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ORIGINAL ARTICLE

# Sociodemographic risk factors for gestational syphilis in a maternity hospital in Santa Catarina, Brazil

*Fatores de risco sócio-demográficos para sífilis gestacional em maternidade de Santa Catarina, Brasil*

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**KEYWORDS**

Epidemiology
Pregnancy
Risk factors
Syphilis

## ABSTRACT

**Objective**: to identify risk factors for the acquisition of gestational syphilis.
**Methods**: Coorte study. The participants will perform rapid tests to detect syphilis during pregnancy and hospitalization. Data referring to age, ethnicity, education, and family income were collected in the interview. To investigate factors associated with syphilis infection in the gestational period, binary logistic regression models were run to analyze the crude and adjusted odds ratios for sociodemographic and economic variables. The statistical significance level of 5% was adopted.
**Results**: There was a statistically significant association between syphilis infection and the social class of the patient [x2 9.821 (4 df); p = 0.05]. The logistic regression model showed that black women had a higher chance of syphilis infection (OR = 2.582; 95% CI 1.068 — 6.243).
**Conclusion**: Low social class and black ethnicity are risk factors for acquiring syphilis during pregnancy.

***PALAVRAS-CHAVE***

Epidemiologia
Fatores de risco
Gravidez
Sífilis

## *RESUMO*

**Objetivo**: identificar fatores de risco para a aquisição de sífilis gestacional.
**Métodos**: Estudo de coorte. As participantes realizaram testes rápidos para detecção de sífilis durante a gestação e no momento da internação. Dados referentes a idade, etnia, escolaridade e renda familiar foram coletados em entrevista. Para investigar fatores associados com a infecção por sífilis no período gestacional, foram executados modelos de regressão logística binária para analisar a *odds ratio* bruta e ajustada para variáveis sociodemográficas e econômicas. O nível de significância estatística de 5% foi adotado.
**Resultados**: Houve associação estatisticamente significativa entre infecção por sífilis e a classe social da paciente [$x^2$ 9,821 (4 gl); $p$ = 0,05]. O modelo de regressão logística demonstrou que mulheres negras têm mais chance de infecção por sífilis (OR = 2,582; IC95% 1,068 — 6,243).
**Conclusão**: Classe social baixa e etnia negra são fatores de risco para adquirir sífilis na gravidez.

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## INTRODUCTION

Syphilis is a sexually transmitted infection (STI) systemic, curable, and exclusive to humans[1-3]. The transmission occurs mainly through sex. Infectivity is most significant in the early stages, gradually decreasing over time. In pregnant women, when untreated or inadequately treated, vertical transmission occurs more frequently through the transplacental route (with a transmission rate of up to 80%)[2-6] and can have severe consequences for maternal and fetal health[7].

Even with the improvement in notifications in different regions[8,9], gestational syphilis has a high underreporting in Brazil[10]. It has been a notifiable disease since 2005, with an increase in the number of new cases yearly. In 2018, the number of reported cases of syphilis in pregnant women in Brazil was 62,599, 25.7% more than that in 2017[8]. According to the Ministry of Health, in 14% of pregnant women, even treated adequately for syphilis, there may be therapeutic failure[1,2].

The increase in syphilis in pregnant women remains a worrying situation throughout Brazil. Allied with this, the high rate of therapeutic failure places children born to properly treated mothers at risk of developing congenital syphilis. These indicators led to the development of this study, which aimed to identify risk factors for the acquisition of gestational syphilis and, consequently, help the development of public policies aimed at eradicating syphilis in pregnant women.

## METHODS

This is a historical cohort with a quantitative approach whose project was approved by the Institutional Ethics Committee for Research with Human Beings (CAAE: 90848618.7.0000.0121; opinion number 2.825.269). The participants (or their legal guardians) read and signed the Informed Consent Form after receiving information about the study. Those under the age of 18 received the Informed Assent Form.

Patients who spontaneously went to a university hospital in southern Brazil between 2018 and 2019 were considered eligible for the study. The maternity had low- and high-risk care and attended approximately 250 births/month. Patients of any age, lucid at the time of admission — without the effects of medications that could interfere with their state of consciousness — and with a diagnosis of pregnancy or postpartum puerperium were consecutively included. Patients with mental disabilities, cognitive deficits, or any other clinical condition that prevented the interview from being carried out were excluded, in addition to patients whose legal guardians expressed a desire against participation.

The calculated sample size was equal to 489 patients. The OpenEpi[11] program was used for the sample calculation, and a bilateral significance level of 5%, test power of 80%, and prevalence of 4% were considered. The sample was selected for convenience. Data collection was carried out on random days in which all patients hospitalized in rooming-in beds or obstetric emergency offices had the opportunity to participate in the research.

The participants underwent rapid tests to detect syphilis during pregnancy and at the time of hospitalization. Data referring to age, self-declared ethnicity, schooling, and family income were collected in an interview conducted with a structured questionnaire during hospitalization. The authors selected these parameters for comparison with other studies of syphilis in Brazil. Data related to the VDRL titer were also collected in participants who presented any reagent rapid test (prenatally and/or at the time of admission). As the VDRL tests were performed during the prenatal period and each municipality had a contract with different laboratories, information on the test's sensitivity and specificity was unavailable.

Data were tabulated in a Microsoft Excel® spreadsheet, and the analysis was performed using the Statistical Package for the Social Sciences version 22 (IBM Corp. Armonk, NY, USA). The verification of data normality was analyzed using the Kolmogorov-Smirnov test. Descriptive analysis was performed to summarize the sample profile, presenting measures of central tendency and variability (for numerical variables) and absolute and relative frequencies (for categorical variables). Chi-square and Fisher's exact tests were used to analyze the association between syphilis infection and sociodemographic and economic factors. To investigate factors associated with syphilis infection (yes or no) during pregnancy, binary logistic regression models were run to analyze the crude and adjusted odds ratios for sociodemographic and economic variables. The statistical significance level of 5% was adopted.

## RESULTS

Five hundred and sixty women agreed to participate in this study, 15% more than expected by the sample calculation as a safety margin in case of sample loss during follow-up. The mean age was 27.7 ± 6.4 years, with a predominance of the age group between 18 and 30 years (58.0%). The majority were self-declared white (59.2%), 282 (50.4%) had high school, 376 (67.4%) were employed, and 229 (42.6%) were in social stratum D, according to the IBGE classification. The average family income of the participants was R$ 3,164.00 ± 2,416.60. Table 1 illustrates the sociodemographic data of the patients participating in this study.

The average number of prenatal consultations was 8.7 ± 2.9, with 66 (11.8%) reporting having 0 to 5 consultations and 491 (88.2%) having 6 or more consultations. Regarding the screening test for gestational syphilis, in the first, second, and third trimesters, 107 (19.1%), 181 (32.3%), and 246 (43.9%) patients did not undergo the rapid test for syphilis, respectively.

Thirty-three patients were diagnosed with syphilis during pregnancy. Of these, 29 (87.9%) successfully completed treatment with penicillin G benzathine, and four failed, the causes of which were inadequate dose for the stage of the disease (3.0%) and probable reinfection (9.1%).

There was a statistically significant association between syphilis infection and the patient's social stratum [x2 9.821 (4 gl); p = 0.05].Other factors that could be related to syphilis infection (age group, education, and ethnicity) did not present significant associations (Table 1).

Sociodemographic and economic variables were entered into the logistic regression model. Crude analysis showed that pregnant women belonging to social stratum C were less likely to have syphilis infection compared with those belonging to social stratum E (OR = 0.121; 95%CI 0.016 – 0.921). Black women were more likely to be infected with syphilis than white women (OR = 2.582; 95%CI 1.068 – 6.243). However, after adjusting the model, the result showed statistical significance only for the ethnicity variable (Table 2).

***Table 1*** — Relationship between syphilis infection and sociodemographic factors.

| Variables | Total | Syphilis infection | | p-value* |
|---|---|---|---|---|
| | | No n (%) | Yes n (%) | |
| Age** | | | | 0.18 |
| 15 to 17 | 19 (3.4) | 17 (3.2) | 2 (6.1) | |
| 18 to 30 | 325 (58.1) | 302 (57.4) | 23 (69.7) | |
| 31 to 45 | 215 (38.5) | 207 (39.4) | 8 (24.2) | |
| Social stratum (IBGE)** | | | | 0.05 |
| A | 1 (0.2) | 1 (0.2) | - | |
| B | 6 (1.1) | 5 (1.0) | 1 (3.1) | |
| C | 90 (16.7) | 89 (17.6) | 1 (3.1) | |
| D | 229 (42.6) | 217 (42.9) | 12 (37.5) | |
| E | 212 (39.4) | 194 (38.3) | 18 (56.3) | |
| Education** | | | | 0.33 |
| No education | 54 (9.6) | 52 (9.9) | 2 (6.1) | |
| Elementary school | 113 (20.2) | 105 (19.9) | 8 (24.2) | |
| High school | 282 (50.4) | 262 (49.7) | 20 (60.6) | |
| University | 111 (19.8) | 108 (20.5) | 3 (9.1) | |
| Ethnicity (self-declared)** | | | | 0.08 |
| White | 330 (59.2) | 317 (60.5) | 13 (39.4) | |
| Black | 94 (16.9) | 85 (16.2) | 9 (27.3) | |
| Brown | 131 (23.5) | 120 (22.9) | 11 (33.3) | |
| Yellow | 2 (0.4) | 2 (0.4) | - | |

IBGE: Brazilian Institute of Geography and Statistics. *Fisher's exact test. **Values with missing data.

***Table 2*** — Chance of syphilis in pregnancy according to sociodemographic and economic variables.

| Variables | Raw Odds ratio * | | Adjusted Odds ratio * | |
|---|---|---|---|---|
| | OR (CI95%) | p-valor | OR (CI95%) | p-value |
| Age | | | | |
| 15 - 17† | 1 | | 1 | |
| 18 - 30 | 0.647 (0.141 - 2.975) | 0.576 | 0.523 (0.096 - 2.840) | 0.452 |
| 31 - 45 | 0.329 (0.065 - 1.671) | 0.180 | 0.296 (0.047 -1.866) | 0.195 |
| Social stratum‡ | | | | |
| B | 2.156 (0.239 - 19.469) | 0.494 | 5.751 (0.506 - 65.373) | 0.158 |
| C | 0.121 (0.016 -0.921) | 0.044 | 0.165 (0.020 - 1.327) | 0.091 |
| D | 0.596 (0.280 - 1.269) | 0.179 | 0.669 (0.300 - 1.492) | 0.325 |
| E† | 1 | | 1 | |
| Education | | | | |
| No education† | 1 | | 1 | |
| Elementary school | 1.981 (0.4061 - 9.663) | 0.398 | 1.814 (0.361 - 9.121) | 0.470 |
| High school | 1.985 (0.4501 - 8.751) | 0.365 | 2.495 (0.528 - 11.797) | 0.249 |
| University education | 0.722 (0.1171 - 4.455) | 0.726 | 1.445 (0.199 - 10.471) | 0.716 |
| Ethnicity‡ | | | | |
| White† | 1 | | 1 | |
| Black | 2.582 (1.068 - 6.243) | 0.035‡ | 2.703 (1.062 - 6.880) | 0.037§ |
| Brown | 2.235 (0.975 - 5.126) | 0.058 | 2.233 (0.930 - 5.360) | 0.072 |

*Binary logistic regression. †Reference category. ‡ Excluded from the model the categories A stratum and the yellow category for containing only 1 and 2 cases, respectively. §p valor < 0.05.

## DISCUSSION

The situation of syphilis in Brazil, as well as in other countries, is worrying, and the infection needs to be controlled[12,13]. In May 2016, the World Health Assembly adopted the global health sector STI strategy 2016–2021, intending to control STIs (including syphilis) and decrease their impact as a public health problem by 2030[14].

According to this study's demographic and socioeconomic characteristics, there was a predominance of the age group between 18 and 30 years old, of self-declared white ethnicity, with complete high school, working women, and social stratum D according to the IBGE classification.

A study carried out in Bahia, covering 2007 to 2017, observed a reduction in the illiteracy rate of patients and an increase in average household income (R$ 335.81)[15]. At another maternity hospital in Santa Catarina, in 2018, the average age was 27.98 years, 70.8% were white, and most had completed high school[16]. In São Paulo, in a study conducted between 2010 and 2017, most pregnantwomen were between 20 and 39 years old, were white and had completed elementary school[17]. In a study conducted in a hospital at Maranhão in 2018 and 2019, most patients were between 20 and 29 years old, were brown, had incomplete primary education, had a household income of up to 1 minimum wage, and were unemployed[18]. In Amazonas, most were between 20 to 29 years, were brown, and had incomplete primary education[19].

There are numerous women with gestational syphilis younger than 30 years old. This trend follows what was observed for the whole of Brazil between 2005 and 2018, according to the Ministry of Health[12]. These findings may be related to the early onset of sexual activity, more intense sexual phase, low frequency of condom use during sexual intercourse, high rate of unplanned pregnancies, and late initiation of prenatal care in adolescents and young adults[19-22].

Regional differences were observed between patients in different studies. The self-declared ethnicity presents a different result from that found in the literature. According to the Ministry of Health, in 2018 and 2019, most pregnant women diagnosed with congenital syphilis in Brazil were brown[12,13]. However, there are differences in colonization throughout the national territory, with indigenous, African, European, and Asian ancestors. Brazil may be the most diverse country in the world[23], and these variations are easily perceived in different regions.

Regarding average household income, although there has been an increase in Bahia, there is a large discrepancy between the amounts received in Bahia, Maranhão, and Santa Catarina. According to the IBGE, the average income in 2019 of families in Bahia, Maranhão, and Santa Catarina was R$ 913.00, R$ 636.00, and R$ 1,769.00[24], demonstrating the wide variation in income between the Northeast and South Brazil.

Concerning prenatal consultations, 88.2% of the patients had 6 or more consultations, as recommended by the Ministry of Health[1,6]. Even so, regarding the screening test for gestational syphilis, most patients did not undergo the rapid test for syphilis, particularly in the third trimester. This demonstrates that the number of consultations alone would not be enough to consider prenatal care adequate and to reduce maternal and neonatal morbidity and mortality. Pregnant women need access to medication, accessible information, understanding of the disease and the treatment to be followed, and the possibility of an adequate follow-up with the necessary tests[18,21,25]. Additionally, pregnant women and their partners should feel included and welcomed by the health service, generating a relationship of trust and that health professionals are constantly updated and trained to provide patients with quality care[18].

Some studies demonstrate the diagnosis of gestational syphilis only at delivery, even if the patients have received adequate prenatal care[18]. A study in Portugal showed that only 7.4% of patients with gestational syphilis were diagnosed at the time of delivery, demonstrating a difference in the quality of prenatal care in a developed country[26].

Of the 33 patients diagnosed with gestational syphilis, 29 (87.9%) successfully completed the treatment, and 4 failed, caused by an inadequate dose for the stage of the disease (3.0%) and probable reinfection (9.1%). These treatment failures demonstrate a deficiency in prenatal care: in the active search for patients to adequately perform the treatment, in the prescription of an inadequate dose for the stage of the disease, and lack of understanding of the importance of STI prevention so that there is no reinfection.

Soares and Aquino demonstrated a statistically significant association between prenatal coverage and gestational syphilis. In Bahia, although Rede Cegonha has advocated rapid tests since 2011, implementation is still incipient, revealing a limitation in the quality of prenatal care[15].

A qualitative study in Rio Grande do Sul in 2018 evaluating pregnant women's knowledge about syphilis showed that women receive little information about the disease in consultations at health units. Although pregnant women had limited knowledge about the disease and transmission routes, some patients cited the condom as a prevention method[27]. Thus, strategies are needed to sensitize women and encourage self-care to prevent STIs, even in patients with stable relationships[28-30]. It is also necessary to ensure that the pregnant woman understands the information and guidance given in the prenatal consultations since the level of education interferes with the interpretation of the information[31].

There was a significant association between syphilis infection during pregnancy and the patient's social stratum and ethnicity, but not for age group and education. This study demonstrated that lower social stratum, lower family income, and self-declared black ethnicity are risk factors for acquiring syphilis during pregnancy. The lowest social stratum compromises access to quality health care[21] and the perception of self-care in health[17]. Although schooling was not a statistically significant risk factor for maternal syphilis in this study, there is a direct proportionality between schooling and income[32].

Other studies show that brown ethnicity and education are associated with gestational syphilis[18]. A

review by Santos observed that “non-white” skin color would be related to a worse quality of health[33]. In this sense, there is an inequality of access to health services related to ethnicity. Low schooling is a limitation for understanding the importance of preventing STIs through sex education, making it difficult to break the transmission chain[21].

Syphilis is a multifactorial disease, a reflection of living conditions and social inequalities in health. During pregnancy, this also reflects the lack of access to and quality of prenatal care[15]. Most publications referring to gestational syphilis alone or with congenital syphilis address the adequacy of treatment during pregnancy and risk factors for congenital syphilis.

Since Florianópolis is among the capitals with the highest rates of syphilis detection during pregnancy, with an incidence above the national average[12,13], more local studies are essential to assess characteristics of the region that may influence the high rates.

As limitations, we can consider that the study was conducted in a hospital unit that cares for high-risk pregnant women, a local reference for humanized care, which can lead to a better quality of prenatal care for most patients. Additionally, much of the information collected came from the patients' prenatal cards, which may not have been appropriately filled out.

More studies in other locations in Greater Florianópolis must be conducted so that the data can be generalized to the region.

## CONCLUSION

Low family income and self-declared black skin color are risk factors for acquiring syphilis during pregnancy. Public health projects related to health education aimed at the importance of preventing STIs, including syphilis, using barrier methods, such as male and female condoms, are in the future for eradicating gestational syphilis.

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