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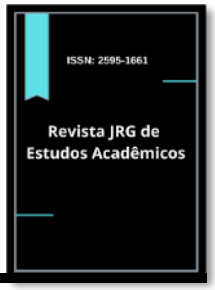

The impact of covid-19 pandemic on syphilis notifications in northeast Brazil

O impacto da pandemia de COVID-19 nas notificações de sífilis no Nordeste do Brasil

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Abstract

This study aims to evaluate the impact of the COVID-19 pandemic on the number of syphilis notifications (acquired, during pregnancy and congenital) in northeastern Brazil. An ecological study was carried out using the database provided by the Ministry of Health through the Department of Informatics of the SUS (DATASUS). The monthly numbers of notifications of acquired, gestational and congenital syphilis were organized on the Google Sheets online platform and the data were statistically analyzed, using the Wilcoxon test, for the pandemic (Jan/2020-Jun/2021) and pre pandemic periods (Jan/2018-Dec/2019), with a statistical significance of 5%. There was a reduction in the number of notifications of total cases of syphilis in the Northeast in 2020 and in 2021 when compared to the pre-pandemic period ($p < 0.001$ and $p = 0.031$, respectively). This reduction represents a drop of 32.38% in 2020 and 28.84% in 2021. Regarding the states, there was no statistical significance in the number of notifications for Sergipe in 2020 ($p = 0.638$), Ceará in 2021 ($p =$

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0.156) and Rio Grande do Norte in 2021 (p = 0.219) compared to 2018 and 2019. In addition, it was observed that in Sergipe there was an increase of 53.96% in notifications in 2021 compared to the same period (p = 0.031). These variations may be a consequence of social distancing, the reallocation of resources during the pandemic and socioeconomic issues, or even all of these factors combined.

Keywords: COVID-19. Brazil. Syphilis. Epidemiology. Disease Notification.

Resumo

Este estudo teve como objetivo avaliar o impacto da pandemia de COVID-19 no número de notificações de sífilis (adquirida, gestacional e congênita) no Nordeste do Brasil. Foi realizado estudo ecológico utilizando banco de dados disponibilizado pelo Ministério da Saúde por meio do Departamento de Informática do SUS (DATASUS). Os números mensais de notificações de sífilis adquirida, gestacional e congênita foram organizados na plataforma on-line Google Sheets e os dados foram analisados estatisticamente, por meio do teste de Wilcoxon, para os períodos pandêmico (Jan/2020-Jun/2021) e pré pandemia (Jan/2018-Dez/2019), com significância estatística de 5%. Houve redução no número de notificações de casos totais de sífilis no Nordeste em 2020 e em 2021 quando comparado ao período pré pandemia (p < 0,001 e p = 0,031, respectivamente). Essa redução representa uma queda de 32,38% em 2020 e 28,84% em 2021. Em relação aos estados, não houve significância estatística no número de notificações para Sergipe em 2020 (p = 0,638), Ceará em 2021 (p = 0,156) e Rio Grande do Norte em 2021 (p = 0,219) em comparação a 2018 e 2019. Além disso, observou-se que em Sergipe houve um aumento de 53,96% nas notificações em 2021 em comparação ao mesmo período (p = 0,031). Essas variações podem ser consequência do distanciamento social, da realocação de recursos durante a pandemia e de questões socioeconômicas, ou mesmo de todos esses fatores combinados.

Palavras-chave: *COVID-19. Brasil. Sífilis. Epidemiologia. Notificação de Doenças.*

1. Introduction

At the end of 2019, a new coronavirus (SARS-CoV-2) triggered an outbreak of COVID-19 that began in Wuhan, China. The new disease quickly spread to other countries and continents, so that on January 30, 2020, the United Nations (UN) declared it a public health emergency of international concern (Croda, et al. 2020). In the Brazilian context, the Unified Health System (SUS) faced a real challenge in sustaining universal access to the public health service for a population estimated at 211 million people spread across the national territory (Rosa et al., 2021).

In addition to changes in the pattern of human mobility, for example, social isolation, there have been reallocations of resources available for diagnosis and treatment of some diseases. In the context of syphilis, there was a sharp drop in test requests by the Albert Einstein Hospital laboratory in the initial period of the pandemic (March-May 2020) (De Morais et al., 2022). In the Primary Health Care Network, a tendency to reduce the use of rapid tests was observed at the beginning of the pandemic in most Brazilian capitals, which may have impacted efforts to combat syphilis across the country (Dos Santos, De Lima, & Bay, 2022).

In the initial months of the pandemic, there was a drop of 2.5 million in the number of procedures related to the treatment of syphilis (treponemal test, non-treponemal test, FTA-Abs IgG, FTA-Abs IgM, rapid test, non-treponemal test for

detection in pregnant woman, rapid test in pregnant women or father/partner and administration of penicillin) compared to the average of the previous four years. From February 2020, there was a progressive decrease in the number of procedures carried out month by month in the national territory, reaching 43% in May 2020 in relation to the average for May in the previous four years. In Sergipe, the downward trend in the number of procedures began in March 2020, reaching more than 100% in April and May of the same year (Furlam, Pereira, Frio, & Machado, 2022).

Regarding the number of syphilis notifications, a study carried out in the Northern region of Brazil observed that there was a significant drop in the notification of acquired syphilis, gestational syphilis and congenital syphilis in all states in the region in 2020 compared to the average of 2015 to 2019. Other notifiable diseases also had a general downward trend, making it possible to attribute this event to the COVID-19 pandemic itself and the underreporting of diseases in the Northern region of the country. Regarding the impact of COVID-19, it is pertinent to think that its influence on notifications was caused by the reduction in the occurrence of infectious diseases as a whole, due to restriction measures that limited direct human contact and the population's reduced access to health services (Formigosa, Brito, & Neto, 2022).

The behavior of new cases of syphilis around the world is quite heterogeneous, making it impossible to estimate this trend nationwide without similar studies being conducted. There is neither sufficient data nor consensus on the true impact of the COVID-19 pandemic on the number of syphilis notifications in the world and in Brazil. There is a lack of more systematic investigations to provide a better understanding of the impact of the COVID-19 pandemic on the epidemiology of syphilis (Pinheiro, & Silva, 2022). Therefore, it is essential to conduct a study to better understand the effect that COVID-19 had on the number of syphilis notifications in the northeastern region of Brazil.

2. Methodology

This is an observational, ecological study, using data available in the open access public domain, provided by the Ministry of Health through the SUS Information Technology Department (DATASUS), collected by the Notifiable Diseases Information System (SINAN).

Data collection was carried out by the main researcher in July 2023 using the TabNet tool on SINAN/SUS, accessed through the DATASUS website (https://datasus.saude.gov.br/). The population was delimited at regional and state level, with the variables referring to the Northeast region and the states that comprise it. The established periods were pre-pandemic (2018 and 2019), first pandemic year (2020) and second pandemic year (January to June 2021). During data collection, an outlier behavior of the data was noticed from July 2021 onwards, therefore this data was not taken into account during the statistical analysis. To generate an effective control interval, the 24 pre-pandemic months were neatly divided by two after summing (e.g. January 2018 and January 2019), generating a balanced data set between periods to act more consistently, each interval consisting of 12 months (n = 12).

The dependent variables were reports of acquired syphilis, congenital syphilis and syphilis in pregnant women, with the number of total cases representing the sum of these last three. Data collection took place by accessing the DATASUS website (https://datasus.saude.gov.br/) and selecting the option “TabNet – health information”. To retrieve the monthly number of notifications of new cases,

"epidemiological and morbidity", "notifiable diseases and conditions – 2007 onwards" and "acquired syphilis", "congenital syphilis" and "syphilis in pregnant women" were selected consecutively. Then, for each subcategory mentioned, the geographic scope was delimited regionally, comprising all notifications in northeastern Brazilian territory, covering all states in this region. The data was organized in the Google Sheets online spreadsheet program, from the free Google Document Editor package.

For statistical calculations, the Jamovi version 2.3.28 was used, and the significance level established was 5% ($p = 0.05$) for all interferences. The variables in their raw and relative form (%) were presented using the median as a measure of central tendency. The dispersion of variables was presented by the first (Q1) and third (Q3) quartiles, followed by the interquartile range (IQR). The characteristics of the samples indicates the need to use a non-parametric test. Therefore, the statistical tool used was the Wilcoxon ranked test (W). The descriptive analysis was carried out for reports of acquired and congenital syphilis in pregnant women and total cases of syphilis for the Northeast region of Brazil and for total cases of syphilis in the states that make up the region: Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia.

3. Results

Tables 1 and 2 present the analytical panorama when considering the number of syphilis notifications, considering the pre-pandemic and pandemic intervals of COVID-19, for the Northeast region and the states that comprise it, respectively. For the Northeast region, the Wilcoxon test revealed that there was a statistically significant reduction in 2020 and 2021 when compared to the pre-pandemic period for acquired syphilis ($p < 0.001$ and $p = 0.031$), congenital syphilis ($p < 0.001$ and $p = 0.031$) and total cases of syphilis ($p < 0.001$ and $p = 0.031$). For cases of syphilis during pregnancy, in 2020 the numbers also fell ($p < 0.001$), but the comparison with 2021 did not show statistical relevance ($p = 0.438$). For the Northeastern states, the Wilcoxon test showed that there is no statistically significant difference between the number of syphilis notifications in Ceará and Rio Grande do Norte in 2021 ($p = 0.156$ and $p = 0.219$ respectively) and in Sergipe in 2020 ($p = 0.638$) in relation to the average of 2018 and 2019. It is observed that the only state that showed an increase in the number of notifications with statistical significance ($p = 0.031$) was Sergipe, in 2021 (+53.96%).

Table 1. Analytical overview of the number of syphilis notifications in the Northeast.

	Period	Difference [IC95%]	% [IC95%]	p-value
Acquired syphilis	2018-2019 versus 2020	-10190	-39,36%	< 0.001
	2018-2019 versus 2021	-2625	-21,47%	0.031
Congenital syphilis	2018-2019 versus 2020	-981	-13,59%	< 0.001
	2018-2019 versus 2021	-602	-15,86%	0.031
Syphilis during pregnancy	2018-2019 versus 2020	-2157	-15,40%	< 0.001
	2018-2019 versus 2021	-458	-6,58%	0.438
Total cases of syphilis	2018-2019 versus 2020	-15253	-32,38%	< 0.001
	2018-2019 versus 2021	-7852	-28,84%	0.031

Table 2. Analytical overview of the number of syphilis notifications in the Northeast states.

	Period	Differençe [IC95%]	% [IC95%]	p-value
Alagoas	2018-2019 versus 2020	-340	-19,73%	0.009
	2018-2019 versus 2021	-213	-25,36%	0.031
Bahia	2018-2019 versus 2020	-5504,5	-45,25%	< 0.001
	2018-2019 versus 2021	-1336,5	-22,83%	0.031
Ceará	2018-2019 versus 2020	-559,5	-8,96%	0.007
	2018-2019 versus 2021	-178	-5,96%	0.156
Maranhão	2018-2019 versus 2020	-1274,5	-29,78%	0.003
	2018-2019 versus 2021	-578,5	-27,20%	0,031
Paraíba	2018-2019 versus 2020	-807,5	-29,22%	0,003

	2018-2019 versus 2021	-338,5	-24,41%	0.031
Pernambuco	2018-2019 versus 2020	-3314,5	-26,04%	< 0.001
	2018-2019 versus 2021	-1045,5	-16,79%	0.031
Piauí	2018-2019 versus 2020	-777	-34,67%	< 0.001
	2018-2019 versus 2021	-621	-53,49%	0.031
Rio Grande do Norte	2018-2019 versus 2020	-219	-6,95%	0.038
	2018-2019 versus 2021	128,5	8,64%	0.219
Sergipe	2018-2019 versus 2020	232	12,75%	0.638
	2018-2019 versus 2021	497	53,96%	0.031

Tables 3 and 4 present the monthly proportional variations of the pandemic years in relation to the pre-pandemic period for notifications of acquired, congenital, syphilis during pregnancy and total cases in the Northeast and total cases of syphilis in the Northeast states. For the Northeast region, it is observed that the majority of variations are negative, being positive for syphilis during pregnancy in the months of February and March 2021. When checking the states, it is clear that Bahia, Maranhão, Pernambuco and Piauí only presented negative variations in 2020, while the other states showed some positive variations. For 2021, it is observed that Alagoas, Bahia, Maranhão, Paraíba, Pernambuco and Piauí present exclusively negative variations, Sergipe presents exclusively positive variations and the other states present positive and negative variations.

Table 3. Monthly variation in the number of syphilis notifications in the Northeast in relation to 2018-2019.

	Acquired syphilis		Congenital syphilis		Syphilis during pregnancy		Total cases of syphilis	
	2020	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
Jan	-11,38%	-24,21%	-9,24%	-6,83%	-3,81%	-5,60%	-13,21%	-15,89%
Feb	-24,36%	-10,31%	-20,20%	-0,50%	-12,93%	4,79%	-21,09%	-4,01%
Mar	-32,73%	-14,58%	-21,18%	-0,96%	-15,68%	11,91%	-28,15%	-4,33%
Apr	-63,33%	-19,65%	-23,68%	-13,72%	-18,23%	-1,71%	-42,14%	-13,25%

May	-65,76%	-25,31%	-24,94%	-16,50%	-14,59%	-14,76%	-45,04%	-20,73%
Jun	-49,53%	-35,81%	-14,53%	-55,54%	-1,09%	-37,23%	-34,71%	-39,83%
Jul	-47,38%		-12,40%		-17,42%		-40,26%	
Aug	-44,89%		-14,14%		-26,08%		-40,95%	
Sep	-36,09%		-4,77%		-27,85%		-36,64%	
Oct	-39,06%		-4,23%		-24,13%		-37,48%	
Nov	-32,92%		-7,42%		-16,03%		-30,84%	
Dec	-24,41%		-1,17%		-3,08%		-14,37%	

Tabela 4. Monthly variation in the number of syphilis notifications in the Northeast states in 2020 and 2021 in relation to 2018-2019.

	AL	BA	CE	MA	PB	PE	PI	RN	SE
Jan/20	3,35%	-23,31%	3,54%	-6,62%	7,69%	-12,36%	-22,38%	35,00%	-12,13%
Feb/20	-12,98%	-37,93%	-10,46%	-12,01%	-24,74%	-21,93%	-14,81%	-6,42%	4,35%
May/20	-6,47%	-43,34%	-16,09%	-16,51%	-12,20%	-28,08%	-32,08%	-1,95%	-14,09%
Apr/20	-45,27%	-60,00%	-19,61%	-56,94%	-58,81%	-39,24%	-49,26%	-24,71%	-4,56%
May/20	-50,91%	-57,23%	-23,72%	-55,94%	-55,22%	-44,54%	-45,61%	-12,45%	8,16%
Jun/20	2,70%	-46,67%	-0,40%	-32,46%	-38,12%	-22,21%	-42,12%	-9,76%	-0,35%
Jul/20	-32,76%	-54,95%	-0,96%	-23,73%	-19,16%	-30,71%	-41,02%	-11,99%	9,09%
Aug/20	-27,05%	-52,75%	-10,20%	-33,98%	-35,25%	-27,87%	-43,32%	-13,38%	-15,87%
Sep/20	-17,19%	-48,29%	-2,24%	-27,83%	-28,54%	-21,93%	-39,94%	-3,64%	-9,58%
Oct/20	-23,17%	-41,88%	-14,39%	-35,18%	-28,69%	-31,60%	-36,69%	-1,26%	54,72%
Nov/20	0,00%	-43,93%	-6,90%	-33,04%	-37,09%	-18,37%	-20,75%	-15,79%	68,87%
Dec/20	-5,98%	-32,65%	-7,86%	-23,66%	-13,04%	-10,26%	-29,20%	-9,51%	80,95%
Jan/21	-29,37%	-25,49%	1,12%	-38,58%	-34,07%	-9,20%	-37,14%	7,27%	40,98%
Feb/21	-10,88%	-7,59%	0,20%	-22,00%	-24,34%	-0,05%	-33,51%	13,21%	62,54%
May/21	-3,60%	-11,83%	-4,51%	-23,06%	-19,29%	-0,14%	-36,39%	11,72%	100,00%
Apr/21	-19,59%	-20,10%	-8,50%	-27,75%	-27,92%	-11,81%	-55,67%	32,82%	44,07%
May/21	-36,36%	-27,93%	-4,17%	-17,02%	-4,48%	-30,35%	-69,97%	-4,67%	46,22%
Jun/21	-57,66%	-47,41%	-20,52%	-33,04%	-38,12%	-51,82%	-90,18%	-11,06%	32,40%

3. Discussion

As in the North of Brazil (Formigosa, Brito, & Neto, 2022), there was a drop in notifications of acquired syphilis, congenital syphilis and syphilis during pregnancy in the Northeast in 2020 when compared to the pre-pandemic period. The current analysis also includes the first six months of 2021, increasing the observational interval and enabling a better understanding of the behavior of notifications during the second wave of COVID-19 contagion. With the exception of Sergipe ($p = 0.031$), all other states, where there was a statistically significant difference between the periods analyzed, showed a drop in notifications in the first six months of 2021. There was no statistical relevance in the comparisons for Ceará and Rio Grande do Norte in the same period ($p = 0.156$ and $p = 0.219$ respectively).

What can be seen when checking the monthly variations in notifications in the states is that, from March 2020, when COVID-19 was classified as a pandemic by the WHO (Croda, et al. 2020), until December of the same year, the The only states that showed a positive variation in the number of notifications were Alagoas, in June, and Sergipe, in May, July, October, November and December. In 2021, Sergipe showed a positive variation in every month, reaching a 100% increase in March. All other states that showed significant variation showed a reduction in notifications in all months evaluated in 2021.

The significant increase in syphilis notifications in Sergipe during the first months of 2021 may be related to a series of factors. Firstly, the loosening of social isolation measures after the defervescence of the first wave of COVID-19 contagion may have contributed to greater risky sexual behavior. Additionally, the disruption of sex education programs due to the pandemic may have impacted the dissemination of crucial information. Changes in healthcare patterns due to the pandemic may also have led to delays in diagnoses and treatments, resulting in an increase in reports as healthcare services resumed. Socioeconomic issues, such as limited access to healthcare and worsening inequalities, may also have influenced the spread of the disease.

Lockdown, as a policy to contain the spread of the new coronavirus during 2020 and 2021, may have been one of the causal factors for the decrease in syphilis notifications in these years (Formigosa, Brito, & Neto, 2022). Social distancing has led to less sexual exposure, as people are theoretically less likely to meet up with sexual partners. However, this argument does not justify the fact, for example, that the number of notifications increased in Sergipe during 2021, while it decreased in other states and in the Northeast region as a whole.

Together, the reallocation of technological and human resources during the fight against the pandemic also seems to have had an impact on the reduction in syphilis notifications. There were fewer diagnostic tests for syphilis in Brazil and in Brazilian capitals during 2020 (De Morais et al., 2022; Dos Santos, De Lima, & Bay, 2022), therefore, it is important to also consider the lower demand for testing by the population, due to fear exposure to COVID-19, which may result in late diagnoses of the disease. The slight increase in reports of syphilis during pregnancy in February (+4.79%) and March (+11.91%) of 2021 in the Northeast reinforces this hypothesis.

Mobility restrictions during the COVID-19 pandemic were associated with a significant decrease in syphilis and HIV testing performed in outpatient settings served by the clinical laboratory at Albert Einstein Hospital in Brazil (Seara-Morais et al., 2023). Furthermore, it was observed that the number of tests performed was inversely associated with the percentage of positive results for syphilis, when compared to the mobility reduction categories.

As an alternative, resources such as telemedicine, self-collection kits and home self-test devices as facilitators of diagnostic tests for sexually transmitted infections are indispensable (Seara-Morais et al., 2023), not only in environments with reduced mobility, but also among difficult-to-reach populations.

The percentage of positive results presented in certain months may also be associated with patients who presented symptoms suggestive of syphilis or those at higher risk, therefore more likely to seek care, despite mobility restrictions. Furthermore, it is suggestive that health professionals prioritized patients at higher risk and, therefore, requested more tests in these cases, since this resource must be attributed to those most in need, in the case of sexually transmitted infections, just as it is necessary for it to be available appropriate screening tests for all individuals to prevent secondary transmission and other complications from untreated infections. This association helps understand the extent and complexity of the consequences of COVID-19 in specific conditions and communities, where it is essential to build strategies to minimize the long-term consequences of COVID-19.

Future studies and investigations can help to elucidate the true impact of the COVID-19 pandemic not only on reports of syphilis, but also other health problems. Furthermore, it is important to consider the limitations of the study, mainly due to the possible underreporting of new cases due to the relocation of professional and technological resources and the lack of correlation with the movement of people during the periods analyzed. Finally, it is important to consider that in order to establish a better-founded understanding of the impact of the COVID-19 pandemic on the number of syphilis notifications in the Northeast, it is necessary to analyze syphilis notifications in the post-pandemic period, so that have a more complete set of samples.

4. Conclusion

The present study reveals a striking panorama regarding syphilis notifications in the Brazilian Northeast during the years 2020 and 2021, in relation to the period before the covid pandemic. In general, it is possible to conclude that there was a notable decrease in notifications of the disease in most states in the region, reflecting a possible impact of the isolation and social distancing measures adopted to contain the spread of the coronavirus.

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