ORIGINAL ARTICLE

Situational analysis of syphilis cases taking place between 2015 and 2021 in the state of Rio Grande do Norte - Brazil

Análise situacional da sífilis entre os anos de 2015 e 2021 no estado do Rio Grande do Norte, Brasil

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ABSTRACT

Introduction: Syphilis is a sexually transmitted infection that represents a severe public health problem worldwide and in Brazil it has not been different. The national compulsory notifications regarding syphilis cases are significantly increasing, and therefore, this fact alone justifies the study of such a relevant subject. **Objective:** This work presents a situational analysis of syphilis cases in the state of Rio Grande do Norte, Brazil, between 2015 and 2021, aiming primarily at assisting public healthcare authorities in decision-making processes to cope with the disease. Concomitantly, this research aims to build knowledge as well as to provide awareness to the population. **Methods:** This study analyzed data from compulsory notifications reports from 2015 to 2021, available in the database of the Brazilian Unified Health System's Informatics Department, in the Brazilian Information System of Notifiable Diseases and in the Brazilian Health Surveillance Secretariat. **Results:** In the state, 70% of patients with syphilis are aged 15 to 39 years. The rate of patients affected with acquired syphilis that have low education is 48%, and for pregnant women, this value rises to 77%. The declared mixed-race patients represent 48% of notifications for acquired syphilis, and for mixed-race pregnant women, this value increases to 60%. In congenital syphilis, 98% of compulsory notifications occurred for children aged up to 7 days of birth. **Conclusion:** Syphilis in Rio Grande do Norte is a public health problem that mainly affects the vulnerable population, predominantly the groups at risk with low education, mixed race, and young-adult people, being of paramount importance to combat the disease through population awareness, as well as through constant and adequate compulsory notification.

Keywords: Syphilis. Sexually transmitted infections. Public health.

RESUMO

Introdução: A sífilis é uma infecção sexualmente transmissível que representa um grave problema de saúde pública para o mundo, bem como para o Brasil. As notificações compulsórias nacionais de casos de sífilis estão crescendo significativamente, portanto esse fato por si só justifica o estudo centrado nesta temática de primordial importância. **Objetivo**: Este trabalho apresenta uma análise situacional da sífilis entre os anos de 2015 e 2021 no estado do Rio Grande do Norte, visando principalmente auxiliar as autoridades públicas de saúde nos processos decisórios em resposta à sífilis, mas também construir conhecimento e embasar a conscientização da população. **Métodos**: Foram analisados dados das notificações de 2015 a 2021 disponíveis na base de dados do Sistema Único de Saúde, no Sistema de Informação de Agravos de Notificação e na Secretaria de Vigilância em Saúde. **Resultados**: No estado, mais de 70% dos pacientes afetados por sífilis têm entre 15 e 39 anos de idade. A taxa de pacientes com baixa escolaridade e que foram notificados com sífilis adquirida é de 48% e, para as gestantes, esse valor sobe para 77%. Pacientes declarados pardos representam 48% das notificações para sífilis adquirida e, para gestantes pardas, esse valor amplia-se para 60%. Na sífilis congênita, 98% das notificações ocorreram para crianças com idade de até sete dias de nascidos. **Conclusão**: A sífilis no Rio Grande do Norte é um problema de saúde pública que atinge principalmente a população vulnerável, com predominância dos grupos de baixa escolaridade, raça parda e jovens adultos, sendo de suma importância o combate à doença por meio da conscientização da população, como também a constante e adequada notificação compulsória.

Palavras-chave: Sífilis. Infecções sexualmente transmissíveis. Saúde pública.

INTRODUCTION

Syphilis is a sexually transmitted infection (STI) which can be transmitted in different ways, either through sexual intercourse, through contact with contaminated blood – characterizing acquired syphilis (AS) –, or by vertical transmission, when the infected pregnant woman transmits the infection to the fetus – called congenital syphilis (CS). In addition to these classifications, there are cases in which pregnant women are infected, which is called syphilis in pregnancy (SP). This infection has three distinct phases – primary, secondary and tertiary – interspersed with latency moments when the disease becomes asymptomatic[1].

Historically, the first recorded cases of syphilis occurred in Europe in 1495 at the battle of Fornovo[2,3]. In an attempt to explain the origin of the disease, two theories were created: the first attributed the introduction of syphilis in Europe to Columbus' expeditions, assuming that the disease was endemic in the New World and that the sailors returned to Spain infected; the second theory claimed that endemic treponemes from Africa had mutated, contaminating Europe. Despite the different theories, the true origin of syphilis is still unknown[4,5].

Meanwhile, according to Magalhães et al.[2], the cases of syphilis transmitted to the fetuses were initially recorded by Lopes de Villa Lobos and Fracastoro, authors who believed in a link between the

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disease and childbirth, breastfeeding or both. Intrauterine contamination emerged as a hypothesis raised by Paracelsus, however, differently from what is known today, he believed that the father was responsible for the contamination of the fetus, i.e., that the spermatozoon transmitted the syphilis agent. This hypothesis was left aside after the diagnosis of the disease by serological tests[2].

In 1905, the etiologic agent of syphilis, *Treponema pallidum*, a helicoidal-shaped gram-negative bacteria, was discovered in Germany by Fritz Richard Schaudinnn and Paul Erich Hoffmann. Two years later, it was developed the first serological test to effectively detect syphilis[2,3,6]. The first attempts to treat syphilis were through iodides, mercury, arsenic, bismuth, and body temperature increase, based on the low resistance of the bacteria to high temperatures, however, these methods were not efficient[3,4].

In 1928 penicillin was discovered, which stood out as an effective drug for the treatment of syphilis due to its ability to destroy the bacteria by breaking the membrane caused by the ingress of too much water into its biological structure. Later, in 1943, Mahoney demonstrated that penicillin acts in all phases of syphilis, which played an important role in curing the infection. However, over the years, the efficiency of the drug resulted in a false sense of total control of the infection, reducing interest in the study and control of the disease[4].

As the main and most effective way to destroy the bacteria that causes syphilis, benzathine penicillin has become a reference to its treatment and can be easily found in basic health units. The antibiotic is used to combat sensitive bacteria that cannot survive without a host, as occurs with the *Treponema pallidum*[7]. Moreover, this antibiotic is widely used in clinical cases in which pregnant women are infected, requiring the rapid treatment of both the pregnant woman and her sexual partner, avoiding the chances of vertical contamination to the fetus, as well as reinfection by the pregnant woman[8].

Therefore, even though clinical manifestations may not appear in the patients, it is necessary to diagnose syphilis by serological tests. In Brazil, the Venereal Disease Research Laboratory (VDRL) test is widely used due to the low cost and also because it is easy to handle, whereas the Rapid Plasma Reagin (RPR) test is most used in other countries[9,10].

It is estimated that more than one million new STIs cases occur every day worldwide, with syphilis and human immunodeficiency virus (HIV) being the major indications[11]. In Brazil, a significant increase in syphilis cases has been observed in recent years. In 2020, approximately 115,000 cases for AS and 22,000 cases for CS were reported. This exponential growth can often be compounded due to a lack of adequate information to the population and the shortage of penicillin. As a result of this scenario, syphilis has regained visibility in recent years as a serious public health problem, due to the new trend of the disease's high spread rate, especially in low-income countries[5]. Thus, a new interest and strategies focused on syphilis control has emerged.

Due to the alarming number of new cases throughout the national territory, the compulsory notification for CS was instituted through Ordinance GM N.° 542, December 22, 1986[12]. Data from the Epidemiological Syphilis Report of 2021 brought up worrying information regarding the increase of compulsory notifications as for SP, CS, and AS in the year of 2018[7]. It is relevant to point out, that syphilis ranks among neglected aggravations in Brazil. In this context, variables related to the decrease in the worldwide production of the penicillin raw material led several countries to a shortage of this medicine. In Brazil, this was only overcome by the adoption of a centralized approach to purchase penicillin led by the Ministry of Health[12].

In these circumstances, seeking to reduce the incidence of syphilis, studies focused on this subject are of utmost importance to build knowledge and support the population's awareness by alerting them to the dangers of this infection, particularly in underdeveloped countries. Moreover, providing an overview of syphilis infection and its status in recent years may help healthcare authorities to take a stand in response to syphilis.

OBJECTIVE

Given the whole scenario, this work aimed primarily at assisting healthcare public authorities in decision-making processes to cope with syphilis by providing a situational analysis of syphilis cases in Rio Grande do Norte (RN), between 2015 and 2021, according to the data available in the Brazilian Health Surveillance Secretariat (SVS), in the Brazilian Information System of Notifiable Diseases (SINAN) and in the database of the Brazilian Unified Health System's Informatics Department (TABNET/ DATASUS). Concomitantly, this research aims to build knowledge as well as to provide awareness to the population. Considering that the increase in the cases of syphilis is a common problem throughout the national territory, it is, therefore, prime important to analyze each state individually to provide more reliable data.

METHODS

Regarding the situational analysis of syphilis cases, firstly the information notified through the SVS was analyzed. This aforementioned information belongs to the Brazilian Ministry of Health (MS). In addition to that, it was necessary to analyze data available in SINAN and TABNET. For this research, compulsory notifications concerning syphilis cases was sought in RN, between 2015 and 2021.

Geographically, the state is located in the Brazilian Northeast region, it has 52,809.599 km² of geographical area, contains 167 municipalities, a Human Development Index (HDI) of 0.648, and an estimated population of 3,560,903 inhabitants, according to the Brazilian Institute of Geography and Statistics (IBGE, 2021). The syphilis cases analyzed were those referring to acquired syphilis, syphilis in pregnancy and congenital syphilis – referred in this work as AS, SP and CS, respectively.

The parameters evaluated for the AS cases were gender, age group, education, and race, while for the SP cases were age group, education, race, the federal unit of prenatal care, and clinical classification of the infection. Regarding the CS cases, general compulsory notifications were analyzed taking into account the age group, race, and education level of the mothers of the children born with CS. The analyzed data were also used to construct tables, graphs, and maps to facilitate the visualization of the addressed information.

For the literature review, the searches were carried out in the Latin American and Caribbean Literature in Health Sciences (LILACS), Medical Literature Analysis and Retrieval System

Online (MEDLINE) and Virtual Health Library (VHL) databases, accessed through the Brazilian Coordination for the Improvement of Higher Education Personnel (CAPES) journal portal. Papers from 2011 to 2021 were filtered, and in addition, relevant papers were included, even from previous years. The keywords "syphilis", "syphilis in pregnancy", "congenital syphilis", "syphilis in Brazil", and "syphilis in the world" were also considered for the research in scientific databases. The papers included in this study were classified by their general subject to identify which subject about syphilis were in the literature trend, such as: basic concepts, clinical cases, congenital syphilis, syphilis in Brazil, syphilis in the world and innovations for diagnosis. After this step, relevant criteria were considered in order to deepen knowledge as well as to help the diffusion of current issues concerning this work subject.

RESULTS

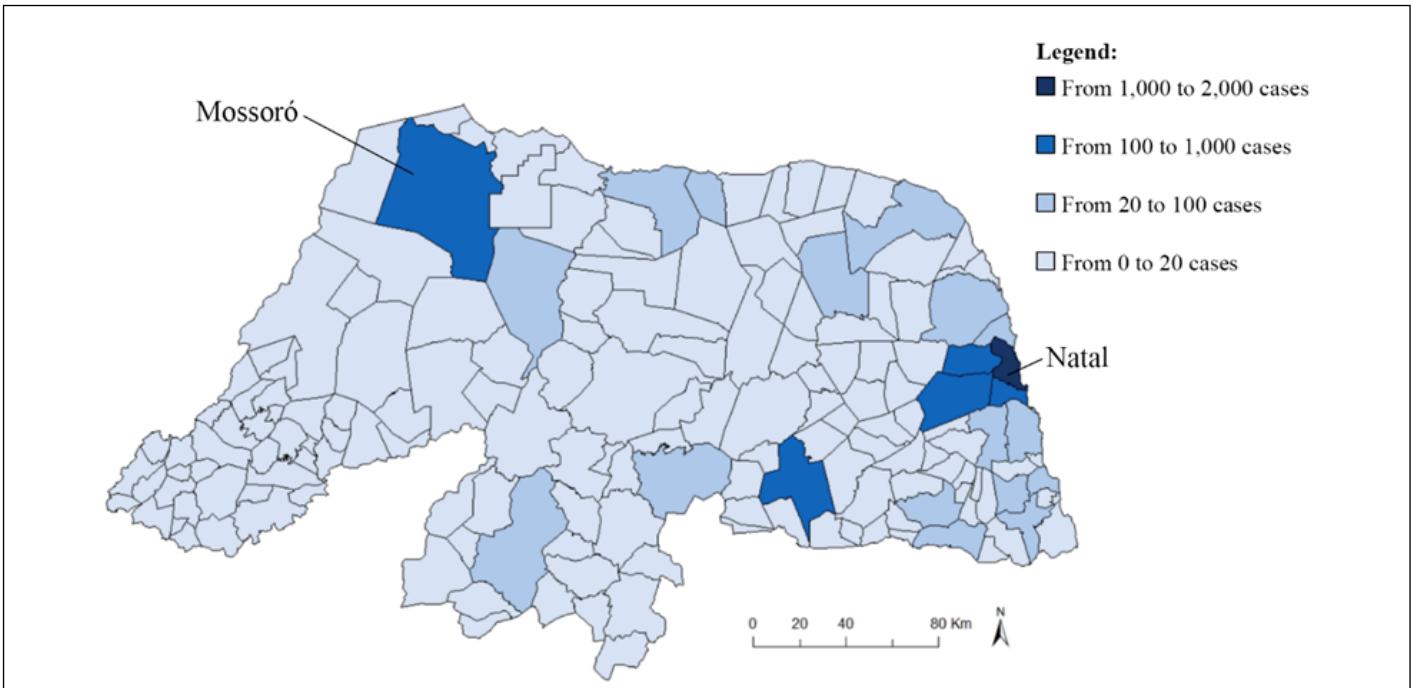
Between 2015 and June 2021, in RN, 8,788 cases of AS and 3,922 cases of SP were reported. For AS cases, the highest incidence of compulsory notifications occurred in Natal, Mossoró, and Parnamirim cities, with 49.9%, 13.09%, and 4.68%, respectively. For SP cases, the same cities had the highest compulsory notifications, in the same percentage sequence, but with different percentages values, which were 45.17%, 7.62%, and 5.09%, respectively.

Table 1 compares the notification regarding syphilis cases in Natal and Mossoró, the two cities that had the highest compulsory notifications in the state, according to the number of patients residing at the moment the report was registered. The geographic distribution map of compulsory notifications by municipalities for AS and SP cases can be seen in **Figure 1** and **2**.

Among the notified cases of AS, the predominant age group was those between 20 and 39 years old. As for the sex of patients, 3,630 declared themselves female, while 5,156 affirmed themselves male. There were two remaining compulsory notifications that had the sex ignored during the data filling. Thus, the male patients represented the higher incidence of the cases, adding up to a total of 58.67%. Concerning the educational level, it was evaluated that AS cases reached higher incidence rate for those patients with low education level: patients with complete high school education had the highest percentage representation, with 1,075 cases, totaling 12.23% of the compulsory notifications; those with incomplete 5th to 8th school grade represented 11.80% and incomplete 1st to 4th grade, 6.52%. According to the races informed, the mixed race summed 4,186 cases, which is the most significant percentage, 47.63% of the total, followed by the white and black races, adding up to 17% and 7%, respectively. All detailed information is in **Table 2**. Analyzing the SP notifications, the predominant age group was 20 to 39 years old, representing 71.93% of the syphilis cases. As for

Table 1. Comparison among numbers of acquired syphilis and syphilis in pregnancy compulsory notifications and the numbers of patients residing in Natal and Mossoró cities between 2015 and 2021.

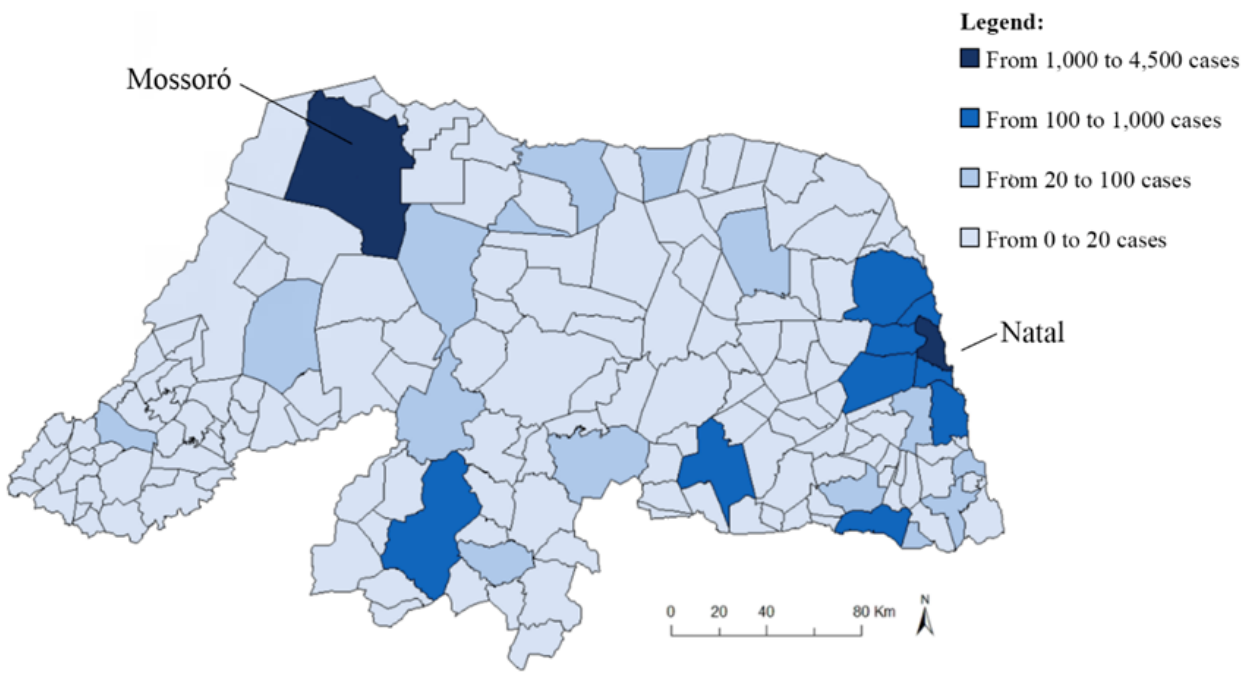
	Total notifications	Resident patients
Acquired syphilis		
Mossoró	1.150	983
Natal	4.385	3.864
Syphilis in pregnancy		
Mossoró	298	209
Natal	1.767	1.515



Source: Prepared by the authors based on TABNET/DATASUS data.

Figure 1. Map of compulsory notification regarding acquired syphilis by municipality in the state of Rio Grande do Norte between 2015 and 2021.

education and race, the patients with 5th to 8th incomplete elementary school grades had the highest incidence rate, representing a total of 29.27%, and for those of mixed race, this percentage represented 60.33%. The prenatal care of 3,600 patients' exams that occurred in Rio Grande do Norte itself represented 91.79% of the total medical exams, and the others were carried out in other states, abroad, or were ignored at the moment of compulsory notification registration. Notably, only 313 cases over the six years evaluated



Source: Prepared by the authors based on TABNET/DATASUS data.

Figure 2. Map of compulsory notification regarding syphilis in pregnancy by municipality in the state of Rio Grande do Norte between 2015 and 2021.

Table 2. Information of the compulsory notifications regarding acquired syphilis in the state of Rio Grande do Norte between 2015 and 2021, according to age, sex, education, and race group.

	Total number of cases	Percentage (%) (Total = 8.788)		Total number of cases	Percentage (%) (Total = 8.788)
Age Group			Education		
10–14	54	0.61	Ignored/Blank	4,142	47.13
15–19	983	11.19	Illiterate	216	2.46
20–39	5.324	60.58	Incomplete 1st to 4th grade of primary education	573	6.52
40–59	1.942	22.10	Complete 4th grade of primary education	313	3.56
60–64	168	2.12	Incomplete 5th to 8th grade of primary education	1.037	11.80
65–69	122	1.39	Complete primary education	447	5.09
70–79	130	1.48	Incomplete secondary school	566	6.44
80 and +	47	0.53	Complete secondary school	1.075	12.23
Race			Incomplete higher education	163	1.85
Ignored/Blank	2.434	27.70	Complete higher education	255	2.90
White	1.500	17.07	Not applicable	1	0.01
Black	608	6.92	Gender		
Asian	48	0.55	Ignored	2	0.02
Mixed race	4.186	47.63	Masculine	5.156	58.67
Indigenous	12	0.14	Feminine	3.630	41.31

Source: Prepared by the authors based on data from TABNET/DATASUS.

were reported as prenatal abroad or were omitted. Concerning the clinical classification regarding syphilis in the pregnant women, 1,359 were diagnosed with primary syphilis, representing the majority of the reported cases, with a total of 34.65%, followed by the diagnosis of latent syphilis, representing 1,131 cases, which is 28.84% of the cases. All this information is detailed in **Table 3**. It is possible to analyze the number of compulsory notifications regarding AS and SP in **Figures 3** and **4**, respectively, over the years. Between 2015 and 2019, there was a growth in the notifications of AS (312.04%) and SP (405.48%) and between 2019 and 2020, the compulsory notification rate decreased for AS (16.55%) and increased for SP (103.27%) cases.

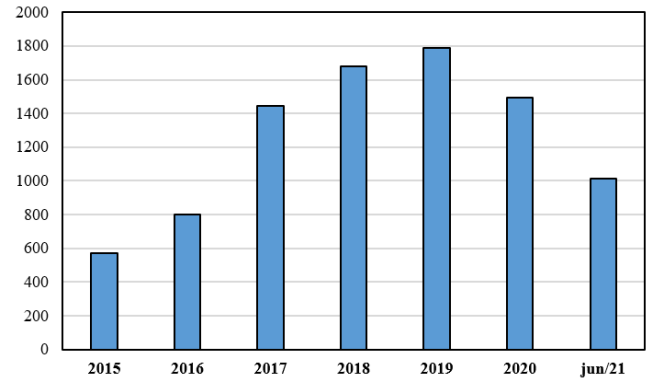
Based on the data surveyed, it is observed that there was a considerable number of cases regarding AS and SP that was reported in RN state between 2015 and 2021. Among the municipalities, the highest number of cases occurred in the capital, Natal, followed by Mossoró city.

Observing the parameters of sex, age range, education level and race, there are some points to be highlighted. As for the age range, the predominance was between 20 and 39 years old for both AS and SP cases. However, when analyzing the female patient with both AS and SP, we have 7,552 women, pregnant or not, who were infected with syphilis. Thus, females represented the majority of patients, with 59.42% of syphilis cases reported in RN, excluding cases of CS.

Table 3. Compulsory notifications regarding syphilis in pregnancy in the state of Rio Grande do Norte between 2015 and 2021, according to age, education, race group, federal unit of prenatal care, and clinical classification.

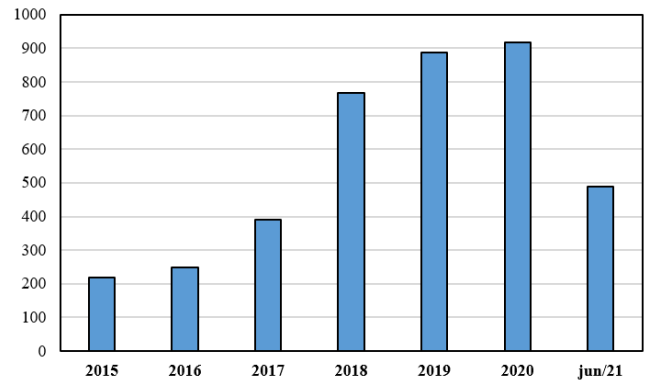
	Total number of cases	Percentage (%) (Total = 3.922)		Total number of cases	Percentage (%) (Total = 3.922)
Age Group			Education		
10–14	53	1.35	Ignored/Blank	820	20.91
15–19	956	24.38	Illiterate	20	0.51
20–39	2.821	71.93	Incomplete 1st to 4th grade of primary education	224	5.71
40–59	92	2.35	Complete 4th grade of primary education	174	4.44
Race			5th to 8th grade of primary education	1,148	29.27
Ignored/Blank	233	5.94	Complete primary education	322	8.21
White	978	24.94	Incomplete secondary school	540	13.77
Black	294	7.50	Complete secondary school	595	15.17
Asian	45	1.15	Incomplete higher education	39	0.99
Mixed race	2.366	60.33	Complete higher education	40	1.02
Indigenous	6	0.15	Federative unit of prenatal care (%)		
Clinical classification			Ceará	1	0.03
Ignored/Blank	891	22.72	Rio Grande do norte	3.600	91.79
Primary	1.359	34.65	Paraíba	2	0.05
Secondary	230	5.86	Pernambuco	1	0.03
Tertiary	311	7.93	Rio de janeiro	3	0.08
Latent	1.131	28.84	Paraná	2	0.05
			Ignored/Exterior	313	7.98

Source: Prepared by the authors based on data from TABNET/DATASUS.



Source: Prepared by the authors based on data from TABNET/DATASUS.

Figure 3. Compulsory notifications regarding acquired syphilis in Rio Grande do Norte between 2015 and 2021.



Source: Prepared by the authors based on data from TABNET/DATASUS.

Figure 4. Compulsory notifications regarding syphilis in pregnancy in Rio Grande do Norte between 2015 and 2021.

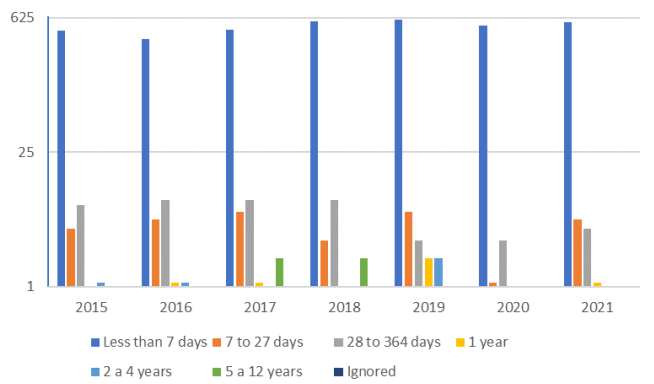
Regarding race, in both compulsory notification for AS and SP, there was a predominance of mixed-race patients. Considering the education level, there was a distinction between AS and SP cases. Among patients with AS, the most predominant notification was for patients with complete high school education, followed by those with incomplete elementary school, and the remaining cases are well distributed among the other reported schooling. For SP patients, the most common education level was for those with incomplete primary education, representing a considerable quantity of the cases. As for the evolution of STIs in the state, it can be observed that there was an increase between 2015 and 2019 for both AS and for SP cases. However, between 2019 and 2020, there was a decrease in AS cases and an increase in SP cases.

In RN, the cases of CS according to the child's age by year of diagnosis show a general decrease in compulsory notifications between 2015 and 2021, as presented in **Figure 5**. In **Figures 6**, **7** and **8**, respectively, it is presented the data regarding compulsory notifications for CS according to the race, age group, and education of the mothers of children born with CS.

For the CS scenario, it was observed that over 98% of the compulsory notifications include children less than 7 days old from birth. Between 2016 and 2019, there was a significant increase in compulsory notifications for CS, followed by a huge decrease from 2020 to 2021. The mixed race obtained more significant compulsory notification among mothers of children born with CS, adding to this data, approximately 65% of these mothers have low education, with the most prevalent age ranging between 20 and 39 years old.

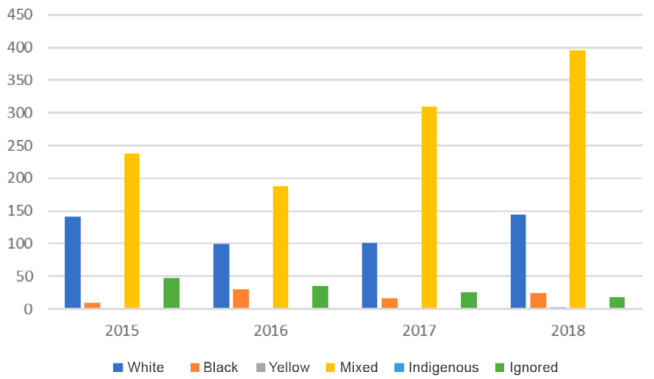
DISCUSSION

According to Hook[13], syphilis is an endemic infection in low-income countries that has resurged with an alarming increase



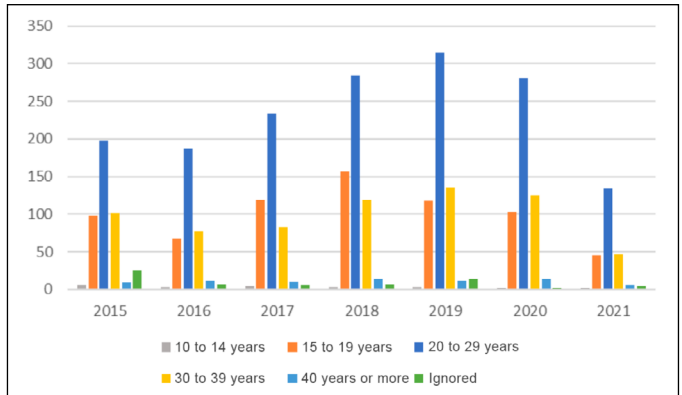
Source: Prepared by the authors based on data from Ministério da Saúde/Secretaria de Vigilância em Saúde/Department of Diseases of Chronic Conditions and Sexually Transmitted Infections.

Figure 5. Compulsory notifications regarding congenital syphilis in the state of Rio Grande do Norte, between 2015 and 2021.



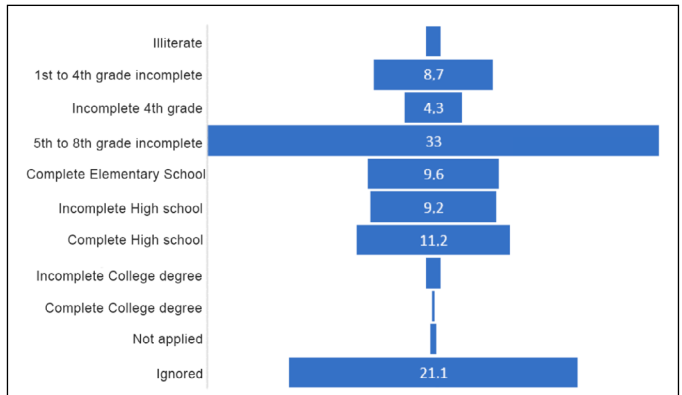
Source: Prepared by the authors based on data from Ministério da Saúde/Secretaria de Vigilância em Saúde/Department of Diseases of Chronic Conditions and Sexually Transmitted Infections.

Figure 6. Compulsory notifications regarding congenital syphilis according to the race of the mothers of the children born with congenital syphilis in the State of Rio Grande do Norte, between 2015 and 2021.



Source: Prepared by the authors based on data from Ministério da Saúde/Secretaria de Vigilância em Saúde/Department of Diseases of Chronic Conditions and Sexually Transmitted Infections.

Figure 7. Compulsory notifications regarding congenital syphilis according to the age group of mothers of the children born with congenital syphilis in the State of Rio Grande do Norte, between 2015 and 2021.



Source: Prepared by the authors based on data from Ministério da Saúde/Secretaria de Vigilância em Saúde/Department of Diseases of Chronic Conditions and Sexually Transmitted Infections.

Figure 8. Percentage of compulsory notifications regarding congenital syphilis according to the education of the mothers of the children born with congenital syphilis in the State of Rio Grande do Norte, between 2015 and 2021.

in Western Europe and in the Americas, becoming a relatively common problem that tends to fluctuate periodically. Magalhães et al.[2] pointed out that in the early 2000s, it was realized that in developing countries there were an increase of syphilis cases, with the prevalence of primary and secondary phases in women of childbearing age.

Recently, in the global context, according to data from the World Health Organization (WHO), Dos Santos et al.[5] also showed that compulsory notifications regarding syphilis cases were higher in countries and populations with low income, and among young men. In Brazil, from the same perspective, in six years, that is from 2010 to 2016, the number of reported cases increased from 703 to 16,723, and during the first six months of 2017, it was registered 8,311 cases, representing 17.6% of the total cases of acquired syphilis[14].

Regarding the evolution of this grievance in RN state, both the growth between 2015 and 2019 and the drop in indicators between 2019 and 2020, may have occurred as brought by Menezes et al.[15], due to a national scenario issue, once until 2018, there was an annual increase in the compulsory notification of syphilis cases, followed by a drop in the number of cases in 2019 and 2020, with probable cause of underreporting due to the pandemic of Covid-19.

The authors reinforced that 2018 was the year with the highest number of notified cases and the highest notification rate, highlighting the Southeast region, which surpassed the national compulsory notification rate with 82.5% of all cases. The growth in the compulsory notification in RN may be due not only to the higher population rate in the main cities but also due to the greater general coverage of healthcare in the municipalities.

Magalhães et al.[2] and Hook[13] emphasized that the increasing number of syphilis cases is directly related to risky behavior, such as sexual practices without condoms, recreational drug use, optimism about the effectiveness of penicillin treatment, as well as predominantly to low education and low income of the patients.

According to the information presented, it is observed that the overall increase in compulsory notifications of syphilis cases, as well as the socioeconomic characteristics of the most affected population group, also reflected in the notifications data in RN state, between 2015 and 2021. Of the total cases notified with AS, patients with low education – with illiteracy, elementary school, or incomplete high school –, followed by those with complete high school resulted, respectively, in 36% and 12% of the compulsory notifications, representing a sum of 48% of the notified cases.

Regarding the race of the patients with AS, the mixed race was prevalent, representing almost 48% of the population notified in the state, which reinforces the information brought by Menezes et al.[15] and Signor et al.[16], who stated that people declared as mixed or black are among the racial groups most affected in the grievance regarding syphilis cases. These data reveal the importance of preventive actions and more effective awareness for this target group since syphilis is a public health problem mainly affecting the vulnerable population.

It is also important to emphasize that some information concerning education, race, and clinical classification were missing, that represented, respectively, 21%, 6%, and 23% of the total compulsory notifications, thus signaling opportunities in the filling out of these data. It is noteworthy that the lack of these information directly affects the management of the socioeconomic mapping for this STI that, consequently, impacts the assertiveness of the actions designated to the most affected group in RN.

It can be observed that syphilis is not a specific-group infection since more than 70% of the affected public is aged 15 to 39 years, with a higher incidence in males. If we add the percentage of patients between 40 and 59 years old, this scenario increases to more than 90% of the patients infected, of which 25% are white. Thus, the plurality of the public in question can make it challenging to implement actions to fight the infection. In this context, a study by Mahmud et al.[17] on syphilis showed that an essential way to prevent diseases is providing education through the promotion of informative campaigns, approaching also the consequences of the disease, and mainly focusing on the risk groups.

Concerning the total cases reported with SP in the state, the most alarming scenario is when it is compared with AS cases, in which patients with low education – illiteracy, elementary school or incomplete high school –, followed by those with complete high school, had, respectively, 62% and 15% of the compulsory notifications, summing 77% of the reported cases. As for the race of the patients notified with SP, the mixed race is prevalent, representing more than 60% of the population notified in RN. Thus, the relevance of the diagnosis in the initial phase of syphilis is notorious since the progression of the disease can not only worsen the clinical status of the pregnant woman but also expose the fetus to infection with possible disabling sequelae, and may even lead to death, as revealed by Cabral et al.[8].

As specified in the compulsory notifications about age range, the resulting data were similar for AS and SP, in which the incidence of infected pregnant women was in the age group between 20 and 39 years old. This information is aligned with the national study of Signor et al.[16] in which it was identified that SP occured with more significant predominance in women aged between 20 to 34 years. The authors introduced that these pregnant women have lower level of education, have black skin color and have no paid activity. In addition, they started prenatal consultations late, had fewer consultations and serological tests, and were more likely to receive inadequate treatments, resulting in a risk factor for prematurity, fetal mortality, and higher frequency of hospital admissions.

Thus, the representation of almost 35% of reported cases regarding SP in RN state brings light to the urgent need to expand the coverage of testing during pregnancy and reinforces the need to raise population awareness about prevention and primary care to avoid infection. Cohen et al.[18] enhance that the prevention and early detection of CS depend on routine triage of SP, being necessary that all of them are triage in the first prenatal, and get reinforcement in the third trimester and in childbirth, especially in women at high risk of syphilis infection. It is noteworthy that the SP cases did not suffer significant sudden changes in compulsory notifications, which probably occurred because pregnant women needed to attend their prenatal care appointments, even in the face of the pandemic scenario.

Considering the specific parameters for SP cases analyzed in this study, as well as the federative unit where prenatal care was performed, and also considering the clinical classification, it was

observed that more than 90% of the patients had prenatal care in RN state, which indicates that this care is managing to cover the demand in the state.

It was noticed that the fluctuations of CS compulsory notifications in RN followed the same behavior as SP cases, having increased between 2016 and 2019, followed by a huge drop from 2020 to 2021. Therefore, it is questionable whether the low compulsory notification in recent years is due to an actual decrease in CS cases or perhaps because there was a control failure. Nevertheless, it is essential to draw attention to the fact that more than 98% of compulsory notifications for CS occurred in children up to 7 days of birth, revealing the rapid action to detect syphilis in this target group. It is also noteworthy that it is essential to ensure that all newborns have full health care coverage for early detection of CS, preventing this STI from evolving and causing severe harm to children, which happened with 2% of notified newborns over 7 days old. The compulsory notifications on race, age, and education of the mothers of children born with CS were similar to the data obtained for the SP cases and it is due to the low education level of those pregnant women, that directly impacts syphilis rates and exposes the fetuses to a higher transmission risk.

Moreover, among the municipalities, the highest number of syphilis cases occurred in the capital, Natal, and in one of the main cities of RN state, Mossoró, providing a great impact on the incidence of syphilis compulsory notifications, which number is lower in smaller cities when compared to those huge ones. Given this scenario, it is hypothesized that, besides the demographic density, there is speculation that patients from neighboring cities prefer looking for healthcare in the main cities due to the provision of more excellent hospital structures and medical specialties. This hypothesis can be substantiated when comparing the number of patients living in Natal and Mossoró at the time when the compulsory notifications were registered with the number of records on syphilis cases, which shows that the number of cases of the disease is higher than the number of patients residing in these cities.

Based on the parameters raised in this study, the actions to combat this grievance should be focused on the young-adult public, citizens with low education, and for both genders, women and men. Thus, informative campaigns on syphilis could be made available in virtual media, such as social networks and streaming platforms, in order to reach the public between 20 and 39 years old, and in health care units as well. These campaigns will help the population become aware of the symptoms and risks of the disease'.

It is also necessary to emphasize the need for both sexual partners to be tested and treated for syphilis in case of a positive result for infection, since recontamination can occur for both involved. This fact is emphasized by Scherer et al.[19] when they reinforce the importance of testing men to prevent the infection of the uninfected partner, and this action can even prevent the vertical transmission of STIs, once an infected pregnant woman has a potential chance to transmit syphilis to the fetus.

The fight against infection through tools that promote education is of great importance since, as discussed earlier, education is an effective action to prevent and contain syphilis in all age ranges and risk groups. Education also has advantages regarding the easy access once a quality information about the infection can be accessed via the Internet. As an example of a media dedicated to promoting education, awareness and information to the population is the AVASUS course platform (available at avasus.ufrn.br), which provides free self-study educational courses in the health area. There are more than 50 courses about STIs, with 28 focusing only on syphilis. Providing information to the population through campaigns or self-instruction courses generates a positive impact, causing people to avoid infection or helping them to seek appropriate treatment when infected.

Finally, it is noteworthy that syphilis is an infection that is widely under debate due to the alarming increasing cases not only in Brazil but also globally, making it essential to study the scenario in RN state and also in other Brazilian states, since each region may present specificities on the contagion behavior and compulsory notifications related to this grievance. Thus, actions to combat syphilis infection will be better planned and efficient, making it possible to decrease the rate of this disease effectively.

Strengths

The strengths of this study are the huge data sample with information between 2015 and 2021, as well as the data analysis, which shows the increase of the compulsory notification regarding syphilis cases in RN state, affecting mainly the most vulnerable population. This is significant because studies focused on this subject are essential to assist health authorities in decision-making processes to cope with the disease, being indispensable to providing actions against this STI, especially in the current global scenario where there is an increased rate of infection.

Limitation

Opportunity regarding the data update, at least quarterly, of the compulsory notifications data regarding syphilis cases, not being possible to provide analyses, interventions in real time, avoiding immediate follow-up in response to this infection. Lack of a unified platform with centralized data that provides information not only concerning the compulsory notifications but also providing data on socioeconomic, geographic, and investment scenarios for this disease.

CONCLUSION

The study concluded that syphilis in RN is not specific to an age, race, or sex group. However, this grievance is characterized as a public health problem that affects mainly the vulnerable population, that include those at risk groups aged 20 to 39 years, with low education and mixed race.

It is also concluded that the syphilis cases in the state are increasing despite a possible underreporting for cases of AS, CS, and SP, in 2020 and 2021. This information brings up the importance to maintain a constant and also an adequate compulsory notification because this resource is essential to understand the syphilis grievance scenario, and also it is a relevant tool to assist health authorities in decision-making processes to cope with the disease. Added to this, it highlights the importance of providing impactful actions to combat this STI in RN state.

Approval by the Human Research Ethics Committee

The present study is based on information from the Brazilian Health Surveillance Secretariat (SVS) database, Information System of Notifiable Diseases (SINAN) and TABNET through DATASUS. Therefore, the research protocol on humans was not submitted to an ethics committee.

Participation of each author

TBOA: Writing - draft and original version, Writing - review and editing, Conceptualization, Data curation, Formal analysis, Research, Methodology. NVRV: Writing - draft and original version, Writing - review and editing, Project administration, Supervision, Validation, Formal analysis, Methodology. CLBGN: Writing - review and editing, Project administration, Supervision, Validation, Formal analysis. AROG: Writing - review and editing, Project administration, Supervision, Validation, Formal analysis. RPS: Writing - review and editing, Writing - draft and original version, Conceptualization, Methodology, Data Curation, Formal Analysis, Investigation, Validation. FASO: Writing - review and editing, Formal Analysis, Methodology, Validation. CJS: Writing - review and editing, Formal Analysis, Methodology, Validation. WWVS: Writing - review and editing, Formal Analysis, Methodology, Validation. ALMS: Writing - review and editing, Formal Analysis, Methodology, Validation.

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Conflict of interest

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