Cogitare Enfermagem

ORIGINAL ARTICLE

PAYMENTS FOR HOSPITALIZATION FOR CONGENITAL SYPHILIS IN CHILDREN UNDER ONE YEAR OF AGE

HIGHLIGHTS

1. Increase in hospitalizations for Congenital Syphilis in Rio Grande do Sul.
2. Increase in transfers for medical and hospital treatment of this condition.
3. Real investments have decreased over the years.
4. The length of hospital stay has not changed over the period.

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ABSTRACT

Objective: To analyze the financial transfers of authorizations for hospital admissions for Congenital Syphilis in children under one year of age in Rio Grande do Sul, Brazil, from 2012 to 2022. **Method**: Cross-sectional study with information from Hospital Admission Authorizations from the Hospital Information System on the TabNet Platform (DATASUS). The data was analyzed using descriptive and frequency statistics. **Results**: There was an increase in the proportion of hospital admissions for congenital syphilis in the universe of infectious and parasitic diseases in children under one-year-old, amounting to an increase of 201.7%. As a result, there was an increase in the number of financial transfers. However, the nominal values were out of line when adjusted for inflation. It was found that 10 days of hospitalization were maintained. **Conclusion**: The results suggest an urgent need to update the financial resources passed on by the SUS for hospital admissions, as well as the creation of cost-effective actions aimed at reducing hospitalizations for Congenital Syphilis.

KEYWORDS: Syphilis, Congenital; Hospital Costs; Financing, Government; Hospitalization; Public Health.

HOW TO REFERENCE THIS ARTICLE:
Carvalho LMC de, Santos VCF dos, Machado M da GP, Ramos AR. Payments for hospitalization for Congenital Syphilis in children under one year of age. Cogitare Enferm. [Internet]. 2024 [cited "insert year, month and day"]; 29. Available from: https://doi.org/10.1590/ce.v29i0.96724.

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INTRODUCTION

Syphilis impacts the health of vulnerable populations in a similar way to other infectious diseases[1]. It is one of the neglected diseases in Latin America and the Caribbean[2], as it is in underdeveloped countries in the Eastern Mediterranean and Africa, two regions where high rates of congenital syphilis (CS) persist[3].

The CS incidence rate in Brazil has increased by 19.1% in recent years despite the decrease in live births. In 2022, the incidence rate of CS was 10.3, 15.9, and 39.4 cases per 1,000 live births in Brazil, Rio Grande do Sul, and Porto Alegre, respectively[4].

In Europe, CS rates indicate that even in developed countries, there are disparities in the epidemiological situation of this disease. Italy is facing difficulties in eradicating the disease in its territory[5]. On the other hand, Portugal has had a stable incidence rate over the last decade, with approximately three cases of CS per 100,000 inhabitants[6].

The US and Brazil are facing an increase in CS. In the last decade, the country went from 8.4 disease cases per 100,000 live births (in 2012) to 57.3 cases per 100,000 live births (in 2020). This increase occurred even with the national availability of benzathine penicillin and the infrastructure of a highly developed nation[7].

Between 2012 and 2022, Brazil recorded 157,066 hospitalizations due to CS, which corresponds to 20.05% of the group of infectious and parasitic diseases[8]. It is noteworthy that CS incurs significant financial and indirect costs for families and newborns[9] due to hospitalizations and their consequences.

CS generates greater use of health services and, consequently, more costs for institutions, but prevention can reduce costs related to hospitalizations and treatment[10-11]. Even with the material resources needed to eliminate the disease, this preventable condition remains a serious public health problem. This is one of the diseases for which there is a formal agenda, but its demands have not yet been translated into decision-making agendas and policies for concrete action[2].

Care management is fundamental, given that timely maternal treatment reduces the likelihood of vertical transmission[12]. Without adequate treatment during prenatal care, transmission rates to the newborn vary between 70% and 100%[13].

The study is justified insofar as the increase in the number of CS cases generates the need for the state to provide financial support to meet the increase in transfers needed to meet the demands of hospital services. We focused on data on CS in children under one year old, considering treatment carried out in the neonatal (early and late) and post-neonatal periods.

Rio Grande do Sul has higher CS incidence rates than the national rate, and Porto Alegre is the leading capital in CS cases. It is assumed that knowing the data on transfers related to AIH will allow us to broaden the scope of the discussion on syphilis in the sense that intensifying prevention and early diagnosis strategies will help make efficient use of public resources and minimize the social and financial cost of this disease. With this in mind, we sought to analyze the financial transfers of authorizations for hospital admissions for Congenital Syphilis in children under one year of age in Rio Grande do Sul - Brazil, from 2012 to 2022.

METHOD

This cross-sectional, descriptive study sought to analyze the transfer of authorizations for hospital admissions for CS in children under one year of age who were SUS users in Rio Grande do Sul, between 2012 and 2022. The research description was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The period studied was chosen because of the considerable increase in the incidence rate of this disease since 2012 in all regions of Brazil. The country had a total of 157,038 hospitalizations for CS in children under one year of age between 2012 and 2022, with Rio Grande do Sul accounting for 7.23% of all hospitalizations[8] and Porto Alegre being the capital with the highest CS rate per thousand live births in Brazil[4].

The study used secondary data from the SUS Information Technology Department (DATASUS) on hospitalizations of children diagnosed with CS in Rio Grande do Sul. The data was collected on the TabNet Platform (Internet Tabulation) of DATASUS, in the "Epidemiological and Morbidity" information interface, specifically in the "Hospital Morbidity of SUS (SIH/SUS)" section. The Hospital Admission Authorizations (AIH) were computed from January 2012 to December 2022, the last year with complete information available for public access[8].

In this study, AIHs for CS in children under one year of age were studied, as this condition is the main reason for hospitalization in Brazilian hospitals in this age group[14]. For conceptual definition, it should be noted that this study did not consider the analysis of hospitalization costs due to CS, only the transfers referring to the AIHs approved in the period. This methodological choice was since "transfer" represents financial resources paid by the SUS to the hospital according to the values for each procedure and ICD included in the AIH, following the references set by the SUS Table of Procedures[8]. It should be noted that in some situations, depending on the specifics of the hospitalization and the patient's clinical condition, the hospital needs to add monetary sums to the amount passed on to cover the costs of an AIH.

The following variables were used to select the AIHs: main diagnosis and secondary diagnosis whose codes, according to the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), will refer to diseases in Chapter I: Some infectious and parasitic diseases, which incorporate the morbidity list: ICD A50 to A50.9. From this selection, the AIHs referring to ICD A50.9, relating to CS[8], were broken down.

As for the information, the following data on AIHs was collected: amounts paid for AIHs; average amounts of AIHs paid corresponding to the total amount divided by the number of hospitalizations; hospitalizations of children under one year of age with infectious and parasitic diseases, and subsequently of children under one year of age with CS; amounts of hospital services; number of AIHs approved; amounts of professional services; days of hospital stay of the child and average days of hospital stay for AIHs paid, counted as hospitalizations. The amounts transferred nominally per AIH were broken down into two components: a) Hospital Services - HS (refers to food, hygiene, bedside patient support staff, equipment, medicines, and routine diagnostic and treatment auxiliary services - SADT); b) Professional Services - PS (refers to the work of professionals who provide direct assistance to patients)[8].

The secondary data documentation and recording type was the tool chosen to acquire the data. The data was entered into a Microsoft Office Excel spreadsheet (version 2023). Statistical analysis was supported by statistical consulting, and calculations were

performed in the R software (version 4.2.3, R Core Team, 2023) using the RStudio integrated development environment (version 2023.3.0.386, Posit Team, 2023). The data was analyzed for categorical variables (relative and absolute frequency) and numerical variables (measures of central tendency: mean and median). After the statistical analysis and calculation of the inflation-adjusted present value, the graphs presented were generated in Microsoft Office Excel (version 2023).

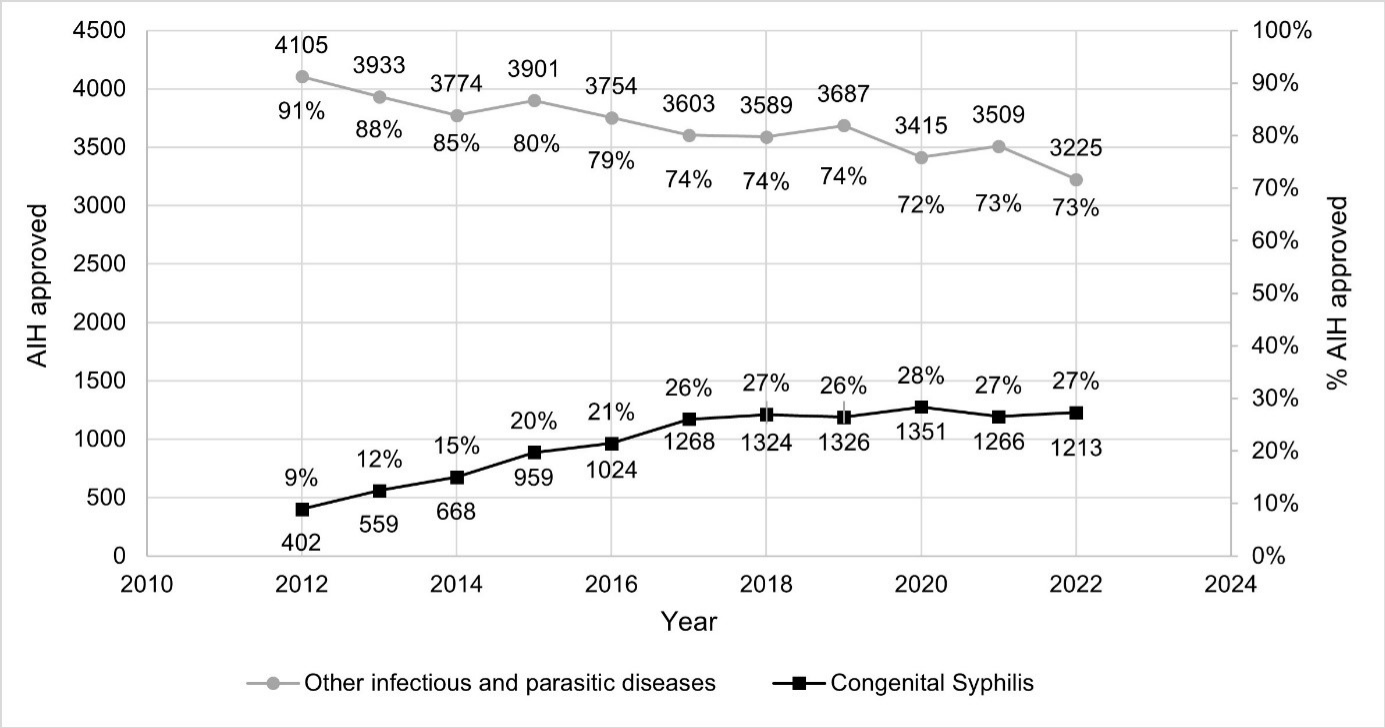
The study used a public domain database, but it was approved by the Nursing Research Committee of the Nursing School of the Federal University of Rio Grande do Sul (registration: 44.009) and respected current ethical precepts[15].

RESULTS

During the period studied, 2012 to 2022, there were 51,854 hospital admissions for infectious and parasitic diseases (chapter 1 of ICD-10) in children under one year of age in Rio Grande do Sul. AIHs for CS accounted for 11,360, or 21.91%, of all these hospitalizations in the state. The number of admissions was equal to the number of approved AIHs throughout the period analyzed, indicating no discrepancy between the number of admissions and authorizations.

Figure 1 shows a graphical representation of the number of AIHs approved for infectious and parasitic diseases and for hospitalizations for CS in children under one year of age in Rio Grande do Sul through the SUS. 402 AIHs were approved for CS in 2012 and 1,213 in 2022. The lines in the graph show that the proportion of CS in the universe of infectious and parasitic diseases in children under one-year-old increases over the period, so in 2012, there was 8.9% of AIH for CS. In 2022, the proportion was 27.3%, representing an increase of 201.7% in hospitalizations compared to the first and last years studied.

Figure 1 - Number of AIH for children under one-year-old due to infectious and parasitic diseases by CS and proportion of hospitalizations due to syphilis in the total number of hospitalizations due to other infectious and parasitic diseases in RS. Porto Alegre, Rio Grande do Sul, Brazil, 2023

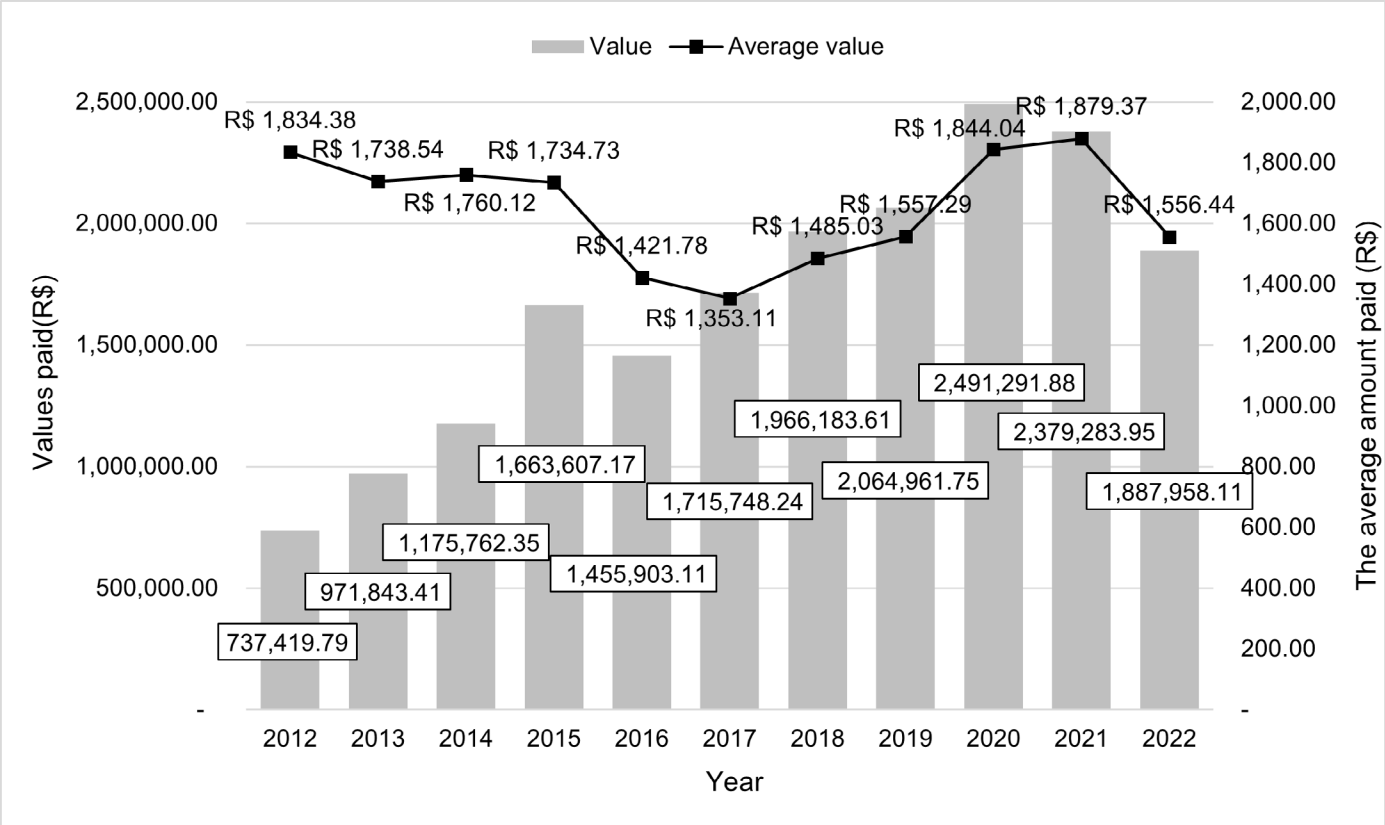


Source: Ministry of Health/DATASUS/SIH-SUS (2023)[8]

The total amount paid by the SUS for hospitalizations of children under one by CS in Rio Grande do Sul between 2012 and 2022 was R$18,509,672.60. Figure 2 shows that in 2012, the total amount transferred by AIH was R$737,419.79, with an average nominal value of R$1,834.38. In 2022, the total amount transferred by the AIH was R$1,887,958.11, with an average nominal value of R$1,556.44. The lowest amount was R$1,353.11 (in 2017), and the highest was R$1,879.37 (in 2021).

Graphically, Figure 2 shows an increase in the total amount transferred for hospitalizations by CS, which is related to the increase in the number of AIHs per year in the period under analysis, as shown in the previous graph. The line in the graph represents the nominal amount transferred, and there are differences between the years, but they are not discrepant.

Figure 2 - Amounts paid and average amounts paid in reais for AIH for hospitalizations for CS in children under one year old. Porto Alegre, Rio Grande do Sul, Brazil, 2023.

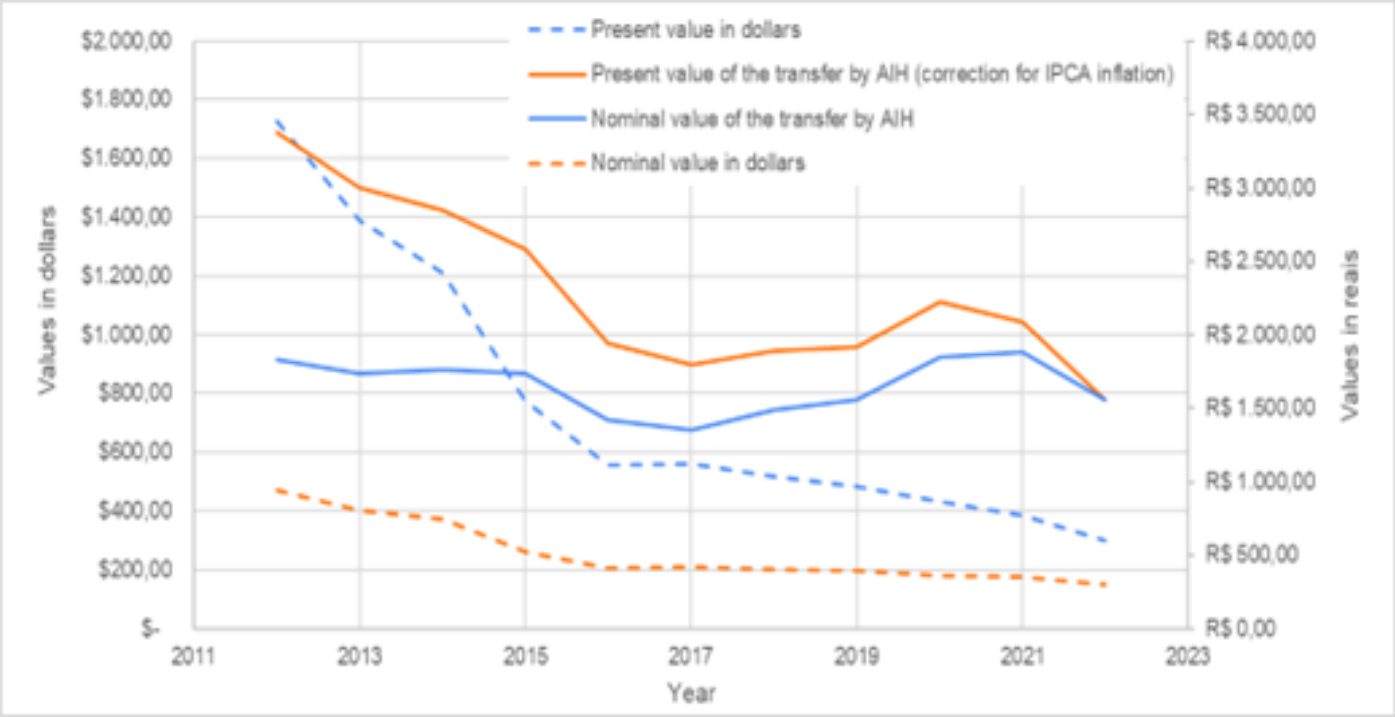


Source: Ministry of Health/DATASUS/SIH-SUS (2023)[8]

The graph (Figure 3) shows the nominal amounts transferred per AIH for CS in children under one year of age, the transfers adjusted for inflation, and the respective amounts converted into US dollars. The solid lines represent the amounts in reais and the dotted lines in dollars; the dotted lines represent the amounts in reais, and the dotted lines represent the amounts in dollars.

The graph's line representing the amount in reais shows that although there has been no significant decrease over the years, lending has not kept pace with inflation over the same period. When adjusted by the IPCA (yellow line), the reais transfers show a significant deterioration in the SUS transfers to hospitals over the period. This shows that real investments in terms of transfers to hospitals have decreased over the years.

Figure 3 - Values in reais (R$) and US dollars (US$) of hospitalizations for CS in children under one year of age in RS from 2012 to 2022. Porto Alegre, Rio Grande do Sul, 2023



Source: Ministry of Health/DATASUS/SIH-SUS[8], Ipea[16] and Central Bank[17] (2023).

The average values transferred by SUS for each hospitalization were adjusted by the IPCA index (present value of the transfer) to analyze the impact of inflation. In 2012, the average value of each hospitalization for SC in children under one year in RS, adjusted for inflation, should have been R$3,377.23; in 2022, the value was R$1,556.44.

When the average values per hospitalization are converted into US dollars, there has been an even greater gap in the value of the AIH paid to hospital institutions. The present value in dollars in 2012 was US$1,727.84; in 2022, it was US$301.36.

Table 1 shows the transfers by AIH, with a breakdown of the hospital services and professional services components. This table shows that the average amount transferred per AIH according to the hospital services component varied from R$1,400.64 in 2012 to R$1,033.05 in 2022. The professional services component saw a small increase over the period studied, from R$433.73 in 2012 to R$523.39 in 2022. It is worth noting that between 2016 and 2017, the hospital services funding component saw the most significant reduction in the amount transferred per AIH.

Table 1 - Values in Reais (R$) of AIH for CS in children under one year of age in RS, according to the component, from 2012 to 2022. Porto Alegre, Rio Grande do Sul, 2023

	Hospital services		Professional services	
Year	Total value	Average value	Total value	Average value
2012	563,059.21	1,400.64	174,360.58	433.73
2013	725,722.44	1,298.25	246,120.97	440.29
2014	878,108.45	1,314.53	297,653.90	445.59

2015	1,124,176.71	1,172.24	539,430.46	562.49
2016	965,896.80	943.26	490,006.31	478.52
2017	1,095,892.35	864.27	619,855.89	488.85
2018	1,324,172.26	1,000.13	642,011.35	484.9
2019	1,431, 867.88	1,079.84	633,093.87	477.45
2020	1,775,224.77	1,314.01	716,067.11	530.03
2021	1,752,826.84	1,384.54	626,457.11	494.83
2022	1,253,086.44	1,033.05	634,871.67	523.39
Total	12,890,034.15	-	5,619,929.22	-

Source: Ministry of Health/DATASUS/SIH-SUS (2023)[8]

In total, children spent 113,626 days in hospital, with variations between 9.72 and 10.85 and an average of 10 days over the period studied (Table 2).

Table 2 - Days of hospital stay per year, Number of hospitalizations per year and Average days of hospital stay per CS in children under one year old in RS. Porto Alegre, Rio Grande do Sul, Brazil, 2023.

Year	Days of hospital stay per year	Number of hospital admissions per year	Average number of days spent in hospital
2012	4361	402	10.85
2013	6029	559	10.79
2014	7213	668	10.8
2015	9685	959	10.1
2016	9953	1024	9.72
2017	12735	1268	10.04
2018	12881	1324	9.73
2019	13123	1326	9.9
2020	13306	1351	9.85
2021	12415	1266	9.81
2022	11925	1213	9.83
Total	**113626**	**11360**	**10**

Source: Ministry of Health/DATASUS/SIH-SUS (2023)[8]

DISCUSSION

The results show an increase in the total number of IHAs approved for hospital admissions due to CS in children under one year in the state of Rio Grande do Sul between 2012 and 2022, indicating that this preventable condition is becoming more representative in the universe of hospitalizations, reaching 27% in 2022. This trend was also found in other Brazilian studies[9,14,18-19] and developed countries such as Canada[20] and the United States of America[1,10-11].

The results show that, due to the increase in the number of hospitalizations, there has been an increase in transfers due to hospitalizations for CS, which represents a higher expense for the public coffers due to this condition.

The significant increase in hospitalizations due to CS is reflected in higher spending on the disease by countries[10]. Even in developed countries, this condition is still a significant challenge, as in the USA, where hospital costs for CS hospitalizations are higher than those for acquired syphilis[1]. Furthermore, the cost of screening pregnant women for syphilis is lower than the cost of treating a newborn with CS[21].

Other studies show that hospitalizations due to CS result in high costs for the SUS and confirm the loss of opportunity for prevention during prenatal care, and the money spent on this demand for tertiary care could be used for other purposes[9,19]. It is estimated that each child hospitalized for neurosyphilis generates a cost to the public purse of at least US$881.48 (US dollars)[19].

The amounts passed on by SUS to hospitals about AIH are not adjusted for inflation, which means they don't keep up with the National Consumer Price Index (INPC, in Portuguese) and the Broad National Consumer Price Index (IPCA, in Portuguese), as seen in the adjusted data. It can be inferred that there is a lag in the amounts paid by the SUS when they are converted into US dollars. Over the years studied, there has been a gradual increase in the amount of Reais passed on to health services, but because of the increase in the number of children hospitalized over the years and not an increase in the amount passed on per AIH. In other words, the increase in admissions by CS culminated in total transfers for hospital admissions. However, it was found that the nominal transfer per AIH was reduced.

Furthermore, when the transfers are broken down into hospital services and professionals, the data shows that, despite inflation, the amount transferred by the SUS to pay for hospital services has been reduced. From this, it can be inferred that CS-related hospitalizations are underfunded. In this way, the institutions may be contributing more of their financial resources to cover the costs of these hospital services.

In the state of Ceará, as in RS, there was a substantial increase in hospitalizations and hospital costs for CS in children under one year between 2012 and 2017, and the average amount paid by SUS for each child hospitalized was US$234.73[9]. In the empirical field studied, the average value of the AIH in dollars was US$513.88, which is higher than the value found in the study.

An American study highlighted the fact that children diagnosed with CS spend longer in hospital and incur higher hospital costs[11]. In the US state of Arizona, the average number of days of hospitalization for CS in 2019 was 10 to 14 days, and the average total hospitalization cost was US$12,660. In contrast, the average cost of treating gestational syphilis was US$12.53 in 2017 in the country[22].

The average time spent in the hospital for CS was 10 days over the years analyzed. This is mainly due to the treatment regimen recommended by the SUS for intramuscular or intravenous antibiotic therapy being the same length of time as the average found[23]. However, it should be noted that children admitted to hospitals are more susceptible to nosocomial infections[24-25].

Therefore, timely diagnosis and treatment of syphilis during pregnancy is considered necessary to reduce hospital admissions and the exposure of newborns and their families[9].

Managers' efforts to prevent CS can reduce costs and the burden of using health services and improve patients' quality of life[1].

From this perspective, the high rates of the disease are generally linked to social inequalities[26]. Therefore, improvements in the socio-economic sphere, equitable access to health services, and more routine tests are necessary to reduce the number of children affected by the disease[27-28].

One limitation of this study was secondary data, which refers only to the amounts nominally authorized in the AIH, which may be withheld or supplemented depending on the hospital units.

CONCLUSION

This study showed an increase in the number of hospitalizations of children under one year old due to CS and, consequently, an increase in financial transfers for medical and hospital treatment of this condition in Rio Grande do Sul over the eleven years analyzed. However, it was found that the nominal transfer from the SUS to hospitals because of hospitalizations did not increase considerably over the years.

Only the transfers for professional and hospital services saw a small increase. However, when the nominal values are adjusted for inflation, real transfers from hospitals significantly decrease. This suggests that the amounts paid by the SUS for AIHs of CS must be updated, as there is a risk of underfunding the services provided.

As a contribution to the study, it is suggested that cost-effective actions to prevent CS should be taken by state and municipal managers in the state of Rio Grande do Sul, to reduce the number of newborns affected by the disease. In this way, there will be less suffering for families and, in addition, the possibility of reducing costs related to hospitalizations in the healthcare network. As a recommendation for future studies, it is suggested that research be conducted with primary data and that methodologies be used that can bring together tools from health economics to estimate the actual costs incurred by these hospitalizations, using data on transfer by AIH and the amounts spent by the hospital according to the unified SUS table and monetization of indirect costs for families.

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Received: 24/10/2023
Approved: 28/06/2024

Associate editor: Dra. Claudia Palombo

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Role of Authors:
Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Carvalho LMC de, Santos VCF dos, Ramos AR.** Drafting the work or revising it critically for important intellectual content - **Carvalho LMC de, Santos VCF dos, Machado M da GP, Ramos AR.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Carvalho LMC de, Ramos AR.** All authors approved the final version of the text.

ISSN 2176-9133