

Diagnosis and treatment of syphilis in pregnant women at the services of Primary Care

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Abstract *The aim of this article is to evaluate the conditions of Primary Care (PC) services in Brazil as regards the availability of quick tests (QTs) for early diagnoses and of Benzylpenicillin (BZP) for the treatment of pregnant women with syphilis. This was a cross-sectional study, conducted with data from PC services that participated in the National Program for Access and Quality Improvement in Primary Care (PMAQ-AB, in Portuguese). The services where QTs were not readily available or where BZP was not available in a sufficient quantity were categorized as “inadequate”, while those where the QTs were readily available and BZP was found in sufficient quantities were categorized as “adequate”. A bivariate analysis and Odds Ratio (OR) estimates, together with their respective 95% confidence intervals (CI), were performed. The sample included 20,286 PC services from regions throughout the country. The prevalence of services with inadequate conditions for the diagnosis and treatment of syphilis was 47.7%. The Midwest region and non-capital cities presented the highest prevalence rates for PC services with inadequate conditions for the diagnosis and treatment of syphilis in pregnant women ($p < 0.05$). Differences in the regions and locations of the PC services impact the availability of QTs and BZP.*

Key words *Syphilis congenital, Maternal and Child Health, Primary Health Care, Quality of Health Care*

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Introduction

Congenital syphilis, an infectious disease caused by *Treponema Pallidum* and transmitted vertically from the pregnant woman to the fetus, can cause an abortion, premature births, or even late sequelae that can compromise the child's full development¹. It is estimated that some 930,000 cases of congenital syphilis are reported yearly around the world, resulting in approximately 350,000 adverse outcomes to births, with the majority occurring in low to middle income countries^{2,3}. Considering the rate of high morbidity-mortality and of clinical repercussions of syphilis of the mother to the fetus^{1,4}, the World Health Organization (WHO) has set forth strategies to ensure the diagnosis and the treatment of pregnant women with syphilis in an attempt to reduce the rates of congenital syphilis to less than 50 cases per 1,000 live births in at least 80% of the countries worldwide by 2030².

In Brazil, the Ministry of Health has adopted strategies to improve the surveillance of syphilis in pregnant women by expanding the access to and the supply of quick tests (QTs) for diagnoses and the tracking of Sexually Transmitted Infections (STIs) in the scope of Primary Care (PC) services¹. The QTs for the syphilis screening are of easy application and of low operational cost; they do not require a laboratory infrastructure; and they can be applied during pre-natal appointments¹. In addition to the support provided to diagnoses, the Ministry of Health has made benzathine benzylpenicillin available within PC services for the treatment of pregnant women and their sexual partners, which is the only effective medicine for the prevention of the vertical transmission of syphilis⁵. The combination of support strategies for the diagnosis and treatment of syphilis during pre-natal care in the realm of Primary Health Care increases the chances of success in the treatment of congenital syphilis and reduces the exposure of the fetus to *Treponema pallidum*^{1,6}.

Despite the strategies adopted by the Ministry of Health for the improvements in the surveillance of syphilis in pregnant women, from 2009 to 2019, the rate of congenital syphilis in Brazil went from 2.1 to 9.0 cases per 1,000 live births, but showed regional differences⁷. In 2019, the rates of congenital syphilis above the national average were recorded in the South and Southeast regions, which reached 8.2 cases per 1,000 live births⁷. The increase in the number of health centers over the past 30 years in Brazil, along

with the increase in the population's coverage provided by the Family Health Strategy and PC teams, has expanded the population's access to health services, but the regional inequalities in the healthcare structures still persist⁸⁻¹⁰. Considering that the progressive precarious nature of the PC services can impact the access of pregnant women who reside in the coverage area to these services¹¹ and that the regional inequalities in the allocation of resources and investments in the health sector¹² can be compromised by both the population's supply and access to syphilis screening, the present study aims to evaluate the conditions of PC services in Brazil as regards the availability of QTs for diagnoses and of benzathine benzylpenicillin for the treatment of syphilis in pregnant women.

Methods

This was a cross-sectional, multicenter, and nationwide study, conducted with secondary data from the PC services that participated in the third cycle of external assessments of the National Program for Access and Quality Improvement in Primary Care (PMAQ-AB, in Portuguese), from the Ministry of Health¹³. The PMAQ-AB was created in 2011 in order to improve the Unified Health System (SUS, in Portuguese), aimed at expanding access to and the quality of PC¹³.

Data collection from the third cycle of external assessments of PMAQ-AB took place from January to December 2017, and from May to August 2018, including 30,347 PC services, corresponding to 95.36% of all PC services, located in 5,324 Brazilian municipalities (95.6%)¹³. As regards regional distribution, 2,255 of the services that participated in the third cycle of external assessment of the PMAQ-AB were located in the North region, corresponding to 94.6% of the total number of services rendered in this region, as compared to 12,048 (95.6%) in the Northeast; 2,145 (96.2%) in the Midwest; 8,331 (94.7%) in the Southeast, and 4,160 (95.8%) in the South¹⁴.

The databank was formulated by the Ministry of Health and organized in modules: Modules I, II, and III, of which, in the present study, Module I was used for its data related to the conditions of infrastructure, materials, inputs, and medicines from Primary Health Care¹³. The data from this module were collected, with a structured questionnaire applied in-person to the professional responsible for the evaluated service. Guided inspections and verification of service records

were also carried out in an attempt to verify the information provided in the questionnaire. The resulting data of these two processes were organized and tabulated in Microsoft Excel 2016 and are of open access, available at: <https://aps.saude.gov.br/ape/pmaq>. The assessment of data consistency after data collection was conducted by the higher education institutions and partner research groups, under the coordination of the Primary Health Care Department of the Ministry of Health¹³.

The following questions were selected in Module I (1) Was the benzathine benzylpenicillin sufficient? (2) Was the quick test for syphilis always available?, together with the possible answers: yes/no. To answer the questions of this study, the following variable was created: “inadequate conditions for the diagnosis and treatment of syphilis”, through questions 1 and 2, in the following manner: the services that presented benzathine benzylpenicillin in sufficient quantity and available QTs for syphilis were categorized as “no”, as they presented adequate conditions of diagnosis and treatment for syphilis. The services that have available access to QTs for syphilis and/or did not have a sufficient quantity of benzathine benzylpenicillin were categorized as “yes”, as they presented inadequate conditions for diagnosis and treatment (Chart 1).

The independent variables of this study were chosen based on previous studies and according to theoretical criteria¹⁵. The geographic and location characteristics of the PC services included in this study were: Capitals (Yes/No), States of the Federation and the Federal District, and regions (North, Northeast, South, Southeast, and Midwest).

Excluded from this study were: 1) services that did not answer Module I of the PMAQ-AB and 2) services that did not provide Benzylpenicillin. As such, 20,286 PC services were included (Figure 1).

The data from Module I of the PMAQ-AB were transferred to the Statistical Package for the Social Science (SPSS), version 20.0, and were submitted to statistical analysis. For the analysis, the Statistical Package for the Social Sciences, version 26, was used. First, the conditions for the diagnosis and treatment of syphilis in the services that participated in the PMAQ-AB were analyzed, according to geographic characteristics, considering absolute and relative frequencies. Next, a bivariate analysis was performed to show the differences between the prevalence of services with inadequate conditions for the diagnosis and/or treatment of syphilis and the independent variable by means of the Pearson Chi-squared test and 95% confidence interval (95%CI). In all of the analyses, a 5% statistical significance was adopted ($p \leq 0.05$).

Results

The sample included 20,286 PC services from five regions of Brazil, most of which were located in the Northeast Region (50.4%) and in municipalities that were not capitals of the states or the Federal District (91.3%). As regards the diagnosis and treatment of syphilis, 47.7% of the services did not have a sufficient quantity of benzathine benzylpenicillin and/or did not have readily available QTs for syphilis, with the Midwest region and the non-capital cities being responsible for the highest prevalence of PC services with inadequate conditions for the diagnosis and/or treatment of syphilis ($p < 0.05$) (Table 1).

In the bivariate analysis, the North, Northeast, Midwest, and Southeast regions presented a higher probability of providing services with inadequate conditions for the diagnosis and treatment of syphilis than those of the South region. The Midwest stood out, showing a 1.87-fold (95%CI 1.62-1.91) greater chance of providing

Chart 1. Composition of the dependent variable “Inadequate conditions for the diagnosis and treatment of syphilis” according to the answers from services included in this study. PMAQ-AB, Brazil, 2019.

Dependent variable	Category	Characteristics
Inadequate conditions for the diagnosis and treatment of syphilis	No	Readily available quick test for syphilis and benzathine benzylpenicillin offered in a sufficient quantity
	Yes	Quick test for syphilis was NOT readily available and benzathine benzylpenicillin was NOT offered in a sufficient quantity

Source: Authors.

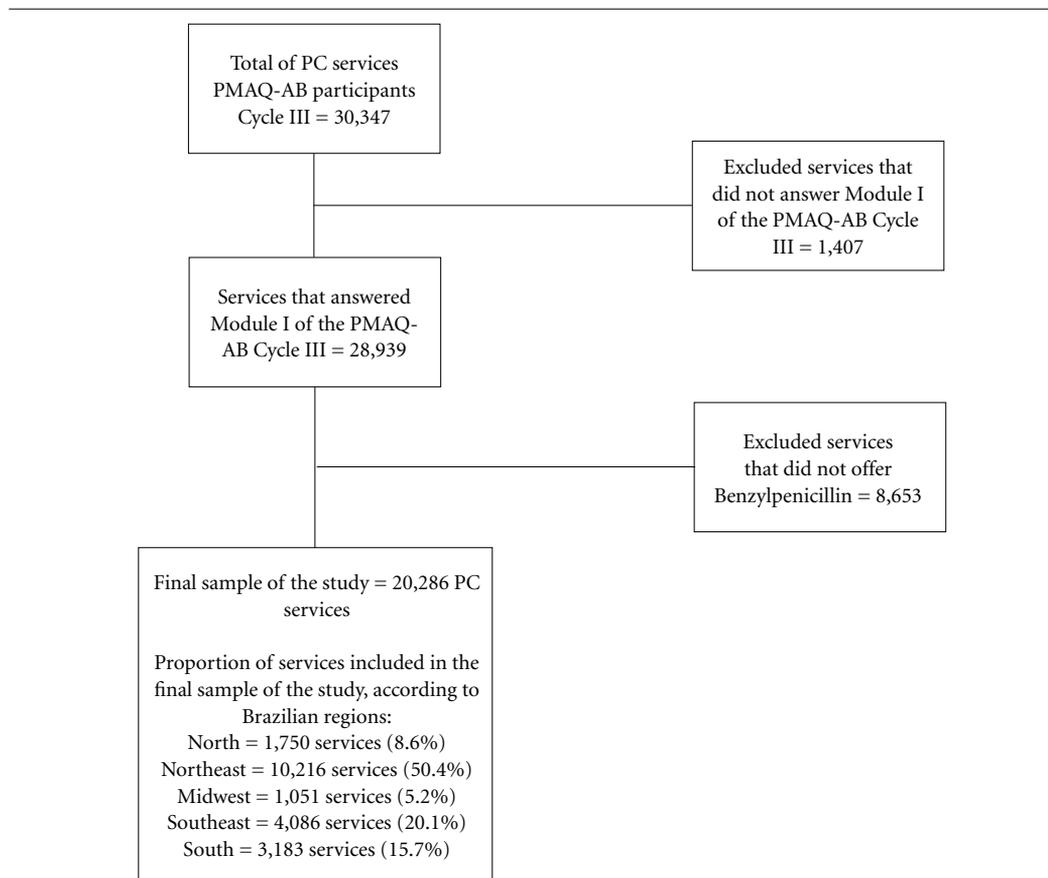


Figure 1. Characterization of the population of the study based on eligibility criteria. PMAQ-AB, Brazil, 2019.

Source: Authors.

services with inadequate conditions when compared to the South Region ($p < 0.05$) (Table 2). The ranking of the states with a greater percentage of services with inadequate conditions for the diagnosis and/or treatment of syphilis in Brazil is shown in Figure 2.

The states of the North region presented the chance of services with inadequate conditions for the diagnosis and/or treatment of syphilis that varied from 3.17 (95%CI 1.46-6.85) in the state of Roraima to 9.80 (95%CI 4.58-20.95) in the state of Acre ($p < 0.05$).

In the Northeast region, all of the states presented a probability of services with inadequate conditions for the diagnosis and/or treatment of syphilis that was higher than that of the state of Sergipe, with the state of Piauí presenting a 5.07

(95%CI 3.79-6.78) chance of services with inadequate conditions for the diagnosis and/or treatment of syphilis when compared to the state of Sergipe ($p < 0.001$).

In the South region, only the state of Paraná presented a statistically significant chance of services with inadequate conditions for the diagnosis and/or treatment of syphilis when compared to the state of Santa Catarina, corresponding to 2.46 (95%CI 2.07-2.93) ($p < 0.001$).

When the location of PC services was evaluated, those that were not located in capital cities presented a 1.70 (95%CI 1.53-1.88) chance of inadequate conditions for the diagnosis and/or treatment of syphilis when compared to those located in capital cities ($p < 0.001$).

Table 1. Inadequate conditions for the diagnosis and/or treatment of syphilis in the services that participated in PMAQ-AB, according to Regions and Brazilian States. Brazil, 2019.

Regions and Brazilian States	Inadequate conditions for the diagnosis and/or treatment of syphilis				Total
	No		Yes		
	n	%	n	%	
Regions					
North	865	49,43	885	50.57	1,750
Acre	30	34,9	56	65.1	86
Amazonas	170	39,5	260	60.5	430
Amapá	63	84	12	16	75
Pará	405	49,7	410	50.3	815
Rondônia	57	58,2	41	41.8	98
Roraima	48	62,3	29	37.7	77
Tocantins	92	54	77	45.6	169
Northeast	5,113	50,05	5,103	49.95	10,216
Alagoas	314	51,6	295	48.4	609
Bahia	1,477	56,8	1,123	43.2	2,600
Ceará	1,076	60,4	706	39.6	1,782
Maranhão	491	38,2	795	61.8	1,286
Paraíba	139	32,3	292	67.7	431
Pernambuco	895	49,9	897	50.1	1,792
Piauí	277	32,1	586	67.9	863
Rio Grande do Norte	240	42,6	324	57.4	564
Sergipe	204	70,6	85	29.4	289
Midwest	510	48,53	541	51.47	1,051
Distrito Federal	38	69,1	17	30.9	55
Goiás	229	37	390	63	619
Mato Grosso	97	77,7	92	17	189
Mato Grosso do Sul	146	51,3	42	22.3	188
Southeast	2,092	51,2	1,994	48.8	4,086
Espírito Santo	117	48,1	126	51.9	243
Minas Gerais	229	17,1	1,113	82.9	1,342
Rio de Janeiro	396	50,6	387	49.4	783
São Paulo	1,350	78,6	368	21.4	1,718
South	2,031	63,81	1,152	36.19	3,183
Paraná	601	51,1	574	48.9	1,175
Santa Catarina	810	72,1	314	27.9	1,124
Rio Grande do Sul	620	70,1	264	29.9	884
Location	1,759	8,67	18,527	91.33	20,286
Capital cities	1,127	10,62	9,484	89.38	10,611
Non-capital cities	632	6,53	9,043	93.47	9,675

Source: Authors.

Discussion

In this study, 20,286 PC services from throughout Brazil were evaluated, of which 47.7% presented inadequate conditions for the diagnosis and/or treatment of syphilis in pregnant women,

with 52.3% of these located in the Midwest and 48.8% in non-capital cities.

In Brazil, the pre-natal follow-up of pregnant women is performed in PC services and the progressive precarious nature of these services can impact the diagnosis and treatment of syphilis in

Table 2. Bivariate analysis of the prevalence of PC services with inadequate conditions for the diagnosis and/or treatment of syphilis in the services that participated in the PMAQ-AB, according to Regions and Brazilian States. Brazil, 2019.

Geographic characteristics	Quick test for syphilis was not readily available AND/OR benzathine benzylpenicillin was NOT offered in a sufficient quantity				
	n	%	OR	95%CI	p-value
Regions					
North	885	50.6	1.80	1.60-2.03	<0.001
Acre	56	65.1	9.80	4.58-20.95	<0.001
Amazonas	260	60.5	8.02	4.20-15.33	<0.001
Pará	410	50.3	5.31	2.82-10.03	<0.001
Tocantins	77	45.6	4.39	2.20-8.73	<0.001
Rondônia	41	41.8	3.77	1.80-7.88	<0.001
Roraima	29	37.7	3.17	1.46-6.85	<0.001
Amapá	260	16.0	1.00		
Northeast	5,103	50.0	1.76	1.62-1.91	<0.001
Alagoas	295	48.4	2.25	1.67-3.04	<0.001
Bahia	1,123	43.2	1.82	1.40-2.37	<0.001
Ceará	706	39.6	1.57	1.20-2.06	<0.001
Maranhão	795	61.8	3.88	2.94-5.12	<0.001
Paraíba	292	67.7	5.04	3.64-6.96	<0.001
Pernambuco	897	50.1	2.40	1.83-3.14	<0.001
Piauí	586	67.9	5.07	3.79-6.78	<0.001
Rio Grande do Norte	324	57.4	3.24	2.39-4.38	<0.001
Sergipe	85	29.4	1.00		
Midwest	541	51.5	1.87	1.62-2.15	<0.001
Distrito Federal	17	30.9	0.47	0.24-0.89	0.021
Goiás	390	63.0	1.79	1.29-2.49	<0.001
Mato Grosso	92	48.7	0.30	0.19-0.47	<0.001
Mato Grosso do Sul	42	22.3	1.00		
Southeast	1,994	48.8	1.68	1.52-1.84	<0.001
Espírito Santo	126	51.9	3.95	2.99-5.21	<0.001
Minas Gerais	1,113	82.9	17.83	14.84-21.41	<0.001
Rio de Janeiro	387	49.4	3.58	2.99-4.29	<0.001
São Paulo	368	21.4	1.00		
South	1,152	36.2	1.00		
Paraná	574	48.9	2.46	2.07-2.93	<0.001
Rio Grande do Sul	264	29.6	1.09	0.90-1.33	0.344
Santa Catarina	314	27.9	1.00		
Location					
Non-capital cities	9,043	48.8	1.70	1.53-1.88	<0.001
Capital cities	632	35.9	1.00		

Note: OR = Odds Ratio; 95%CI = 95% confidence interval.

Source: Authors.

pregnant women¹⁵. The increase in the number of health clinics and centers in the last 30 years, along with the increase in the population's coverage by the Family Health Strategy and PC teams, has expanded the access of the population to

these services; however, the regional inequalities of the healthcare structure still persist⁸⁻¹⁰.

In this study, the North and Midwest regions presented a proportion of services with inadequate conditions for the diagnosis and/or treat-

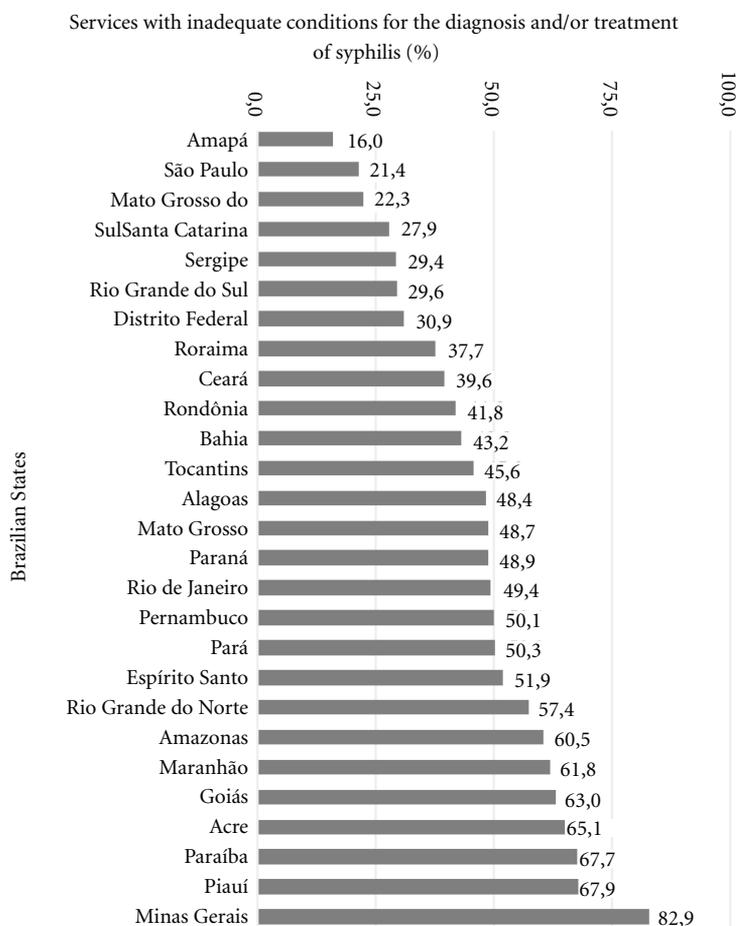


Figure 2. Ranking of Brazilian states according to the percentage of services that participated in the PMAQ-AB and that presented inadequate conditions for the diagnosis and/or treatment of syphilis. Brazil, 2019.

Source: Authors.

ment of syphilis that was higher than those with adequate conditions. The regional differences in the availability of the diagnosis and/or treatment of syphilis in pregnant women in PC services was pointed out by a cross-sectional study with data from cycle II of the PMAQ-AB, which analyzed the relationship among the offers of the diagnosis and/or treatment of syphilis in PCs¹⁵. In 41.9% of the evaluated municipalities, more than 50% of the PC service teams reported the administration of benzathine benzylpenicillin, varying from 73.12% in the North to 22.71% in the Southeast. As regards the QT, most of the teams affirmed that they performed QTs for syphilis, with the lowest frequency identified in

the Southeast (56.61%) and the highest in the North (83.87%)¹⁵. These results differ from the results found by this study and which point out the South region with the highest proportion of QTs and treatment of syphilis in pregnant women among all of the regions of Brazil. This difference between the results of the studies is possibly associated with the differences of the methodological design adopted by the studies.

Although the regional and municipal inequalities of structure and access to PC services are historical and significant^{8,9}, epidemiological studies about congenital syphilis have been limited to individual and family-related factors, associated with the rates of syphilis in pregnant

women or congenital syphilis^{16,17}. This was a cross-sectional study, conducted with data from the PMAQ-AB and from the Live Birth Information System, which evaluated the adequacy of the pre-natal care provided in Brazilian capital cities with the diagnosis of gestational syphilis and pointed out that the diagnosis of syphilis was more prevalent among pregnant women in vulnerable situations, women with a low level of education, non-whites, and teenagers¹⁸. As regards congenital syphilis, the proportion was seven times greater in the group that did not undergo any pre-natal care, when compared to the population as a whole¹⁸.

In this study, most of the Brazilian states presented a high prevalence of PC services with inadequate conditions for the diagnosis and treatment of syphilis, thus hindering the early identification and opportune treatment of the pregnant women with syphilis. One study, which evaluated the relationship between the providing of the diagnosis and treatment of syphilis in PC services and the incidences of gestational and congenital syphilis, revealed that the incidence of gestational syphilis was higher in municipalities with a greater number of available QTs, highlighting the increase in the capacity to detect syphilis when the municipality had a greater access to the diagnosis⁸. As regards congenital syphilis, this study observed a drop in vertical transmission among the teams with access to QTs and penicillin, demonstrating the relationship of these actions with the fall in rates of congenital syphilis in the evaluated municipalities¹⁵.

In addition to the availability of benzathine benzylpenicillin within the PC services, it is important to note the refusal on the part of health professionals to apply this medicine, alleging the lack of technical and human resources in the PC services to provide medical care in the case of anaphylactic reactions associated with benzathine benzylpenicillin. In 2017, the Federal Nursing Council authorized the application of benzathine benzylpenicillin within PC services¹⁹. Another reason for the non-administration of benzathine benzylpenicillin in PC services may

well be related to this medicine's lack of supply in 2014. Through a Technical Note, the Ministry of Health communicated the emergency acquisition and distribution of penicillin as of the first semester of 2016^{20,21}, which may have impacted the availability of benzathine benzylpenicillin within the PC services at the time of the data collection from cycle III of the PMAQ-AB.

In the rural areas, the health services are often located far from the residences of the population, which can add an additional cost for transport, make the access to the services difficult, and result in a lower demand for health services^{22,23}. Moreover, the scarcity in the supply of health services in rural areas reflects the historical inequalities in the allocation of resources earmarked for health in Brazil²³, which runs in line with the results found in the present study, since the PC services that are not located in capital cities presented greater chances of inadequate conditions for the diagnosis and treatment of syphilis in pregnant women when compared to the services located in capital cities.

Finally, it is important to highlight the limitation inherent to the nature of the analysis of secondary data, since the available data were not collected specifically to answer the questions of this study; therefore, some variables that were not collected or are omitted from the databank could have been useful in formulating a better comprehension of the object of this study. Nevertheless, it is important to note the accuracy in the data collection from the PMAQ-AB of the Ministry of Health, the use of a nationwide database, and the large sample size in this study.

It is important to mention that the differences in the regions and locations of the PC services impact the availability of the QTs and of benzathine benzylpenicillin, which compromise the diagnosis and treatment of syphilis in pregnant women. The results of this study therefore reinforce the need for strategies to conduct the proper diagnosis and treatment of syphilis in pregnant women within PC services in an attempt to reduce the vertical transmission of syphilis.

Collaborations

MA Paula and LA Simões participated in data interpretation; article writing; final approval of the version to be published. JC Mendes participated in the analysis and interpretation of data; article writing; final approval of the version to be published. EW Vieira participated in the conception and design, analysis and interpretation of data; article writing; final approval of the version to be published. FP Matozinhos participated in the interpretation of data; final approval of the version to be published. TMR Silva participated in the conception and design and analysis and interpretation of data; article writing; final approval of the version to be published. All authors were responsible for all aspects of the work in ensuring the accuracy and integrity of the work.

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