

Temporal trend of congenital syphilis hospitalizations between 2008 and 2018 in Minas Gerais

Tendência temporal de internações por sífilis congênita entre 2008 e 2018, em Minas Gerais

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ABSTRACT

The objective was to analyze the temporal trend of congenital syphilis hospitalizations between 2008 and 2018 in Minas Gerais. Method: ecological time-series study. Prais-Winsten estimation was used for trend analysis. The Annual Percentage Variation was calculated to show the trend intensity. Results: an ascending trend of congenital syphilis hospitalizations was observed in 12 macro-regions of Minas Gerais. The greater Annual Percentage Variations were observed in the Leste do Sul, West and East regions. The Leste do Sul macro-region showed the highest variation in the state (84.34%; CI_{95%} 50.30; 126.09) while Triângulo Norte showed the lowest annual percentage variation (19.62; CI_{95%} 6.48; 34.38). Conclusion: the ascending trend of congenital syphilis hospitalizations observed in 12 out of the 13 health macro-regions characterizes an ascending trend in the state and reinforces the need to develop or review actions that prioritize the prevention of this disease.

Descriptors: Syphilis, Congenital; Primary Health Care; Child Health; Epidemiology.

RESUMO

Objetivou-se analisar a tendência temporal de internações por sífilis congênita entre 2008 e 2018 em Minas Gerais. Método: estudo ecológico de série temporal. Para a análise de tendência, realizou-se modelo de *Prais-Winsten*. Calculou-se a Variação Percentual Anual para apresentar a intensidade da tendência. Resultados: foi observada tendência ascendente de internações por sífilis congênita em 12 macrorregiões de Minas Gerais. As maiores Variações Percentuais Anuais foram observadas nas regiões: Leste do Sul, Oeste e Leste. A macrorregião Leste do Sul apresentou a maior variação do estado (84,34%; IC_{95%} 50,30; 126,09) e a Triângulo Norte apresentou menor variação percentual anual (19,62; IC_{95%} 6,48; 34,38). Conclusão: a tendência de aumento de internações por sífilis congênita, observada em 12 das 13 macrorregiões de saúde, caracteriza uma tendência ascendente no estado e reforça a necessidade de formulação ou revisão de ações que priorizem a prevenção desse agravo.

Descritores: Sífilis Congênita; Atenção Primária à Saúde; Saúde da Criança; Epidemiologia.

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How to cite this article: Souza TR, Moreira AD, Matozinhos FP, Lana FCF, Arcêncio RA, Freitas GL. Temporal trend of congenital syphilis hospitalizations between 2008 and 2018 in Minas Gerais. Rev. Eletr. Enferm. [Internet]. 2021 [cited _____];23:64978. Available from: <https://doi.org/10.5216/ree.v23.64978>.

Received: 08/13/2020. Approved: 02/22/2021. Published: 04/13/2021.

INTRODUCTION

Congenital syphilis (CS) refers to the hematogenous dissemination of the *Treponema pallidum* in untreated or incorrectly treated infected pregnant women to her conceptus via the transplacental route⁽¹⁾. Vertical transmission of syphilis is a major public health problem in Brazil, as this disease has the highest rates of transmission in the group of diseases transmitted during the pregnancy-puerperal cycle⁽²⁾.

The World Health Organization (WHO) has established the elimination of CS as a goal to achieve the Millennium Development Goals (MDGs)⁽¹⁾. As this is a preventable and curable disease, the Family Health Strategy (FHS) takes center stage in the actions of early identification of symptomatic pregnant women, antenatal care and timely treatment, thus avoiding the risks of transplacental transmission to the fetus⁽²⁾.

Considering that CS can be prevented with an effective action in Primary Health Care (PHC), hospitalization for this pathology is in the group of Hospitalizations for Conditions Sensitive to Primary Care (ICSAP). This concept was developed in the 1980s by John Billings and indicates which hospitalizations are potentially preventable as an indirect reflection of the effectiveness of primary care⁽³⁾. In Brazil, the list has 19 groups of pathologies and was implemented through Ordinance No. 221 of April 17, 2008⁽⁴⁾.

Primary Health Care is built on a set of actions that give consistency to the concept of health surveillance, coordinating the bases of promotion, protection and assistance, seeking to guarantee comprehensive care. However, the full and timely access to these services by the population presents challenges, especially in places with lower coverage of the National Health System (Brazilian SUS)⁽⁵⁾.

In Brazil, the number of cases of CS among live births increased by 3.8 times between 2010 and 2018. In the period from 1998 to 2019, the concentration of the number of CS cases in children under one year of age was 44.4% among residents of the Southeast region, followed by the Northeast (30.2%), South (11.3%), North (8.5%) and Central-West (5.6%)⁽⁶⁾.

The adequate treatment of syphilis during the pregnancy-puerperal cycle prevents maternal complications as well as congenital syphilis, and such diseases may be under the control of PHC (provided that infected pregnant women have quality monitoring, access to information and prevention of health problems)⁽⁷⁾. There is a shortage of current studies published on this topic in the state of Minas Gerais (MG). Thus, the objective was to analyze the temporal trend of congenital syphilis hospitalizations between 2008 and 2018 in Minas Gerais.

METHODS

This is an ecological time-series study on congenital syphilis hospitalizations in children under one year of age in the state of MG from 2008 to 2018.

The state of MG is located in southeastern Brazil, has the fourth largest territorial area in the country with an extension of 586,528 km² and is the second most populous state, with approximately 21.1 million inhabitants. The Health Regionalization Master Plan is organized in 76 health micro-regions and 13 macro-regions, namely Triângulo Sul, Triângulo Norte, South, Southeast, West, North, Northwest, Northeast, Leste do Sul, East, Jequitinhonha, Central South, Central⁽⁸⁾.

Data on CS hospitalizations were collected in the Hospital Information System of the SUS Department of Informatics. Hospitalization rates were calculated by the ratio between the total number of CS hospitalizations and the number of resident children up to one year old per year analyzed multiplied by 100,000. Population data stratified by age group and health macro-region of MG were collected from the last IBGE census in 2010.

Congenital syphilis hospitalization rates from the entire state and from each macro-region were considered as outcome variables. Initially, there was a logarithmic transformation of CS hospitalization rates for each year and macro-region in order to reduce the heterogeneity of residues from regression analysis. The trend analyzes of historical series were performed using the statistical program Stata, version 14.0. General linear regression was used by the Prais-Winsten estimation with robust variance, with the period studied (2008-2018) as an independent variable. The choice of the method considers the serial autocorrelation and the absence of independent equation residues and avoids possible errors that overestimate the quality of fit measures⁽⁹⁾. Trends were classified as stationary ($p > 0.05$), declining ($p < 0.05$ and negative regression coefficient) or ascending ($p < 0.05$ and positive regression coefficient) in each region.

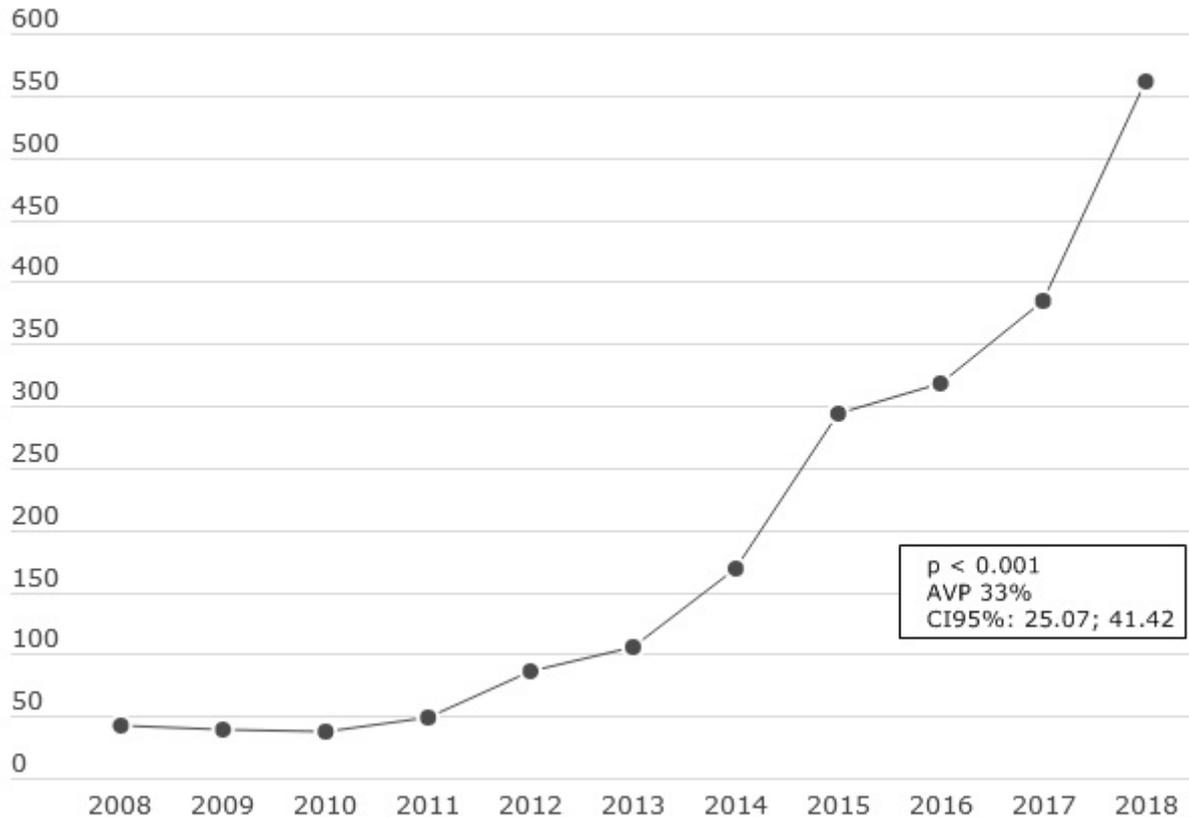
The values of the $b1$ and e (standard error) coefficients generated by the statistical analysis program were used to calculate the annual percentage variation (APV) and the 95% confidence interval (CI_{95%}). To identify the APV, the corresponding $b1$ coefficient values were applied to the following formula: $APV = -1 + 10 [b1]*100\%$. Then, the CI_{95%} of variation measures was calculated using the following formulas: minimum CI_{95%} = $-1 + 10 [b1-t*e] *100\%$; and maximum CI_{95%} = $-1 + 10 [b1+t*e]*100\%$. The t refers to the t -student and corresponds to ten degrees of freedom (2.2281) related to the 11 years of analysis⁽¹⁰⁾.

The study complied with Resolution 466/2012, which involves research with human beings. In addition, the project was approved by the Research Ethics Committee (COEP) at UFMG under number 3.230.972.

RESULTS

Congenital syphilis hospitalization rates in children aged up to one year increased in the state of MG between years 2008 and 2018. The average rate in the period studied was of 190.15 cases per 100,000 inhabitants. In 2008, the average rate in the state was 42.05 cases per 100 thousand inhabitants

and in 2018, 561.05 cases per 100 thousand inhabitants. The AVP of 33% was observed (CI_{95%}: 25.07%; 41.42%). As of 2012, hospitalizations increased more sharply and year 2015 presented the largest relative increase in relation to the prior year, with almost the double number of hospitalizations of year 2014 (Figure 1).



Notes: APV = 33% = annual percentage variation in the state of Minas Gerais. CI = confidence interval.

Source: prepared for the purposes of this study.

Figure 1. Congenital syphilis hospitalization rates in children up to one year old per 100 thousand inhabitants - Minas Gerais, 2008 to 2018.

When comparing years 2018 and 2008, the macro-regions with the highest hospitalization rates (per 100 thousand inhabitants) were North, West and Triângulo Sul. The macro-regions with the highest rates throughout the period were Central (886.7), Leste do Sul (813.7) and East (754.7). In contrast, the lowest rates were in Triângulo Norte (72.94), Northwest (165.66) and Jequitinhonha (187.2) (Table 1).

The analysis of CS hospitalization trends in children under one year old in the health macro-regions of MG showed that 12 out of the 13 investigated macro-regions presented an ascending trend. No declining trend in CS hospitalization rates in children under one year old was identified, and only the Central South macro-region showed a stationary trend (APV = 26.06 and CI_{95%} -1.96; 61.66). The macro-region with the lowest APV was Triângulo Norte (19.62%

and CI_{95%} 6.48; 34.38), while Leste do Sul had an APV of 84.34% (CI_{95%} 50.30; 126.09), the highest in the state (Table 2).

DISCUSSION

This study showed that in MG, CS hospitalization rates for in children under one year of age increased during the years analyzed, going from 42.05 (2008) to 561.05 (2018) per 100 thousand children. The AVP was 33.0% in the state, varying from 19.62% in the Triângulo Norte macro-region to 84.34% in Leste do Sul. Twelve out of the 13 health macro-regions showed an ascending trend in CS hospitalizations in children under one year of age, characterizing an ascending trend in the state. The highest AVP values were observed

Table 1. Congenital syphilis hospitalization rates by macro-region. Minas Gerais, Brazil, 2008 to 2018.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Triângulo Sul	n	3	3	4	3	5	9	19	25	20	16	60
	T	35.61	35.61	47.48	35.61	59.35	106.82	225.52	296.74	237.39	189.91	712.17
Triângulo Norte	n	0	2	7	4	2	6	12	10	14	10	11
	T	0	13.26	46.42	26.53	13.26	39.77	79.58	66.31	92.84	66.31	72.94
Sul	n	8	7	6	11	35	38	68	98	78	89	125
	T	27.03	23.65	20.27	37.17	118.26	128.39	229.75	331.11	263.54	300.71	422.34
Sudeste	n	6	9	9	10	9	14	15	23	32	58	78
	T	33.06	49.58	49.85	55.09	49.58	77.13	82.64	126.71	176.30	319.54	429.73
Oeste	n	3	1	2	3	9	13	32	49	54	52	66
	T	20.73	6.91	13.82	20.73	62.18	89.82	221.10	338.56	373.11	359.29	456.02
Norte	n	2	7	5	7	3	4	8	25	34	52	66
	T	9.05	31.69	22.63	31.69	13.58	18.11	36.21	113.16	153.90	235.38	298.75
Noroeste	n	1	0	3	2	5	5	9	20	27	29	14
	T	11.83	0	35.50	23.67	59.16	59.16	106.5	236.66	319.49	343.15	165.66
Nordeste	n	2	4	2	4	3	10	4	4	16	14	28
	T	16.23	32.46	16.23	32.46	24.34	81.15	32.46	32.46	129.84	113.61	227.22
Leste do Sul	n	0	0	6	1	4	13	11	35	14	31	69
	T	0	0	70.76	11.79	47.18	153.32	129.73	412.78	165.11	365.61	813.78
Leste	n	7	5	0	6	11	14	11	21	40	57	123
	T	42.96	30.68	p<0.01	36.82	67.50	85.91	67.50	128.87	245.46	349.78	754.79
Jequitinhonha	n	1	0	1	0	2	0	1	4	6	5	7
	T	26.75	0	26.75	0	53.50	0	26.75	107.01	160.51	133.76	187.27
Centro-sul	n	5	0	2	3	3	3	2	4	12	34	32
	T	58.36	0	23.34	35.01	35.01	35.01	23.34	46.69	140.06	396.83	373.48
Centro	n	64	57	47	65	118	130	219	397	426	489	682
	T	83.22	74.11	61.11	84.52	153.43	169.03	284.75	516.19	553.90	635.82	886.76
Minas Gerais	n	102	95	94	119	209	259	411	715	773	936	1361
	T	42.05	39.16	38.75	49.06	86.16	106.77	169.43	294.75	318.66	385.85	561.05

Notes: n = Number of hospitalizations. T = Hospitalization rates per 100 thousand inhabitants.

Source: prepared for the purposes of this study.

in Leste do Sul, West and East regions. Only the Central South health macro-region showed a stationary trend. There was an absence of regions with a declining trend of CS hospitalizations, a preventable condition at the primary level of care.

This panorama has been observed in the national scenario, as identified in a study conducted in Fortaleza/Ceará⁽¹¹⁾, which aimed to analyze the notified cases of gestational syphilis with the respective cases of CS between years 2008 and 2010, and showed that the increase in number of CS cases occurred as a result of the low quality of antenatal care and non-concomitant treatment of the partner. Still, an analysis performed at the national level showed as ascending

trend of CS cases in newborns, with an incidence of 2.3% in 2007 and 13.1% in 2016⁽¹²⁾.

In the international scenario, in the department of Córdoba, Colombia, there was an increase in the incidence of this pathology between 2012 and 2015, mainly among children of adolescents or young women⁽¹³⁾. According to a Pan American Health Organization (PAHO) report, 15 Latin American countries have eliminated congenital syphilis, but many countries have rising cases. In 2017, 37 countries recorded a 22% increase in cases compared to year 2016 (28,800 cases)⁽¹⁴⁾. On the other hand, there was a reduction in the incidence of CS in Portugal as a result of the pertinent

Table 2. Congenital syphilis hospitalization trends per year and by macro-region. Minas Gerais, Brazil, 2008 to 2018.

	Mean hospitalization rate	β coefficient	% AVP	95%CI MIN	95%CI MAX	Interpretation
Triângulo Sul	180.20	0.12	33.91	22.33	46.59	Ascending
Triângulo Norte	47.02	0.07	19.62	6.48	34.38	Ascending
South	172.93	0.13	36.84	21.76	53.77	Ascending
Southeast	131.72	0.10	28.38	17.43	40.35	Ascending
West	178.39	0.18	51.39	31.95	73.69	Ascending
North	87.65	0.14	38.83	16.91	64.86	Ascending
Northwest	123.71	0.14	39.58	25.98	54.64	Ascending
Northeast	67.13	0.09	24.38	14.58	35.01	Ascending
Leste do Sul	197.28	0.26	84.34	50.30	126.09	Ascending
East	164.57	0.17	48.86	18.47	87.05	Ascending
Jequitinhonha	65.66	0.09	23.73	11.09	37.81	Ascending
Central South	106.10	0.10	26.06	-1.69	61.66	Stationary
Central	318.44	0.11	31.24	21.81	41.39	Ascending
Minas Gerais	190.15	0.12	33	25.07	41.42	Ascending

Source: prepared for the purposes of this study.

antenatal surveillance in the country. Despite this fact, there is still a high number of cases of early syphilis⁽¹⁵⁾.

The World Health Organization considers syphilis one of the most common sexually transmitted infections (STIs) worldwide. Despite the decrease in cases between years 2012 and 2016, in May 2016, the WHO adopted a global strategy to expand interventions and services for the control of sexually transmitted infections aiming to reduce their impact as a public health problem until the year 2030, and included specific goals to reduce the incidence of syphilis⁽¹⁾.

Brazil implemented the National Program for the Control of Sexually Transmitted Diseases in 1988⁽¹⁶⁾. Syphilis and congenital syphilis have been conditions of compulsory notification in Brazil since the publication of Ordinance No. 542, of December 22, 1986⁽¹⁷⁾. The Brazilian List of Conditions Sensitive to Primary Care of the Ministry of Health understands that CS is part of the group of “Diseases related to antenatal care and childbirth”, thus, a condition that deserves double attention by PHC professionals, both in terms of screening, diagnosis, management and treatment, as with regard to its adequate notification.

The Ministry of Health (MS) also has a Manual of Guidelines for the Control of Congenital Syphilis and through its Health Surveillance Secretariat, provides the Clinical Protocol and Therapeutic Guidelines for Comprehensive Care for People with Sexually Transmitted Infections (STI), which contains information for CS screening, evaluation and management. The State Coordination of STI/AIDS and Viral Hepatitis of the Minas Gerais State Health Secretariat

incorporates actions established by the Ministry of Health and promotes training in the health regions of the state. The actions involve primary care and epidemiological surveillance professionals in order to raise awareness of the diagnosis, early treatment, notification and investigation of cases.

Although efforts are being made at the federal and state levels to confront and control this situation, the ascending trend in hospitalization in MG stands out. The Central, Leste do Sul, South and East macro-regions presented the highest CS hospitalization rates in children aged under one year in the analyzed period. The regions with the highest AVP were Leste do Sul, West and East. The Jequitinhonha macro-region is among those with the lowest AVP in the period. This region is characterized by unfavorable socioeconomic conditions, low development indicators and low resources, which can lead to a greater number of referrals to more resourceful regions. Given this fact, the government of MG has adopted measures to reduce inequalities, in particular economic development plans and financial incentives to improve the quality of health services in this macro-region and other macro-regions in the north of the state⁽⁸⁾.

Congenital syphilis hospitalization rates have increased by more than ten times in municipalities of the Southeast health macro-region. The pole municipality of the region, Juiz de Fora, has a high Human Development Index (HDI), surpassing the state average in the income dimension and showing high values in the other dimensions (longevity and education). The Regionalization Master Plan of the state of MG proposes the structuring of health care networks based

on a stronger PHC. The north of MG has low levels of human development and the greatest needs of the state, in addition to a great distance between municipalities, which can make access to services of greater complexity difficult. In contrast, the South, Center and Triângulo Mineiro regions stand out for their economic development and the amount of resources. Only one out of all university hospitals in the state is located in the North region⁽⁸⁾.

There is a great economic and social inequality between regions in the state of MG, which may explain the heterogeneity perceived in hospitalization rates and in the different AVP observed in the different macro-regions. A study on the epidemiological profile of notified cases of CS in a maternity hospital in a capital city of Northeastern Brazil showed that most pregnant women who transmit syphilis to their children have common socioeconomic characteristics, such as low education, mixed race, low family income and non-treatment of the partner⁽¹⁸⁾.

Notification is an important factor for the epidemiological understanding of the local health situation. An investigation conducted in the city of Montes Claros/MG showed that only 24.1% of CS cases were reported between 2007 and 2013; and in relation to gestational syphilis (GS), 6.5% of cases were reported. The authors warn of the need for attention from multidisciplinary health teams, because GS can be diagnosed and treated, avoiding the occurrence of CS⁽¹⁹⁾.

Underreporting is one of the factors that complicate the understanding of the real situation of a population's health conditions and consequently, health managers' decision making. An analysis of situations that hinder the processes of notification of diseases and conditions of compulsory notification, in which was considered the perception of professionals themselves, indicated the doctor's or the nurse's conduct (23.3%) as a complicating factor in the process. Such difficulty was justified by the lack of communication between the health team and delayed notification, considering the loss of quality in notifications made outside the time of service⁽²⁰⁾.

Despite the problems identified, which generate failures in the notification of this pathology within PHC, the higher number of hospitalizations can also be justified by the higher rate of detection of syphilis and consequently, of CS. In Brazil, a 28.5% increase was observed in the detection rate in pregnant women in 2017 compared to the previous year⁽²¹⁾. In the city of Belo Horizonte, capital of the analyzed state, there has been an increase in the detection rate in the previous ten years, a result of improvements in epidemiological surveillance actions and the greater coverage of detection tests⁽²²⁾.

In the state of MG, policies and protocols aimed at pregnant women are adopted from the beginning of pregnancy, and the Antenatal Care Line of the Rede Cegonha Strategy (antenatal care program) recommends offering the syphilis rapid test and Human Immunodeficiency Virus (HIV)

testing with the pregnant woman's consent. According to the Health Care Protocol, the number of CS cases in children of pregnant women monitored at Basic Health Centers serves as an assessment of the quality of antenatal care provided.

In Brazil, a country of enormous social inequalities, there is inequity in relation to access to syphilis detection tests, which is directly related to socioeconomic factors such as family income and education⁽²³⁾. Social inequalities are also a reality in the state of MG and may reflect differences in hospitalization rates and AVP between health macro-regions of the state. A study on the conduct in antenatal consultations showed that only 58.2% of interviewed nurses stated they use the Ministry of Health Manual for the prevention of CS⁽²⁴⁾, and these conditions may be a reality in MG. In addition, PHC failures such as problems in the implementation of protocols and loss of opportunity to perform exams during antenatal care contribute to the vertical transmission of syphilis.

The low quality of antenatal care is undoubtedly a responsible factor for the increase in hospitalizations. Follow-up from the beginning of pregnancy is essential to prevent the transmission of bacteria through the placenta. A set of guidelines launched by the Ministry of Health for the control of CS recommend the early capture of pregnant women, the performance of at least six antenatal consultations and the Venereal Disease Research Laboratory (VDRL) in the first quarter of pregnancy. Therefore, the commitment by managers and health professionals is fundamental to guarantee the quality of care through investments and training in order to allow access to services and exams. In addition, such actions tend to guarantee the safety of pregnant women and children, and the family's quality of life, avoiding the occurrence of an easily preventable, diagnosed and treated disease, especially in socioeconomically disadvantaged regions.

Limitations of this study were the restricted scope of the index of Hospitalizations for Conditions Sensitive to Primary Care, as only data on hospitalizations by SUS were considered, so the numbers may be even higher. It is also important to consider the possibility of underreporting, possible flaws in diagnostic classification and the non-stratification of data analyzed by sex. Failures in access and quality of antenatal services by primary care may occur, and it is important to perform studies analyzing this correlation and the correlation with sociodemographic aspects.

CONCLUSION

The study showed an ascending trend in CS hospitalization rates between 2008 and 2018 in the state of MG, heterogeneously distributed among the macro-regions. Considering the epidemiological importance of this disease, the serious risks to children's health and the real possibility

of treatment and cure, knowledge about these data can guide priority actions in order to mitigate this increase. In addition to the minimum number of recommended consultations, antenatal care must be of high quality, seeking to prevent the disease or treat pregnant women and their partners and make prompt notification when necessary.

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