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RESEARCH ARTICLE

Profile and Spatialization of Pregnant Women with Gestational Syphilis and Congenital Syphilis in a Municipality in South Brazil

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Abstract

Introduction: Congenital Syphilis (CS) is one of the most serious adverse outcomes in pregnancy, avoidable through early detection and treatment of the pregnant woman and her sexual partner.

Objectives and methods: To analyze and spatialize the occurrence of CS and Gestational Syphilis (GS) in a municipality in the central region of Rio Grande do Sul, from 2007 to 2012, by observing the population profile, using secondary data from the Notifiable Diseases Information System (SINAN-NET) database.

Results: During this period, 128 cases of GS and 73 cases of CS were notified. The frequency of notifications during the studied period increased from 2.3% to 39.2% for GS and from 1% to 41% for CS. Only 23.4% of the pregnant women's partners with GS were treated during antenatal care. Considering the number of GS and CS cases notified by administrative region, the greatest percentage occurred in the West region of the municipality.

Conclusion: GS and CS have increased considerably in the municipality. Actions are needed that qualify the attention to antenatal care and focus on the iniquity and health conditioning factors to reach the integrality of care.

Keywords

Syphilis, Antenatal care, Public health, Pregnant women

Introduction

Syphilis is an infectious systemic disease of chronic progression, with temporary cutaneous manifestations, subject to latency periods. Its course is divided into primary, secondary and tertiary. It is an ancient disease and its origin has been discussed for centuries [1]. The first theory states that syphilis was endemic in America and spread to Europe through Christopher Columbus's sailors; the second says that environmental factors could have caused alterations in the treponematoses that existed in Europe [2,3]. Although there are preventative measures in present days that allow its control such as condom use, tests that allow effective diagnosis with low costs, and simple treatments with high cure rates, syphilis still is a world problem [4-6] representing a serious issue of public health [4].

The transmission of acquired syphilis happens through sexual contact [1] in most cases nowadays. As syphilis is an infection of vertical transmission (VT), antenatal assistance for pregnant women is fundamental to detect infection and contribute to

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decrease fetal morbimortality, being this the ideal period to avoid losing opportunities to prevent CS besides providing access to diagnosis and treatment for pregnant women and their partners [7-9].

Early diagnosis and treatment for pregnant women are relatively simple and effective measures to prevent the disease [10]. A number of studies that incorporate the quality of antenatal care [11-15] show how weak the assistance provided to pregnant women is. Antenatal assessments based only on number of medical appointments and gestational age when antenatal care started are not enough to ensure good quality, being necessary to assess their content. In addition, mistakes made in antenatal care regarding CS include failing to perform serologic test, failing to treat the pregnant women and their partners [16-19], poor accessibility to exams [18], noncompliance with official protocols [20], poor counseling and approach for the partners [16].

CS is the consequence of *Treponema pallidum* dissemination from the infected pregnant woman to her child. Evidences of the presence of treponema in fetuses with a few weeks indicate that infection may occur at any stage of the pregnancy, including before the 16th week. In non-treated pregnant women, vertical transmission of the infection happens in approximately 70% of cases in primary syphilis, 70% to 100% in secondary syphilis, and 10% to 30% in tertiary and latent syphilis. The degree of intensity of CS manifestations depends on factors such as period of treponema penetration, number and virulence of infective treponemas and immune status of the mother [21].

According to the World Health Organization (WHO) [6,22], CS is one of the most severe adverse outcomes that can be preventable during pregnancy; approximately 40% of pregnancies result in fetal and perinatal losses, and from the remaining 60%, around 50% of the newborns may have physical, sensorial or developmental sequelae [23]. Thus, it is evident that the strategies used cannot solve the problem or identify its causes [24,25].

Therefore, in addition to an adequate antenatal care, control measures must include other moments such as the period before pregnancy and before admission to the maternity ward, time of delivery, the curettage due to abortion, or during any other intercurrence during pregnancy. Even late diagnosis of maternal infection confirmed in the admission for the birth is valid because although it does not avoid the disease in the child, it will provide conditions to treat the woman and the conceptus, reducing complications from infection [21].

Still according to the WHO [6], 12 million people are infected, from which 2 million are pregnant women, establishing a tendency to increase the occurrence of Gestational Syphilis (GS) and Congenital Syphilis (CS) worldwide. Thus, its control is a challenge for many countries [26,27].

Some authors [9,28] emphasize the importance of improving skills and awareness of professionals regarding adequate clinical procedures for vertically transmitted diseases in order to progress towards decreasing these grievances. A broad network of Health Information Systems (HIS) is available nationwide in Brazil, and the appropriation of information by managers or scholars must take into consideration its limitations and benefits. The Notifiable Diseases Information System (SINAN-NET) was developed to collect and transmit data generated by the System of Epidemiologic Surveillance of the three governmental spheres, by notifying and investigating cases of diseases and grievances that are in the national list of compulsory notifiable diseases through a computer network, to give support to the investigation process and provide information for analysis and planning of the health status in municipal, state and federal levels.

The Ordinance 104 of January 25th, 2011 presents the list of diseases, grievances and events in public health of compulsory notification throughout the country and establishes flow, criteria, responsibilities and duties of health professionals, being CS and GS part of this list [29].

Spatalization is a set of essential techniques to manage spatially referred information on health issues, allowing mapping of diseases and risk assessment. This action strengthens health surveillance in presupposed health grievances that have occurred in a specific space, identifying geographic areas and population groups that show higher vulnerability to diseases and death, needing further health assistance [30]. Following this principle, this study aimed to spatialize GS and CS, two compulsory notifiable grievances, between 2007 and 2012, in a municipality in south Brazil.

Methodology

Epidemiologic descriptive study of secondary data from the database of the Notifiable Diseases Information System (SINAN-NET) in a municipality located in the central region of Rio Grande do Sul, Brazil, with a population of 261,031 inhabitants, population density 145,98 inh/Km^2, female population of 137,397 inhabitants [31]. Records notified by healthcare facilities during the studied period were included, established by the Ministry of Health protocols as confirmed cases of gestational syphilis (CID O98) and congenital syphilis (A. 509). Two cases were excluded: one in the rural area of the municipality and another whose address was not informed, both GS patients. The research project was approved by the Research Ethics Committee at Universidade Federal de Santa

Maria under the CAAE nº 23081.012145/2011-67.

The variables used for GS were year of notification, age, gestational period at diagnosis, ethnic group, education, address (borough and administrative unit), occupation (the Brazilian list of occupations was used) [32], test results, treponemal test during antenatal care, treatment of pregnant woman and partner.

The following variables for CS from the SINAN-NET database were analyzed: year of notification, address (borough and administrative area), mother's age in years, mother's ethnic group, mother's occupation, mother's education, antenatal care, moment of diagnosis of maternal syphilis, mother's treponemal test at delivery/curettage, confirmatory treponemal test at delivery/curettage, maternal treatment, partner concomitantly treated. Child's laboratory test data: clinical diagnosis and course of the disease.

In order to perform spatialization, the Supplementary Law n.042 of December 29th, 2006 was used, being the Administrative Region (AR) a sectorial unit of the urban area, linking together the borough units for administrative purposes, delimited in a total of eight areas, according to the homogeneity criterion. They are AR Urban Center (59,800 inhabitants), AR Center East (22,299 inhabitants), AR Center West (12,176 inhabitants), AR South (18,611 inhabitants), AR North (18,004 inhabitants), AR East 21,822 inhabitants), AR West (278,549 inhabitants), and AR Northeast (38,890 inhabitants) [33].

For the mapping, *shapefiles* (shp) of the municipality were used in the reference system *Universal Transverse Mercartor* (UTM), time zone 22 and datum SIRGAS 2000 as main data source, as well as tables in format xlsx with quantitative and descriptive data. Maps were developed with ArcGis 10®, and the theme map was made with Arc View 10 (Join tool that joins the table with the *shapefile* and spatializes data), pointing the reference ARs and the percentage of occurrence of cases, and the number of cases per borough in the AR with the highest index was spatialized. Theme maps were developed with data from the Brazilian Institute of Geography and Statistics (IBGE), 2010 Census and Live Births Information System (SINASC).

Statistical analysis was performed with the software SPSS, version 13.3 for Windows. It included procedures of bivariate descriptive statistics, and the Chi-square test was used to control possible conflict factors. To calculate incidence, the number of new cases of syphilis in the studied population was used, in each studied year times 1,000 divided by the number of people under risk of developing the disease during the same period.

Once it is a study that uses secondary data, some limitations must be considered: Sub-notifications, incomplete notification forms with several blank fields, what evidences the need for more awareness and accountability of professionals regarding the importance of this tool that holds the necessary information for planning health measures.

Another limiting factor was the unavailability of data referring to the number of pregnant women and live births by AR of the studied area due to the lack of territorialization of the municipality.

Table 1: Distribution of maternal characteristics of notified cases of CS and GS in a municipality of the central region of Rio Grande do Sul, Brazil.

Variables pregnant	**SC**		**SG**	
Variables Age	**N**	**%**	**N**	**%**
< 15	0	0	1	0.8
15-20	8	10.8	16	12.5
20-30	40	54.0	77	60.1
30 e +	26	35.2	34	26.6
Ethnic group				
White	59	79.7	90	70.3
Black	4	5.4	14	10. 9
Brown	9	12.2	21	16.4
Indigenous				
Asian			1	0.8
Ignored	2	2.7	2	1.6
Education				
None	1	1.3	2	1.6
Até 7	35	47.3	46	36
8 e +	16	21.7	35	27.3
Ignored	22	29.7	45	35.1
Occupation				
House wife	48	64.9	83	64.8
House keeper	7	9.4	6	4.7
Not answered	10	13.5	28	21.9
Others	9	12.2	11	8.6
Total	73	100	128	100

Results

The importance of actions aiming to decrease *T. Pallidum* infection becomes evident if we observe the number of notified cases between 2007 and 2012. In this period, 128 cases of GS and 74 cases of CS were notified, demonstrating the increase of syphlis occurrence throughout the years. In 2007, the incidence coefficient was 0.32; in 2008, 1.50; 2.45 in 2009; 3.94 in 2010; 4.88 in 2011, and an allarming rate of 8,38 in 2012. Absolute values also indicate this increase: in 2007, three cases of GS and only 1 case of CS were notified, and in 2012, 51 cases of GS and 30 cases of CS.

The pregnant women's average age was 25-years-old for GS, and 26-years-old for CS (± 6.62 and ± 6.47, respectively).

Table 1 shows the distribution of maternal charac-

Table 2: Characteristics of the monitoring of women notified with GS in a municipality of the central region of Rio Grande do Sul, Brazil, between 2007 and 2012.

Clinical condition of the pregnant woman	Number (N)	Frequency (%)
Trimester of pregnancy		
1° Trimester	13	10.1%
2° Trimester	18	14.1%
3° Trimester	91	71.1%
Ignored	6	4.7%
Stage of Syphilisinfection		
Latent	42	32.8
Primary	29	21.0
Secondary	8	6.3
Tertiary	28	21.9
Ignored	15	11.7
Not answered	8	6.3
Non treponemal test during antenatal care		
Not reactive	2	1.6
Reactive	121	94.5
Not performed	3	2.3
Ignored	2	1.6
Confirmatory treponemal test during antenatal care		
Not reactive	17	13.3
Reactive	35	27.3
Not performed	63	49.2
Ignored	13	10.2
Partner treated concomitantly with the pregnant woman		
No	36	28.1
Yes	30	23.4
Ignored	39	30.5
Not performed	23	18.0
Total	128	100

teristics of notified cases of GS and CS in the studied municipality, from 2007 to 2012. Considering the profiles of pregnant women notified with GS, it was verifed that 70.3% were white individuals, 36% had low educational level (maximum 7 years of education) and 64.8% were housewives. For CS, 79.7% were white women, 47.3% had up to seven years of education, and 64.9% were housewives.

Table 2 and Table 3 describe the variables from SINAN-NET database analyzed in this study regarding the frequency of CS and GS in the municipality studied.

Spatialization of the notified cases of CS and GS by urban AR in the municipality in south Brazil (2007-2012) is shown in Map 01. Considering the percentage of cases from the total amount of notifications, it is evidenced that the highest percentage of CS was in the West AR with 21.62%, followed by North and Northeast ARs, both with 16.21%, and South with 14.86%. Similarly to CS, the West urban AR showed the highest percentage of cases of GS with 19.5%, followed by Central-West, North, and Northeast with 18%, 17.2%, 12.5%, respectively.

Discussion

Gestational syphilis and congenital syphilis have increased considerably over the years in the municipality studied, from two cases of GS in 2007 to 51 in 2012, and 1 case of CS in 2007 to 30 cases in 2012, representing a serious public health issue. Thus, there have been a significant increase in cases from 0.32 in 2007 to an alarming value of 8.38 in 2012, according to the coefficient of incidence of syphilis, going against the operational plan to reduce vertical transmission of HIV and syphilis developed by the Ministry of Health in 2007 that proposed CS incidence rates of 2.45 per 1000 live births in the South region in 2009, as well as expected incidence rates of 1.71 in 2011 [34].

The characterization of syphilitic pregnant women showed that the majority was young, white and, housewives, corresponding to the most vulnerable sectors of

Table 3: Characteristics of the monitoring of cases of women whose children were born with CS in a municipality of the central region of Rio Grande do Sul, Brazil, between 2007 and 2012.

Clinical Characteristics	Number (N)	Frequency (%)
Antenatal care		
Yes	60	81.1
No	13	18.9
Time of diagnosis of maternal syphilis		
After delivery	7	9.5
During antenatal care	41	55.4
Not performed	2	2.7
No momento do parto/curetagem	23	32.4
Nontreponemal test at delivery		
Reactive	71	95.9
Not performed	3	4.1
Maternal treatment		
Adequate	6	8.1
Inadequate	51	68.9
Not performed	12	16.2
Ignored	4	6.8
Partner treated		
Yes	35	47.3
No	31	41.9
Ignored	7	12.2
Clinical course		
Still birth	2	2.7
Death from other causes	2	2.7
Death post congenital syphilis	1	1.4
Born-alive	67	91.9
Ignored	1	1.4
Clinical diagnosis of the child		
Non-symptomatic	55	75.7
Not applicable	3	4.1
Not applicable	9	12.2
Not answered	3	4.1
Ignored	3	4.1
Total	73	100

the population, evidenced by low educational levels. A study developed by Figueiró-Filho, et al. [35] found a similar profile, where the average age of the mother with GS was 24.45 years old (± 6.2 years). In a study carried out in Rio de Janeiro, Nascimento, et al. [36] observed the prevalence of brown-skinned women with gestational syphilis; Araújo, et al. [37] verified the prevalence of black women with congenital syphilis (49%) in Brazilian municipalities covered by the Family Health Strategy. These data differ from the present study in which white women are predominant, what may be justified by the diversity of the population in different regions in Brazil, and also because ethnic groups were not always declared.

Regarding education and occupation, this study found a similar profile as Nascimento, et al. [36] who observed the prevalence of women with gestational syphilis with incomplete primary education, and Mesquita, et al. [38] who verified that the most frequent occupation for both CS and GS was household activities (housewives).

It is essential to the mother-child health that antenatal care is performed, aiming to develop actions that promote health and identify grievances, not only for the pregnant woman but also for the conceptus, allowing the prevention of several complications, as well as the reduction and elimination of risk factors related to health [39-41]. According to Table 2, most of the pregnant women were in the third trimester of pregnancy, data that differs from the study by Bastos, et al. in which

most of the cases were notified in the first trimester [42].

According to a protocol of the World Health Organization [43], syphilis has three stages: Primary, in which the infected person develops a painless genital ulcer after 21 days of infection that lasts from 2 to 6 weeks; secondary, the infected person shows cutaneous eruptions over the body, lasting from 2 to 6 weeks followed by a latent period; and the tertiary stage that manifests after years or decades after infection and may lead to neurosyphilis and cardiovascular syphilis. This study shows that most of notified cases were classified as latent, and this may be justified by the natural course of the disease that develops alternating periods of activity and latency with distinct clinical, immunological, and histopathological characteristics. Latency periods may occur between primary and secondary syphilis (lasting from 6 to 8 weeks) and during the secondary stage, which occurs between the first and second years of the non-treated disease when the outbreaks recede spontaneously (it is possible to reach clinical and serological cure in one-third of the cases), or latency periods can become increasingly longer, being the diagnosis made exclusively through serological assessments, reactive non-treponemal tests with unclear clinical signs [44].

It should be noted that syphilis diagnosis during pregnancy is relevant as an opportunity for early treatment. Similarly to other studies [45,46], most of the pregnant women (95.9%) had antenatal assistance in notified cases of GS during the studied period, however, it not always allowed diagnosis and treatment in the ideal period. This limitation becomes evident once among the women whose children were born with congenital syphilis only 55.4% had the disease diagnosed during antenatal care. The same was described by Campos, et al. [47], who observed that 55.2% of pregnant women with GS had reactive non-treponemal test during antenatal care, being the other cases diagnosed at delivery. In the present study, 94.5% of pregnant women notified with GS showed reactivity for the same test during antenatal care, however, the diagnosis was confirmed late, during the third trimester of the pregnancy, evidencing the difficulty to assist these pregnant women and their partners in order to perform an adequate treatment.

Another existing problem is the need to confirm non-treponemal serological screening tests with confirmatory treponemal tests. Reactivity initially found is often not confirmed in treponemal tests, being the initial result considered false positive. According to Campos, et al. [47], the performance of the confirmatory treponemal test during antenatal care was reactive in 55.2% of cases, and the test was not performed in 12% of cases. A similar situation was observed in the present study with 49.2% of cases not being confirmed, and when confirmed only 27.3% were reactive. As an attempt to decrease the problem, Brazilian authorities issued the Ordinance n° 3.242 on December 30th, 2011 [48] that states the possibility to perform the reverse sequence for syphilis diagnosis in which screening is started by the treponemal test, and if the result is non-reactive the chance of infection by *T. pallidum* is excluded. Nevertheless, if the treponemal test outcome is positive, it is necessary to perform the VDRL test (non-treponemal) because the serological diagnosis for syphilis is only possible when both tests are combined, once non-treponemal tests are necessary to detect active infection [49]. When GS is confirmed through clinical/laboratorial tests, it is necessary to treat both the pregnant woman and her partner. These aspects seem problematic since a high number of pregnant women remain being inadequately treated, a reality which is also evidenced in the study by Magalhães, et al. [50]. The low frequency of treatment for partners observed in the current study (23.4%) is similar to previous studies, which evidenced only 20% of partners of pregnant women with syphilis were treated during antenatal care [37], perpetuating infection due to sexual transmission, thus being the lack of treatment of the partner the main reason for inadequate treatment of GS [19].

Taking into account the case outcome according to Table 3, it possible to observe that the majority of newborns were non-symptomatic, a result that is similar to the one found by Gonçalves, et al. [14] in which 98.11% of cases resulted in live births at the University Hospital of Vitória/Espírito Santo [51], and 79.25% were non-symptomatic newborns.

Once the difficulties of diagnosis and treatment of syphilis occur in a similar way in different regions of Brazil, spatialization of cases of GS and CS (Figure 1) that focus on the characteristics of the studied AR allow some reflections: most of the notified cases of GS and CS were evidenced in AR West (n = 25 and n = 15 for GS and CS, respectively). The west region of the municipality is characterized by being an area of extreme vulnerability, with a high number of people with low salary rates, low educational levels and precarious urban infrastructure. In addition, it is observed that there is a high number of clandestine housing, in which sanitary and housing conditions are scarce [52,53]. Considering areas with a lower number of cases than AR West, AR South had 12 cases of GS and 11 culminated in CS, what means that only one pregnant woman was properly treated; AR Northwest showed 16 cases of GS, 12 resulting in CS (four pregnant women were properly treated). It is observed that even in diagnosed cases the treatment was not always effective, regardless the administrative region. Data also showed that access to antenatal care was not a relevant problem to detect preg-

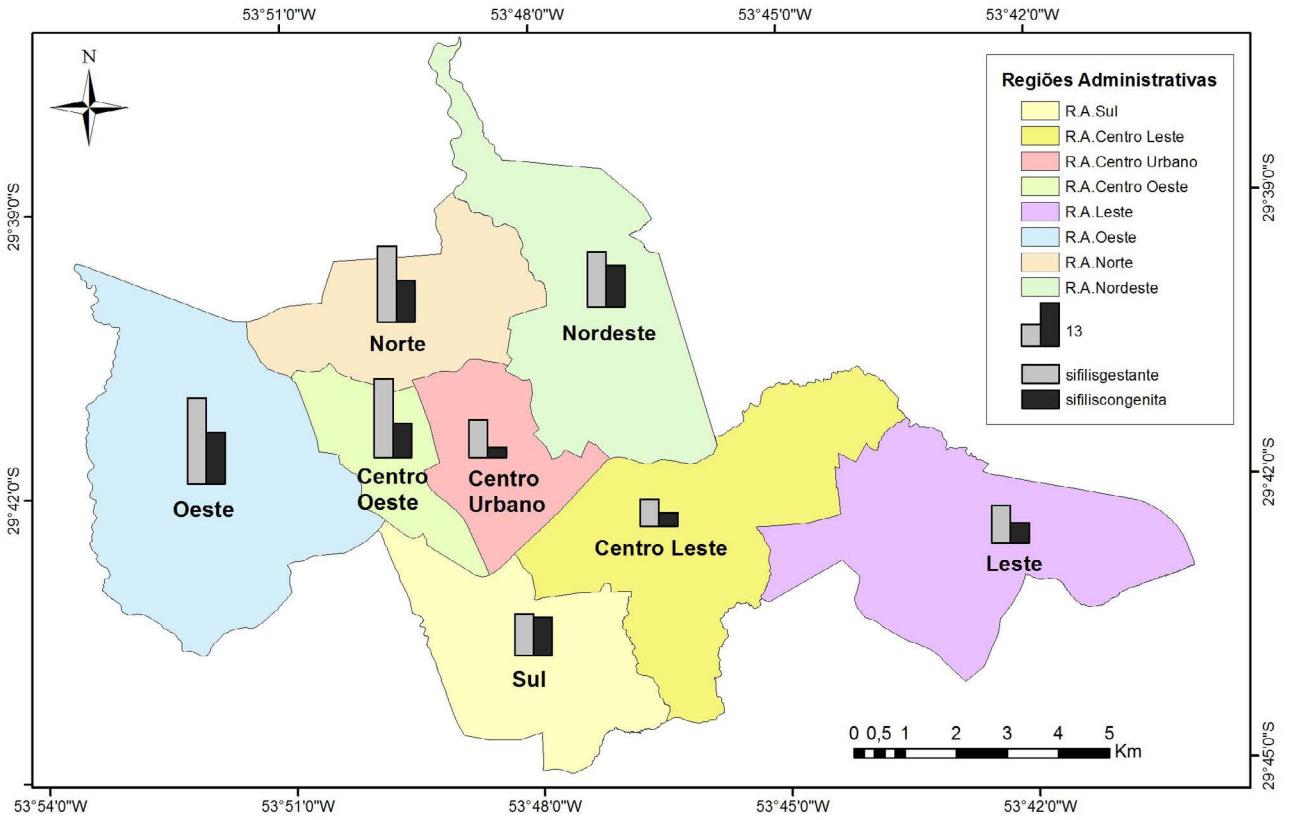

Figure 1: Different regions of Brazil, spatialization of cases of GS and CS.

nant women with GS. Thus, prevention campaigns should include not only information regarding the importance of antenatal care but also the need to treat the pregnant woman and her partner to ensure the health of all people involved. Socio-educational measures must be implemented to alert and raise awareness in pregnant women about the risks of infection by *T. pallidum* and the sequelae that may result for the newborn, as an attempt to persuade the pregnant woman and her partner to receive treatment, and consider the importance of assistance for the newborn exposed to infection.

Conclusion

Strategies must be introduced to minimize the incidence of CS not only in pregnant women but also women in childbearing age. An intersectoral approach must be optimized and articulated with public policies for education, housing, social assistance, work, health services professionals and institutions focusing on a broader concept of health and fomenting network, allowing professionals to assist and monitor pregnant women, women and their partners for suitable treatment.

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