

Hospitalization costs for congenital syphilis in the state of Ceará

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Abstract

Objectives: this study aimed to describe direct medical-hospital costs of hospitalizations for Congenital Syphilis (CS) in children under one year of age, users of the public health network in the state of Ceará, Brazil, from 2012 to 2017.

Methods: this is a cross-sectional study that used the DATASUS Hospital Information System database, built from the information registered in the Inpatient Hospital Authorizations (IHA), organized in a Microsoft Office Excel 2010 spreadsheet and analyzed in SPSS, version 23.

Results: there were 4,085 hospitalizations registered for CS (16.6% of total hospital admissions for infectious and parasitic diseases) at a cost of US\$ 927,726.84, representing an annual average of US\$ 234.73 per child. A slight decrease in approved IHA for infectious and parasitic diseases (5.5%) was verified when compared with CS, which increased by 36.4% over the evaluated years.

Conclusion: high treatment costs for CS in the state of Ceará were identified, a situation that could be avoided if pregnant women with syphilis were diagnosed and treated during prenatal care.

Key words Syphilis, congenital, Hospital costs, Prenatal care, Hospitalization



Introduction

The eradication of Congenital Syphilis (CS) as a public health problem constitutes a priority for the Latin America and the Caribbean region.¹ For the problem to be considered under control, the World Health Organization (WHO) accepts the occurrence of less than 0.5 cases per 1,000 live births (LB),² a situation that seems far from being attained in poor and developing countries,³ considering that few have managed to achieve it.⁴

In Brazil, the incidence rate of CS has increased over the past few years and it was 8.6 per 1,000 live births (LB) in 2017.⁵ In Ceará, between 2010 and August 2018, 10,406 cases of children under one year of age with CS were notified, with an incidence rate of 13.0 cases per 1,000 LB, far above the national rate of 5.6 cases/LB.⁵⁻⁶

CS prevention is feasible, as long as pregnant women are diagnosed and treated during prenatal care. These actions are cost-effective⁷⁻⁸ and result in a reduction in the neonatal outcomes caused by CS, such as low birth weight, stillbirth and miscarriage.⁹ At birth, all newborns of women diagnosed with syphilis during pregnancy undergo a careful evaluation that involves the association of clinical, epidemiological and laboratory criteria of both mother and child.¹⁰ Brazil follows the WHO recommendation that aims to eliminate CS as a public health problem.¹¹

If a newborn with CS shows signs and symptoms and/or laboratory alterations with central nervous system (CNS) involvement, hospitalization is necessary for the treatment of neurosyphilis.¹⁰⁻¹² It so happens that one of the biggest problems in relation to this diagnosis lies in the difficulty of access to CSF puncture,¹³ most of the time implying keeping the children in the hospital for a period of ten days for treatment, regardless of the certainty of the CNS involvement.

The fact that some hospital units are unable to carry out the diagnosis of neurosyphilis in children with CS has generated additional costs to the Brazilian Unified Health System,¹³ a serious situation in a country such as Brazil, which already has many resource limitations for the health area. To exemplify the magnitude of this problem, in the period from 2012 to 2017, Brazil recorded 434,622 hospital admissions for infectious and parasitic diseases in children under one year old and CS accounted for 63,615 (14.6%) of these hospitalizations.¹⁴

Considering the abovementioned facts and the costs related to the hospitalization of children diag-

nosed with CS, this study aims to describe the direct medical-hospital costs of hospitalizations for CS in children under one year of age within the public health system in the state of Ceará, from 2012 to 2017.

Methods

This was a cross-sectional study describing the direct medical and hospital costs of hospitalizations for CS in children under one year of age, who are users of the public health network of the state of Ceará, from 2012 to 2017. This period was chosen because a significant increase in the incidence rate of CS started to be observed at this time in all regions of Brazil.⁵

Data collection was based on the top-down approach (macro-costing), with the public health system perspective. Data from the Hospital Information System of the Unified Health System - SIH/SUS (Portuguese acronym), which is managed by the Ministry of Health, and processed by the SUS Informatics Department (Datusus), of the Executive Secretariat of the Ministry of Health were used.¹⁵⁻¹⁷ In this study, indirect costs were not taken into account, that is, the ones that would also analyze the problem from the perspective of society.¹⁷

The SIH/SUS is a system for the management of hospital care, through the collection, control and payment of care provided to citizens by hospital units accredited to SUS¹⁶ and exclusively covers hospitalizations carried out by public and health insurance networks.¹⁷

Medical-hospital costs were evaluated, with information extracted from the IHA payment records, an instrument that records the care provided by SUS-funded hospitalizations. These values include, in addition to hospital services, the costs related to hospital daily charges, food, hygiene, medications, complementary diagnostic and therapy services - CDTS, professional services such as doctors, dentists, nurses, and obstetricians.¹⁷ To analyze the underfunding of these values, a bottom-up cost study would be necessary, using tables that are more up-to-date than those provided by SUS.^{16,18} Hospital admission costs are usually classified into: a) direct medical-hospital costs, which refer to expenses directly related to health care, such as the payment of health professionals, medications, complementary exams and hospital charges; non-medical and hospital costs, which include expenses with patient transportation, home and vehicle adaptations due to a disease, as well as the necessary care with food and clothing, among others; b) indirect

costs, which basically include losses and gains in productivity related to an intervention, for instance, days off work; and c) intangible costs, which are those that cannot be commercialized, such as the cost of pain and suffering associated with the disease that is being treated.^{16,19}

For the IHA selection, the variables main diagnosis and secondary diagnosis were used, of which codes, according to the Tenth Review of the International Statistical Classification of Diseases and Related Health Problems (ICD-10),²⁰ referred to the diseases in Chapter I: Some infectious and parasitic diseases that incorporate the list of morbidity: ICD from A50 to A50.9 (congenital syphilis). Chapter I covers the codes A00 to B99, with congenital syphilis included in it.

The information on the national reference payment values defined by the Ministry of Health (MH) for the remuneration of the procedures, are defined in the SUS Management System of the Table of Procedures, Medicines, Orthotics, Prosthetics and Special Materials (SIGTAP). In case of CS, the reference value is the same for the treatment of predominantly sexually transmitted infections and the hospitalization costs amount to R\$ 258.77. This value may increase if admission to the Intensive Care Unit (ICU) is necessary, as well as tests of greater complexity. CS is classified as a procedure of medium complexity and SUS covers the costs of hospitalization of children for a mean hospital stay of six days, which can reach 12 days.²¹

The information collected regarding IHA were: hospitalizations of children with infectious and parasitic diseases, and subsequently, of children under one year of age with CS; amounts paid for the IHAs; mean IHA paid values : corresponding to the total amount divided by the number of hospitalizations; number of IHAs approved; hospital services values; professional service values ; days of hospital stay regarding the child and mean number of days of hospitalization related to paid IHAs, counted as hospitalizations. Monetary values were presented in Brazilian reals and US dollars, since Datasus already makes this information available using the conversion with the daily rate of the dollar for the assessed years.

The data were entered in a Microsoft Office Excel spreadsheet (version 2010) and analyzed using the software SPSS, version 23. As this comprises information of which content is of public domain, the study was not submitted to the Ethics Committee in Research with Human Beings. Nevertheless, the researchers followed all ethical precepts, guaranteeing the preservation of the subjects' identity, in

line with the ethical precepts established by the National Health Council CNS Resolution N. 466/2012, which deals with research involving human beings.

Results

During the period from January 1, 2012 to December 31, 2017, there were 24,552 hospital admissions for infectious and parasitic diseases in children under one year of age in the state of Ceará (10.1% of the total admissions in this age group). The IHA due to CS corresponded to 4,085 (16.6% of the total of these hospitalizations).

Figure 1 shows the number of IHAs approved for infectious and parasitic diseases and for hospitalizations for CS in children under one year in SUS. There is a slight decrease in the proportion of IHAs approved for infectious and parasitic diseases compared to CS, which increased over the assessed years. In 2012, 555 IHAs were approved for CS, whereas 872 were approved in 2017, an increase of 36.4%.

The sum of resources paid by SUS for hospitalizations for CS in the state of Ceará over the six analyzed years was US\$ 927,726.84 dollars, equivalent to R\$ 2,430,808.90, implying an average cost of \$ 234.73 dollars per child (Figure 2).

Table 1 shows a total of 4,085 IHAs approved in all analyzed years. Regarding the average annual values of IHAs paid for hospitalization of children with CS in the period from 2012 to 2017, it was observed that the total paid was 232% higher than that officially instituted by SUS for this morbidity. In the years 2012 and 2015, there was a decrease in the number of approved IHAs, with an average value of R \$ 601.03, showing that the hospital service values are higher than those of professionals.

It was observed that the children's total length of hospital stay was 34,413 days, varying individually from 8.5 to 9.7, with an average of 9.2 days. (Table 2).

Discussion

This study identified an increase in the number of IHAs approved for hospital admissions due to CS. This increase obviously leads to an increase in costs, which have also grown considerably over the assessed years, compared to infectious and parasitic diseases. A gap is perceived due to the lack of updating of these values, a situation also demonstrated in a study on the costs of hospital treatment for pneumococcal meningitis in São José dos

Figure 1

Inpatient Hospital Authorization (IHA), approved for children under one year of age with other infectious and parasitic diseases and with CS. Public and SUS-affiliated hospitals.

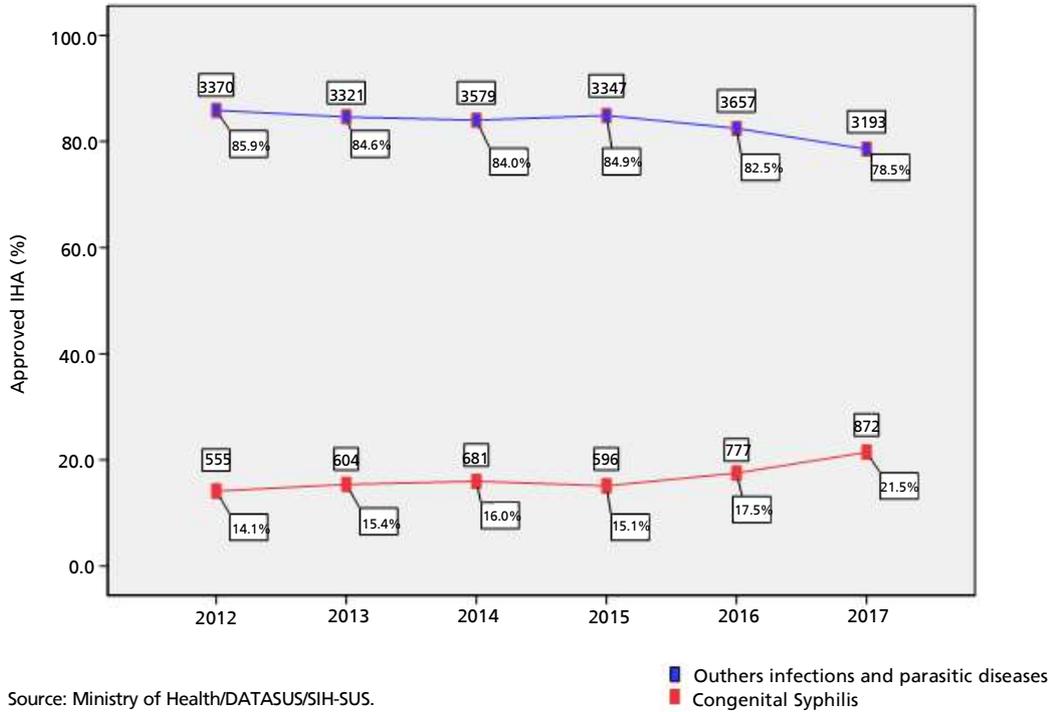


Figure 2

Amounts paid and mean amounts paid in dollars related to IHA for hospitalizations for CS in children under one year old. Public and SUS-affiliated hospitals.

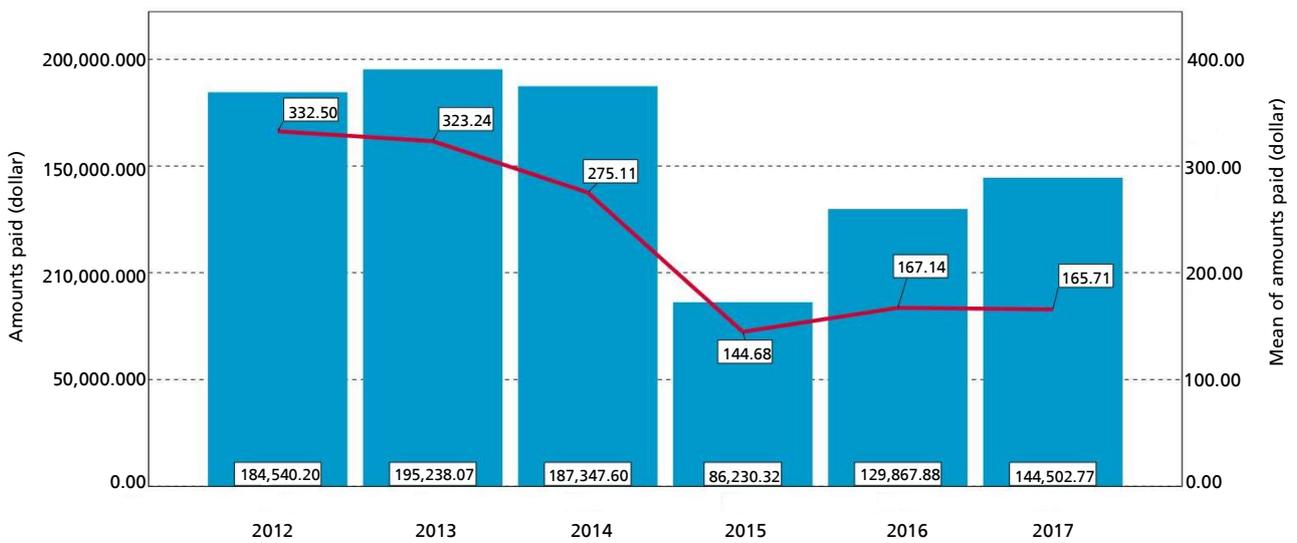


Table 1

Number of approved IHAs, hospital service values (total value and mean value), professional service values (total value and mean value), total value and mean value in Brazilian reais and U.S. dollars for hospitalizations of children under one year with CS. Public and SUS-affiliated hospitals. Ceará, Brazil, 2012 to 2017.

Year	Hospital service values			Professional service values		Total value (real)		Total value (dollar)	
	Approved IHAs	Value (real)	Mean value (real)	Value (real)	Mean value (real)	Value	Mean value	Value	Mean value
2012	555	241,666.64	435.44	120,610.99	217.32	362,277.63	652.75	184,540.20	332.50
2013	604	280,902.36	465.07	145,244.05	240.47	426,146.41	705.54	195,238.07	323.24
2014	681	298,254.18	437.97	143,673.55	210.97	441,927.73	648.94	187,347.60	275.11
2015	596	209,867.61	352.13	942,72.74	158.18	304,140.35	510.30	862,30.32	144.68
2016	777	290,737.51	374.18	142,757.85	183.73	433,495.36	557.91	129,867.88	167.14
2017	872	317,834.80	364.49	144,986.62	166.27	462,821.42	530.76	144,502.77	165.71

Source: SIH-SUS/Datasus/Ministry of Health.

Table 2

Days of hospital stay per year and mean number of days of hospital stay for CS in children under one year. Public and SUS-affiliated hospitals. Ceará, Brazil, 2012 to 2017.

Year	Days of hospital stay per year	Mean number of days of hospital stay
2012	5,349	9.6
2013	5,889	9.7
2014	6,543	9.6
2015	5,338	9.0
2016	6,863	8.8
2017	7,431	8.5
Total	37,413	9.2

Source: SIH-SUS/Datasus/Ministry of Health.

Campos, state of São Paulo, which showed that costs were ten to twenty times higher than the average paid by SUS.¹⁸ It is noteworthy the fact that, in this study, some items are not accounted for and that indirect costs were not included.

The IHA values paid by SUS do not reflect the actual costs of treating CS and do not follow inflationary indices such as the Broad National Consumer Price Index (IPCA, *Índice Nacional de Preços ao Consumidor Amplo*) and the National Consumer Price Index (INPC, *Índice Nacional de Preços ao Consumidor*).

In 2008, the Table of Procedures, Medicines, Orthotics, Prosthetics and Special Materials (SIGTAP – Portuguese acronym) was established to create the SUS and Ambulatory (SIA) and Hospital

(SIH) Information System databases; however, even after these values were readjusted, resources from SUS are still scarce and limited.¹⁸

When the child needs a neonatal ICU bed, it is possible to increase the values, as well as the costs of more complex tests. Nonetheless, it is still likely that these costs are underestimated, not characterizing the costs adequately, consisting of reimbursed amounts and not the actual values of the health resources that were used, as it may have been necessary to perform additional procedures that were not foreseen in the list of those covered by the IHA and, therefore, they were not computed. Other cost studies were carried out using the SIH / SUS data to measure the economic impact on the country, such as the one that evaluated hospitalization among the

elderly, demonstrating a large contribution to SUS expenses.²²

Hospitalizations for CS accounted for a considerable proportion of the total number of hospitalizations for infectious and parasitic diseases in children under one year of age and an increase in this proportion has been observed over the study period. For this reason, it is evident that there was an increase in the costs of these hospitalizations, a situation not observed in the other diseases of the chapter. It must be considered that these costs refer only to hospitalization costs reimbursed by SUS and that the comments related to IHA were not assessed.

The lack of information in the Datasus system about the age, in months, of children under one year old, does not allow the effective identification of the age at which they were hospitalized. It is believed that most of these hospitalizations occurred in the neonatal period, considering that the WHO recommends carrying out some tests for the diagnosis of CS in the maternity ward.¹⁰ Some, such as CSF analysis, are difficult to perform due to its complexity, and for this reason they are not performed. As the definition of the treatment regimen requires the evaluation of these tests, neonatologists end up hospitalizing babies for a period of ten days, the recommended time for the treatment of neurosyphilis.

It is likely that pediatric hospital professionals are not identifying children who come for treatment with late neurosyphilis manifestations as CS cases, and an analogy with this situation can be made with a study that evaluated the follow-up of children in Fortaleza, Ceará, which showed that a large number of these children are brought to a primary care unit for treatment and the professionals do not even request the VDRL test for evaluation.²³ Another aspect that reinforces this observation is when the children's mean length of hospital stay was analyzed, which was 9.2 days, that is, it seems to have occurred shortly after birth, as recommended by the MH.¹⁰

In the setting of decision-making in Public Health, it is extremely important to evaluate and consider hospital costs for a rational allocation of the scarce resources of SUS. The goal is to optimize and ensure equity in their application. It so happens that, in the case of CS, the employed volume of resources is a very serious issue, since this infection constitutes a preventable perinatal cause. It is possible and highly recommended that CS be prevented, since the pregnant woman is diagnosed with syphilis and treated during prenatal care.

In primary care, these actions are effective, inex-

pensive and prevent the diagnosis and treatment in pregnant women from occurring only at the time of delivery. As previously mentioned, babies born to pregnant women with syphilis are hospitalized for an average of 9.2 days, which inevitably entails higher costs, in addition to increasing neonatal morbidity and bringing other harmful consequences that could have been prevented.^{13,24-25}

In Brazil, there has been a significant advance in the coverage of prenatal care;²⁶⁻²⁷ however, at this moment, the opportunity to perform the diagnosis of syphilis and implement an effective treatment is lost, including the woman's partner, with benzathine penicillin, the only drug capable of preventing vertical transmission in 97% of cases.^{10,28-29} Although prenatal care is cost-effective for several conditions, including CS,^{7,8} with the cost of treating syphilis in pregnancy being less than U \$ 1.50,³⁰ this still remains a challenge for health care professionals and managers.

One of the limitations of this study is related to the use of secondary databases due to the scope and quality of the information. It is of utmost importance to report that the assessment of indirect costs was not carried out, and that the assessment of direct costs may not have been carried out in its entirety, that is, it is necessary that studies be carried out with this purpose.

The results of this study demonstrated the high costs of CS treatment in the state of Ceará, which have a great impact on public health and demonstrated that opportunities for CS prevention are lost. If the mothers were adequately diagnosed and treated, preferably during early prenatal care, hospitalizations and the suffering of babies and their families would be prevented and, thus, the resources spent on hospitalization could be used for other purposes.

Authors' contribution

Elarrat Canto SV and Araújo MAL: study conception and design, analysis and interpretation of results, writing of the manuscript. Almeida RLF: database construction, organization and analysis, contributed to the writing of the manuscript. Cutrim BEC: writing and organization of the manuscript. All authors approved the final version of the article.

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Received on June 17, 2019

Final version presented on February 23, 2020

Approved on November 30, 2020