ORIGINAL ARTICLE

PREVALENCE AND FACTORS ASSOCIATED WITH THE OUTCOME OF GESTATIONAL SYPHILIS

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Highlights: (1) High syphilis detection rate of 57.4 cases per 1,000 live births. (2) Syphilis prevalence of 5.8%. (3) Women without a partner aged 20 to 29 had higher prevalence of syphilis.

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ABSTRACT

Objective: To estimate the prevalence and factors associated with gestational syphilis. **Methodology:** A cross-sectional study was carried out in two maternity hospitals of a municipality of Rio Grande do Sul, including 2,292 new mothers from January 1 to December 31, 2019, with analysis adjusted by means of Poisson regression, using a hierarchical three-level model. contemplating demographic, socioeconomic, reproductive and gestational variables. **Results:** A prevalence of gestational syphilis of 5.8% (n=132) was observed. In the adjusted analysis, the occurrence of syphilis during pregnancy showed a statistically significant association with maternal age (p 0.001; 95%CI: 1.10-2.99), living with a partner (p 0.001; 95%CI: 1.50-3.14) and maternal schooling (p 0.001; 95%CI: 2.01-11.46). **Conclusion:** The study identified a high occurrence of syphilis in pregnancy in the municipality, influenced by sociodemographic factors, especially maternal age, absence of partner and low education. These findings highlight the need for public health strategies aimed at reducing social inequalities, strengthening prenatal care and expanding access to diagnosis and treatment, aiming at the prevention of gestational syphilis.

Keywords: Sexually transmitted infections; syphilis; pregnancy; maternal and child health. Prevalence.

INTRODUCTION

Syphilis is a chronic, curable, sexually transmitted systemic bacterial infection caused by *Treponema pallidum*. During pregnancy, the absence of treatment or inadequate treatment carries a high risk of vertical transmission, characterized by the passage of infection from the pregnant woman to the fetus, resulting in the development of congenital syphilis (CS), defined as the infection of the concept resulting from this transmission. CS is the main endpoint of vertical transmission and is associated with significant maternal-infant conditions, such as abortion, stillbirth, neonatal death, prematurity, and low birth weight[1-3].

PREVALENCE AND FACTORS ASSOCIATED WITH THE OUTCOME OF GESTATIONAL SYPHILIS

Although gestational syphilis (GS) is preventable and low-cost treatment, the disease still poses a major public health challenge. It is estimated that 390,000 cases of adverse pregnancy outcomes are attributed to syphilis worldwide, and it is still considered the second most common cause of stillbirth in the world[1-10,18].

The diagnosis of syphilis is made from the correlation between clinical findings, results of laboratory tests, history of previous infections and recent exposure investigation. Treatment of pregnant women and their sexual partnerships should be performed with penicillin benzatine. Both the diagnosis and treatment are considered simple execution, which can be carried out in Primary Health Care (PHC)[1].

Although there is an increasing trend of syphilis cases in pregnant women between 2014 and 2024, from 2023 there was a slowdown in this growth, with an average annual increase of 3.2%. The national detection rate of syphilis in pregnant women in 2024 was 35.4 cases per 1,000 live births[4]. GS presents unequal distribution in the population, being strongly associated with social determinants of health, such as unfavorable socioeconomic conditions, racial inequalities and limitations in access and quality of prenatal care. Studies show a higher incidence of infection among young, black or brown women with lower education, which reflects structural processes of social vulnerability and inequities in health care[8,9,11-16].

Recent international studies show that a significant proportion of pregnant women diagnosed with syphilis do not receive adequate treatment during pregnancy. In a retrospective cohort conducted in China, Liu et al. identified that sociodemographic factors such as migration status, lower education level, marital status and late diagnosis were associated with the failure or inadequacy of syphilis treatment during gestation[19]. Similarly, a more recent international study showed that late diagnosis of the infection and later clinical stages of syphilis were important predictors of inadequate treatment, reinforcing the role of timely access to pre-syphilis Christmas and proper clinical management in the prevention of vertical transmission[20].

The Pan-American Health Organization (PAHO) and the World Health Organization (WHO) have reinforced recommendations for eliminating vertical transmission of this infection through actions in prenatal care[4,10,17]. However, measures are needed that in addition to ensuring early diagnosis and appropriate treatment, are directed at preventing syphilis infection during pregnancies[2,17]. The present study aimed to analyze the prevalence of syphilis in pregnancy and associated factors, in line with the Sustainable Development Goals (SDGs)

of the 2030 Agenda, by considering gestational and congenital syphilis as preventable and relevant to reducing maternal and neonatal morbidity and mortality.

METHOD

The data in this study are the result of a research conducted in two stages. The first stage consisted of a cross-sectional survey carried out in the municipality of Rio Grande with the intention of evaluating pregnancy and childbirth assistance. The survey included all 2,292 women who gave birth from January 1 to December 31, 2019 in the two maternity wards of the municipality. The inclusion criteria were: mothers who should reside in the municipality, newborns should weigh 500 grams or more and be born with gestational age equal to or greater than 20 weeks. Women with cognitive impairment or difficulty understanding and answering the questions were excluded.

The participants were interviewed once at the maternity hospital, in the period of up to 48 hours after childbirth, by applying a single form, standardized and pre-coded, predominantly composed of closed questions, by previously trained interviewers. For the identification of syphilis cases in pregnancy, composing the evaluation of the outcome of the study, the following questions were used: "Ms. had a rapid test for syphilis in pregnancy?"; "How many were positive?"; "Did you have any other syphilis tests during your pregnancy?"; "How many were positive?" and "Did you ever get treatment for syphilis?" Cases of syphilis in pregnancy were considered those in which women reported positive results for syphilis during pregnancy and treatment for the infection. The cases in which there was a positive test report, but without reference to the realization of treatment, were classified as potential cases of syphilis in pregnancy, and these participants were included in the second stage of the study. The confirmation of cases occurred through the verification, in medical records, of the record of treponemic and non-treponemic tests reagents during pregnancy or the diagnostic note of syphilis in pregnancy.

The search for the parturients was carried out daily, through consultation of the birth register book, followed by visits to the wards of the two maternity hospitals. After the identification of a woman, the researcher established direct contact at the bed, confirmed the place of residence and, being the municipality of Rio Grande, read the Term of Free and Informed Consent (FIC). After signing the term, the data collection form was applied.

Data entry was made simultaneously with the interview, using tablets and the Research Electronic Data Capture application. At the end of each day, questionnaires were download to the server of the Federal University of Rio Grande (FURG) and reviewed. At the end of the process, all variables and their categories were labeled.

In the second stage of the study, the mothers who had reported having been tested positive for syphilis, but without treatment during pregnancy, had their hospital records of the period of hospitalization in the maternity hospital consulted for confirmation or exclusion of potential cases of syphilis during pregnancy.

The independent variables for analysis purposes were: maternal age, self-reported skin color, living with a partner, maternal schooling in full years of study, monthly family income, number of previous pregnancies, abortion history, stillbirth history, planned current pregnancy, gestational quarter of the first consultation, number of consultations carried out.

Considering the identification of 2,292 puerperal mothers in the two maternity wards during the collection period, a prevalence of "syphilis in pregnancy" outcome between 5% and 7%, and a significance level of 5% ($\alpha = 0.05$), the study presented an estimated statistical power of 80%, sufficient to detect associations between the independent variables and the outcome of interest, ensuring the reliability of the analyses carried out.

The raw analysis consisted in obtaining prevalence measures of both exposures and outcome. The measure of effect used was the prevalence ratio (PR), the confidence interval of 95%, and the p value. For the categorical ordinal variables, the *p* of the linear trend test was reported, while for the other variables the Wald test for heterogeneity was used. The adjusted analysis was obtained by means of Poisson regression and followed a hierarchical model designed for control of confounding factors, consisting of three levels. At the first level, demographic (age, skin color, marital status) and socioeconomic characteristics (education, family income); at the second level, reproductive characteristics (number of previous pregnancies, prior abortion, prior stillbirth); at the third level, gestational characteristics (if pregnancy was planned, prenatal start trimester, number of prenatal appointments). In the regression model, the variables were controlled for those of the same level or previous levels, and $p \leq 0.20$ was established to maintain the variables in the proposed analysis model. The significance level adopted was 95% for bicaudal tests. All analyses were performed using the statistical software Stata 14.0.

Two stages of the research were approved by the Ethics Committee in the Health Area of the Federal University of Rio Grande, protocol nº 278/2018 and the Charity Association Santa Casa do Rio Grande, protocol nº 016/2018.

RESULTS

The study included 2,292 postpartum women, 132 were considered as cases of syphilis in pregnancy, which corresponds to a detection rate of 57.4 cases per 1,000 live births.

Table 1 describes the characteristics of women who had syphilis during pregnancy, most were between 20-29 years old (69%), white skin color (69.7%), lived with their partner (67.4%), and had up to eight years of study (48.5%) and presented as monthly family income up to a minimum wage (63.8%). 73.5% had up to two previous pregnancies, did not have a history of abortion and stillbirth 73.4% and 92.4%. Regarding the current pregnancy, most were not planned (55.3%), 74.6% started prenatal care during the first trimester of gestation, 86.1% had six or more prenatal consultations.

The prevalence of syphilis in puerperal mothers was 5.8% ($_{95\%}$CI: 4.8-6.8). Given that women aged 20-29 had 80% more syphilis than those aged 19 or younger (PR:1.81; $_{95\%}$CI:1.10-2.99; p=0.049). Women who lived without a partner had twice as much syphilis when compared to those with a partner (RP:2,17; $_{95\%}$CI:1,50-3,14; p≤0,001). In relation to maternal schooling, it was identified that the fewer years of study, the greater the probability of presenting with syphilis during pregnancy. Women with nine to 11 years of study had approximately four times more chance of having syphilis (PR:3.65; $_{95\%}$CI:1.57-8.48; p p≤0.001), as well as those with up to eight years of study, the chance of syphilis infection in pregnancy was practically five times higher (PR:4.80; $_{95\%}$CI:2.01-11.46; p≤0.001), when compared to those who had studied 12 years or more (Table 2).

Table 1. Sociodemographic and obstetric characteristics of the women who gave birth in the municipality of Rio Grande/RS in 2019 and of the cases of syphilis during pregnancy (N = 2,292 and n = 132)

Variables	General (N=2.292) n (%)	Syphilis in Pregnancy n=132 (5.8%) n (%)
Maternal age (years)		
Up to 19	301 (13.1)	19 (14.4)
20–29	1.159 (50.6)	91 (69.0)
30 or older	832 (36.3)	22 (16.6)
Skin color (self-reported)		
White	1.750 (76.3)	92 (69.7)
Black or mixed-race	542 (23.7)	40 (30.3)
Lives with a partner		
No	341 (14.9)	43 (32.6)
Yes	1.951 (85.1)	89 (67.4)
Maternal education (years of schooling)		
Up to 8	719 (31.4)	64 (48.5)
9–11	1.078 (47.0)	61 (46.2)
12 or more	495 (21.6)	7 (5.3)
Monthly family income	**N= 2.232**	**N= 127**
Up to 1 minimum wage	990 (44.4)	81 (63.8)
2 or more minimum wages	1.242 (55.6)	46 (36.2)
Number of previous pregnancies		
Up to 2	1.576 (68.8)	97 (73.5)
3 or more	716 (31.2)	35 (26.5)
History of abortion	**N= 1.422**	**N= 79**
No	1.059 (74.5)	58 (73.4)
Yes	363 (25.5)	21 (26.6)
History of stillbirth	**N= 1.422**	**N= 79**
No	1.373 (96.6)	73 (92.4)
Yes	49 (3.4)	6 (7.6)
Current pregnancy planned		
Yes	1.235 (53.9)	59 (44.7)
No	1.057 (46.1)	73(55.3)
Start of prenatal care	**N= 2.216**	**N= 122**
1st trimester	1.806 (81.5)	91 (74.5)
2nd trimester	361(16.3)	25 (20.5)
3rd trimester	49 (2.2)	6 (5.0)
Number of prenatal visits	**N= 2.216**	**N= 122**
Up to 5	250 (11.3)	17 (13.9)
≥ 6	1.966 (88.7)	105 (86.1)

Source: Study authors.

Caption: MW

Table 2. Prevalence of gestational syphilis, crude and adjusted analysis among puerperal women in the municipality of Rio Grande, Rio Grande do Sul, 2019. (N=2,292)

Variables	GS (%)	Raw Analysis PR (95% CI)	p-value	Adjusted Analysis PR (95% CI)	p-value
Maternal age			≤ 0.001*		0.049*
13–19 years	6.31	1		1	
20–29 years	7.85	1.24 (0.77–2.00)		1.81 (1.10-2.99)	
30 years or older	2.64	0.41(0.22–0.76)		0.71 (0.37-1.33)	
Skin color (reported)			0.063		0.926
White	5.26	1		1	
Black or mixed-race	7.38	1.40 (0.98–2.00)		0.98 (0.67–1.43)	
Lives with partner			≤ 0.001		≤ 0.001
Yes	4.56	1		1	
No	12.61	2.76 (1.95–3.90)		2.17 (1.50–3.14)	
Maternal education (years of schooling)			≤ 0.001*		≤ 0.001*
12 or more	1.41	1		1	
9–11	5.66	4.00 (1.89–8.68)		3.65 (1.57–8.48)	
8 or fewer	8.90	6.29 (2.90–13.62)		4.80 (2.01-11.46)	
Monthly family income			≤ 0.001		0.095
Up to 1 minimum wage	8.18	2.20 (1.55-3.14)		1.39 (0.94-2.06)	
2 or more minimum wages	3.70	1		1	
Number of previous pregnancies			0.230		0.106
Up to 2	6,15	1		1	
3 or more	4.89	0.79 (0.54–1.15)		0.65 (0.39-1.09)	
History of miscarriage			0.824		0.191
No	5.48	1		1	
Yes	5.79	1.05 (0.65–1.71)		1.40 (0.84-2.33)	
History of stillbirth			0.036		0.054
No	5.32	1		1	
Yes	12.24	2.30 (1.05–5.03)		2.14 (0.98–4.68)	
Current pregnancy planned			0.030		0.946
Yes	4.78	1		1	
No	6.91	1.44 (1.03–2.01)		0.97 (0.61–1.54)	
Start of prenatal care			0.017*		0.872*
1st trimester	5.04	1		1	
2nd trimester	6.93	1.37 (0.89–2.10)		0.88 (0.49–1.57)	
3rd trimester	12.24	2.40 (1.11–5.28)		1.40 (0.41-4.72)	
Number of prenatal visits			0.339		0.988
Up to 5	6.80	1		1	
≥ 6	5.34	0.78 (0.47–1.28)		1.03 (0.57-1.86)	

Legend:* linear trend p-value, PR, p-value

Source: Study authors.

DISCUSSION

The study showed a high prevalence of syphilis during pregnancy, indicating that the condition represents a relevant public health problem in the analyzed context. The analysis of the pregnant women's profile indicated greater occurrence of infection among women in the young-adult age group, without marital bond and with lower level of education, highlighting the association of gestational syphilis with sociodemographic determinants of vulnerability.

A study conducted in the capital of Mato Grosso do Sul, Campo Grande, between 2013 and 2018 observed a sharp and continuous increase in the detection rate of gestational syphilis, with a cumulative detection rate for the period of 174.3/1,000 live births[21]. In the municipality of Itapeva, in the state of São Paulo, an increase in the rate of detection of syphilis during pregnancy was observed from 2010 to 2014, going from 17.2 to 31.4 cases per 1,000 live births. In the city of Cariri, in Ceará, there was also an increase in the rate of syphilis detection in pregnant women from 2015 to 2021, going from 5.4 cases in 2015 to 12.3 cases per 1,000 live births in 2017, remaining stable since then[22].

Rio Grande presented rates similar to that of Porto Alegre (POA), which is the national capital with the highest rate of syphilis in statement[4]. The official data, published by the Ministry of Health of Brazil, with reference to the year of this study, demonstrate a syphilis detection rate in pregnant women of 22.7 cases per 1,000 live births in the country. In the state of Rio Grande do Sul, the rate of syphilis in pregnant women is 34.5 cases per 1,000 live births, with 70 cases/1000 births in the capital. The state has increasing numbers of syphilis infection in pregnancy in recent years, as well as detection rates above the national average[4]. Perhaps this association of the present study with POA data is given by the profile of the two cities as university and with a large flow of people passing through them, either in the capital or in Rio Grande as a port city.

Regarding prevalence, data from two national studies conducted in the period of 2011 and 2014, one with free women and the other with women deprived of liberty, identified 1.4% of gestational syphilis among free women and 8.7% among those deprived of liberty[17]. In the state of Paraná, the municipal laboratory of Guarapuava identified a prevalence of 1.4% of cases of syphilis during pregnancy among the 2,868 pregnant women who underwent tests in 2014[13]. Among pregnant women admitted to a maternity hospital in Florianópolis, Santa Catarina, in 2018, a prevalence of 3.6% of gestational syphilis was observed. Among 399

women who participated in a study in Juiz de Fora, Minas Gerais, in the year 2018 was found a prevalence of 9.61% syphilis in gestation[23].

In this study, the age group of 20-29 years presents itself as the highest proportion of cases of syphilis infection in pregnancy, as well as in most articles dealing with the subject and information released by the Ministry of Health, presented[8,9,11-14]. This is the age group considered of highest risk for various sexually transmitted infections (STIs), which should be considered a warning sign to care for these patients. When this group seeks the health service regardless of the reason for consultation, the professional must offer exams for STIs[1,13,14].

Regarding the marital situation, not living with a partner was also associated with the greatest occurrence of syphilis during pregnancy, as well as in a national hospital-based study conducted between February 2011 and October 2012[15], besides being the only associated factor in a study conducted in 2020 at a maternity hospital in Ribeirão Preto, São Paulo[24]. In light of these findings, it is observed that the presence of a fixed partner does not eliminate the risk of STIs, reinforcing the need to intensify serological testing and guidelines for condom use during pregnancy, with special attention to pregnant women without a partner. In addition, it is important to warn about the risk of acquiring STIs during pregnancy and breastfeeding and about the possibilities of vertical transmission, as well as to encourage adherence to appropriate treatment for pregnant women and their partners.

In this study, the probability of presenting with syphilis during pregnancy was higher as women were less educated. Hospital-based research, with national data also identified that women with lower education were more likely to have syphilis in gestation[15]. It is suggested that women of lower education are probably more economically dependent on their partners and thus have less subsidy to charge for the use of condoms by them.

Some measures are suggested with the intention of contributing to the prevention of syphilis infection during the gestational period. Strengthen the guidelines on STI prevention during prenatal care, especially among pregnant women aged 20-29 years, with less than 12 years of study and who do not live with a partner. Among managers, sensitize health professionals from the dissemination of the magnitude of the problem. Among health professionals, develop continuous education actions on syphilis and its possible outcomes in pregnancy, with emphasis on practice based on scientific evidence.

In this study, possible limitations must be considered when interpreting the results; the first one refers to the cross-sectional design used, where exposure and outcome data are

collected at the same time, denying the possibility of inferring causation; the second, is related to the fact that the information is provided from the maternal report, which can lead to an underestimate of the outcome. However, the limitations do not invalidate the data presented here, since the identified outcome factors would be minimally subject to change if the data were collected longitudinally.

CONCLUSION

The high prevalence of GS significantly associated with maternal age, marital status, schooling, brown or black color, low income, nativity history, absence of gestational planning, and late onset of pre-pregnancy Christmas, explicitly explains the persistence of deep social inequalities and serious systemic failures in women's health care. These results show that GS does not result primarily from individual factors, but from the inability of the health system to ensure timely, accessible and resolute prenatal care, especially for socially vulnerable populations. Because it is an avoidable condition, easy to diagnose and widely available treatment, its persistence in high levels constitutes an indicator of insufficiency of current public policies. In this way, it becomes imperative to implement actions that address the critical deficiencies of prenatal care, ensure equity in access and quality of care and break with the naturalization of social inequities that underlie the occurrence of this affliction.

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PREVALENCE AND FACTORS ASSOCIATED WITH THE OUTCOME OF GESTATIONAL SYPHILIS

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