births were recorded, confirming the Gestational Syphilis detection rates — 33.30, 36.92, and 36.10 per 1000 live births, with the incidence of Congenital Syphilis being 26.1, 21.33, and 20.39 per 1000 live births. Pregnant women in their third trimester who were brown, had incomplete primary education, and lived in an urban area were the main sociodemographic variables. In total, 217 (73.3%) patients were diagnosed with Gestational Syphilis during or after delivery, indicating a low prenatal coverage (70.6%). In terms of the progression of Congenital Syphilis, unfavorable outcomes was found in 40 (13.5%) patients, including 16 (40%) abortions, 10 (25%) stillbirths, nine (22.5%) deaths from Congenital Syphilis, and 5 (12.5%) deaths from other causes. **Conclusion:** Gestational Syphilis detection rates and Congenital Syphilis incidence remain alarming, with abortions and stillbirths being the most common unfavorable outcomes. To change the dramatic situation of Congenital Syphilis in Brazil, the associated factors point to a poor quality of prenatal care and an urgent need to change public policies for pregnant women and newborns, in conjunction with socioeconomic assistance.

Keywords: syphilis. congenital syphilis. pregnancy, high-risk. epidemiology. prenatal care.

RESUMO

Introdução: A sífilis é uma doença infecciosa e sistêmica causada pela bactéria *Treponema pallidum*. Em Recife, situa-se o Centro Universitário Integrado de Saúde Amaury de Medeiros, maternidade de referência para gestações de alto risco. Ela inclui o manejo das principais infecções sexualmente transmissíveis durante o pré-natal, abarcando a sífilis gestacional e a sífilis congênita. **Objetivo:** Conhecer o perfil epidemiológico da população exposta a esses agravos, a taxa de detecção de sífilis gestacional, a incidência de sífilis congênita e de desfechos desfavoráveis associados no Centro Universitário Integrado de Saúde Amaury de Medeiros / Universidade de Pernambuco entre janeiro de 2019 e dezembro de 2021. **Métodos:** Estudo de coorte retrospectivo com gestantes e neonatos atendidos e notificados com sífilis, no Centro Universitário Integrado de Saúde Amaury de Medeiros. Dados foram obtidos das Fichas de Notificação/Investigação para sífilis gestacional e sífilis congênita, durante o período de janeiro de 2019 a dezembro de 2021. **Resultados:** Foram notificados 463 casos de sífilis gestacional e 296 de sífilis congênita no Centro Universitário Integrado de Saúde Amaury de Medeiros. Nos anos do estudo foram computados, respectivamente, 4.444, 4.360 e 4.265 nascidos-vivos, constatando-se as respectivas taxas de detecção de sífilis gestacional — 33,30; 36,92 e 36,10 por mil nascidos-vivos — e de incidência de sífilis congênita — 26,1; 21,33 e 20,39 por mil nascidos-vivos. Com relação ao perfil sociodemográfico, as principais variáveis foram gestantes que estavam no terceiro trimestre, pardas, com ensino fundamental incompleto e que residiam em zona urbana. Observou-se baixa cobertura pré-natal (70,6%), e a maioria, 217 (73,3%) foi diagnosticada com sífilis gestacional no momento do parto ou curetagem, ou após o parto. Quanto à evolução dos casos de sífilis congênita, percebeu-se desfechos desfavoráveis em 40 (13,5%), entre os quais 16 (40%) abortos, dez (25%) natimortos, nove (22,5%) óbitos por sífilis congênita e cinco (12,5%) óbitos por outra causa. **Conclusão:** As taxas de detecção da sífilis gestacional e incidência de sífilis congênita continuam alarmantes, e os desfechos desfavoráveis foram expressivos, sendo os principais abortos e natimortos. Os fatores associados apontam para a má qualidade na assistência pré-natal e a urgente necessidade de mudança das políticas públicas de atenção à gestante e ao recém-nascido, associadas às assistências socioeconômicas, para mudar o dramático quadro da sífilis congênita no Brasil.

Palavras-Chave: sífilis. sífilis congênita. gravidez de alto risco. epidemiologia. cuidado pré-natal.

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INTRODUCTION

Syphilis is a worldwide chronic infectious disease caused by the bacterium *Treponema pallidum*, for which humans are the sole host, vector, and reservoir. Transmission can occur via blood, sexual intercourse, or vertically, with the last two forms being the most common. The disease is associated with risky sexual behavior, low socioeconomic status, low education, drug

use, teenage pregnancy, lack of safe sex adherence, and limited access to healthcare[1,2].

Syphilis can be divided into "early" and "late" according to the time of infection or into "primary," "secondary," and "tertiary" according to the characteristics of the clinical manifestations. However, in most cases, the infection is asymptomatic, leading to inadvertent sexual transmission and complicating its diagnosis and treatment[3]. Syphilis is classified as a pregnancy-related disease when this transmission occurs in pregnant women. If not properly diagnosed and treated, it allows for vertical transmission from mother to fetus via the intrauterine route or during delivery, resulting in congenital syphilis (CS)[4,5]. As a result, unfavorable outcomes (UO), such as miscarriage, premature birth, and fetal or neonatal death, may occur, which cause concern to authorities and overload the healthcare system[6].

Worldwide, syphilis affects 2 million pregnancies annually[7]. In 1994, this disease was considered a public health problem in North, Central, and South America, prompting the Pan American Health Organization (PAHO) to call for increased efforts to eradicate CS. In 2005, the Brazilian Ministry of Health (MS) included gestational syphilis (GS) on the list of notifiable diseases intended to control vertical transmission, monitor the infection process, plan and evaluate treatment measures, and prevent and control syphilis. Since 2012, the number of acquired syphilis, GS, and CS cases has increased. According to the Sentinel Susveillance Study (*Estudo-Sentinela Parturiente*), syphilis is present in 1.6% of pregnant Brazilian women, and affects 15,000 children every year[8,9]. Owing to the high prevalence of this condition, the World Health Organization (WHO) launched a global initiative in 2007 to eliminate the vertical transmission of syphilis by reaching less than 50 cases of CS per 100,000 live births (LB). Despite government efforts, however, there has been a significant global increase in the prevalence of GS and incidence of CS in recent years, resulting in 200,000 perinatal deaths globally in 2016[10].

In Brazil, the CS incidence rate increased gradually between 2009 and 2019: in 2009, it was 2.1 cases/1,000 LB, and in 2018, it reached 9.0 cases/1,000 LB before falling to 8.2 cases/1,000 LB in 2019[4,11]. The Notifiable Diseases Information System (SINAN) reported 449,981 cases of GS from 2010 to July 2021, with the Southeast Region accounting for roughly half of all cases, followed by the Northeast, South, North, and Midwest regions. Pernambuco reported 17,989 cases of syphilis in pregnant women between 2010 and 2021[8,12].

Consequently, despite several state initiatives and a slight decrease in cases in 2019, GS and CS remain major public health issues in the country. This warns of deficiencies in primary care services and the quality of assistance that arise from the lack of access to resources, given that despite the comprehensiveness of the Universal Health System, social ills frequently end up opposing the full effectiveness of this principle[5,6].

According to the Ministry of Health's epidemiological bulletin for 2020 (2019), Pernambuco is one of the states with higher detection rates for GS, CS, and subsequent mortality in children under one year of age. Pernambuco's recent growth can be attributed to system failures in meeting the needs of this population, as well as improved reporting by trained health professionals. The fact that the number of CS cases in 2017 surpassed the detection rate during pregnancy supports this finding, implying underreporting and a significantly higher proportion of cases in the capital city. Furthermore, Recife has had the highest number of cases of CS for the past two years in a row, with a rate roughly three times that of the national average[8].

The Amaury de Medeiros Integrated University Health Center (*Centro Universitário de Saude Amaury de Medeiros* – CISAM) in Recife is a reference maternity hospital for high-risk pregnancies and Sexually Transmitted Infections (STIs) during prenatal care, including GS and CS.

OBJECTIVE

To learn more about the epidemiological profile of the population exposed to these conditions, the detection rate of GS and the incidence of associated CS and UO in CISAM/UPE between January 2019 and December 2021.

METHODS

This was a retrospective cohort study involving pregnant women and newborns diagnosed with syphilis at the CISAM. Data were obtained from the GS and CS Notification/Investigation Forms between January 2019 and December 2021. We collected data on women's sociodemographic profile, prenatal care, abortion or fetal deaths, and syphilis treatment conditions. Newborns' data included birth conditions, clinical evidence of congenital syphilis, treatment, and follow-up.

The collected data were organized in a Microsoft Excel spreadsheet and analyzed using frequencies, means, and percentages before being presented in tables and graphs.

A descriptive analysis of the sociodemographic variables of the CS cases was performed, including age group, education, mother's race/color, prenatal care, maternal syphilis diagnosis, and maternal treatment scheme. In the case of gestational syphilis, gestational age, race/color, education level, area of residence, clinical classification, prenatal non-treponemal and treponemal tests, treatment scheme, partner treated concurrently with the pregnant woman, and partner treatment scheme were all considered.

The study followed the Declaration of Helsinki's ethical determinations for research with human beings, as well as the norms that regulate research involving human beings, contained in Resolution 466, of December 12, 2012. This project was approved by the CISAM Ethics Committee/UPE (CAEE No. 51559321.0.0000.5191) and Consolidated Opinion (4.992.753).

RESULTS

Between January 2019 and December 2021, 463 GS and 296 CS cases were reported at CISAM with the following distributions:148 and 116 in 2019, 161 and 93 in 2020, and 154 and 87 in 2021 (**Figure 1**).

During the study's years, 4444, 4360, and 4265 LB were computed, confirming the respective detection rates of GS (33.30, 36.92, and 36.10 per 1000 LB) and CS incidence (26.1, 21.33, and 20.39 per 1000 LB).

When GS and CS cases from the last three years were examined globally, it was discovered that the vast majority (74.5%) of pregnant women were in their third trimester at the time of notification (**Figure 2**).

Table 1 shows the sociodemographic variables of the pregnant women, based on the two notification forms.

In pregnant women, the clinical classification of syphilis was mostly latent (451/463, 97.4%). One pregnant woman (0.2%) had primary syphilis, one had secondary syphilis, one had tertiary syphilis, and in nine of them (1.9%) this information was unknown.

Figure 3A depicts CS cases in mothers who received prenatal care (n=209, 70.6%) and those who did not (43, 14.5%). This information was unknown in 44 (14.9 %) patients. Figure 1b depicts the time of diagnosis of GS, with the vast majority, 207 (69.9%), diagnosed during delivery or curettage, 74 (25%) diagnosed during prenatal care, 10 (3.4%) diagnosed after delivery, four (1.4%) undiagnosed, and one (0.3%) whose information was unknown.

The non-treponemal prenatal test was reactive in 98.1% and 97.3% of pregnant women, respectively, and non-reactive in 1.5% and 2.7%, according to the GS and CS databases. The treponemal test (VDRL) during the prenatal period was reactive in 98.9% and 98% of pregnant women, respectively.

Figure 4 compares the treatments provided to the pregnant women and their partners. **Figure 4A** depicts the treatment plans for pregnant women who had been diagnosed with syphilis: 340 (73.4%) received 7,200,000 intramuscular (IM) units of benzathine penicillin G, 13 (2.8%) received 2,400,000 IM units, three (0.6%) received 4,800,000 IM units, two (0.4%) underwent another scheme, 90 (19.4%) did not receive any treatment, and in 15 (3.2%) cases the information was unknown.

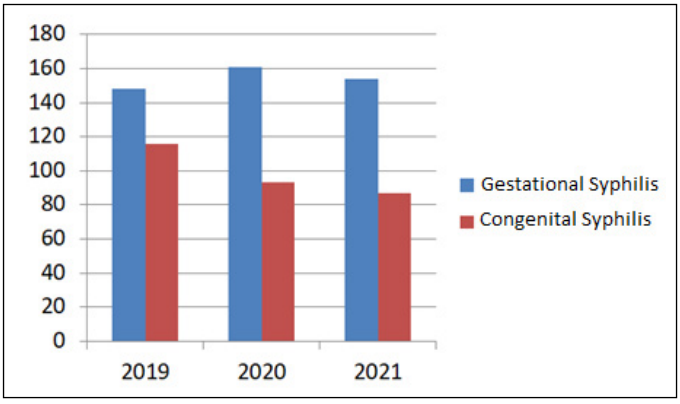

Figure 1. Number of notified cases of Gestational and Congenital Syphilis in 2019, 2020, and 2021. CISAM/UPE from 2019 to 2021.

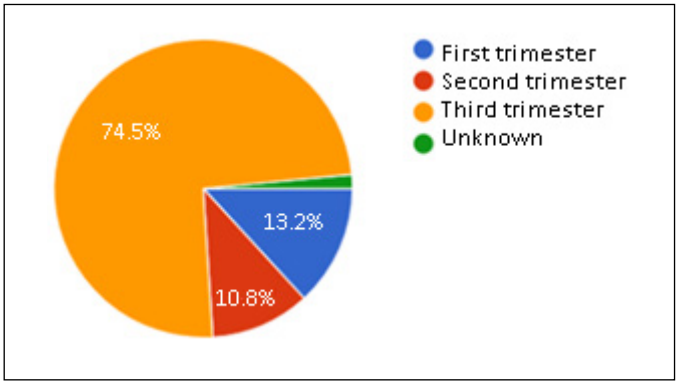

Figure 2. Distribution of pregnant women with syphilis cases by gestational trimester. CISAM/UPE from 2019 to 2021.

The GS distribution by partner treatment is shown in **Figure 4B**. Information was unknown in 428 patients (92.4%). Treatment was provided in six (1.3%) cases, but not in the other 29 (6.3%). Figure 2c depicts the distribution of the partners treated under the prescribed scheme. The data were unknown in relation to 421 patients (90.9%). In 14 cases (3%), the treatment was 7,200,000 IM units of benzathine penicillin G, whereas in 28 cases (6%), no treatment was administered.

The reason for not treating the partners was "not having been communicated/invited to the Health Unit for treatment" in 77 cases (16.63%), "not having had more contact with the pregnant woman" in one case (0.22%), another reason in 111 cases (23.97%), and no information was obtained in the remaining 274 cases (59.18%).

Figure 4D shows the distribution of CS cases based on adequate treatment in pregnant women. Treatment was not provided to 51 pregnant women (17.22%), but was provided to 242 pregnant women; 239 (80.78%) received inadequate care and three (1%) received adequate care. In three cases (1%), the information was unknown.

In terms of CS case evolution, 256 (86.5%) had LB, and 40 (13.5%) had UO, with 16 (40%) miscarriages, 10 (25%) stillbirths, 9 (22.5%) deaths from CS, and 5 (12.5%) deaths from other causes (**Figure 5**).

DISCUSSION

According to the current study's analysis, there has been some stabilization in the reporting of GS cases and a decrease in the incidence rate of CS between 2019 and 2021 at the CISAM/UPE. This decrease in the reported CS cases is not unusual, as it corresponds to a recent trend in the northeast region.

The northeast region experienced an increase in GS and CS cases between 2010 and 2018. In 2018, the region experienced a year-on-year decrease in cases[8], signifying a shift in the pattern. However, as of 2020, this apparent decline may not reflect epidemiological reality, but rather may be an artifact of the delay in reporting cases due to the COVID-19 pandemic, which has mobilized experts from different areas of epidemiological surveillance in the country to monitor this new pandemic disease.

The decrease in notifications is unlikely to be attributable to the lower incidence of the pandemic, which is an effect that, if any, will be detected later. The decrease in notifications may be related to the decrease in demand for health services and the interruption of many outpatient services due to the prioritization of people affected by COVID-19 during the pandemic. This resulted in changes in the care profile, monitoring, and notification quality, which could significantly impact people's lives, in addition to jeopardizing syphilis control and elimination[13].

Despite the decrease in reported cases of CS, Recife remains one of the two Brazilian capitals with the highest incidence rates in 2020, with 25.1 cases/1,000 LB, which is more than three times the national rate. Alarming data are also present in the GS scenario, as

Recife stands out nationally as having one of the highest detection rates in 2020, higher than the national rate. Furthermore, Pernambuco, along with Amapá, was the federated state with the highest proportion of pregnant women with no information on treatment (both 12.1%) in 2020[8].

During this period, the CISAM/UPE had higher detection rates and more information on schooling and clinical classification of GS than Recife,[14] This university reference center also had higher CS incidence rates, but comparable percentages of other variables, such as race and maternal education level, time of diagnosis, prenatal care, and adequate treatment.

It is worth noting that, at the national level, the majority of syphilis cases in pregnant women are primary syphilis[14]. This contrasts with the findings of the current study, which revealed that the vast

Table 1. Distribution of notified cases of Gestational and Congenital Syphilis based on maternal sociodemographic variables (MSV). UPE/CISAM, 2019-2021.

Maternal sociodemographic variables	Gestational syphilis		Congenital syphilis	
	Number	Percentage	Number	Percentage
Race/color				
White	39	8.40	24	8.11
Black	79	17.10	51	17.23
Yellow	2	0.43	1	0.34
Brown	322	69.54	217	73.31
Indigenous	0	0	0	0
Unknown	21	4.53	3	1.01
Subtotal	463	100	296	100
Education Level				
Illiterate	6	1.3	3	1
Incomplete Elementary School	180	38.8	132	44.6
Complete primary education	60	13	42	14.2
Incomplete high school	81	17.5	54	18.2
Complete high school	89	19.2	54	18.2
Incomplete Higher Education	6	1.3	2	0.7
Complete Higher Education	0	0	0	0
Unknown	40	8.6	9	3
Not applicable	1	0.2	0	0
Subtotal	463	100	296	100
Residence Zone				
Urban	433	93.72	270	91.2
Rural	26	5.63	18	6.1
Periurban	1	0	2	0.7
Unknown	3	0.65	6	2
Subtotal	463	100	296	100
City of Residence				
Recife	182	39.30	111	37.50
Recife Metropolitan Region	209	45.14	133	44.93
Country town in Pernambuco	70	15.12	50	16.9
Sao Paulo	1	0.22	2	0.67
Unknown	1	0.22	0	0
Subtotal	463	100	296	100

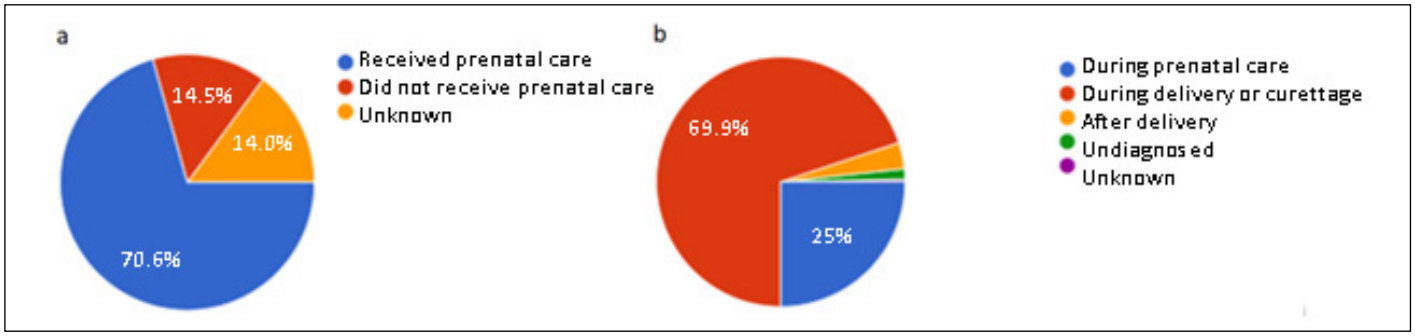

Figure 3. Distribution of Congenital Syphilis cases based on maternal prenatal care (A) and time of syphilis diagnosis (B). UPE/CISAM, 2019-2021.

majority of cases were latent syphilis, with only a few cases of primary syphilis. This study also identified cases in which the clinical classification was unknown. Such findings raise concerns regarding the lack of knowledge among health professionals caring for pregnant women when it comes to the clinical classification of syphilis.

In this study, the majority of pregnant women in their third trimester were brown or black, had low education and inadequate treatment, and had low pretreatment coverage despite living in Recife or RMR. Consequently, many opportunities for effective treatment and prevention of CS have been missed.

This study discovered a significant lack of information regarding partner treatment in the notification forms. As a result, it cannot be assumed that the health team did not attempt to contact the partners or inform them of their treatment. The absence of registration in the medical record may be due to the new Technical Note[12], which states that the concept of CS is no longer dependent on whether or not the partner was treated.

Although information on partner treatment is no longer required for the notification of GS and CS cases, the non-treatment of a pregnant woman's sexual partners, with the risk of reinfection, implies a higher risk of fetal or neonatal UO, including premature and spontaneous miscarriages[15]. For this reason, as well as for other preventive measures, it is now recommended that the partner/man perform prenatal care alongside the pregnant woman[16].

Previous research has identified stigma, fear of abuse due to having an STD, and inability to contact casual partners as major barriers to notify partners[17]. Other studies have found that men experience shame, neglect, lack of time to seek treatment, and lack of support from the health-care system[18].

Significant failures in GS management were also identified, such as limited access to diagnostic tests and treatment, as well as a lack of standardized strategies for notifying the partner[19]. As records of partner treatment were scarce in this study, cases of inappropriate partner treatment stood out, emphasizing the importance of continuing health education, particularly for professionals working in Basic Health Units.

As the means of diagnosing syphilis has been known for over 100 years, and anti-treponemal medication has been available without any documentation of bacterial resistance for over 80 years, CS is directly related to poor prenatal care. Few antenatal visits, undetermined duration of illness in the mother, elevated non-treponemal tests during diagnosis, younger gestational age of the fetus at the time of diagnosis, and maternal syphilis treatment in the third trimester are risk factors associated with CS[20] .After analyzing the 111 articles included in the review, the authors of a recent systematic review concluded that the most common conditions associated with CS were intercurrences in the diagnosis, treatment, and care of pregnant women and prenatal inefficiency[20].

Another factor contributing to the high prevalence of the disease in Brazil is the social context in which the pregnant women are placed[20]. As it is one of the world's most unequal countries with low levels of education and a conservative attitude toward sexual and reproductive health issues, health education must focus on defying

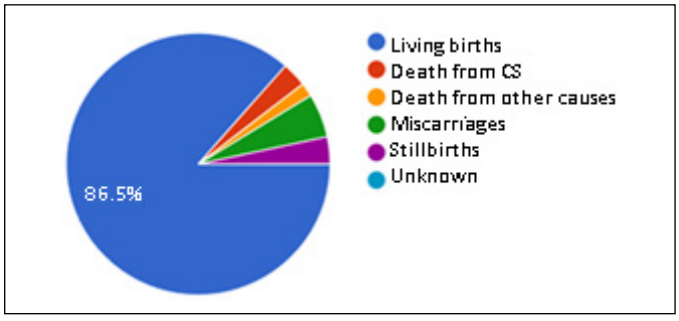

Figure 5. Distribution of congenital syphilis cases according to evolution. CISAM/UPE, from 2019 to 2021

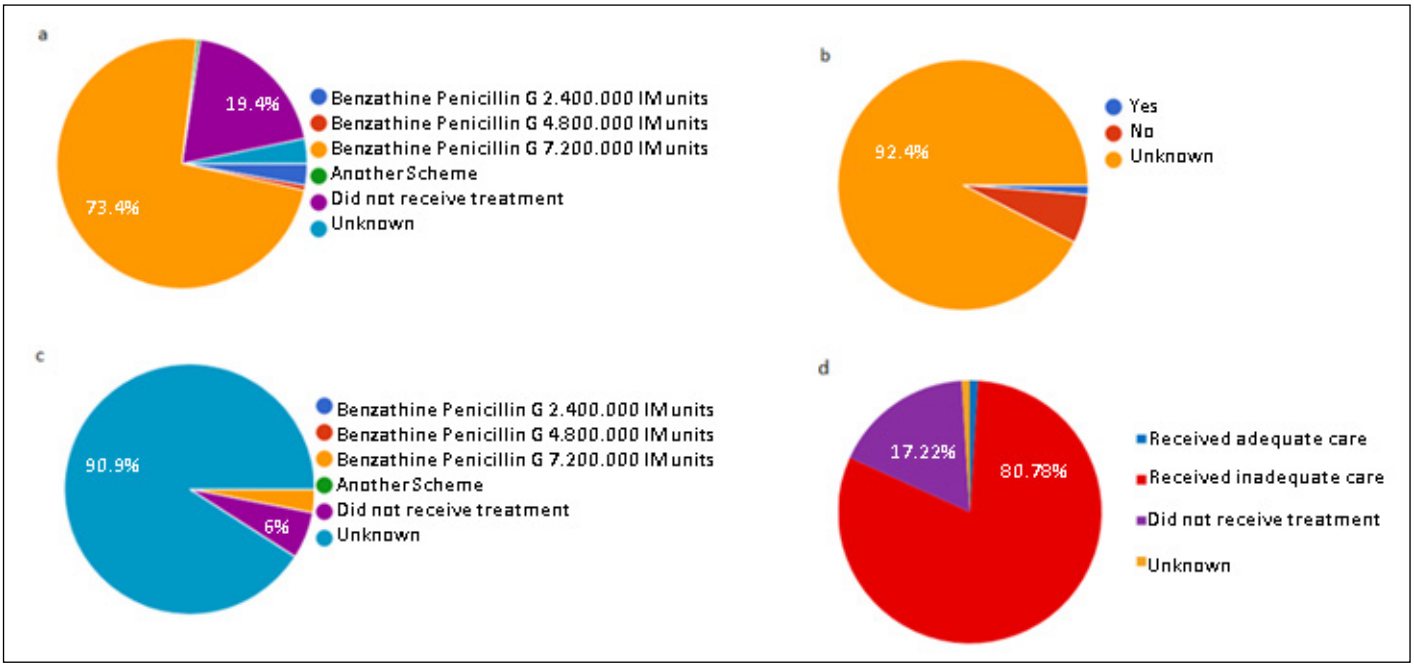

Figure 4. Distribution of Gestational Syphilis cases based on the treatment scheme prescribed to the pregnant woman (A), partner's treatment (B), partner's treatment scheme (C), and adequacy of treatment (D). UPE/CISAM, 2019-2021

this reality. To effectively combat syphilis, dialogue and care for an illiterate pregnant woman living on the edge of poverty and in precarious sanitary conditions must be differentiated[21].

The Family Health Strategy (*Estratégia Saúde da Família* – ESF) is a critical component in the early detection of GS and subsequent elimination of CS. Many studies have demonstrated the effectiveness of their actions and their low implementation cost. This is aided by privileged access to families and availability of active search mechanisms for cases and defaulters through community health agents. It is necessary to pay attention to fully implemented prenatal care, with the performance of all activities recommended in protocols to maintain and improve their actions[22].

Another concern in this study was the high rate of UO among CS cases (13.5%), which included 40% cases of abortions, 25% of stillbirths, 22.5% of deaths due to congenital syphilis, and 12.5% of deaths from other causes. Another study found that the average percentage of fetal mortality from CS in Recife-PE neighborhoods between the five-year periods of 2007–2011 and 2012–2016 was 6.05%, which was higher than that in other studies in Brazilian municipalities. Recife had a higher incidence of CS than the regional and national coefficients, which may explain the higher percentage of UO, including fetal deaths, as compared to other parts of the country[23].

The persistence of associated cases of CS and UO underscores the importance of evaluating health services, as syphilis is regarded as a sentinel event in the quality of prenatal care, since it is an infection with vertical transmission that can be avoided and eliminated through early detection and treatment of pregnant women and their partners. Furthermore, if a pregnant woman receives adequate and early treatment during pregnancy, the risk of UO in the child is reduced[3].

As a result, this study corroborated the magnitude of syphilis in the service as a reflection of what happens in the capital and the State of Pernambuco during the critical period of the COVID-19 pandemic, and reinforced the importance of pregnant women and newborn demands in public health care policy. However, new and permanent epidemiological monitoring is required to follow the epidemiology of GS and CS, particularly after the improvement in COVID-19 pandemic rates, to assess the quality of prenatal care, improve care for the at-risk population, and ensure adequate and timely treatment of pregnant women and their partners in prenatal care, with the purpose of reducing and possibly eliminating cases of CS and, consequently, UO.

Strengths: The data showed the local epidemiological situation based on the notification forms.

Limitations: The COVID-19 pandemic may have caused information bias, resulting in the underreporting of GS and CS cases.

CONCLUSION

This study found a higher rate of detection of GS than CS, which may indicate a better adaptation to the definitions of the two conditions, but unfortunately points to a clear deficiency in prenatal care, as it does not address whether it is possible to establish a timely diagnosis and adequate treatment of pregnant women to reduce the incidence of CS to WHO-accepted limits (0.5/1000 LB). The main clinical classification presented by pregnant women was latent, which justifies the need for consistent STI screening during prenatal care and beyond in the sexually active population, thereby contributing to the reduction in acquired syphilis and, as a result, SG and SC. Concerning the sociodemographic profile associated with GS and CS, the main variables discovered were pregnant women in the third trimester, brown, with incomplete primary education, and who lived in an urban area, demonstrating the impact of socioeconomic conditions on epidemiology; it could be noticed that the UO represented a significant number, with abortions and stillbirths being the most common. The study allowed researchers to better understand the epidemiology of GS and CS in the healthcare system, as well as the importance of urgently changing public policies for the care of pregnant women and newborns, in conjunction with socioeconomic assistance, in order to change the dramatic situation of CS in Brazil.

Approval by the Human Research Ethics Committee

This study was approved by the Ethics Committee for Human Research under CAEE no. 51559321.0.0000.5191 and consolidated opinion no. 4.992.753.

Participation of each author

ARBM: Data curation, Formal Analysis, Writing – original draft. ABGA: Data curation, Formal Analysis, Writing – original draft. BLSA: Data curation, Formal Analysis, Writing – original draft. GMF: Data curation, Formal Analysis, Writing – original draft. MLBM: Data curation, Formal Analysis, Writing – original draft, Writing – review & editing. RMMB: Data curation, Formal Analysis, Writing – original draft. VLSC: Data curation, Formal Analysis, Writing – original draft.

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Conflict of interest

The authors declare no conflicts of interest.

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