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Research Article

Urinary tract Infection during pregnancy in the Western Amazon

Infecção do trato urinário durante a gravidez na Amazônia Ocidental

Infección del tracto urinario durante el embarazo en la Amazonia occidental

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Abstract

Introduction: The universality of the Unified Health System (SUS) faces challenges such as underfunding and regional inequalities. Hospitalizations for Ambulatory Care Sensitive Conditions, including urinary tract infections during pregnancy, are indicators of low resolution of primary care and point to deficiencies in prenatal care and health coverage. **Objective:** To characterize hospitalizations for urinary tract infections during pregnancy in the Western Amazon between 2008 and 2022. **Methods:** This is an ecological observational study, whose secondary data source was the Hospital Information System of the Unified Health System (SIH/SUS), with public and unrestricted access provided by the SUS Information Technology Department (DATASUS). **Results:** 41,053 hospitalizations for urinary tract infections during pregnancy were analyzed. Urinary tract infections were more frequent in the state of Amazonas (52%), in the age group between 15 and 29 years old (80%) and with brown skin color (65%). Moste hospitalizations occurred urgently (93%), and 78% were related to hospitalizations for the obstetric specialty. Discharge due to improvement was recorded in more than 80% of cases. The main hospitalizations in Acre were due to the clinical specialty (74%), while in Rondônia (89%) they were obstetric. Amazonas and Roraima showed an increasing trend in hospitalizations until 2018, followed by a slight decrease. Rondônia experienced growth until 2014, followed by a decrease. Primary health care coverage ranged from 60.39% in Rondônia in 2008 to 92.33% in Acre in 2015. **Conclusions:** The study findings reveal the need to improve the prevention of urinary tract infections during pregnancy in the Western Amazon, in order to avoid, mainly, emergency hospitalizations in young women. The regional disparity, especially in Amazonas, emphasizes the importance of considering territorial particularities when formulating health policies, in addition to the incompleteness of the database.

Keywords: Primary health care; Ambulatory care sensitive conditions; Urinary tract infections; Pregnancy; Hospital information systems.

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Resumo

Introdução: A universalidade do Sistema Único de Saúde (SUS) enfrenta desafios como subfinanciamento e desigualdades regionais. As Internações por Condições Sensíveis à Atenção Primária (ICSAP), incluindo Infecções do Trato Urinário (ITUs) na gravidez, são indicadores de baixa resolubilidade da atenção primária e apontam deficiências no acompanhamento pré-natal e na cobertura de saúde. **Objetivo:** Caracterizar as internações por infecções do trato urinário na gravidez na Amazônia Ocidental entre 2008 e 2022. **Métodos:** Trata-se de um estudo observacional do tipo ecológico, cuja fonte de dados secundária foi o Sistema de Informações Hospitalares do Sistema Único de Saúde (SIH/SUS), de acesso público e irrestrito, disponibilizado pelo Departamento de Informação e Informática do SUS (DataSUS). **Resultados:** Foram analisadas 41.053 internações por infecções do trato urinário na gravidez. As ITUs foram mais frequentes no estado do Amazonas (52%), com pacientes na faixa etária entre 15 e 29 anos (80%) e cor de pele parda (65%). A maioria das internações ocorreu em caráter de urgência (93%), e 78% estavam relacionadas a internações pela especialidade obstétrica. Alta por melhora foi registrada em mais de 80% dos casos. A maior parte das internações no Acre foi pela especialidade clínica (74%), enquanto em Rondônia (89%) ocorreram por motivos obstétricos. Os estados do Amazonas e de Roraima mostraram tendência crescente nas internações até 2018, seguida de leve queda. Rondônia obteve crescimento até 2014, seguido por diminuição. A cobertura da atenção básica variou entre 60,39% em Rondônia, no ano de 2008, e 92,33% no Acre em 2015. **Conclusões:** Os achados do estudo revelam a necessidade de melhorar a prevenção de infecções do trato urinário na gravidez na Amazônia Ocidental a fim de evitar, principalmente, internações em caráter de urgência em mulheres jovens. A disparidade regional, especialmente no Amazonas, enfatiza a importância de considerar as particularidades territoriais na formulação de políticas de saúde, além da incompletude da base de dados.

Palavras-chave: Atenção primária à saúde; Condições sensíveis à atenção primária; Infecções urinárias; Gravidez; Sistemas de informação hospitalar.

Resumen

Introducción: La universalidad del Sistema Único de Salud (SUS) enfrenta desafíos como la falta de financiación y las desigualdades regionales. Las hospitalizaciones por Condiciones Sensibles en Atención Ambulatoria, incluidas las infecciones urinarias durante el embarazo, son indicadores de baja resolución de la atención ambulatoria y señalan deficiencias en la atención prenatal y en la cobertura de salud. **Objetivo:** Caracterizar las hospitalizaciones por infecciones urinarias durante el embarazo en la Amazonía Occidental entre 2008 y 2022. **Métodos:** Se trata de un estudio observacional ecológico, cuya fuente secundaria de datos fue el Sistema de Información Hospitalaria del Sistema Único de Salud (SIH/SUS), con acceso público y sin restricciones proporcionado por el Departamento de Tecnología de la Información del SUS (DATASUS). **Resultados:** Se analizaron 41.053 hospitalizaciones por infecciones del tracto urinario durante el embarazo. Las infecciones urinarias fueron más frecuentes en el estado de Amazonas (52%), en el grupo de edad entre 15 y 29 años (80%) y con color de piel parda (65%). La mayoría de las hospitalizaciones ocurrieron de urgencia (93%) y el 78% estuvieron relacionadas con hospitalizaciones por la especialidad obstétrica. El alta por mejoría se registró en más del 80% de los casos. La mayoría de las internaciones en Acre fueron por especialidad clínica (74%), mientras que en Rondônia (89%) fueron obstétricas. Amazonas y Roraima mostraron una tendencia creciente en las hospitalizaciones hasta 2018, seguida de una ligera disminución. Rondônia experimentó un crecimiento hasta 2014, seguido de una disminución. La cobertura de atención primaria de salud varió entre el 60,39% en Rondônia en 2008 y el 92,33% en Acre en 2015. **Conclusiones:** Los hallazgos del estudio revelan la necesidad de mejorar la prevención de infecciones del tracto urinario durante el embarazo en la Amazonia Occidental, para evitar, principalmente, hospitalizaciones de emergencia en mujeres jóvenes. La disparidad regional, especialmente en Amazonas, enfatiza la importancia de considerar las particularidades territoriales al formular políticas de salud, además de lo incompleto de la base de datos.

Palabras clave: Atención primaria de salud; Condiciones sensibles a la atención ambulatoria; Infecciones urinarias; Embarazo; Sistemas de información en hospital.

INTRODUCTION

The principle of universality of the Brazilian Unified Health System (*Sistema Único de Saúde* – SUS) paradoxically encounters the challenge of ensuring access for all. Since its establishment, access to health services for the Brazilian population has expanded; however, market dynamics, political interests, underfunding, the country's continental size, and regional and social inequalities remain major obstacles.[1] These factors contribute to disparities in the allocation of federal resources, compromising the quality and equity of care, particularly in smaller municipalities and historically underserved areas.[2]

In this context, the Family Health Strategy (FHS) has established itself as the preferred model for reorganizing the health system, aiming to achieve an 85% resolution of primary health care (PHC) through the implementation of its essential and derived attributes.[3,4] After three decades of implementation, FHS

coverage reaches approximately 70% of the Brazilian population and, when well-structured, is capable of addressing up to 85% of the health needs of the assigned communities.[5]

The close relationship between family health teams and the population served is intended to ensure the effectiveness of health promotion actions through intersectoral policies that address the intermediate social determinants of health, as well as the prevention of diseases and health problems via educational interventions that reinforce self-care and population autonomy. In this context, PHC coverage is defined as the proportion of the population with access to these services.

However, the territory of *Amazônia Legal* (Legal Amazon) presents distinct cultural characteristics, including riverside populations whose access to health teams depends on boat transportation and the navigability of local rivers. Furthermore, according to the most recent census, this region is home to more than half of the country's indigenous population.[6] Consequently, geographical barriers are further exacerbated by a shortage of professionals and insufficient infrastructure in the communities, which compromises the continuity of care in the region.[7]

To enable comparability and evaluation of health systems between countries, or of services provided across states or regions, an indicator was proposed in the 1990s in the United States, which improved the planning and management of health services by national, state, and local administrators.[8] In Brazil, Ordinance No. 221, of April 17, 2008,[9] introduced Hospitalizations for Ambulatory Care Sensitive Conditions (HACSC), which can serve as an indirect measure of the care provided by family health teams in PHC. These conditions allow for the assessment of hospitalizations that could be prevented with timely access to and effective performance of PHC, as elevated rates of this indicator may indirectly reflect the low effectiveness of PHC and deficiencies in health service coverage.

Regarding diseases related to the prenatal period and childbirth, as outlined in Ordinance No. 221/2008, pregnant women are more likely to be hospitalized for primary care-sensitive conditions compared with the general population,[8] with urinary tract infection (UTI) being the leading cause during the second and third trimesters of pregnancy.[10] Physiological and hormonal changes during pregnancy favor the development of UTIs due to urinary stasis, reduced ureteral peristalsis; increased urine production; glycosuria; and aminoaciduria, all of which promote bacterial proliferation.[11] UTIs can be classified as complicated or uncomplicated, with pregnancy representing a complicating factor.[12] This condition is the most frequent complication during pregnancy and may result in premature rupture of membranes, abortion, preterm labor, chorioamnionitis, septicemia, low birth weight, and neonatal infection.[13]

During prenatal care, potential maternal and fetal risks can be mitigated, reinforcing the recommendation for at least six consultations as advised by the World Health Organization (WHO). Urinalysis and urine culture should be performed in the first and third trimesters of pregnancy — with results made available in a timely manner to enable appropriate intervention when necessary.[11]

Therefore, this study aimed to analyze the trend of hospitalizations due to urinary tract infections during pregnancy and the coverage of primary health care in Western Amazonia from 2008 to 2022.

METHODS

This observational study, with an ecological design, utilized secondary data from the Hospital Information System of the Unified Health System (*Sistema de Informações Hospitalares do Sistema Único de Saúde* – SIH/SUS), available through the Department of Information and Informatics of the SUS (*Departamento de Informação e Informática do SUS* – DataSUS). This study design enabled the analysis

of relationships between variables at the population level, using aggregated data from the Federative Units (FU) of Western Amazonia (Acre, Amazonas, Rondônia, and Roraima). The selection of this region is justified by the particularities of access to health services and the unavailability of disaggregated data from the portion of Maranhão that is part of *Amazônia Legal*.

The study population consisted of hospital admission records for urinary tract infections during pregnancy, classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10: O23).

The variables analyzed included municipality of residence (identified by the code of the Brazilian Institute of Geography and Statistics/*Instituto Brasileiro de Geografia e Estatística* – IBGE); primary diagnosis; length of stay (in days); type of hospitalization (elective or emergency); specialty (clinical, obstetric, surgical, or pediatric); year of hospitalization (2008–2022); location (Acre, Amazonas, Rondônia, or Roraima); age range (categorized into 10–14, 15–19, 20–24, 25–29, 30–34, and 35 years old or older); gender (female); level of education (primary or secondary); race/skin color (Yellow, White, Indigenous, Brown, and Black); reason for discharge/stay (discharge at patient request, discharge with scheduled follow-up, discharge cured, discharge of mother/postpartum woman and newborn, discharge due to maternal/postpartum or newborn death, discharge of mother/postpartum woman and newborn still hospitalized, discharge improved, discharge due to elopement, administrative closure, death with death certificate (DC) issued by the attending physician, transfer to another facility, or other); and death (yes or no).

Primary care coverage data were extracted from the e-Gestor platform by month of competence, and average annual coverage was calculated for the study period according to location. Proportions and Pearson's χ^2 test were computed, with a significance level set at 5%, using R software version 4.1.1 and the microdatasus and tidyverse packages for descriptive analyses.

For trend analysis, the percentages of hospitalizations due to UTIs and primary care coverage, both by state and for Western Amazonia, were organized in Microsoft Excel for Windows® spreadsheets and analyzed using the Joinpoint Regression Program software, version 5.0. The relationship between the variables, percentage of hospitalizations due to UTIs and calendar year, was evaluated using segmented linear regression. Trends of increase, decrease, or stability, identified through inflection points, were highlighted throughout the study period. The average annual coverage of primary health care by state served as the dependent variable, and the year of hospitalization was the independent variable. For both analyses, the Annual Percentage Change (APC), the Average Annual Percentage Change (AAPC), and their respective 95% confidence intervals (95%CI) were calculated.

Regarding ethical considerations, public and aggregated data from DataSUS were used, eliminating the need for review by a Research Ethics Committee for Human Subjects, in accordance with Resolution No. 466/2012 of the National Health Council (*Conselho Nacional de Saúde* – CNS).

RESULTS

A total of 41,053 hospitalizations for urinary tract infections were analyzed (Table 1), occurring exclusively in females; 52% of cases originated in Amazonas, and 80% were among individuals aged 15–29 years.

The variable level of education could not be analyzed due to high incompleteness (data not shown) (n=2; 0.1%). Regarding race/skin color, 65% of the analyzed population identified as brown, and 29% of the records lacked this information.

Table 1. Sociodemographic characteristics of hospitalizations for urinary tract infections in pregnant women in Western Amazonia, 2008–2022

Characteristics	Values	
	n	%
State		
Acre	4,166	10
Amazonas	21,520	52
Rondônia	10,726	26
Roraima	4,641	11
Age range (years)		
10–14	1,012	2.5
15–19	12,098	29
20–24	12,571	31
25–29	8,150	20
30–34	4,557	11
35 or +	2,665	6.5
Race/Skin color		
Yellow	628	1.5
White	885	2.2
Indigenous	846	2.1
Brown	26,756	65
Black	180	0.4
No information	11,758	29
Specialty		
Surgery	34	<0.1
Clinical Practice	8,946	22
Obstetrics	31,969	78
Pediatrics	104	0.3
Type of hospitalization		
Elective	3,055	7.4
Emergency	38,998	93
Discharge/Stay outcome		
Discharge on request	158	0.4
Discharge with scheduled follow-up	133	0.3
Discharge cured	3,737	9.1
Discharge of mother and newborn	156	0.4
Discharge of mother and neonatal death	1	<0.1
Discharge of mother and newborn stay	4	<0.1
Discharge improved	35,086	85
Discharge due to elopement	394	1
Administrative closure	392	1
Death with DC provided by attending physician	1	<0.1
Transfer to another facility	886	2.2
Other	105	<0.1
Total	41,053	100

Source: Sistema de Internações Hospitalares (SIH/DataSUS), 2008–2022.
DC: Death certificate.

Regarding the nature of hospitalization, 93% of cases were emergency admissions, while fewer than 4,000 cases were elective. Concerning the specialty of hospitalization, 78% of admissions were obstetric. Additionally, more than 80% of cases resulted in discharge due to improvement (Table 1).

Regarding sociodemographic variables, in the states of Acre and Amazonas, the proportion of UTIs among women aged 10–14 years was twice as high compared with the states of Roraima and Rondônia. White race/skin color was reported by 12% of pregnant women in Rondônia, while 7.5% were Indigenous in Roraima, and 94% were Brown in Amazonas (Table 2).

Regarding clinical variables, 73.6% of hospitalizations in Acre were clinical and 25.1% were obstetric. In Rondônia, 88.6% of hospitalizations for UTIs occurred in obstetric beds, and 11.2% in clinical beds. Hospitalizations were predominantly of an emergency nature, ranging from 74.6% to 100%, with 25.3% classified as elective in Acre. Among the reasons for discharge or stay, 16.3% of hospitalizations in Amazonas were due to cure. The highest proportion of discharges across all states was due to improvement, observed in 95% of hospitalizations in Rondônia, 92% in Acre, 88% in Roraima, and 79% in Acre. Transfers to another facility occurred in 0.7% of hospitalizations in Roraima and 2.8% in Acre. One death was recorded in Rondônia (Table 2).

Figure 1 illustrates the trend of urinary tract infection cases during pregnancy in Western Amazonia and its respective states from 2008 to 2022. An increasing trend was observed in all four states between 2008 and 2018 (APC 9.25; 95%CI 7.70; 11.18), as well as specifically in Amazonas (APC 10.54; 95%CI 8.62; 14.22). From the peak, a statistically significant decrease was observed in Western Amazonia (APC -7.03; 95%CI -14.95; -2.03). In Rondônia, the trend showed an increase from 2008 to 2014 (APC 22.70; 95%CI 15; 37.22), followed by a decrease from 2014 to 2022 (APC -2.81; 95%CI -8.99; 1.49).

Two change points in trend behavior were observed in the states of Acre and Roraima. From 2008 to 2011, both states exhibited a statistically significant downward trend (APC -24.14; 95%CI -44.92; -8.85 and APC -15.96; 95%CI -32.34; -2.90, respectively). In Acre, an upward trend was observed between 2011 and 2014 (APC 39.04; 95%CI 13.70; 58.15), followed by a decline from 2015 to 2022 (APC -7.61; 95%CI -14.48; -3.77). In Roraima, the trend increased between 2011 and 2018 (APC 12.62; 95%CI 7.97; 26.54), followed by a decrease in subsequent years (APC -16.18; 95%CI -27.90; -7.85); both trends were statistically significant.

The trend in primary care coverage in Western Amazonia is presented in Figure 2. An initial increase followed by a decrease was observed in Acre and Rondônia, whereas the opposite pattern was noted in Roraima and Amazonas.

In Acre, the trend showed an increase until 2017 (APC 2.55; 95%CI 0.97; 5.65), followed by a decline (APC -5.67; 95%CI -13.87; -2.17); both changes were statistically significant. Primary care coverage in Rondônia increased between 2008 and 2016 (APC 2.84; 95%CI 1.97; 4.63), followed by a slight decrease in subsequent years (APC -0.79; 95%CI -3.78; 0.49). In Amazonas, coverage decreased from 2008 to 2012 (APC -1.31; 95%CI -6.33; 2.29), followed by an increase (APC 0.68; 95%CI -3.46; 5.29). In Roraima, coverage declined from 2008 to 2013 (APC -1.84; 95%CI -7.32; 3.26), with a trend toward stabilization in subsequent years (APC 0.10; 95%CI -5.18; 5.61).

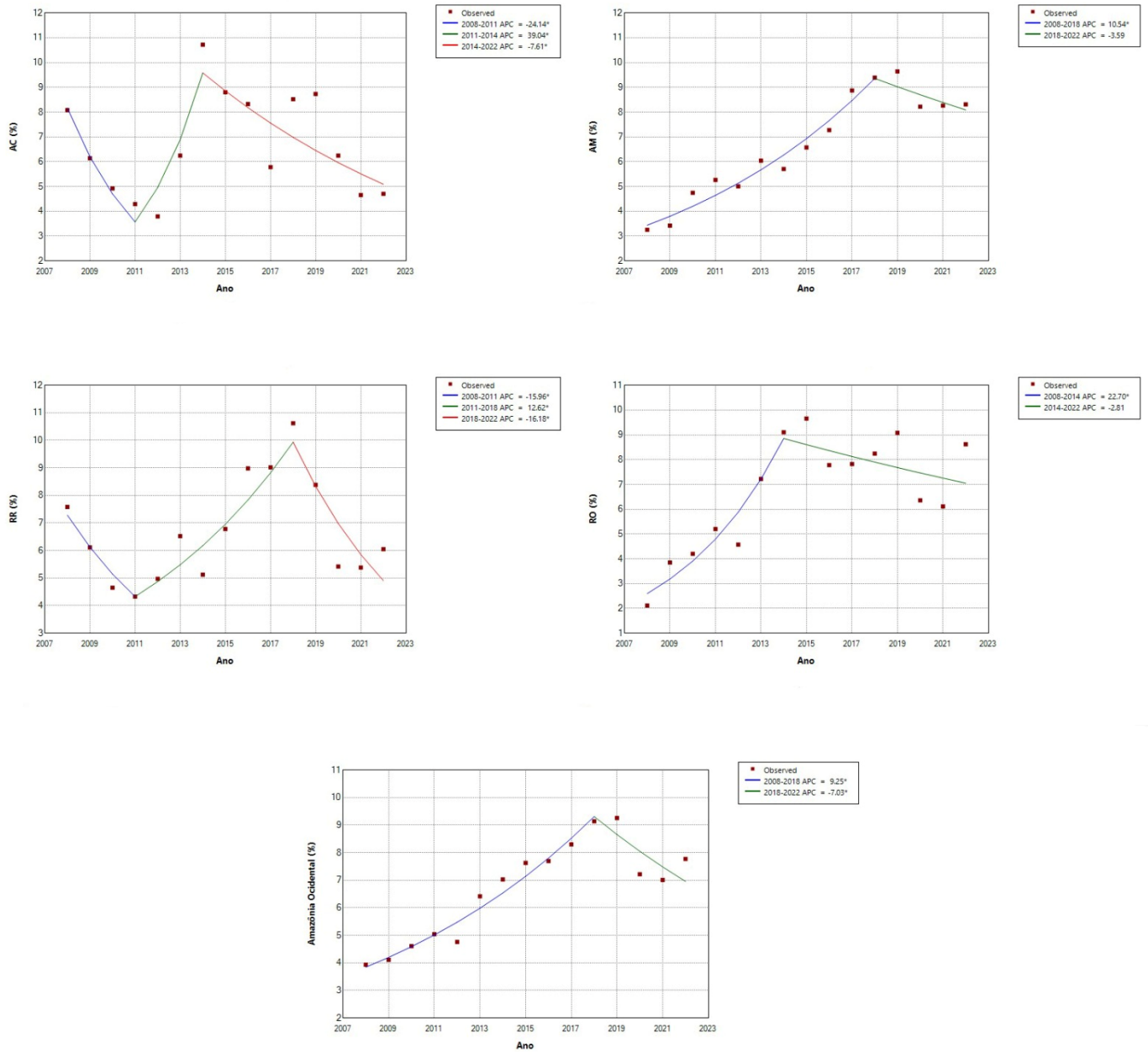
DISCUSSION

A total of 41,053 hospitalizations for urinary tract infections during pregnancy were analyzed. UTIs were most frequent in Amazonas (52%), among women aged 15–29 years (80%), and in individuals with

Table 2. Distribution of maternal sociodemographic and clinical characteristics by location, 2008–2022.

Characteristics	AC (n=4,166, 10.2%)	AM (n=21,520, 52.4%)	RO (n=10,726, 26.1%)	RR (n=4,641, 11.3%)	Pearson χ^2
Age range (years)					
10 to 14	115 (2.8)	642 (3)	173 (1.6)	82 (1.8)	<0.001
15to 19	1,219 (29.3)	6,792 (31.5)	2,853 (26.6)	1,234 (26.6)	
20 to 24	1,230 (29.5)	6,406 (29.8)	3,527 (33)	1,408 (30.3)	
25 to 29	821 (19.7)	3,979 (18.5)	2,325 (21.7)	1,025 (22.1)	
30 to 34	485 (11.6)	2,291 (10.6)	1,195 (11)	586 (12.6)	
35 and more	296 (7.1)	1,410 (6.6)	653 (6.1)	306 (6.6)	
Race/skin color					
Yellow	124 (3)	326 (1.5)	168 (1.6)	10 (0.2)	<0.001
White	72 (1.7)	256 (1.2)	480 (4.5)	77 (1.6)	
Indigenous	51 (1.2)	427 (2.1)	129 (1.2)	239 (5.1)	
Brown	2,310 (55.4)	18,419 (85.6)	3,181 (29.6)	2,846 (61.3)	
Black	9 (0.2)	71 (0.3)	91 (0.8)	9 (0.2)	
No information	1,600 (38.4)	2,021 (9.3)	6,677 (62.2)	1,460 (31.4)	
Specialty					
Surgery	4 (<0.1)	29 (0.1)	1 (<0.1)	0 (0)	<0.001
Clinical Practice	3,067 (73.6)	3,927 (18.2)	1,207 (11.2)	745 (16)	
Obstetrics	1,048 (25.1)	17,526 (81.4)	9,503 (88.6)	3,892 (83.8)	
Pediatrics	47 (1.1)	38 (0.2)	15 (0.1)	4 (<0.1)	
Type of hospitalization					
Elective	1,055 (25.3)	1,777 (8.2)	215 (2)	8 (0.2)	<0.001
Emergency	3,111 (74.6)	19,743 (91.7)	10,511 (98)	4,633 (99.8)	
Discharge/Stay outcome					
Discharge on request	46 (1.1)	73 (0.3)	33 (0.3)	6 (0.1)	<0.001
Discharge with scheduled follow-up	86 (2.1)	31 (0.1)	7 (<0.1)	9 (0.2)	
Discharge cured	48 (1.1)	3,565 (16.5)	78 (0.7)	46 (1)	
Discharge of mother and newborn	20 (0.5)	127 (0.6)	7 (<0.1)	2 (<0.1)	
Discharge of mother and neonatal death	0 (0)	1 (<0.1)	0 (0)	0 (0)	
Discharge of mother and newborn stay	0 (0)	3 (<0.1)	0 (0)	1 (<0.1)	
Discharge improved	3,815 (91.5)	16,948 (78.7)	10,229 (95.3)	4,094 (88.2)	
Discharge due to elopement	24 (0.5)	122 (0.5)	187 (1.7)	61 (1.3)	
Administrative closure	6 (0.1)	16 (<0.1)	1 (<0.1)	369 (7.9)	
Death with DC provided by attending physician	0 (0)	0 (0)	1 (<0.1)	0 (0)	
Transfer to another facility	117 (2.8)	590 (2.7)	146 (1.3)	33 (0.7)	
Other	4 (<0.1)	44 (0.2)	37 (0.3)	20 (0.4)	
Death					
No	4,166 (100)	21,520 (100)	10,725 (100)	4,641 (100)	<0.001
Yes	0 (0)	0 (0)	1 (<0.1)	0 (0)	

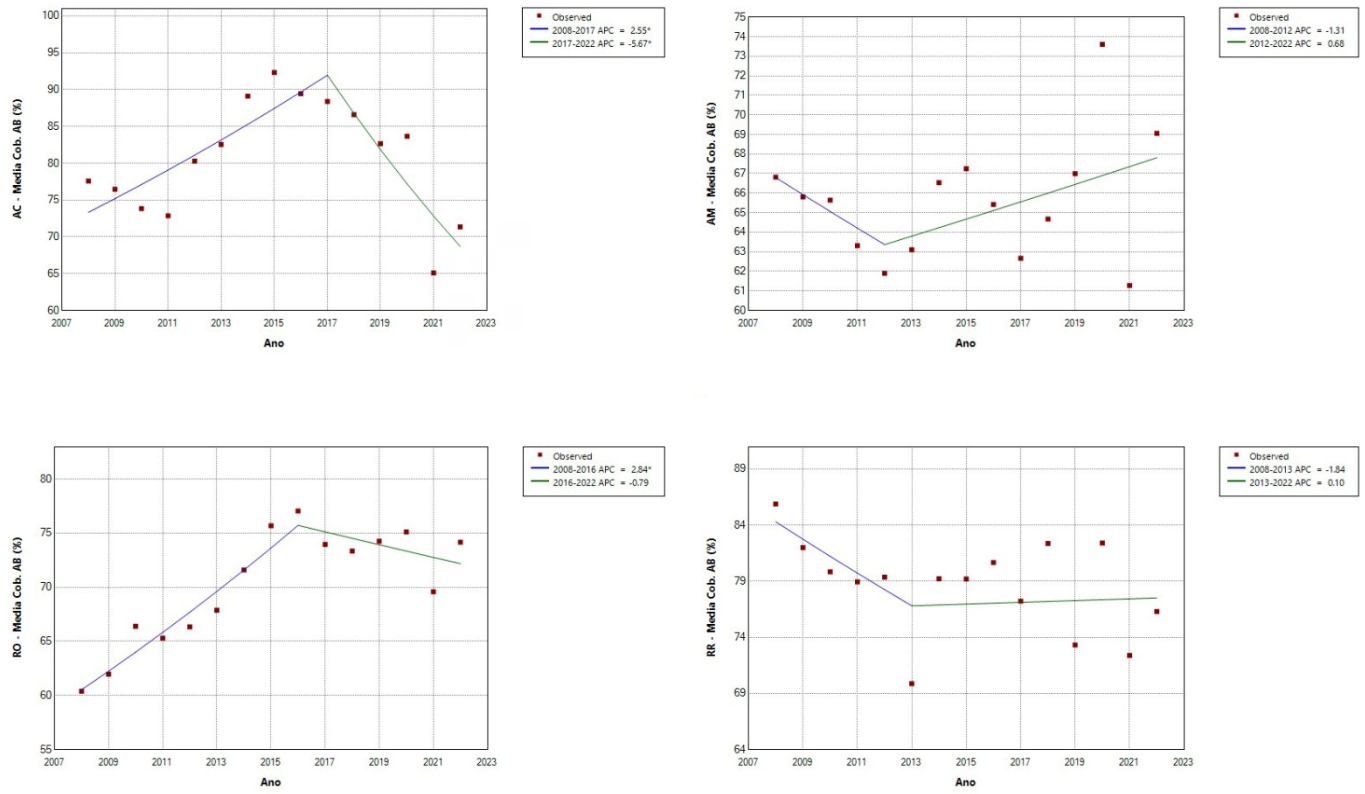
AC: Acre; AM: Amazonas; RO: Rondônia; RR: Roraima; DC: Death certificate.
Source: Sistema de Informações Hospitalares (SIH/DataSUS), 2008–2022.



*Indicates that the APC is significantly different from 0 at $\alpha = 0,05$.
Source: Prepared by the authors, 2024.
Figure 1. Trend of urinary tract infection cases during pregnancy by location, 2008-2022.

brown skin (65%). The majority of hospitalizations were emergency admissions (93%), with 78% related to obstetrics. Discharge due to improvement was recorded in 85% of cases. In Acre, most hospitalizations were in clinical specialties (74%), whereas in Rondônia, they were predominantly obstetric (89%). Amazonas and Roraima exhibited an increasing trend in hospitalizations until 2018, followed by a slight decrease, while Rondônia showed growth until 2014, followed by a decline. Primary care coverage varied across the states studied.

Pregnancy is recognized as a significant risk factor for the development of UTIs, a circumstance attributable to the physiological and hormonal changes characteristic of this period.[11,13] A study conducted in Southern Brazil in 2015 found that pregnant women had a 112% higher likelihood of hospitalization



*Indicates that the APC is significantly different from 0 at α=0,05.
Source: Prepared by the authors, 2024.
Figure 2. Primary care coverage by location, 2008–2022.

for a primary care-sensitive condition (OR 2.12; 95%CI 1.30; 3.68) compared with the rest of the studied population.[10] In 2017, another study reported that 70.97% of hospitalizations among pregnant women were for primary care-sensitive conditions, with UTIs being the leading cause during the second and third trimesters of pregnancy. Among these women, 57.62% had incomplete prenatal card data; 81.35% did not receive the minimum number of recommended prenatal consultations; and 55.93% initiated prenatal care late — all statistically significant differences compared with pregnant women hospitalized for non-primary care-sensitive conditions.[12]

In the studied population, the highest percentage of hospitalizations occurred among women aged between 15 and 29 years. In Acre and Amazonas, the frequency of UTIs in girls aged between 10 and 14 years was higher than in Roraima and Rondônia. These findings are consistent with an integrative review by Teles et al.,[14] which reported a higher prevalence among individuals under 19 years of age, particularly in the context of unfavorable socioeconomic conditions, low educational attainment, three or more sexual encounters, inadequate personal hygiene, anemia, and diabetes.

The state of Amazonas is home to approximately 56.3% of the population of Western Amazonia, which corresponds proportionally to its leading number of hospitalizations for UTIs during pregnancy in the region.[15] Notably, 91.7% of hospitalizations in the state were emergency admissions, suggesting gaps in pregnancy monitoring, as the high proportion of urgent hospitalizations may be related to late diagnosis and insufficient prenatal screening and follow-up. In this context, research on prenatal care in Brazil[16] indicated that the proportion of women without any prenatal care was 60% higher in the North region compared with the national average.

According to the WHO, pregnant women should receive at least six prenatal consultations to ensure healthy pregnancy development, mitigate potential maternal and fetal risks, and maximize the impact of these interventions on maternal and child health.[11] The pregnancy record booklet serves as a tool that consolidates key clinical information and pregnancy complications, functioning as an alert for health professionals across all levels of care. Versions prior to 2022 included a field for "urinary tract infection" in the "personal history" section, to be monitored by medical or nursing staff during follow-up. However, the absence of a specific field for documenting this complication in the current version may delay diagnostic suspicion, contributing to the occurrence of urgent and emergent cases of UTIs during pregnancy.

Analysis of the variable "level of education" revealed minimal missing data, with only two records incomplete. Nevertheless, the lack of comprehensive data limits understanding of the relationship between educational attainment and hospitalizations for UTIs, highlighting the need to improve health record quality. Additionally, 29% of hospitalization records "lacked information" on race/skin color. Among the reported cases, a predominance of individuals identifying as "Brown" was observed (65%), followed by "White" (2.2%), "Indigenous" (2.1%), "Yellow" (1.5%), and "Black" (0.4%). Regional differences were also evident, with 4.5% of pregnant women in Rondônia identifying as White, 5.1% in Roraima as Indigenous, and a predominance of 85.6% of Brown women in Amazonas. A study conducted in Manaus[17] reported a similar distribution: White (7.2%), Black (3.2%), Yellow (8.8%), Brown (43.8%), Indigenous (2.0%), and no information (35.1%). The high proportion of missing data underscores the insufficiency of records on pregnant women.

According to Silva et al.,[18] Brown and Black women are 49% more likely to lack access to health services compared with non-Black women. Regarding indicators of prenatal care, including the minimum recommended six visits and adequacy of care, Black women had the lowest proportions compared with White women. Living and working conditions are closely associated with health outcomes, and the findings of this study support that the brown and black population experiences social and economic vulnerability, which contributes to greater susceptibility to health problems. Although the National Policy for Comprehensive Health of the Black Population was established in 2009 to promote equity in health care for this segment of the population, challenges persist after 15 years.

Regarding the nature of hospitalization, in Acre, admissions were predominantly clinical (73.6%), whereas in Rondônia, obstetric hospitalizations predominated (88.6%), reflecting differences in the presentation and management of UTIs between the states. The high prevalence of emergency hospitalizations, ranging from 75% to 100%, with a lower proportion of elective admissions in Acre (25.3%), underscores the urgency of timely detection and appropriate treatment of UTIs during pregnancy, given that this represents the most frequent clinical complication in pregnancy and is associated with serious risks for both mother and infant.[11]

Improvement at discharge was the most frequent outcome, accounting for 95.3% of discharges in Rondônia; 91.5% in Acre; 88.2% in Roraima; and 78.7% in Amazonas, where 16.5% of hospitalizations resulted in discharge due to cure. Transfers to other facilities were infrequent, ranging from 0.7% of hospitalizations in Roraima to 2.8% in Acre. One death was recorded in Rondônia.

Analysis of HACSC data is essential for evaluating the effectiveness of primary health care services.[19] The observed pattern of a slight increase followed by a continuous decrease in hospitalizations until 2022 suggests a potential improvement in the prevention and management of these conditions over time, possibly related to prenatal care and expanded primary care coverage. However, an increasing trend in UTIs during pregnancy was observed in all four states of Western Amazonia until 2018.

The decline in hospitalizations between 2020 and 2022 may have been influenced by the COVID-19 pandemic. During this period, although prenatal care was maintained with special precautions (such as teleconsultations and visits to Basic Health Units at specific stages or under particular conditions of pregnancy),[20] there was a decrease in procedures performed in primary care, particularly in disease and infection screening and diagnosis.[21] Furthermore, variations in trends among states, such as growth in Rondônia and decline in Roraima after 2018, highlight the need for health policies that are better adapted to local particularities.

Regarding primary care coverage, distinct patterns were observed among the states, suggesting that factors such as access to health services may influence trends in hospitalizations and the incidence of UTIs. However, increasing PHC coverage alone is insufficient to reduce HACSC; adequate health service infrastructure, qualified professionals, and work processes that ensure first-contact care, longitudinality, comprehensiveness, care coordination, family guidance, and cultural competence are essential to effectively intervene in the health-disease process. Immunization initiatives and scheduled consultations for monitoring specific groups, such as pregnant women, are particularly associated with a reduced risk of hospitalization for primary care-sensitive conditions.[22]

Ensuring universality, comprehensiveness, and equity requires an organized healthcare network, which is often lacking in areas with service gaps or remote locations, particularly in the North region, highlighting inequalities in the distribution of health services across the country. Western Amazonia is home to indigenous and riverside populations who, in addition to their cultural particularities, face geographical barriers that hinder logistics and access to healthcare[7] — and, more specifically, the continuity of prenatal care.

The ecological study design presents the limitation that data pertain to the population level, making extrapolation to individuals susceptible to ecological fallacy. Additional limitations include the potential for underreporting, particularly in the North region, and incomplete data for socioeconomic variables, which are important for characterizing the population in descriptive analyses. Furthermore, the categorization of prenatal care coverage into ranges of one to three, four or five, and six or more consultations precludes direct comparison with hospitalizations for UTIs, as it is not possible to determine whether the same pregnant woman attended one, two, or three consultations in a given month.

Among the potential benefits, this study highlights the characterization of over 40,000 pregnant women hospitalized for urinary tract infections in the Western Amazon region, based on data reported under Ordinance No. 221.[9] The findings emphasize differences between locations in both hospitalization trends and primary care coverage during the study period.

CONCLUSION

The study results revealed gaps in the longitudinality, access, and coordination of prenatal care, particularly among young women. The influence of external factors, such as sociodemographic characteristics, regional disparities, and territorial particularities, on the formulation of health policies was acknowledged, along with the importance of complete data in health information systems. Studies employing a similar methodology across the country's macro-regions would facilitate comparability of PHC quality and coverage. Furthermore, these findings can inform local interventions, including continuing education for family health teams, aimed at preventing hospitalizations for avoidable causes during pregnancy and reorganizing obstetric care in Western Amazonia.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

PATB: Formal analysis, Data curation, Writing – original draft, Writing – review & editing, Investigation, Validation, Visualization. VBMC: Formal analysis, Data curation, Writing – original draft, Writing – review & editing, Investigation, Validation, Visualization. JPPS: Data curation, Writing – original draft, Validation. ILS: Data curation, Writing – original draft, Validation. ARMR: Conceptualization, Writing – original draft, Writing – review & editing, Validation, Supervision. TSR: Formal analysis, Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Methodology, Software, Validation, Visualization. JDF: Project administration, Formal analysis, Conceptualization, Writing – original draft, Writing – review & editing, Methodology, Funding acquisition, Resources, Software, Supervision, Validation, Visualization.

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