

**EPIDEMIOLOGICAL  
PROFILE OF  
GESTATIONAL AND  
CONGENITAL SYPHILIS  
IN THE MUNICIPALITY  
OF SAO JOÃO DO IVAÍ-  
PARANÁ- BRAZIL**

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**Abstract:** **INTRODUCTION:** Syphilis is an infectious disease caused by the systemic agent *Treponema pallidum*, preventable and which, when not treated early, can develop into a chronic condition with irreversible sequelae. The vertical transmission of the disease is one of the most worrying outcomes of the syphilis problem in the world, due to its unfavorable consequences for the conceptus. **OBJECTIVE:** Evaluate the epidemiological profile of gestational syphilis (SG) and congenital syphilis (SC) in the city of São João do Ivaí/Paraná, and know the sociodemographic profile of pregnant women affected by the disease between 2010 and 2020. **METHOD:** This is an epidemiological, quantitative study, descriptive, cross-sectional that used data obtained from the diagnoses of gestational and congenital syphilis in the city of São João do Ivaí/PR reported in the National System of Diseases and Notifications (SINAN) in the period 2010 to 2020. **RESULTS:** In the evaluated period, 11 cases of gestational syphilis were reported in São João do Ivaí, the pregnant women being predominantly young, brown and with low education. All pregnant women diagnosed prenatal care and 50% of them underwent appropriate treatment. Two cases evolved into a congenital form, one conceptus was born with syphilis and the other died from the disease. **CONCLUSION:** The occurrence of gestational and congenital syphilis is still a challenge for public health worldwide and the findings of this research are of great epidemiological importance so that health services can organize themselves and create strategies to cope with the disease at the local level.

**Keywords:** Congenital syphilis, Gestational syphilis, Prenatal care, *Treponema pallidum*, Vertical Transmission of Infectious Disease.

## INTRODUCTION

Syphilis (IS) is a systemic infectious disease that can be preventable and, when not treated early, can evolve to a chronic condition with irreversible sequelae (ANDRADE *et al.* 2018). It is a systemic infection of bacterial etiology caused by the spirochete *Treponema pallidum* whose transmission occurs predominantly sexually, and may also occur by transplacental (vertical or congenital transmission) or blood (ROWLEY *et al.*, 2019, HOOK, 2017).

The etiological agent of SI, *T. pallidum* subspecies *pallidum*, is a pathogenic bacterium that belongs to the order *Spirochaetales* of the family *Treponemataceae* (FERREIRA; SOUZA, 2000). Bacteria of this kind have a cell wall of structure similar to that of Gram-negative bacteria, characterized by helical bacilli with spiral-shaped cell body surrounded by a cytoplasmic membrane and delimited by an external membrane (LAFOND; LUKEHART, 2006).

Despite the existence of effective measures for the diagnosis, treatment, prevention and control of IS, epidemiological data from the Ministry of Health show that between 2010 and 2017, 650,258 new cases of acquired IS and 324,321 cases of gestational syphilis (GS) were reported in Brazil. Cases of congenital syphilis (CS) between 1998 and 2017 totaled 214,891 new notifications, with incidence rates rising from 2.4 in 2010 to 8.6 cases per 1,000 live births in 2017 (BRASIL 1A, 2018). The Pan American Health Organization (PAHO) states that since 2015, the incidence of CS in the Americas is mainly influenced by the increasing rate of cases in Brazil, which accounts for 85% of cases across the continent (PAHO, 2019).

Vertical transmission of the disease is one of the most worrying outcomes of the IS problem in the world, due to its numerous unfavorable consequences (HOOK, 2017). CS has a broad clinical spectrum,

and may manifest from asymptomatic or oligosymptomatic to severe forms, with septic conditions, fetal and neonatal deaths (ORTIZ-LOPEZ et al., 2012). Several authors agree and point out that CS, if not adequately treated, is related to serious consequences for pregnant women and the conceptus, such as: abortion, fetal death, stillbirth, congenital malformations, prematurity and low birth weight (LIN; EDER; BEAN, 2018, HOOK, 2017, RAC; REVELL, REVELL. EPPES, 2017).

Health authorities recommend that tests for the diagnosis of GS be performed in the first and third trimester of pregnancy and also at the time of delivery, regardless of the results of previous tests, and also in cases of abortion (BRASIL 1B, 2019). The correct diagnosis and proper treatment of infected pregnant women is the best method of preventing CS, and can reduce vertical transmission by up to 97% (ROWLEY *et al.* 2019; SARACENI et al.2017).

Ordinance 3161/2011 of the Ministry of Health (MS) provides for the treatment of CS in Brazil and according to this document, Benzathine benzylpenicillin is the only medicine that effectively treats pregnant women with IS and the fetus, given its ability to completely cross the transplacental barrier. It is recommended that pregnant women in the primary and secondary phase of the disease receive Benzathine benzylpenicillin at a dose of 2,400,000 IU divided into two injections, with an interval of seven days between them. Maternal treatment will only be considered appropriate if it has been started up to 30 days before delivery and if the full cycle has been administered. Pregnant women who do not fit this treatment protocol will be defined as inadequately treated and their newborn will be classified as a case of CS and submitted to clinical, laboratory and therapeutic evaluation and epidemiological notification.

It is irrefutable that CS is a preventable disease, provided that GS is diagnosed and

properly treated. However, despite efforts to diagnose and treat adequately, the disease still remains a serious public health problem and denounces existing failures in primary care services, especially in prenatal programs.

The aspects mentioned above make evident the importance of CS in public health, mainly due to the significant social and economic impacts they have on society. Thus, considering the relevance of this theme, this study aimed to evaluate the epidemiological profile of GS and CS in the municipality of São João do Ivaí/Paraná, Brazil and to know the sociodemographic profile of pregnant women affected by the disease between 2010 and 2020.

## METHODOLOGY

This is an epidemiological, quantitative, descriptive, cross-sectional study. The present used secondary data referring to the municipality of São João do Ivaí/PR. The data of this research were obtained from the diagnoses of SG and CS notified in the National System of Diseases and Notifies (SINAN), from the DATASUS database in the period from 2010 to 2020. The study population included all cases of GS and CS reported in pregnant women living in the municipality, including abortions, fetal deaths and live births.

Maternal sociodemographic variables were also analyzed, referring to age group, marital status, education and race, and variables related to prenatal/delivery of pregnant women such as prenatal care (yes/no), number of prenatal consultations, previous deliveries, time of diagnosis of IS, treatment schedule, diagnostic tests performed (non-treponemal test or treponemal confirmatory test).

The incidence rates of SG and CS were calculated by dividing the number of new cases per year by the number of live births in the same year, and this result was multiplied by

1000. The number of live births was obtained from the Information System on Live Births (SINASC). Because it is a secondary study, it was not necessary to submit it to the Research Ethics Committee of the Ingá University Center (UNINGÁ) as recommended by Resolution 466/12 of the National Health Council.

## RESULTS AND DISCUSSION

Epidemiological data from SINAN show that the number of Brazilian notifying municipalities and the occurrence of GS have increased considerably in the last 10 years, from 10,070 cases in 2010 to 61,127 in 2019. The state of Paraná followed this growth trend in the rest of the country, from 339 cases in 2010 to 2,837 cases reported in 2019.

From 2010 to 2020, 11 cases of GS were reported in the city of São João do Ivaí/PR. Most diagnoses were made in the first trimester of pregnancy (72.7%). In 2019, the highest number of GS diagnoses was observed with 4 cases. These data mean that the number of cases of GS also increased over the years in the municipality of São João do Ivaí/PR, and although it did not occur in a prevalent way during the 10 years studied, it went from 1 case reported in 2010 to 3 cases in 2019 (Table 1).

According to Azeredo *et al.* (2021) the considerable increase in the number of cases of IS in pregnant women throughout the country is related to several factors, among which we highlight the improvement in the epidemiological surveillance system, the increase in access to diagnosis resulting from the dissemination of rapid tests and the reduction of condom use. Guimarães *et al.* (2018) and Da Silva *et al.* (2019) also add to the non-realization or implementation of ineffective health education actions for sexually active women.

When stratification of the proportion of pregnant women with IS according to sociodemographic characteristics, it was noticed that the indicator was higher in pregnant women aged 15 to 29 years (63.6%), with low schooling (less than 8 years of schooling), that is, incomplete elementary school (36.3%) and skin color or brown race (81.8%) (Table 2).

These findings related to the epidemiological profile are in agreement with the results obtained by several other studies conducted at the national level, which also showed that pregnant women affected by GS are predominantly young, with low schooling and brown (LOBATO *et al.* 2021, TOBIAS, AQUINO 2021, SILVA; CARVALHO; CHAGAS 2021, GARBIN *et al.* 2019, PADOVANI; OLIVEIRA; PELLOSO 2018).

According to Silva *et al.* (2017) the age group between 20 and 29 years is the one with the highest prevalence of GS is related to the reproductive period in which women are, that is, sexually active, and are therefore more likely to acquire the infection. Azeredo *et al.* (2021) corroborate the mention that young adults are more vulnerable and exposed to sexually transmitted diseases and unplanned pregnancy, since the age, emotional and cognitive immaturity of these individuals causes them to neglect the use of contraceptives.

Most pregnant women reported with IS have a low level of education, a variant considered a factor of higher risk for exposure to sexually transmitted diseases. The studies of Domingues *et al.* (2014) demonstrate that the prevalence of GS is 3.2 times higher in pregnant women with low or no schooling and it is already well established that the lower access to information triggers a limited understanding of the importance of prevention measures, identification and treatment of sexually transmitted diseases

Gestational age	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
1st quarter	1	-	-	-	-	-	2	1	1	3	-	8
2nd quarter	-	-	-	-	-	1	1	-	-	1	-	3
3rd quarter	-	-	-	-	-	-	-	-	-	-	-	-
Ignored	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>-</b>	<b>11</b>

Table 1 - Cases of pregnant women diagnosed with syphilis according to gestational age per year of diagnosis. Brazil, 2010-2020.

Source: MS/SVS/SINAN/Epidemiological Surveillance Division/Municipal Health Department of São João do Ivaí (PR).

Variables	SG cases	
	n	%
<b>Age group in years</b>		
10-14 years old	0	-
15-19 years old	6	54,5
20-29 years old	1	9,1
30-39 years old	3	27,3
40 years or older	1	9,1
Ignored	0	-
<b>Schooling</b>		
Illiterate	0	-
Incomplete elementary school	4	36,3
Complete elementary school	2	18,2
Incomplete high school	2	18,2
Complete high school	3	27,3
Incomplete higher education	0	-
Complete higher education	0	-
Ignored or blank	0	-
<b>Skin color or race</b>		
White	1	9,1
Black	1	9,1
Yellow	0	-
Brown	9	81,8
Indigenous	0	-
Ignored	0	-

Table 2. Sociodemographic characteristics of pregnant women diagnosed with syphilis. São João do Ivaí (PR), Brazil, 2010 to 2020.

Source: MS/SVS/Epidemiological Surveillance Division/Municipal Health Department of São João do Ivaí (PR)

(SILVA; CARVALHO; CHAGAS 2021, PADOVANI; OLIVEIRA; PELLOSO 2018, SERAFIM et al. 2014).

Regarding prenatal follow-up, we identified that 100% of the pregnant women from São João do Ivaí-PR had prenatal care during the period analyzed (Table 3). This finding is very similar to Ramos' study; Boni (2018) who evaluated the prevalence of GS and CS in the population of the municipality of Maringá-PR and demonstrated that 97.8% of the pregnant women in their study underwent prenatal follow-up. It is emphasized that the early and complete onset of prenatal care is associated with greater adequacy of IS control actions (DOMINGUES et al. 2021). However, despite the expansion of access to prenatal care in Brazil in recent years, there is an increase in the cases of GS, indicating that prenatal care alone is not enough (FIGUEIREDO *et al.* 2020).

For Silva; CARVALHO; Chagas (2021) and Azeredo *et al.* (2021) agree that only prenatal consultations are not enough, because pregnant women need accessible information about the disease and the importance of adequate treatment, good bond with health teams, and easy access to health professionals and medications.

Of this total of pregnant women with IS, 45.5% were diagnosed during prenatal care and 45.5% during hospitalization for delivery or curettage, and in only one case this information was ignored (9%) (Table 3). This result is in line with other national studies that identified diagnosis rates during prenatal care ranging from 47% to 62.5% (TOBIAS; AQUINO 2021, LAFETÁ et al. 2019, RAMOS, BONI, 2018, MASCHIO-LIMA et al. 2018, BARBOSA et al. 2017).

These figures are worrisome, since the diagnosis of infection in this period is considered late and indicates failures in the early identification of the disease and

compromises the actions of prevention of the disease, as well as the occurrence of high rates of vertical transmission and negative outcomes. Trevisan *et al.* (2018) and Nonato; Melo; Guimarães (2015) justify that this high rate of late diagnosis is also due to the fact that many pregnant women start prenatal care in the last gestational trimester, compromising the quality of care directed to them.

Regarding the clinical classification of the disease, it was identified that the majority of pregnant women from São João do Ivaí-PR were diagnosed in the secondary phase (latent) (54.6%), followed by primary (36.3%) and tertiary (9.1%) (Table 3). These data contradict the published literature in which the diagnosis in the secondary phase of the disease is greater than 90% (SILVA; CARVALHO; CHAVESKZ 2021, GARBIN et al. 2019). The Brazilian Ministry of Health (BRASIL 1B, 2019) highlights that forms filled out with detection of IS in its primary and tertiary phases may be incorrect and is usually related to the lack of knowledge of professionals about the infection, since the prevalence of occurrence of the disease occurs mostly in the latent phase, being difficult to diagnose in the primary and tertiary phases.

The detection and treatment of IS in pregnant women represent important public health measures and are considered essential for the control and prevention of CS (NONATO; MELO; GUIMARÃES 2015). Our findings showed that 63.6% of pregnant women diagnosed with IS received adequate treatment, a higher number than those reported by Silva; CARVALHO; Chaveskz (2021) and Padovani; Oliveira; Pelloso (2018) who identified in their studies rates of 46% and 50%, respectively.

Penicillin is the drug of choice in the treatment of IS with an efficacy rate of 98% in the prevention of CS, acting in all stages of the disease and without reports of

Variables	SG cases	
	n	%
<b>Realization of prenatal</b>		
Yes	11	100
No	0	-
<b>Moment of diagnosis</b>		
During prenatal care	5	45,5
During childbirth/curettage	5	45,5
Postpartum	0	-
Unrealized	0	-
Ignored	1	9
<b>Clinical classification</b>		
Primary syphilis	4	36,3
Secondary syphilis	1	9,1
Tertiary syphilis	0	-
Latent syphilis	6	54,6
Ignored	0	-
<b>Maternal Treatment Scheme</b>		
Benzathine benzylpenicillin	7	63,6
Another scheme	1	9,1
Unrealized	1	9,1
Ignored	2	18,2

Table 3. Prenatal characteristics, clinical classification and treatment of pregnant women with syphilis according to clinical classification by year of diagnosis. São João do Ivaí (PR), Brazil, 2010 to 2020.

Source: MS/SVS/Epidemiological Surveillance Division/Municipal Health Department of São João do Ivaí (PR).

Variables	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
<b>Congenital syphilis</b>	1	-	-	-	-	1	3	1	1	4	-	11
<b>Gestational syphilis</b>	-	-	-	-	-	-	1	1	-	-	-	2
<b>Incidence Rate of CS</b>	-	-	-	-	-	-	7,1	6,9	-	-	-	

Table 4 - Comparison between cases of gestational syphilis and the number of cases of congenital syphilis per year of diagnosis and incidence rates of CS. Brazil, 2010-2020.

Source: MS/SVS/SINAN/SINASC/Epidemiological Surveillance Division/Municipal Health Department of São João do Ivaí (PR).

resistance of *Treponema pallidum* to this drug (CAVALCANTE; PEREIRA, CASTRO 2014). But according to the Ministry of Health, despite the existence of well-established, simple and low-cost treatment protocols, the flaws in this important stage and the consequent increase in CS rates are evident (BRASIL 1E, 2015).

CS is the result of hematogenous dissemination of *Treponema pallidum* from untreated or inadequately treated infected pregnant women for their conceptus, via transplacental (LEITÃO *et al.* 2009). Vertical transmission of IS can occur at any stage of pregnancy, being influenced by the stage of the infection of the mother and also by the time of exposure of the fetus, factors that determine the possible negative consequences of the disease, which include abortion, stillbirth, preterm delivery, neonatal death and early or late congenital manifestations.

Like SG, CS is a problem of compulsory notification, but despite this, there are still failures in this process, with a high rate of underreporting of cases (RAMOS; BONI 2018). A comparison between the number of pregnant women with IS and the number of cases of CS reported between the years 2010 to 2020 was traced and the results are represented in Table 4. Of the 11 cases of GS diagnosed in the period in the municipality of São João do Ivaí, 2 of them evolved to CS (18%), one in 2016 and one in 2017. This information and data regarding the rates of occurrence (incidence) of CS in the municipality are shown in Table 4.

The incidence rate of CS in São João do Ivaí/PR was 7.1 per thousand live births in 2016 and 6.9 per 1,000 live births in 2017, data very similar to state and national rates. SINAN data show that in the state of Paraná in 2018, CS presented a rate of 5.6 per 1,000 livebirths, in the Southern region it was 8.9 per 1,000 live births and in Brazil the rate was 9.0 per 1,000 live births.

Table 5 represents the research variables used to characterize the epidemiological profile of CS in the municipality between 2010 and 2020. According to the data analyzed, pregnant women with a history of vertical transmission of IS were between 15 and 29 years old and 100% of them had prenatal care. Nevertheless, in only one of the cases (50%) the diagnosis was made during this period.

It is important to highlight that we observed a divergence in the data related to the gestational period in which GS was diagnosed. SINAN data on GS in the target municipality of this study showed that 100% of pregnant women diagnosed with IS underwent prenatal care, with 100% of the diagnoses made in the 1st and 2nd trimester of pregnancy (Table 1). However, information regarding vertical transmission of the disease in the same system and in the same period showed that 50% of the pregnant women had the diagnosis of CS performed during prenatal care and 50% at the time of delivery or curettage. This last result is closer and in line with other studies in the literature that indicate a high number of late diagnoses (Lobato *et al.* 2021).

Despite the diagnosis still made in prenatal care in one of the pregnant women, the treatment performed by her was considered inadequate (Table 5). To Lago; Vaccari; Fiori (2013) most cases of CS are due to failures in testing during prenatal care, or inadequate treatment or absent from maternal IS.

Maternal treatment is considered appropriate when performed 30 days before delivery, and the pregnant woman is diagnosed in the primary and secondary phase of the disease treated with Benzathine benzylpenicillin at a dose of 2,400,000 IU divided into two injections, with a seven-day delay between them.

Table 5 also shows the variables related to the sociodemographic characteristics of CS and these findings are in line with the results



Variables	Cases of CS	
	n	%
<b>Prenatal Realization</b>		
Yes	2	100
No	0	-
<b>Moment of diagnosis</b>		
During prenatal care	1	50
In childbirth or curettage	1	50
<b>Mother's treatment scheme</b>		
Inadequate	1	50
Ignored	1	50
<b>Mother's age</b>		
15 to 19 years	1	50
20 to 29 years old	1	50
<b>Child's age at diagnosis</b>		
Less than 7 days	2	100
<b>Child race</b>		
Brown	1	50
Yellow	1	50
<b>Evolution of the case</b>		
Born alive	1	50
Death from syphilis	1	50

Table 5. Congenital syphilis variables in the municipality of São João do Ivaí (PR), Brazil.  
Source: MS/SVS/SINAN/ Epidemiological Surveillance Division/Municipal Health Department of São João do Ivaí (PR).

of Lobato et al. (2021) who studied CS in the Amazon/MA and identified the predominance of young mothers, aged 20 to 29 years, brown and with incomplete elementary school.

The two babies who were born with CS in São João do Ivaí/PR in the analyzed period had their diagnoses confirmed up to 7 days after birth (Table 6). The diagnosis of CS involves prolongation of hospitalization and more costly and complex tests involving the direct research of spirochetes under dark field microscopy of a sample from the placenta and umbilical cord and also by VDRL (non-treponemal test). Evidence of spirochetes in tissue, liquid or body fluid samples (LOBATO et al) is considered confirmed. 2021, ROSA et al. 2020, FEITOSA; ROCK; COAST 2016).

Regarding the race of the babies, we identified that one of them was brown (50%) and one yellow (50%) (Table 5). At this point, another possible problem related to SINAN data, now on the race of pregnant women with GS. Information on maternal race indicated that 81.8% of them were classified as brown and 9.1% as white and 9.1% as black (Table 3). Thus, we can think of two conclusions: either that there is another error the answers of the SINAN or that the father of the baby in question was yellow (information not available in the system).

According to Costa; Aanholt; Ciosak (2021) incorrect or incomplete completion of the notification form has serious consequences, since the lack of data makes it impossible to have real accuracy of the situation of GS and CS and reflect the low quality of prenatal care in the country and/or the little knowledge and importance that health professionals have given to the diagnosis and treatment of IS, especially in pregnancy.

One of the babies in this study was born infected with IS (50%) and another died from the disease (50%) (Table 5). Our findings confirm national statistics that perinatal

mortality due to CS can reach up to 40% of infected children (Brasil 1E, 2015).

## CONCLUSION

Early detection and treatment of GS represent important public health measures and are essential for the prevention and control of CS. Despite the numerous preventive measures already implemented, the rates of occurrence of these diseases still present worrying levels, making of it a remarkable health challenge for managers, health professionals and the general population.

Although the diagnosis and treatment are easily accessible and low cost, the results of this research showed that there remains a high incidence of CS and GS in the evaluated municipality, indicating important failures in prenatal care and the need to create strategies to cope with these diseases at the local level.

To this end, the importance of providing training in epidemiology, physio pathogenic and the treatment of syphilis for health professionals, especially those who work in primary health care, who are in direct contact with pregnant women and their partners, is highlighted. It is also notesome the fundamental role of the adoption of well-defined clinical-therapeutic protocols capable of timely diagnosis and providing adequate treatment and monitoring of pregnant women and their concepts.

Finally, it is a great thing that the compulsory notification of these diseases to the Ministry of Health is performed correctly and completely, since this is the instrument that guides the incidence and prevalence of these diseases in society and the guide to create actions to cope with CS and SG.

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