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Research Article

Factors associated with the occurrence of urinary tract infection in pregnant women attended in primary healthcare in the municipality of Anori, Amazonas, Brazil

Fatores associados à ocorrência de infecção do trato urinário em gestantes atendidas na atenção primária do município de Anori, Amazonas

Factores asociados a la ocurrencia de infección urinaria en gestantes atendidas en centros de atención primaria del municipio de Anori, Amazonas, Brasil

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Abstract

Introduction: Urinary tract infection (UTI) is a prevalent problem during pregnancy that can be alleviated or reduced with preventive care and early treatment. **Objective:** To analyze the occurrence and factors associated with UTI during pregnancy in women from Anori, Amazonas. **Methods:** Cross-sectional study. The study population included women who attended prenatal care in 2018 and 2019 at the basic health units of reference in the small municipality of Amazonas, randomly selected. Data was collected by analyzing the medical records filed at the health units to identify clinical variables related to UTI in pregnancy (presence, treatment, hospitalization, complaints). Interviews with the participants were conducted to identify sociodemographic variables (age, race/skin color, schooling, occupation, family income and marital status); obstetric-gynecological-perinatal variables (number of previous pregnancies, miscarriages, periodic gynecological exams, birth data) and knowledge about UTI and its complications. After exploratory analysis, logistic regression models were used to analyze the associations between the variables assessed and the occurrence of UTIs. **Results:** 206 women took part in the study, the majority of whom had completed high school (n=179, 86.9%), had a family income of less than one minimum wage (n=112, 54.4%), were in a primigravida pregnancy (n=107, 51.9%), and had had a UTI (n=111, 53.9%). The majority started prenatal care late (n=122, 59.2%), and 34.0% (n=70) missed prenatal care appointments. Pregnant women who received prenatal care in one of the two units had a higher likelihood of UTI occurrence (OR=2.74; 95%CI 1.40–5.37), as did those who missed prenatal care appointments (OR=1.98; 95%CI 1.07–3.67). **Conclusions:** The occurrence of UTIs during pregnancy in women from Anori, Amazonas, was associated with prenatal care in one of the health units and missing appointments. These findings highlight the importance of adequate follow-up during pregnancy to prevent and treat UTIs early, which was a common condition among the pregnant women studied.

Keywords: Urinary tract infections; Female urogenital diseases and pregnancy complications; Prenatal care; Cross-sectional studies.

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Resumo

Introdução: A infecção do trato urinário (ITU) é um problema prevalente na gestação que pode ser amenizado ou reduzido com cuidados preventivos e tratamento precoce. **Objetivo:** Analisar a ocorrência e os fatores associados à ITU na gestação de mulheres de Anori, Amazonas. **Métodos:** Estudo transversal. A população do estudo incluiu as mulheres que fizeram pré-natal em 2018 e 2019 nas unidades básicas de saúde de referência do município de pequeno porte amazonense, sorteadas aleatoriamente. Os dados foram coletados por meio da análise dos prontuários físicos arquivados nas unidades de saúde, para identificar variáveis clínicas relacionadas à ITU na gravidez (presença, tratamento, internação, queixas). Entrevistas com as participantes foram realizadas para identificar variáveis sociodemográficas (idade, raça/cor da pele, escolaridade, ocupação, renda familiar e estado civil); variáveis obstétrico-ginecológicas-perinatais (número de gestações anteriores, abortamentos, exames ginecológicos periódicos, dados do nascimento) e conhecimento sobre ITU e suas complicações. Após análise exploratória, modelos de regressão logística foram utilizados para analisar as associações das variáveis avaliadas com a ocorrência de ITU. **Resultados:** Participaram do estudo 206 mulheres, dentre as quais a maioria cursou ensino médio completo (n=179, 86,9%), tem renda familiar menor que um salário-mínimo (n=112, 54,4%), estava em gestação primigesta (n=107, 51,9%) e teve ITU (n=111, 53,9%). A maioria teve início tardio do pré-natal (n=122, 59,2%) e 34,0% (n=70) faltaram em consultas de pré-natal. Foi identificada maior chance de ocorrência de ITU entre as gestantes com acompanhamento pré-natal em uma das duas unidades (OR=2,74; IC95% 1,40–5,37) e que faltaram em consultas de pré-natal (OR=1,98; IC95% 1,07–3,67). **Conclusões:** A ocorrência de ITU durante a gestação em mulheres de Anori, Amazonas, mostrou-se associada ao acompanhamento pré-natal em uma das unidades de saúde e à falta de consultas. Esses achados ressaltam a importância do acompanhamento adequado durante a gestação para prevenir e tratar precocemente a ITU, que foi uma condição comum entre as gestantes estudadas.

Palavras-chave: Infecções urinárias; Doenças urogenitais femininas e complicações na gravidez; Cuidado pré-natal; Estudos transversais.

Resumen

Introducción: La infección urinaria (IU) es un problema prevalente durante el embarazo que puede aliviarse o reducirse con cuidados preventivos y tratamiento precoz. **Objetivo**: Analizar la ocurrencia y los factores asociados a la IU durante la gestación en mujeres de Anori, Amazonas. **Método:** Estudio transversal. La población de estudio incluyó mujeres que acudieron a control prenatal en 2018 y 2019 en las unidades básicas de salud de referencia del pequeño municipio de Amazonas, seleccionadas aleatoriamente. Los datos se recogieron analizando las historias clínicas archivadas en las unidades de salud para identificar variables clínicas relacionadas con la IU en el embarazo (presencia, tratamiento, hospitalización, quejas). Se realizaron entrevistas con las participantes para identificar variables sociodemográficas (edad, raza/color de la piel, escolaridad, ocupación, ingresos familiares y estado civil); variables obstétrico-ginecológicas-perinatales (número de embarazos anteriores, abortos espontáneos, exámenes ginecológicos periódicos, datos sobre el parto) y conocimientos sobre la IU y sus complicaciones. Después del análisis exploratorio, se utilizaron modelos de regresión logística para analizar las asociaciones entre las variables evaluadas y la ocurrencia de IU. **Resultados:** Participaron en el estudio 206 mujeres, la mayoría con estudios secundarios completos (n=179, 86,9%), con ingresos familiares inferiores a un salario mínimo (n=112, 54,4%), primigrávidas (n=107, 51,9%) y que habían tenido una IU (n=111, 53,9%). La mayoría inició la atención prenatal tarde (n=122, 59,2%), y el 34,0% (n=70) faltó a las citas de atención prenatal. Las mujeres que recibieron atención prenatal en una de las dos unidades presentaron una mayor probabilidad de ocurrencia de IU (OR=2,74; IC95% 1,40–5,37), al igual que aquellas que faltaron a las citas de atención prenatal (OR=1,98; IC95% 1,07–3,67). **Conclusiones:** La ocurrencia de IU durante el embarazo en mujeres de Anori, Amazonas, se asoció con la atención prenatal en una de las unidades de salud y la inasistencia a las citas. Estos hallazgos resaltan la importancia de un seguimiento adecuado durante el embarazo para prevenir y tratar precozmente la IU, que fue una condición común entre las gestantes estudiadas.

Palabras clave: Infecciones urinarias; Enfermedades urogenitales femeninas y complicaciones del embarazo; Atención prenatal; Estudios transversales.

INTRODUCTION

Anatomical changes in the urinary tract of pregnant women, which begin around the seventh week of pregnancy, include dilation of the renal pelvis and ureters.[1] These changes, along with bladder muscle hypotonia and vesicoureteral reflux, may predispose pregnant women with asymptomatic bacteriuria to the development of symptomatic urinary tract infections (UTIs).[2,3]

UTI is the most common bacterial infection during pregnancy; however, its etiology in this context remains poorly understood.[4,5] Consequently, aside from screening and treating women after the infection has developed, there are limited methods available to prevent its occurrence.[5]

UTIs during pregnancy can negatively impact maternal-child and perinatal outcomes.[6,7] Potential complications include hypertension, anemia, an increased risk of thrombosis, chronic pyelonephritis,

phlebitis, renal failure, and hypertension.[8] Adverse perinatal outcomes may include premature labor, low birth weight, and, in severe cases, perinatal death.[9]

The importance of early diagnosis and therapeutic interventions for UTIs is underscored by their ability to prevent complications in maternal and fetal health. Screening for asymptomatic bacteriuria is important for the early diagnosis of UTIs.[10,11] In Brazil, low-risk prenatal care includes routine testing for Abnormal Urinary Sediment Elements (ASE) (type I urine analysis) and urine culture during the first and third trimesters of pregnancy.[12] These tests are low-cost, widely accessible, and simple to perform,[13] providing results that help reduce healthcare system costs by enabling continuous monitoring in primary care settings and minimizing the need for more complex and expensive hospital interventions.[12]

Several factors contribute to an increased risk of UTIs during pregnancy. These include the pregnant woman's age,[14] being overweight, a history of urinary incontinence before pregnancy,[15] delayed initiation of prenatal care, low educational attainment, lack of awareness about UTI-related complications,[16] and the presence of comorbidities.[17]

UTI represents a significant complication during pregnancy, and understanding its prevalence and associated local risk factors is crucial to ensuring the continuity of prenatal care in primary care settings. In Anori, a small municipality in the interior of Amazonas where 76.9% of the population lives in extreme poverty,[18] several factors can impede access to consultations and continuity of prenatal care. These challenges include reliance on waterways for transportation by many pregnant women traveling to the municipal headquarters or the state capital, as well as seasonal variations that cause droughts in rivers and lakes, which further limiting mobility.

The objective of this study was to analyze the frequency of and factors associated with UTIs during pregnancy among women in Anori.

METHODS

This cross-sectional study utilized data from pregnant women who received prenatal care at two primary healthcare units serving as reference centers for maternal care in a small municipality in Amazonas. The municipality of Anori, part of the Central Amazon Mesoregion and Coari Microregion, is located 234 kilometers west of Manaus. In 2022, the population of Anori was 17,194 inhabitants.[19] At the time of the study, the municipality operated two primary healthcare units, which, following the framework of the Family Health Strategy (ESF), provided routine prenatal care for all pregnant women in the area.

In 2018 and 2019, a total of 723 pregnant women were monitored, with 368 receiving care at UBS A and 355 at UBS B. The sample size calculation was based on an estimated UTI prevalence of 20%.[20] After adjusting for the finite population, the minimum required sample size was determined to be 183 participants (β=0.20 and α=0.05). To account for a potential non-response rate, an additional 30% was added, resulting in a final sample size of 237 participants.

The sample was selected through a random draw from medical records registered at the healthcare units. Data related to the gestational period were collected directly from the medical records and included the following information: whether a urine examination for abnormal elements and sediments (AES) had been performed (yes, no, or no information); whether a UTI had been reported (yes or no); whether the patient had presented complaints (dysuria and/or pelvic pain, usual pregnancy-related complaints, or no complaints); and, in cases of UTI, whether the patient had received medication and whether hospitalization or transfer to another municipality had occurred.

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After collecting these variables, home visits were conducted by the researcher (JHF), accompanied by the community health agent responsible for the respective micro-areas. During these visits, pregnant women were interviewed using a pre-tested questionnaire developed based on guidelines from Brazil.[21] The questionnaire was divided intothree blocks of questions:

- Block 1 - Sociodemographic variables: This block includes five questions related to the pregnant woman's profile: current age; race/skin color (white, brown, no information); education level (illiterate/able to sign their name; incomplete high school; complete high school; higher education; no information); occupation during pregnancy; family income (classified as less than one minimum wage, one minimum wage, more than one minimum wage, no information); marital status (single/ without a steady partner; with a steady partner; no information); and number of previous pregnancies.
- Block 2 – knowledge about UTI: This block includes two questions related to self-perception of knowledge: whether the pregnant woman knows what a UTI is and whether she is aware of its complications during pregnancy.
- Block 3 - obstetric-gynecological and perinatal variables: This block includes eight questions to identify: the number of previous pregnancies (classified as primiparous, multiparous); the number of births; occurrence of abortions (yes, no); performance of cervical cancer screening (CCS) (yes, no); type of delivery (cesarean, vaginal, no information); gender of the child (female, male, no information); gestational age at delivery; and weight of the child at birth.

The variables, gestational age (GA) at delivery and newborn weight at birth, were categorized as follows: gestational age was classified into early term (GA 37 to 38 weeks), full term (GA 39 to 41 weeks), and post-term (GA >42 weeks). Newborn weight was categorized as low weight (<2,500 g), normal weight (2,500 – 3,999 g), and excessive weight (>4,500 g).[22]

In the descriptive analysis, categorical variables were summarized using absolute and relative frequencies, while quantitative variables were described using means, standard deviations, medians, and quartiles. Subsequently, univariate logistic regression models were employed to assess the association between the independent variables and the outcome: the occurrence of urinary tract infection (UTI) during the most recent pregnancy.

The coefficients from the univariate logistic regression models were used to estimate the crude odds ratios with 95% confidence intervals. Variables with a p-value <0.20 in the univariate analysis were selected for inclusion in the multiple logistic regression model. In the multiple model, variables with a p-value ≤0.05 were retained, indicating statistical significance.

To quantify the degree of association between the independent variables and the outcome, the coefficients of the multiple logistic regression model were used to estimate adjusted odds ratios, along with 95% confidence intervals. The model's fit was evaluated using the Akaike Information Criterion (AIC), which facilitates the comparison of the quality of different statistical models.

All statistical analyses were conducted using R software, with a significance level of 5% applied in all tests.

This study adhered to the ethical principles outlined in Resolution 466/12 for research involving human subjects. The research protocol was approved by the Research Ethics Committee of the proposing institution (CAEE 52217221.6.0000.5374). Patients were not directly involved in the planning, execution, or writing of this study. Additionally, all collected data were anonymized in compliance with data protection guidelines and are available for consultation upon request to the corresponding author.

RESULTS

Of the 723 records of pregnant women who received prenatal care during the study period, 237 were selected through simple random sampling. A review of the physical medical records archived at the units revealed that 31 were excluded due to being missing or containing illegible or incomplete information. Consequently, 206 pregnant women with eligible records participated in the study interviews. At the time of the interviews, the participants had a mean age of 27.2 (±6.7) years.

Table 1 provides an overview of the participants' profiles. The majority received prenatal care at UBS A (n=149; 72.3%), identified as having brown skin (n=198; 96.1%), had completed high school (n=179; 86.9%), had a steady partner (n=118; 57.3%), and were primiparous (n=107; 51.9%). Most participants reported a family income of less than one minimum wage (n=112; 54.4%), with farming being the predominant occupation (n=200; 97.1%).

Table 1. Descriptive analysis of the data from the profile of pregnant women attended at primary care in Anori, Amazonas, 2018-2019 (n=206).

Characteristics	Categories	Frequencies (%)
UBS	A	149 (72.3)
	B	57 (27.7)
Skin Color	White	1 (0.5)
	Brown	198 (96.1)
	No information	7 (3.4)
Education	Illiterate/able to sign their name	0 (0)
	Incomplete high school	17 (8.2)
	Complete high school	179 (86.9)
	Higher education	3 (1.5)
	No information	7 (3.4)
Family income	Less than 1 minimum wage	112 (54.4)
	1 minimum wage	70 (34.0)
	More than 1 minimum wage	17 (8.2)
	No information	7 (3.4)
Marital status	Single/without a steady partner	81 (39.3)
	With a steady partner	118 (57.3)
	No information	7 (3.4)
Occupation during pregnancy	Farmer	200 (97.1)
	Others*	6 (2.9)
Pregnancy	Primipara	107 (51.9)
	Multipara	99 (48.1)
Miscarriage	No	186 (90.3)
	Yes	20 (9.7)

*Nurse, fisherman, school manager, teacher, and psychologist.

The mean gestational age at the start of prenatal care was 15.8 (±7.5) weeks. Table 2 indicates that 59.2% (n=122) of the pregnant women began prenatal care late, and 34.0% (n=70) missed prenatal appointments. Regarding exams, 66.5% (n=137) underwent cervical cancer screening (CCS) at the unit, and 98.5% (n=203) underwent an Abnormal Urinalysis and Sediment Analysis (AUS) exam during pregnancy. The prevalence of UTIs was 53.9% (n=111). Among these cases, cephalosporins were the most commonly prescribed antibiotics (62.1%, n=69), followed by penicillin (27.9%, n=31). Additionally, 5.3% (n=7) of the pregnant women were hospitalized, and 16.0% (n=33) reported symptoms of dysuria and/or pelvic pain.

Table 2. Descriptive analysis of the data from the last pregnancy of women attended in primary care in Anori, Amazonas, 2018-2019 (n=206).

Characteristics	Categories	Frequencies (%)
Performed CCS	No	69 (33.5)
	Yes	137 (66.5)
Prenatal care start	Up to 12 weeks	78 (37.9)
	Late	122 (59.2)
	No information	6 (2.9)
Absence in prenatal consultations	No	136 (66.0)
	Yes	(34.0)
Performed ASE	No	3 (1.5%)
	Yes	203 (98.5%)
Had UTI	No	95 (46.1)
	Yes	111 (53.9)
Antibiotic classes for UTI treatment[1]	Cephalosporins	69 (62.1)
	Penicillin	31 (27.9)
	Others[2]	9 (8.1)
	No information	2 (1.8)
Hospitalization	No	188 (91.3)
	Yes	7 (5.3)
	No information	11 (3.4)
Complaints	Dysuria and/or pelvic pain	33 (16.0)
	Usual pregnancy complaints	63 (30.6)
	No complaints	110 (53.4)

[1]The relative frequency calculation considers those who had a UTI during pregnancy; [2]Nitrofurantoin, cephalotin, and various products sold in stores.

Table 3 presents the results of the descriptive analysis of birth data. It shows that 62.1% (n=128) of births were vaginal deliveries, 67.5% (n=139) occurred at full term, and 92.3% (n=190) of newborns had a normal birth weight (2,500 g – 3,999 g).

Regarding the pregnant women's self-perception of knowledge, 89.3% (n=184) reported knowing what a urinary tract infection is, and 93.2% (n=192) stated they were aware of the complications of UTI during pregnancy (Table 4).

The results of the association analysis regarding the occurrence of UTIs are presented in Table 5. In the univariate analysis, the UBS and the type of pregnancy (primiparous or multiparous) showed a significant association with the occurrence of UTI ($p<0.05$). Additionally, the variables marital status,

Table 3. Descriptive analysis of birth data for pregnant women attended in primary care in Anori, Amazonas, 2018-2019 (n=206).

Characteristics	Categories	Frequencies (%)
Type of delivery	Cesarean	71 (34.5)
	Vaginal	128 (62.1)
	No information	7 (3.4)
Newborn's gender	Female	110 (53.4)
	Male	89 (43.2)
	No information	7 (3.4)
Delivery classification	Preterm	47 (22.8)
	Full term	139 (67.5)
	Post term	13 (6.3)
	No information	7 (3.4)
Newborn's weight classification	Low weight	6 (2.9)
	Normal weight	190 (92.3)
	Excessive weight	3 (1.5)
	No information	7 (3.4)
Characteristic	Mean (standard deviation)	
Newborn's weight (grams)	3,316.5 (487.5)	
Gestational age at birth (weeks)	39.4 (1.3)	

Table 4. Descriptive analysis of data on the self-perception of pregnant women attended in primary care regarding their knowledge about urinary tract infection (Anori, Amazonas, 2018-2019; n=206).

Characteristics	Categories	Frequencies (%)
Knows what a urinary tract infection is	No	0 (0.0)
	More or Less	15 (7.3)
	Yes	184 (89.3)
	No information	7 (3.4)
Knows about the complications of UTI during pregnancy	No	6 (2.9)
	More or Less	1 (0.5)
	Yes	192 (93.2)
	No information	7 (3.4)

absence of prenatal consultations, type of delivery, and self-perception of knowledge and complications of UTI during pregnancy presented $p<0.20$ and were included in the multiple model. In the final multiple model, only the variables UBS and absence of prenatal consultations remained significant ($p\leq0.05$). Pregnant women who received prenatal care at UBS B had a higher likelihood of developing UTI (OR=2.74; 95%CI 1.40–5.37), as did those who missed prenatal appointments (OR=1.98; 95%CI 1.07–3.67), $p< 0.05$.

DISCUSSION

A significant proportion of pregnant women evaluated in the municipality of Anori (AM) experienced at least one episode of urinary tract infection (UTI) during pregnancy. This outcome was associated with the reference unit where prenatal care was provided and with the occurrence of missed prenatal appointments.

Table 5. Results of the analysis (crude and adjusted) of association with the occurrence of urinary tract infection (UTI) in pregnant women attended in primary care in Anori, Amazonas, 2018-2019 (n=206).

Characteristics	Category	n (%)	Had UTI		Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
			No	*Yes				
			n (%)	n (%)				
General		206 (100.0)	95 (46.1)	111 (53.9)	-	-	-	-
Profile								
UBS	A	149 (72.3)	77 (51.7)	72 (48.3)	Ref		Ref	
	B	57 (27.7)	18 (31.6)	39 (68.4)	2.32 (1.22–4.41)	0.0106	2.74 (1.40–5.37)	0.0031
Education	Incomplete high school	17 (8.2)	7 (41.2)	10 (58.8)	0.71 (0.05–9.50)	0.7989	-	-
	Complete high school	179 (86.9)	84 (46.9)	95 (53.1)	0.57 (0.05–6.35)	0.6441		
	Higher education	3 (1.5)	1 (33.3)	2 (66.7)	Ref			
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-	-		
Family income	Less than 1 minimum wage	112 (54.4)	51 (45.5)	61 (54.5)	1.35 (0.48–3.74)	0.5693	-	-
	1 minimum wage	70 (34.0)	32 (45.7)	38 (54.3)	1.34 (0.46–3.86)	0.5930		
	More than 1 minimum wage	17 (8.2)	9 (52.9)	8 (47.1)	Ref			
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-	-		
Marital status	Single/without a steady partner	81 (39.3)	33 (40.7)	48 (59.3)	1.46 (0.82–2.58)	0.1988	-	-
	With a steady partner	118 (57.3)	59 (50.0)	59 (50.0)	Ref			
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-	-		
Pregnancies	Primipara	107 (51.9)	42 (39.2)	65 (60.8)	1.78 (1.02–3.10)	0.0406	-	-
	Multipara	99 (48.1)	53 (53.5)	46 (46.5)	Ref			
Previous misscarriage	No	186 (90.3)	85 (45.7)	101 (54.3)	Ref		-	-
	Yes	20 (9.7)	10 (50.0)	10 (50.0)	0.84 (0.33–2.12)	0.7141		
Last pregnancy								
Prenatal care start	Up to 12 weeks	78 (37.9)	35 (44.9)	43 (55.1)	Ref		-	-
	Late	122 (59.2)	55 (45.1)	67 (54.9)	0.99 (0.56–1.76)	0.9768		
	No information	6 (2.9)	5 (83.3)	1 (16.7)	-			
Performed CCS	No	69 (33.5)	29 (42.0)	40 (58.0)	1.28 (0.72–2.30)	0.4040	-	-
	Yes	137 (66.5)	66 (48.2)	71 (51.8)	Ref			
Missed prenatal consultations	No	136 (66.0)	68 (50.0)	68 (50.0)	Ref		Ref	
	Yes	70 (34.0)	27 (38.6)	43 (61.4)	1.59 (0.88–2.86)	0.1202	1.98 (1.07–3.67)	0.0297

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Table 5. Continuation.

Characteristics	Category	n (%)	Had UTI		Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
			No	*Yes				
			n (%)	n (%)				
Birth								
Type of delivery	Cesarean	71 (34.5)	36 (50.7)	35 (49.3)	Ref		-	-
	Vaginal	128 (62.1)	56 (43.8)	72 (56.2)	1.32 (0.74–2.37)	0.3464		
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-			
Newborn gender	Female	110 (53.4)	49 (44.6)	61 (55.4)	1.16 (0.66–2.04)	0.5960	-	-
	Male	89 (43.2)	43 (48.3)	46 (51.7)	Ref			
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-			
Delivery classification	Preterm	47 (22.8)	18 (38.3)	29 (61.7)	1.59 (0.81–3.12)	0.1796		
	Full term	139 (67.5)	69 (49.6)	70 (50.4)	Ref			
	Post-term	13 (6.3)	5 (38.5)	8 (61.5)	1.58 (0.49–5.06)	0.4437		
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-	-		
Newborn weight classification	Small for gestational age	6 (2.9)	2 (33.3)	4 (66.7)	1.72 (0.31–9.65)	0.5345	-	-
	Appropriate for gestational age	190 (92.3)	88 (46.3)	102 (53.7)	Ref			
	Large for gestational age	3 (1.5)	2 (66.7)	1 (33.3)	0.43 (0.04–4.84)	0.4955		
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-	-		
Perception of knowledge								
Knows what a urinary tract infection is	No	0 (0.0)	0 (0.0)	0 (0.0)	-		-	-
	More or Less	15 (7.3)	6 (40.0)	9 (60.0)	1.32 (0.45–3.85)	0.6156		
	Yes	184 (89.3)	86 (46.7)	98 (53.3)	Ref			
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-	-		
Knows about complications of urinary tract infection during pregnancy	No	6 (2.9)	1 (16.7)	5 (83.3)	4.50 (0.52–39.28)	0.1731	-	-
	More or Less	1 (0.5)	0 (0.0)	1 (100.0)	-	-		
	Yes	192 (93.2)	91 (47.4)	101 (52.6)	Ref			
	No information	7 (3.4)	3 (42.9)	4 (57.1)	-	-		

*Event outcome; #Median of the sample; Ref: Reference category for independent variables; OR: Odds ratio; CI: Confidence interval; AIC (empty model): 286.33; AIC (final model): 278.64.

During pregnancy, the estimated prevalence of UTIs is 23.9%.[4] However, in the present study, more than half of the pregnant women (53.9%) experienced at least one episode of UTI during this period. The higher prevalence observed may be associated with the participants' profile — which includes low income and a late start to prenatal care. These factors can delay opportunities for early detection and identification of infection risk factors and limit access to health education initiatives that are effective in preventing UTI.[8] Strategies to minimize the risk of bacterial colonization and ascending infection include

providing guidance on proper hygiene practices, such as frequent handwashing and adequate perineal care. Additionally, encouraging pregnant women to maintain adequate hydration and empty their bladders regularly may help prevent urinary stasis and reduce the likelihood of UTIs.[23]

Prenatal care should begin as soon as a woman discovers she is pregnant, with a minimum of six consultations recommended, ideally starting in the first trimester.[12] In the municipality of Anori, the majority of participants not only started prenatal care late but also missed consultations, reducing the opportunity for guidance on recognizing UTI symptoms and seeking timely evaluation and treatment.[23]

The late initiation or low adherence to prenatal care identified in this study may be associated with cultural factors, low economic status, and geographical challenges that pregnant women face in accessing health units.[22] In this context, it is recommended that qualitative studies be conducted to explore the cultural and social factors underlying these issues, providing insights that can help address them effectively.

Inadequate or late monitoring, particularly in later stages of pregnancy when the baby is heavier, increases the risk of urinary stasis.[24] Preventive measures for UTI include screening for asymptomatic bacteriuria during prenatal consultations and promptly treating positive cases to prevent progression to symptomatic infection.[23] Routine tests to identify high-risk clinical conditions during prenatal care should be requested as soon as the woman is admitted to the health service, immediately after pregnancy confirmation, and repeated at the beginning of the third trimester. The healthcare team must ensure the completion of routine prenatal tests, including urine analysis and urine culture, prescribe appropriate antibacterial treatment for diagnosed cases, monitor treatment efficacy in all cases, and assess for recurrence of the infection.[25]

In the municipality, first-trimester tests, including the AUS test, are requested during the first prenatal appointment by the nursing team assigned to each area. Through a partnership with the municipal laboratory, priority is given to prenatal care, enabling pregnant women to undergo the test and receive results by their second appointment for routine follow-up. Data from this study show that the AUS test was requested for 98.5% of pregnant women, a rate higher than that reported in other studies (75%)[17] and greater than the rates observed in the North region (88.4%) and Brazil as a whole (86.6%).[26]

This screening approach is essencial for early diagnosis because, despite the absence of symptoms in most participants, the risk of maternal and neonatal morbidity and mortality remains elevated even in cases of asymptomatic UTI.[27] Furthermore, early diagnosis reduces the risk of complications, and outpatient treatment is less costly than hospital treatment,[17] contributing to a smoother pregnancy progression. This may help explain the high frequency of normal births observed in this study, with most children being born full term, at normal weight, and exhibiting a low rate of complications related to UTI.

The choice of treatment for UTI cases depends on the clinical evaluation and the degree of impairment of the pregnant woman.[28] In the municipality, the approach adopted was consistent with recommendations, with 62.1% of patients receiving cephalosporins and 27.9% receiving penicillins.

Although the frequency of responses regarding knowledge about UTI (89.3%) and its complications during pregnancy (93.2%) was satisfactory, the method used to assess knowledge did not allow for its depth or quality to be evaluated. Therefore, further studies are needed, as the instrument applied did not provide this level of detail.

The Basic Health Unit where prenatal care was provided showed a significant association with the occurrence of UTI. Several factors, although not evaluated in the present study, may have

contributed to this finding and should be considered. The high turnover of medical professionals at UBS B resulted in consultations being conducted exclusively by the nursing team. Depending on the professional, diagnostic, therapeutic, and follow-up procedures may vary from the guidelines recommended by the Ministry of Health for the care of pregnant women.[12] Additionally, most of the pregnant women receiving care at this unit come from rural areas, where there tends to be lower awareness about infection prevention, weaker health-seeking behaviors, greater geographical challenges in accessing healthcare services, and lower economic levels, factors that are significant contributors to the occurrence of UTI.[23,29]

Another aspect to consider is that higher prevalences of UTI are often identified in studies that, like the present one, rely on data from health professionals' records.[17] In this context, the presence of complete, legible, and properly filled-out clinical records is crucial for adequate pregnancy monitoring, enabling interventions that can reduce maternal and infant morbidity and mortality.[30] In the present study, a significant number of records could not be evaluated due to issues such as illegibility, incompleteness, or non-return of records by pregnant women who had taken them from the unit to request maternity benefits. This finding underscores the negligence in the storage and recording of information, as inadequate records undermine the quality of prenatal care.[31] It is important to note that, at the end of 2019, the implementation of the Citizen's Electronic Medical Record (*Prontuário Eletrônico do Cidadão* – PEC — e-SUS APS) system began in Anori. Due to its ease of use, intuitive interface, and remote access capabilities, the system has the potential to improve adherence and use by frontline professionals,[32] helping to address negligence and enhance the quality of information recording, as identified in this study.

Although the North region exhibited the highest rate of late initiation of prenatal care in Brazil (76.9%),[26] the frequency identified in Anori was lower (59.2%). This result can be attributed to healthcare teams' efforts to keep pregnant women engaged with the service, despite the geographical and seasonal challenges of the municipality. However, this issue must continue to be addressed by the team. Once properly trained, they can utilize the Online Appointment Scheduling System, available free of charge through the PEC e-SUS APS system. This system effectively addresses the main reasons for missed appointments.[33]

Among the limitations of the study, the high frequency of illegible or even nonexistent medical records in the unit's archives stands out. Additionally, the present study did not consider identifying the trimester of pregnancy in which UTIs were most prevalent, nor did it assess other variables that may influence their occurrence during pregnancy, such as sexual activity, parity, anatomical anomalies in the urinary tract, sickle cell anemia, and diabetes.[9,26] However, despite these limitations, the study highlighted issues that must be addressed in the municipality.

The results of this study, considering the realities and specifics of a municipality in the Amazon region, may contribute to the planning of strategies aimed at improving UTI management in pregnant women in the region. The study showed that the frequency of UTIs was high among pregnant women receiving primary healthcare in the municipality, and that this occurrence was associated with the healthcare unit of affiliation and missed prenatal appointments.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

JHF: Project administration, Formal analysis, Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Investigation, Methodology, Resources. LZ: Formal analysis, Formal analysis, Writing – review & editing, Methodology. AMGO: Formal analysis, Formal analysis, Writing – review & editing, Methodology. FMF: Project administration, Formal analysis, Data curation, Writing – original draft, Writing – review & editing, Methodology, Supervision.

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