



## Prevalence and associated factors with syphilis in pregnant women attended in primary health care in a city in the Southeast, Brazil


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### Abstract

*Objectives:* to evaluate the prevalence and associated factors with acquired syphilis in pregnant women attended at the primary health care in Montes Claros-MG.

*Methods:* a cross-sectional study carried out with pregnant women enrolled in the *Estratégia Saúde da Família (Family Health Strategy)* teams in Montes Claros, Minas Gerais, Brazil (2018-2019). Sociodemographic, behavioral and obstetric factors were collected through a questionnaire applied by interview. The result of the Venereal Disease Research Laboratory (VDRL) examination was evaluated. Binary logistic regression analysis was used to determine associated factors with syphilis in pregnancy.

*Results:* the prevalence of syphilis found was 1.7% (CI95%= 1.44-1.96). Pregnant women who graduated from high school had 75% (OR = 0.25; CI95%= 0.08-0.81) less chance of having syphilis, when compared to pregnant women with elementary school. Pregnant women who used illicit drugs during pregnancy (OR = 3.47; CI95%= 1.02-11.82) and consumed alcoholic beverages during pregnancy (OR = 16.35; CI95%= 3.81-70.20) were more likely to have the disease.

*Conclusion:* schooling, consumption of alcohol and illicit drugs are associated with the diagnosis of syphilis in pregnant women. Therefore, educational programs and interventions are needed to address issues related to prevention, diagnosis, treatment and their risk factors, especially social determinants, and women's reproductive health issues.

**Key words** Gestational syphilis, Prenatal care, Risk factors, Infectious diseases



## Introduction

Globally, 36 million people are infected with syphilis and two million of these are pregnant women.<sup>1</sup> Syphilis is a sexually transmitted infection (STI), whose etiologic agent is the bacterium *Treponema pallidum*, first identified in 1905 by German scientists, and after a year, the first test for its diagnosis was developed.<sup>2</sup> Despite, widely available testing and treatment methods, gestational syphilis is still considered one of the main public health problems worldwide.<sup>3</sup>

Disease transmission occurs mainly through unprotected sexual intercourse (acquired syphilis), and can also be transmitted from mother to child during pregnancy, via the transplacental route, or during passage through the birth canal (congenital syphilis).<sup>2,4,5</sup>

Gestational syphilis can have serious implications, such as miscarriage, stillbirth, neonatal death, premature births, low birth weight babies and various early and late clinical complications in live births.<sup>1,6</sup> It can also compromise women's quality of life, mental health and reproductive health.<sup>7</sup>

Brazil is experiencing an increase in syphilis cases, declared as a public health emergency in 2016, mainly affecting pregnant women and newborns. The detection rate of syphilis cases in pregnant women increased from 13.4 in 2016 to 21.6 in 2020, where 61,441 syphilis cases in pregnant women and 22,065 congenital syphilis cases were reported.<sup>8</sup>

The recommendations for controlling the disease reinforce interventions aimed at preventing and diagnosing syphilis. The factors that contribute to women acquiring syphilis are related to various socioeconomic, behavioral and healthcare factors, such as: younger age, non-white race/color, low schooling, living in rural areas, drug, alcohol and smoking use, a history of STIs, abortions, multiple sexual partners, late and low-quality prenatal care, among others.<sup>9-13</sup>

Brazil is a reference in the implementation of actions to tackle syphilis based on the adoption of effective public policies to reduce cases of the infection, in line with the *Objetivos de Desenvolvimento Sustentável* (Sustainable Development Goals) in relation to the 2030 Agenda.<sup>14</sup> And even with 95% coverage of prenatal care and screening for syphilis in pregnant women, there is still a high incidence of this disease and it impacts on public health.<sup>15</sup>

Knowledge and understanding of the syphilis epidemiology and its risk factors are important to enhance education and prevent measures for the most vulnerable groups, the evaluation of actions to reduce vertical

transmission of syphilis, and the organization of the health system and services.<sup>16</sup>

In this context, the aim of this study was to assess the prevalence and associated factors with acquired syphilis in pregnant women attending primary health care (PHC) in Montes Claros-MG, Brazil.

## Methods

This is an epidemiological, cross-sectional, analytical study conducted with data from a larger study entitled ALGE - Evaluation of the Health Conditions of Pregnant Women in Montes Claros - MG: a longitudinal study conducted with pregnant women registered with the *Estratégia Saúde da Família* (ESF) (Family Health Strategy) teams in the urban area of the city of Montes Claros, in the North of Minas Gerais, Brazil.

The total population of the ALGE study was 1,279 pregnant women registered with the ESF teams in the urban area of the city of Montes Claros in 2018. The sample size was established in order to estimate population parameters with a prevalence of 50% (to maximize the sample size and because the project included several events), a 95% confidence interval (CI95%) and a precision level of 2.0%. Correction was made for a finite population (N=1,661 pregnant women) and an addition of 20% was also established to compensate for possible non-response and losses. The calculations showed that at least 1,180 pregnant women needed to take part. However, only 823 pregnant women (64.3%) provided Venereal Disease Research Laboratory (VDRL) test results, thus forming the sample for this study.

To select the sample, the ESF centers in the city were taken into account, which totaled 15 at the time of this study. The number of pregnant women sampled at each center was proportional to their representativeness in relation to the total population of registered pregnant women. We included pregnant women who were registered at a ESF of the PHC at any gestational age and excluded women who were pregnant with twins and those with cognitive impairment, according to information from the family member and/or the ESF team.

As for the data collection process, the coordination managers of the PHC and the ESF in the city were initially contacted to raise awareness and explain the purpose of the research. Once they had agreed, the ESF professionals responsible for prenatal care provided a list of pregnant women in their area of coverage containing their names, telephone numbers and addresses. Once they had these lists, a team of interviewers made initially telephone contact with the women, inviting them to come forward

and raise awareness of the study, and then scheduled and carried out the data collection. Data collection took place between October 2018 and November 2019, at the ESF health units or at the participant's home, depending on their availability.

A multi-professional team made up of health professionals and undergraduate students was responsible for the previously trained interviews, which took place face-to-face.

This study analyzed: (1) sociodemographic characteristics (age group, skin color, marital status, schooling, religious, occupation, family income, number of rooms and number of people in the house) (2) obstetric variables (pregnancy planning, number of pregnancies, previous abortions, prenatal care and number of appointments) (3) behavioral variables (use of licit and illicit drugs) and the outcome variable "diagnosis of syphilis during pregnancy" (VDRL test).

In order to evaluate the laboratorial tests, the research instrument used was a questionnaire containing questions with objective answers about prenatal issues relating to laboratorial tests. Initially, the intention was to identify whether the pregnant woman had access to request for laboratorial tests and which tests were carried out during prenatal care in each trimester. As for serologies, the pregnant woman was asked if she had been tested for Syphilis, Hepatitis B, HIV and Toxoplasmosis. In the case of the VDRL test, the titre of the test was assessed (from titres of 1:1 it is considered reactive) or qualitatively (reactive or non-reactive), as recorded on the pregnant woman's card.

Simple and relative frequencies were used to describe the characteristics of the study population. The magnitude of the association between the dependent variable "diagnosis of syphilis during pregnancy" and the other variables investigated was estimated by means of the odds ratio (OR), using the binary logistic regression model. Initially, bivariate analyses were carried out (Pearson's chi-squared test) and the variables that showed a descriptive level ( $p$ -value of up to 0.25) were selected for the multiple model, with a significance level of 0.05.

It should be noted that the assumption of multicollinearity was checked and there was no autocorrelation between the variables. The quality of the final model was analyzed using the Hosmer and Lemeshow test.

All the analyses were carried out using the statistical program Statistical Package for the Social Science (SPSS), Windows version 20.0® (SPSS for Windows, Chicago, USA).

This research project was approved by the Research Ethics Committee of the *Universidade Estadual de Montes Claros*, with substantiated opinion number 2.483.623/2018, CAAE 80957817.

## Results

A total of 823 women took part in this study, most were aged between 21 and 30 (48.9%), self-declared as non-white (88.6%), with more than eight years of schooling (65.0%) and considered moderately religious (52.2%). With regard to marital status, 637 (79.5%) women had partners, 62.9% lived in homes with five or fewer rooms, the most (59.3%) lived with up to three people in the home, and 42.1% had a family income of up to 1,000 reais per month and 35.2% between 1,001 and 2,000 reais. According to occupational category, more than half of the participants were housewives (53.9%), about 35.5% received salary and 10.6% of these women were self-employed (Table 1).

With regard to obstetric and behavioral variables, more than half (57.0%) of the participants had not planned the pregnancy, 52.4% of the women were primigravidas, 19.7% reported had an abortion, 88.9% started prenatal care in the first trimester of pregnancy and, at the time of data collection, 40.8% of the participants had had up to three prenatal consultations and 24.6% more than six. Before the pregnancy, 38.1% of the women consumed alcohol and 1.5% other illicit drugs. During pregnancy, these percentages fell to 9.4% and 0.4%, respectively (Table 1).

The prevalence of syphilis among the participants was 1.7% (VDRL reactive result). In the bivariate analysis, the variables that were associated ( $p < 0.25$ ) with the occurrence of syphilis during pregnancy were: schooling ( $p = 0.022$ ), marital status ( $p = 0.043$ ), number of people in the household ( $p = 0.017$ ), household income ( $p = 0.252$ ), occupation ( $p = 0.084$ ), number of prenatal consultations ( $p = 0.184$ ), alcohol consumption during pregnancy ( $p = 0.039$ ), use of illicit drugs before pregnancy ( $p = 0.002$ ) and during pregnancy ( $p = 0.067$ ) (Table 1).

Table 2 shows the results of the multivariate analysis. Pregnant women graduated from high school were 75% (OR=0.25; CI95%=0.08-0.81) less likely to have syphilis compared to pregnant women with an elementary schooling. The use of alcoholic beverages during pregnancy (OR=3.47; CI95%=1.02-11.82) and the use of illicit drugs before pregnancy (OR=16.35; CI95%=3.81-70.20) were the associated factors with a higher risk of syphilis.

Table 1

Bivariate analysis for VDRL test and sociodemographic, behavioral and obstetric variables of pregnant women attended at the *Estratégia Saúde da família* (ESF) of Montes Claros, MG, Brazil, 2019 (n=823).

Variables	Total (n=823)		VDRL				p
			Non reactive (n=809)		Reactive (n=14)		
	n	%	n	%	n	%	
Age group (years)							
≤ 20	150	18.6	146	97.3	4	2.7	0.519
21 – 30	390	48.9	385	98.7	5	1.3	
>30	258	32.5	254	98.4	4	1.6	
Skin color							
White	92	11.4	92	100.0	0	0.0	0.997
Non-white	724	88.6	710	98.1	14	1.9	
Schooling							
Elementary school	99	11.7	94	94.9	5	5.1	0.022
High school	532	65.0	525	98.7	7	1.3	
Higher education/post-graduate	192	23.3	190	99.0	2	1.0	
Religious							
Very	229	28.2	227	99.1	2	0.9	0.460
Moderate	430	52.2	422	98.1	8	1.9	
A Little/none	163	19.6	159	97.5	4	2.5	
Marital status							
With partner	649	79.5	641	98.8	8	1.2	0.043
Without partner	173	20.5	167	96.5	6	3.5	
Number of rooms							
≤ 5	513	62.9	504	98.2	9	1.8	0.926
>5	300	37.1	295	98.3	5	1.7	
Number of households							
≤ 3	482	59.3	479	99.4	3	0.6	0.017
4 - 5	25	30.2	245	96.8	8	3.2	
≥6	87	10.5	84	96.6	3	3.4	
Family income (R\$)							
≤1.000	334	42.1	325	97.3	9	2.7	0.252
1.001 up to 2.000	273	35.2	270	98.9	3	1.1	
>2.000	178	22.6	176	98.9	2	1.1	
Occupation							
Self-employed	89	10.6	87	97.8	2	2.2	0.084
Salary worker	290	35.5	289	99.7	1	0.3	
Housewife/none	444	53.9	433	97.5	11	2.5	
Planned pregnancy							
Yes	349	43.0	345	98.9	4	1.1	0.277
No	466	57.0	456	97.9	10	2.1	
Number of previous pregnancy							
Primigravida	250	52.4	245	98.0	5	2.0	0.877
Multigravida	227	47.6	222	97.8	5	2.2	
History of abortion							
None	648	80.3	638	98.5	10	1.5	0.406
≥ 1	160	19.7	156	97.5	4	2.5	
Prenatal onset							
1 <sup>st</sup> trimester	681	88.9	669	98.2	12	1.8	0.702
From the 2 <sup>nd</sup> trimester	84	11.1	83	98.8	1	1.2	

Number of consultations							
≤ 3	327	40.8	324	99.1	3	0.9	0.184
4 - 6	280	34.6	272	97.1	8	2.9	
>6	196	24.6	193	98.5	3	1.5	
Use of alcohol before pregnancy							
No	506	61.9	499	98.6	7	1.4	0.367
Yes	315	38.1	308	97.8	7	2.2	
Use of alcohol during pregnancy							
No	740	90.6	730	98.6	10	1.4	0.039
Yes	80	9.4	76	95.0	4	5.0	
Use of illicit drugs before pregnancy							
No	805	98.5	794	98.6	11	1.4	0.002
Yes	15	1.5	12	80.0	3	2.0	
Use of illicit drugs during pregnancy							
No	815	99.6	802	98.4	13	1.6	0.067
Yes	4	0.4	3	75.0	1	25.0	

R\$ = Brazilian reais, Brazilian currency.

**Table 2**

Adjusted model for acquired syphilis, according to sociodemographic, behavioral and obstetric variables, crude and adjusted Odds Ratio (OR) among pregnant women attended at the *Estratégias Saúde da Família* (ESF)(Family Health Strategies) of Montes Claros, MG, Brazil, 2019.

Variables	ORb (CI95%)	ORa (CI95%)	p
Schooling			
Elementary school	1	1	
High school	0.25 (0.08-0.81)	0.27 (0.08-0.89)	0.032*
Higher education/post-graduate	0.20 (0.04-1.04)	0.19 (0.03-1.03)	0.055
Marital status			
With partner	1	-	-
Without partner	2.88 (0.99-8.41)	-	-
Number of households			
≤ 3	1	-	-
4 - 5	5.21 (1.37-19.83)	-	-
≥6	5.70 (1.13-28.73)	-	-
Family income (R\$)			
≤1000	1	-	-
1001 to 2000	0.40 (0.11-1.50)	-	-
>2000	0.41 (0.09-1.92)	-	-
Occupation			
Self-employed	1	-	-
Salary worker	0.15 (0.01-1.68)	-	-
Housewife/none	1.11 (0.24-5.07)	-	-
Number of consultations			
≤ 3	1	-	-
4 to 6	3.18 (0.84-12.09)	-	-
>6	1.68 (0.34-8.40)	-	-
Use of alcohol during pregnancy			
No	1	1	-
Yes	3.84 (1.18-12.55)	3.47 (1.02-11.82)	0.047*
Use of illicit drugs before pregnancy			
No	1	1	-
Yes	18.05 (4.46-73.04)	16.35 (3.81-70.20)	0.000*
Use of illicit drugs during pregnancy			
No	1	-	-
Yes	20.56 (2.00-211.05)	-	-

OR= odds ratio; CI95%= 95% confidence interval; \*p < 0.05; Hosmer Lemeshow= 0.539 p = 0.764; R\$ = Brazilian reais, Brazilian currency.

## Discussion

The findings of this study show that 1.7% of pregnant women undergoing prenatal care at the ESF in Montes Claros, in the North of Minas Gerais, were infected with syphilis. This prevalence is lower than that observed in studies carried out in the Zona da Mata Mineira and in the South and Midwest regions of Brazil.<sup>17,13,10</sup> In the national context, the prevalence of gestational syphilis has increased significantly over the years. According to data from the Ministry of Health, syphilis detection rate was 5.7% in 2012, reaching 27.1% in 2021.<sup>18</sup> This significant increase can be attributed to the increase in prenatal care coverage and syphilis screening across the country.

It is interesting to note that, despite differences in accessibility to health services, risk behaviors and awareness of syphilis infection, the prevalence found in this study is similar to those reported in international studies were carried out in India, Ethiopia and South Africa.<sup>19,3,11</sup>

In relation to the pregnant women's sociodemographic profile, the findings are similar to other studies in which the majority of women were non-white, had completed high school, had a partner and were housewives.<sup>10,13,17,20</sup> With regard to obstetric variables, Guedes *et al.*<sup>17</sup> found similar data regarding to a history of miscarriage, starting prenatal care in the first trimester of pregnancy and having six or more appointments.

When evaluating the associated factors with a diagnosis of syphilis, this study found that a higher level of schooling reduced the chances of the pregnant woman having the disease by 75%. Biswas *et al.*<sup>19</sup> found that the prevalence of syphilis was higher among illiterate pregnant women, with a gradual reduction in the chance of having syphilis as schooling improved. Low schooling has been identified as a risk factor for syphilis in several studies,<sup>13,16,21,22</sup> suggesting that this group is more exposed to infection due to less access to information and a limited understanding of the importance of health care, and should therefore receive greater attention from syphilis control programs during pregnancy.<sup>16,23,24</sup>

A study carried out by Attanasio *et al.*<sup>25</sup> shows that even pregnant women diagnosed with syphilis did not have sufficient knowledge about what the disease is and how to prevent it, with little knowledge being acquired only after confirmation of syphilis. This is due to difficulties associated with the social context in which women live, such as a low level of schooling and lack of prior knowledge about the disease, as well as a possible failure of the health system in public policies aimed at syphilis prevention and health education for the population.<sup>25,26</sup> In this context, it should be noted that PHC plays a fundamental role in tackling vertical transmission of syphilis in pregnant women, as it is the main gateway to

health services and can help change the epidemiological picture of gestational syphilis.

This study showed that participants who consumed alcohol during pregnancy were 3.47 times more likely to be infected with syphilis. Corroborating this, a study by Enbiale *et al.*<sup>12</sup> showed that pregnant women who consumed alcohol were three times more likely to be seropositive for syphilis than women who did not consume alcohol.

Furthermore, this study found that the chance of having syphilis was 16.35 times higher among pregnant women who had used illicit drugs before pregnancy. Previous studies have also found that the use of illicit drugs resulted in a significant increase in the risk of developing syphilis in pregnant women. For example, while a study carried out in Mato Grosso do Sul, a State in the Midwest region of Brazil, found a 13-fold increase in risk, other studies in Brazil and Ethiopia showed that illicit drug use increased the chance of women having gestational syphilis by more than three times.<sup>10,21,20</sup>

Exposure to syphilis via sexual route is the most common, like any other STI.<sup>27</sup> Alcohol and drug use increases the likelihood of a person having multiple sexual partners, not using condoms, reducing the perception of the risk of contamination and increasing the risk of unwanted pregnancies.<sup>10</sup> In addition, according to Lendado *et al.*<sup>20</sup> pregnant women with a history of drug use tend to be reluctant to attend prenatal care, get tested and follow treatment for syphilis.

Investigating the association between low schooling and the consume of alcohol and illicit drugs with the prevalence of syphilis in pregnant women found in this study provides useful information for public health. It reinforces that the epidemiological dynamics of syphilis in society encompass a multiplicity of factors that condition situations of vulnerability imposed by social and economic factors, such as access to education, family income and place of residence, reflecting access to health services.<sup>28</sup>

This study had some limitations in its development, such as the use of secondary data (prenatal card), subject to the quality of the records. The results achieved do not represent the serological situation of the population of pregnant women in the city of Montes Claros, as the study only included those who had prenatal care at the Montes Claros PHC, which could underestimate the real incidence of congenital syphilis in the city.

Schooling and the consumption of alcohol and illicit drugs are associated with the diagnosis of syphilis in pregnant women. Therefore, educational programs and interventions are needed to address issues related to the prevention, diagnosis and treatment on syphilis and its risk factors, especially social determinants and women's reproductive health issues.

## Authors' contribution

Esméria Neta M, Oliveira e Silva C, Silva Jr RF, Eleutério TP, Holzmann APF, Ruas EFG and Marques LO: conception, structuring, data analysis and interpretation, critical review of the manuscript. All the authors have approved the final version of the article and declared no conflicts of interest.

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