IMPACTO CIENTÍFICO
EDITORA

URINARY TRACT INFECTION IN PREGNANT WOMEN AND COMPLICATIONS FOR THE FETUS AND NEWBORN: SYSTEMATIC REVIEW

INFECÇÃO DO TRATO URINÁRIO EM GESTANTES E COMPLICAÇÕES PARA O FETO E RECÉM-NASCIDO: REVISÃO SISTEMÁTICA

INFECCIÓN DEL TRACTO URINARIO EN MUJERES EMBARAZADAS Y COMPLICACIONES PARA EL FETO Y EL RECIÉN NACIDO: REVISIÓN SISTEMÁTICA

10.56238/edimpacto2025.066-002

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ABSTRACT

Objective: To identify the complications for the fetus and newborn resulting from urinary tract infections in pregnant woman.

Methods: A Systematic Literature Review, protocol registration (ID: CRD42023435657) in the International Prospective Register of Systematic Review (York University). Conducted in the databases National Library of Medicine, Literatura Latino-Americana e do Caribe em Ciências da Saúde, SCOPUS, Embase and Cumulative Index to Nursing and Allied Health Literature.

Results: Thirteen studies were included. The complications identified for the fetus and newborn were low birth weight, prematurity, neonatal urinary tract infection, intrauterine growth retardation, increased risk of developing congenital diseases and fetal death.

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Conclusions: Urinary tract infection in pregnant woman increases the risk of developing health complications for the fetus and the newborn. Therefore, it is necessary for healthcare teams must improve the identification of pregnant woman and enhance prenatal care consultations, including the effective implementation of the Maternal and Child Care Network.

Keywords: Nursing. Primary Health Care. Urinary Tract Infection. Pregnancies. Systematic Review.

RESUMO

Objetivo: Identificar as complicações para o feto e recém-nascido decorrentes da infecção do trato urinário em gestantes.

Métodos: Revisão Sistemática de Literatura, com registro de protocolo (ID: CRD42023435657) no International Prospective Register of Systematic Review (York University). Foram utilizadas as bases de dados National Library of Medicine, Literatura Latino-Americana e do Caribe em Ciências da Saúde, SCOPUS, Embase e Cumulative Index to Nursing and Allied Health Literature.

Resultados: Foram incluídos treze estudos. As complicações identificadas para o feto e o recém-nascido foram o baixo peso ao nascer, prematuridade, infecção do trato urinário neonatal, atraso de crescimento intrauterino, aumento do risco de desenvolvimento de doenças congênitas e óbito fetal.

Conclusão: A infecção do trato urinário em gestantes aumenta o risco do desenvolvimento de complicações à saúde do feto e do recém-nascido. Assim, é necessário que as equipes de saúde aprimorem a captação de gestantes e aperfeiçoem as consultas pré-natais, incluindo a implementação efetiva da Rede de Atenção Materna e Infantil.

Palavras-chave: Enfermagem. Atenção Primária à Saúde. Infecção Urinária. Gestações. Revisão Sistemática.

RESUMEN

Objetivo: Identificar las complicaciones para el feto y al recién nacido derivadas de la infeccion del tracto urinário en mujeres embarazadas.

Método: Revisión Sistemática de la Literatura, con registro de protocolo (ID: CRD42023435657) en el Registro Prospectivo Internacional de Revisión Sistemática de la Universidad de York. Se utilizaro las bases de datos Biblioteca Nacional de Medicina, Literatura Latinoamericana y del Caribe en Ciencias de la Salud, SCOPUS, Embase y Cumulative Index to Nursing and Allied Health Literature.

Resultados: Se incluyeron trece estudios, Las complicaciones identificadas para el feto y el recién nacido fueron bajo peso al nacer, prematuridad, infección del tracto urinario neonatal, retraso del crecimiento intrauterino, mayor riesgo de desarrollar enfermedades congénitas y muerte fetal.

Conclusiones: La infección del tracto urinario en mujeres embarazadas aumenta el riesgo de desarrollar complicaciones de salud para el feto y el recién nacido. Por lo tanto, es necesario que los equipos de salud mejoren la captación de embarazadas y perfeccionen

las consultas prenatales, incluyendo la implementación efectiva de la Red de Atención Materno Infantil.

Palabras clave: Enfermería. Atención Primaria de Salud. Infecciones Urinarias. Gestación. Revisión Sistemática.

1 INTRODUCTION

Urinary Tract Infection (UTI), defined as the invasion and dissemination of microorganisms from the urethra to the kidneys (1) is common during the gestational period. Among the types of microorganisms that cause infection, approximately 80% are related to Escherichia coli (E. coli), with greater involvement in females due to the anatomy of the urethra and proximity to the anus (2).

It is estimated that 20% to 48% of women will have at least one episode of infection throughout their lives (3) and during the gestational period, UTI affects about 5% to 10% of pregnant women, positioning itself as the second most frequent gestational complication (4). During this period, the incidence of asymptomatic UTI, also known as Asymptomatic Bacteriuria (BA), is equivalent to that observed in non-pregnant women (2% to 10%), with progression to Symptomatic UTI (UTI-S) in about 25% of these cases (5).

In this sense, during the prenatal consultation, nursing should act in the prevention, treatment, diagnosis, monitoring and identification of risk factors for the development of UTI. Risk factors for UTI include urological procedures, bladder catheterization, guidance on unprotected sexual intercourse, poor perianal hygiene, anatomical abnormalities, diabetes, kidney transplants, and pregnancy (6,7).

During pregnancy, physiological, anatomical and hormonal changes are observed in the woman's body, impacting several systems, including the urinary tract. These changes, such as the alteration in the hydrogen potential (pH) of urine, increase the risk of UTI occurrence (8). In the Brazilian context, the prevalence of UTI, in the last update of the Ministry of Health in 2012, oscillates between 17% and 20%. However, there are important regional differences, especially in Paraná, with the prevalence rate reaching 16.66% (9).

Such comprehensive data have the potential to assist nursing professionals, managers and other members of the health teams in the structuring and formulation of public policies already in force and, in addition, to instigate the implementation of more specific measures and care aimed at pregnant women and newborns, aiming to prevent adverse consequences for the mother-child binomial.

In view of the above, and considering that UTI during the gestational period represents potential risks and gestational complications such as preeclampsia, acute pyelonephritis, intrauterine growth alteration, premature birth, sepsis, septic shock, acute and chronic renal failure, and gestational hypertensive disease (10), the present study aimed toTo identify complications for the fetus and newborn resulting from urinary tract infection in pregnant women.

2 METHODS

This is a Systematic Review of the Literature (RSL), conducted according to the methodology of the Joanna Briggs Institute (JBI) (11) and the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (12) following its criteria and recommendations. The protocol for this review was registered on July 01, 2023 in the International Prospective Register of Systematics Review (PROSPERO) (ID CRD4202343565714).

To formulate the guiding question, the CoCoPop strategy (11) was used, having as (Co - chosen condition, UTI), (Co - context, gestational period) and (Pop - population, pregnant woman). Thus, the following research question was defined, "What are the complications for the fetus and newborn related to UTI in pregnant women?"

As an eligibility criterion, pregnant women who presented UTI during the gestational period, as well as complications for the fetus and newborns, were included in this review, and newborns were considered up to 28 days after birth (13), publications in the format of a full scientific article, and free availability. There was no temporal and language delimitation. Articles related to UTI cases outside the gestational period, abstracts, literature reviews, editorials, and experience reports were excluded.

Considering that data collection was carried out exclusively through previously published secondary sources, there was no direct involvement of human participants or the collection of primary data. The nature of this work is limited to the analysis of information already publicly available, ensuring compliance with the ethical guidelines established in Article 1, item VI of Resolution No. 510, April 7, 2016, CEP/CONEP.

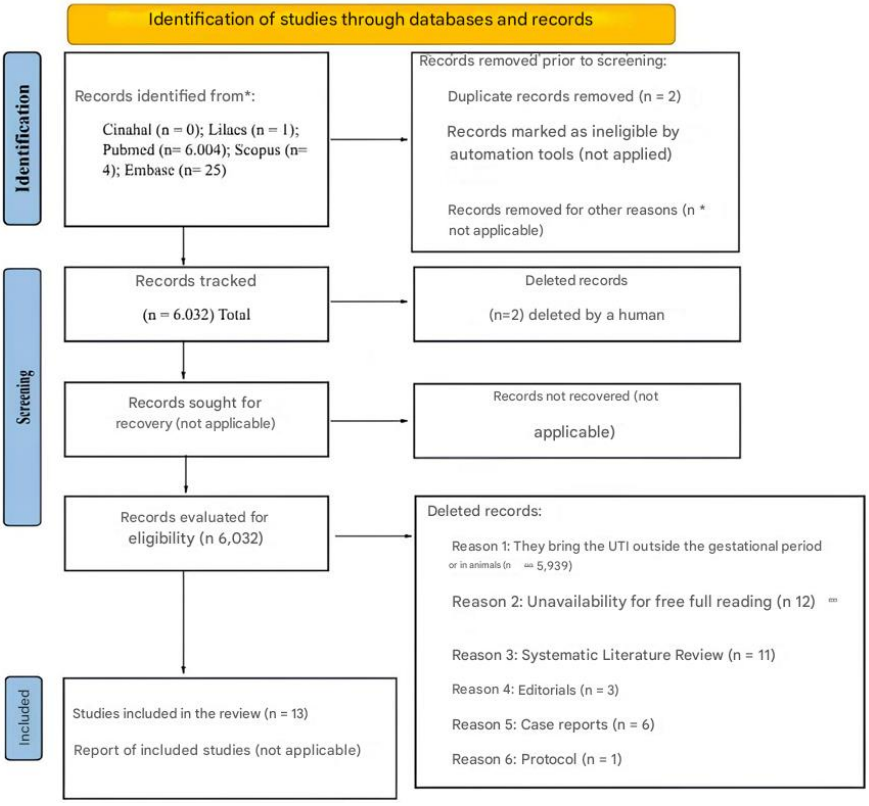
The search was carried out from July to September 2023, in the following databases: National Library of Medicine (PubMed), Latin American and Caribbean Literature on Health Sciences (LILACS), SCOPUS, Embase, and Cumulative Index to Nursing and Allied Health Literature (CINAHL).

For the search strategy, we chose to use the Health Sciences Descriptors (DeCS) and the Medical Subject Heading (MeSH) terms, using the Boolean operators "AND" and "OR", as described below, (Pregnancy) OR (Pregnancy, Infectious) OR (Complications) OR (Pregnancy Complications) OR (Complication, Obstetric Labor) AND (Fetus) OR (Maternal-Fetal Relations) OR (Fetal Death) OR (Fetal Diseases) OR (antenatal injuries) AND (Urinary tract Infections) OR (Infection, Urinary Tract) OR (Female Urogenital Diseases) OR (Urogenital Diseases) OR (Pregnancy Complications, Infectious) OR (Escherichia coli Infections). It is noteworthy that DeCS was used for the national database and MeSH for international databases.

After selecting the databases and descriptors, the studies were imported into the Start of the Art through Systematic Review (START) software, a tool developed by the Federal University of São Carlos, designed to assist in conducting reviews, tracking, and organizing studies. The selection of studies was carried out independently and blindly by two reviewers. When there was a divergence, it was discussed with the participation of a third reviewer, as shown in Figure 1.

Figure 1

Illustrative FlowTable of PRISMA (Paraná, Brazil. 2023)



Source: The authors based on the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA).

The extraction process was subdivided into two stages, the first being the reading of the titles and abstracts and, sequentially, the reading in full. The identified articles were carefully read and evaluated, with their data organized, in four Microsoft Excel® spreadsheets, containing the following information: ID, Journal, Impact factor, authors/year/country of publication, study development period, study title, objective, study design, results, conclusions, diagnostic analysis technique, etiological agent, and complications associated with urinary tract infection in the fetus and newborn.

Eligible articles were evaluated for their methodological quality, following the JBI guidelines, by two independent reviewers (BSG and MFCB), in order to optimize

interpretation, discussion of results, and establish evidence. The studies were rated on a nine-point scale: zero to three points: low quality; four to six points: average quality; and seven to nine points: high quality (11). Subsequently, all articles, regardless of their methodological quality, were subjected to narrative data extraction and synthesis.

The analysis of the results was described in a Table format, providing a concise view of the complications identified. This method aims to facilitate the synthesis and understanding of the implications for the fetus and the newborn, covering the findings of the review.

3 FINDINGS

A total of 6,034 articles were identified. Of these, two were duplicates and 5,939 were excluded, as these were not studies conducted in women or that did not relate UTI during pregnancy. Thus, 60 (sixty) studies were selected for reading in full and 13 (thirteen) articles met the inclusion criteria and answered the guiding question.

Of the thirteen studies submitted to methodological evaluation, nine articles (62.2%) had a score between seven and nine, i.e., high quality, and three obtained the maximum score, as shown in Table 1.

Table 1

Critical evaluation of methodological quality. Bandeirantes, Paraná, Brazil, 2023.

ID	Author (Date) / Title*	1.	2.	3.	4.	5.	6.	7.	8.	9.	Total
25	Micle, Otilia *et al*., 2020. The prevalence of UTI in pregnancy and implications for fetal development	(+)	(+)	(-)	(-)	(+)	(+)	(+)	(+)	(+)	7
111	Yin, Loh Keng; Sivalingam, Nalliah, 2007. Urinary tract infections in pregnancy	(I)	(I)	(I)	(I)	(I)	(I)	(I)	(I)	(I)	Q
125	Delzell Jr, John; Lefevre, Michael, 2000. Urinary tract infections during pregnancy	(I)	(I)	(I)	(I)	(I)	(I)	(I)	(I)	(I)	Q
237	Baleiras, Carla *et al.,* 1998. Urinary Tract Infection and Pregnancy	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	9
858	Ailes, Elizabeth *et al*., 2018. Antibiotics dispensed to pregnant women with private insurance with UTI	(+)	(+)	(+)	(-)	(+)	(+)	(I)	(+)	(+)	8
1171	Asmat, Umema; Mumtaz, Muhammad Z; Malik, Arif. 2020. Increased prevalence of multidrug-resistant uropathogenic bacteria in urinary tract infections in pregnant women	(+)	(+)	(I)	(+)	(+)	(+)	(+)	(+)	(+)	8
2377	Emamghorashi, Fatemeh *et al.,* 2012. Maternal urinary tract infection as a risk factor for neonatal urinary tract infection	(I)	(I)	(-)	(+)	(+)	(+)	(+)	(+)	(+)	6
2621	Bilgin, Huseyin *et al.,* 2021. Is maternal urinary tract infection associated with neonatal urinary tract infection?	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	9
3266	Schieve, L. A *et al.,* 1994. UTI during pregnancy: its association with maternal morbidity and perinatal outcome	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	9
3290	Khalesi, Nasrin *et al.,* 2014. Evaluation of maternal UTI as a potential risk factor for neonatal UTI	(+)	(+)	(I)	(-)	(+)	(+)	(+)	(+)	(+)	7

4669	Krischak, Madison *et al.,* 2020. Beyond Expert Opinion: A Comparison of Antibiotic Regimens for UTI Pathology in Pregnancy	(I)	(I)	(I)	(+)	(+)	(+)	(+)	(+)	(+)	6
5293	Balachandran, Lekshmi *et al*., 2022. Urinary tract infection in pregnancy and its effects on maternal and perinatal outcome: a retrospective study	(+)	(+)	(+)	(-)	(+)	(+)	(+)	(+)	(+)	8
5579	Amiri, Marziyeh *et al.,* 2015. Prevalence of UTI among pregnant women and its complications in their newborns during childbirth in hospitals in Dezful City, Iran, 2012 – 2013	(+)	(+)	(+)	(-)	(+)	(+)	(+)	(+)	(+)	8

Source: The authors based on a review of the literature that entered the study.
*Note: (-) did not meet the criterion; (+) met the criterion; (I) not informed/unclear; (Q) Qualitative study.
(1.) Is the sample frame appropriate to address the target population?
(2.) Were the study participants sampled appropriately?
(3.) Was the sample size adequate?
(4.) Were the participants and the study design described in detail?
(5.) Was the data analysis performed with sufficient sample coverage?
(6.) Were valid methods used to identify the condition?
(7.) Has the condition been measured in a standardized and reliable manner?
(8.) Was there appropriate statistical analysis?
(9.) The response rate was adequate, and if negative, the low response rate was managed correctly.

3.1 CHARACTERISTICS OF THE SELECTED STUDIES

When analyzing the characterization of the studies, a higher number of publications was observed in 2020 (ranging between 1994 and 2022). The investigations were carried out in eight countries, with emphasis on the United States (four publications) and Iran (three publications), published in international journals, most of which had a cross-sectional epidemiological design (Table 2)

Table 2

Characterization of the included studies. Bandeirantes, Paraná, Brazil, 2023.

ID	Magazine	Imp. factor	Authors/year/ Country	Study period	Goal	Type of study
25	The official journal of the Romanian Society of Pharmaceutical Sciences.	1.6	Micle, Otilia *et al*., 2020 Romania	2011-2019	To assess bacterial etiology, the pattern of susceptibility, and whether there are correlations between BA and maternal and neonatal adverse effects outcomes.	Transverse
111	Malaysian Family Physician	0.19	Yin, Loh Keng; Sivalingam, Nalliah. 2007 Malaysia	2007	To provide information on the clinical manifestations, diagnosis, and care of UTI in pregnant women.	Qualitative

125	American Family Physician	5.3	Delzell Jr, John; Lefevre, Michael. 2000 United States	2000	Briefly examine the pathogenesis and bacteriology of UTIs during pregnancy, as well as patient-oriented outcomes.	Qualitative
237	Acta Médica portuguesa.	1.2	Baleiras, Carla *et al.*, 1998 Portugal	1994	To reduce adverse effects and standardize procedures, the authors developed a protocol of action.	Transverse
858	Morbidity and mortality weekly report.	3.5	Ailes, Elizabeth *et al.*, 2018 United States	2011-2018	Examine antibiotic prescriptions filled by pregnant women with UTIs.	Transverse
1171	Journal of Taibah University Medical Sciences.	2.2	Asmat, Umema; Mumtaz, Muhammad; Malik, Arif. 2020 Pakistan	2018-2019	To determine the prevalence of UTI in pregnant women and to characterize BA-associated and symptomatic bacteria.	Transverse
2377	Iranian journal of kidney diseases.	1.28	Emamghorashi, Fatemeh *et al.,* 2012 Iran	2010	To assess the association of maternal UTI during pregnancy with neonatal UTI.	Transverse
2621	Journal of family & reproductive health.	0	Bilgin, Huseyin *et al.,* 2021 Turkey	2017-2018	To assess whether maternal UTI is related to neonatal UTI.	Transverse
3266	American journal of public health.	12.7	Schieve, L. A *et al.,* 1994 United States	1983-1989	To examine associations between UTI, prepartum, and adverse maternal and perinatal outcomes, independent of other possible risk factors.	Transverse
3290	Journal of family & reproductive health.	0	Khalesi, Nasrin *et al.,* 2014 Iran	2011	To assess the relationship between maternal UTI during pregnancy and neonatal UTI.	Transverse
4669	American journal of perinatology reports	3.0	Krischak, Madison *et al.,* 2020 United States	2013-2019	To compare between those who received FLT and those who received alternative antibiotics.	Transverse

5293	Curēus	1.15	Balachandran, Lekshmi *et al*., 2022 United Arab Emirates	2018	To assess any adverse maternal and perinatal morbidity related to UTI in pregnancy, with a focus on identifying common uropathogens and patterns of antibiotic sensitivity and resistance.	Transverse
5579	Iranian Red Crescent medical journal.	0.4	Amiri, Marziyeh *et al.,* 2015 Iran	2012-2013	To study the prevalence of UTI in pregnant women and its complications in their newborns.	Transverse

Source: The authors based on a review of the literature that entered the study.

Table 3 shows the main results involving the techniques for diagnosing UTI, in which urine culture was the most used (eleven articles), and the etiological agent, with Escherichia coli being mentioned in 76.9% (ten articles).

Table 3

Summary of results, conclusions, diagnostic techniques and the main causative agent. Bandeirantes, Paraná, Brazil, 2023.

ID	Findings	Conclusions	ITU Analysis Technique	Bacterium
25	High prevalence of UTI with significant quarterly variations. E. coli was the most common bacteria. The group of mothers with UTI had more preterm births. Babies of mothers with UTI had a slightly lower mean birth weight, without statistical significance.	The prevalence of UTI was significantly higher in the third trimester. Gram-negative bacteria predominated. The results highlight a high prevalence of UTI with moderate neonatal impact.	Urine samples were analyzed chemically (by stick) and microscopy and then cultured in the laboratory.	*E.coli*
111	UTIs often affect pregnant women. Three common clinical manifestations of UTIs in pregnancy are: asymptomatic bacteriuria, acute cystitis, and pyelonephritis. Urine culture and sensitivity are the gold standard in diagnosing UTIs.	UTI in pregnancy is associated with significant morbidity for both mother and baby. Untreated UTI will lead to preterm premature rupture of the membrane, maternal chorioamnionitis, intrauterine growth retardation, and low birth	Uroculture	*E.coli*

	Without treatment, asymptomatic bacteriuria is associated with preterm delivery, intrauterine growth retardation, low birth weight, maternal hypertension, preeclampsia, and anemia. Acute pyelonephritis can lead to sepsis, maternal.	weight infant. Early antibiotic treatment reduced the above complications.		
125	Urinary tract infections are common in pregnant women and can lead to serious complications if not treated properly. Urine culture should be routinely obtained in pregnant women for screening for bacteriuria. Ampicillin has historically been the drug of choice, but bacterial resistance may require the use of other antibiotics.	UTIs during pregnancy are a common cause of severe maternal and perinatal morbidity; With proper screening and treatment, this morbidity can be limited. A UTI can manifest as asymptomatic bacteriuria, acute cystitis, or pyelonephritis.	Uroculture	*E.coli*
237	About 8% of urine cultures in pregnant women were positive, with a contamination rate of 16.5%. There was an association between urinary tract infection during pregnancy and gestational age.	There was no increase in fetal or maternal complications. Timely diagnosis and treatment seem to reduce the consequences described in the literature. To reduce recurrences and morbidity associated with pyelonephritis, a protocol was developed	Uroculture	*E.coli*
858	Because of the risk of birth defects, a 2011 opinion from the American College of Obstetricians and Gynecologists suggests restrictions on prescribing sulfonamide and nitrofurantoin antibiotics in the first trimester of pregnancy, preferring other therapies when possible. Nitrofurantoin and trimethoprim-sulfamethoxazole are often used for urinary tract infections during this period.	Given the recommendations to avoid nitrofurantoin and trimethoprim-sulfamethoxazole in early pregnancy, healthcare professionals should be aware of these guidelines when prescribing antibiotics for urinary or respiratory infections in women who are pregnant or of childbearing potential soon. It is essential to consider the principle of "dealing with two".	N/I*	N/A

1171	Of the 80 pregnant women, 65 had UTI, reflecting a prevalence of 81% of UTI. The results showed that 67 uropathogenic bacterial strains belonged to *Escherichia coli.*	In this study, the uropathogenic MDR strains showed the highest resistance pattern. The alarming signs of MDR uropathogenic infections are rarely addressed and therefore urgent attention to this issue is essential.	Uroculture	*E.coli*
2377	There was a significant relationship between prenatal maternal UTI and neonatal infection; 30.0% of neonates with UTI versus 6.8% of those without UTI had mothers with a history of UTI	Our study showed an association between maternal and neonatal UTIs. This indicates a possible benefit of the evaluation of neonates of mothers who had UTI during pregnancy.	Uroculture	*E.coli*
2621	There were 153 cesarean deliveries and 77 vaginal deliveries. The incidence of low birth weight and preterm birth was higher in the study group. There was a statistically significant higher rate of neonatal UTI in the study group compared to the control group.	The results of this study showed that the presence of maternal UTI can contribute to the increase in the frequency of UTI in the neonatal period.	Uroculture	*E.coli*
3266	High risks for UTI exposure and low birth weight, prematurity, low preterm birth weight, preterm labor, hypertension, preeclampsia, maternal anemia, and amnionitis have been observed.	UTI was associated with perinatal death only among individuals 20 to 29 years of age. These findings underscore the importance of prepartum urine screening to identify patients at risk for adverse outcomes.	Uroculture	N/A
3290	The overall prevalence of UTI among neonates of affected mothers was significantly higher than that observed among uninfected mothers, Maternal UTI resulted in a 5.9-fold increased risk of neonatal UTI.	Our findings confirmed the association between the history of UTI in the mother and the occurrence of UTI in the neonate, emphasizing the need for greater attention in the evaluation and management of UTI in neonates, in order to reduce related complications.	Urine analysis and urine culture were performed on the neonates.	*E.coli*
4669	476 women, 336 received first-line therapy (FLT) and 140 received	Receipt of antibiotics other than nitrofurantoin or trimethoprim-	Uroculture	*E.coli*

	alternative antibiotics. Women who received first-line therapy were more likely to have a BMI ≥ 40. Progression to pyelonephritis did not differ. No difference was observed in the odds of progression to pyelonephritis. FLT was not associated with preterm birth (PTB) or low birth weight (LBW)	sulfamethoxazole (SMZ-TMP) for lower UTI (LUTI) in pregnancy was not associated with increased risk of progression to pyelonephritis, PTB, or LBW.		
5293	Preterm birth, recurrent UTI, pyelonephritis, and low birth weight (LBW). Women who had UTI during pregnancy had more preterm births than those without UTIs. Recurrent UTI was observed in 26.6% of women with UTI, while the incidence of pyelonephritis was relatively low in this group. There was no significant association between LBW and UTI in pregnancy.	Significant predictors of bacteriuria in pregnancy history include UTI, kidney stones, and nulliparity. Women with UTI during pregnancy are more likely to have a preterm birth. The available evidence leads to the recommendation of routine screening for BA in early pregnancy to minimize complications and identify women at significant risk of preterm birth.	Prior diagnosis	*Streptococcus B*
5579	22,600 deliveries occurred during this study. Due to UTI, 5% of births led to hospitalization of mothers. The weight and height of newborns born to mothers with UTI were significantly lower compared to newborns born to healthy women. There was a significant association between the two groups of pregnant women with UTI regarding the type of delivery.	The lower incidence of UTI in pregnant women compared to other areas of Iran represents the role of climate and weather in the prevalence of UTI. In addition, the increase in the number of children with low birth weight had a notable correlation with UTI, which may influence the health of the next generation.	Uroculture	*E.coli*

Source: The authors based on a review of the literature that entered the study.
Note: (N/I) - Not informed.

Table 4 presents the studies that identify complications for the fetus and the newborn. The main complications for the fetus were intrauterine growth retardation (two articles), perinatal death (two articles) and increased risk of developing birth defects (one article). For the NB, they were low birth weight (nine articles), neonatal UTI (three articles) and prematurity (three articles).

Table 4

Complications for the Fetus and the Newborn evidenced by studies. Bandeirantes, Paraná, Brazil, 2023

ID	Authors/ year	Complications for the Fetus and NB
25	Micle, Otilia *et al.*, 2020	Preterm Birth, Low Birth Weight and Morbidity
111	Yin, Loh Keng; Sivalingam, Nalliah, 2007	Intrauterine growth restriction, low birth weight, and premature rupture of preterm membrane.
125	Delzell Jr, John; Lefevre, Michael, 2000	Low birth weight and prematurity
237	Baleiras, Carla *et al.,* 1998	Premature rupture of membranes, preterm delivery and intrauterine growth retardation with low birth weight.
858	Ailes, Elizabeth *et al*., 2018	Potential risk of birth defects
1171	Asmat, Umema; Mumtaz, Muhammad Z; Malik, Arif. 2020	Premature membrane rupture, intrauterine growth restriction
2377	Emamghorashi, Fatemeh *et al.,* 2012	Prematurity, low birth weight, neonatal UTI.
2621	Bilgin, Huseyin *et al.,* 2021	Low birth weight, preterm birth, and neonatal UTI
3266	Schieve, L. A *et al.,* 1994	Low birth weight, prematurity, preterm labor, perinatal death only among individuals 20 to 29 years of age.
3290	Khalesi, Nasrin *et al.,* 2014	neonatal UTI.
4669	Krischak, Madison *et al.,* 2020	Premature birth and low birth weight.
5293	Balachandran, Lekshmi *et al*., 2022	Maternal and perinatal morbidity, preterm birth,
5579	Amiri, Marziyeh *et al.,* 2015	Low birth weight and height of newborns

Source: The authors based on a review of the literature that entered the study.

4 DISCUSSION

UTI in pregnant women is a common problem of international scope and of significant importance for health, being the second disease that most affects pregnant women (4), presenting complications for the fetus and the newborn.

Regarding the number of publications, two countries stood out, the United States and Iran, both of which follow the recommendations of the World Health Organization, with public policies aimed at maternal and child health, but they also have obstacles to a healthy

motherhood, such as limited access to health care and social inequality, which contributes to the compromise of the health of the mother and the newborn (13-16).

Considering that the main technique for the diagnosis and prevention of UTI is urine testing and urine culture at the first consultation and another at the thirtieth week of gestation (17), and the main etiological agent is Escherichia coli, according to the results found in the present study, National Public Policies and ordinances such as the Maternal and Child Care Network (RAMI), prioritizes prenatal care (18).

Policies and ordinances standardize requests for urine tests and urine culture during pregnancy, aiming to provide follow-up that contributes to the attempt to minimize the risks of these complications and playing a crucial role in the prevention of UTI and in the best care directed to both the mother and her child (17).

Considering that the complications of UTI associated with the fetus, observed in this study, were intrauterine growth retardation, perinatal death and increased risk of developing congenital defects, and for the NB low birth weight, neonatal UTI and prematurity, it is known that intrauterine growth retardation, characterized by the size of the fetus lower than expected or determined by its genetic potential, it is a consequence of the complications that UTI causes in pregnant women (19,20), adversely affecting the development of the fetus, increasing the risk of perinatal death and prematurity, even in women who received antibiotic treatment (3).

Perinatal death, defined as early fetal and neonatal deaths with birth weight of 500 grams or more and/or gestational age of 22 weeks, is a major concern for public health, with rates still high in Brazil, with 27,394 deaths in 2022 (21). When associated with UTI, it is correlated with other complications such as low birth weight and prematurity, occurring mainly in pregnant women between 20 and 29 years of age (22,23).

It is important to highlight that the use of specific antibiotics (sulfonamides and nitrofurantoin) during the treatment of UTI in the first trimester, especially during organogenesis, increases the risk of developing birth defects such as anencephaly, heart defects and orofacial clefts, since at this stage of development the cells are differentiating and forming vital structures. Exposure to these antibiotics can interfere with this process and lead to congenital malformations (24).

Regarding UTI complications associated with NB, low birth weight (less than 2,500 grams) stood out. This occurrence is associated with intrauterine growth retardation, related to the restriction of fetal development caused by adverse effects of UTI, such as inadequate inflammatory responses, changes in blood flow, and oxidative stress (26). Other studies (22,

26-30) converge in their conclusions, evidencing the significant relationship between fetal growth impairment and the creation of a less favorable environment in the uterus.

Neonatal UTI, also identified as a complication of maternal UTI, occurs mainly when the mother is affected in the third trimester of pregnancy. It is estimated that the increase in this risk is six times greater compared to newborns whose mothers have no history of UTI (28,32). In addition, the lack of diagnosis of neonatal UTI is attributed to asymptomatic bacteriuria, which can cause hyperthermia, dehydration, electrolyte abnormalities, and febrile seizures, highlighting the complexity of the challenges faced in monitoring this condition during the neonatal period (31, 33).

Prematurity (birth before 37 weeks of gestation) increases the risk of delayed neuropsychomotor development in children and respiratory disorders, influenced by physical immaturity and low birth weight (34, 35). Its occurrence has an increased risk due to the occurrence of UTI, and the incidence of gestational UTI is proportional to the rate of prematurity (22, 35). This interaction highlights the complexity of the factors that influence the development of the fetus and the health of the newborn.

The Health Care Network (RAS), together with the Maternal and Child Care Network (RAMI), are dedicated to women's health care in the pregnancy cycle, ensuring the right to reproductive planning, humanized care during pregnancy, childbirth and the puerperium. For children, the right to a safe birth and healthy growth and development are highlighted (18).

The Ministry of Health recommends at least six consultations for a full-term pregnancy, with the start of prenatal care in the first trimester and the performance of some basic procedures, which include clinical-obstetric and laboratory tests, among others (36). Prenatal care is the best way to ensure the monitoring and development of a healthy and safe pregnancy for the mother and her child, as well as the healthy development of the pregnancy, allowing a delivery with lower risks for the mother and baby, and the development of adequate health of the child during its various life cycles (37). Also noteworthy is the performance of urine culture during prenatal care, which contributes to early detection, monitoring and diagnosis, in order to carry out an effective and immediate treatment.

In addition to treatment, the prevention measures for gestational UTI involve guidance and continuing education carried out by the nursing team, involving adequate intimate hygiene, increased fluid intake, hygiene before and after sexual intercourse, encouragement of voluntary bladder emptying without delays and the use of comfortable clothes (38).

Study Limitations

Most of the articles analyzed focus on a period of more than five years. This time limitation may impact the relevance of the results to the present day, since health conditions,

approaches, and complications may have evolved since the date of the published studies. However, despite the restriction listed, the inclusion of older articles fills the void of recent information and contributes significantly, due to the relevance of the results and the understanding that something common in pregnancy can influence the development of the fetus and newborn.

4.1 CONTRIBUTIONS TO PRACTICE

The present study strengthens the implementation of quality prenatal consultations, focusing on the early detection and treatment of gestational UTI, through regular examinations and well-defined clinical protocols, highlighting the importance of health education for pregnant women, with targeted guidance, aiming at prevention and healthy fetal development, as well as the promotion of preventive practices and continuous training of the health team. the strengthening of public policies and the expansion of access to the health care network for pregnant women, ensuring the fulfillment of rights and the improvement of comprehensive care during pregnancy.

5 CONCLUSIONS

UTI during pregnancy is a risk factor for the development of complications for the mother, fetus, and newborn. It is an internationally recognized challenge, and it is imperative that health professionals improve and perfect prenatal consultations.

Nurses, together with the multidisciplinary team, play a significant role in their prevention, detection, diagnosis and control of complications, as their focus on the health of pregnant women with the implementation of prenatal consultations in adequate number and quality and the performance and monitoring of the exams recommended for the gestational period, contributes to an environment conducive to adequate fetal development and minimization of undesired consequences. which can involve low birth weight, neonatal UTI, prematurity, intrauterine growth delay, perinatal death, increased risk of developing congenital defects, and even death of the fetus and/or newborn.

The findings of this study emphasize the importance of systematized prenatal care, with active search and follow-up aimed at guiding, detecting, diagnosing and treating gestational UTI, contributing to the reduction of the incidence of these complications.

Health education aimed at women of childbearing age and pregnant women from the beginning of pregnancy, with the implementation of updated guidelines, educational lectures and the promotion of preventive practices such as hygiene, hydration, adequate clothing and diet and encouragement of frequent emptying of the bladder, with the aim of avoiding the

development of UTI during pregnancy, strengthening the basis for a healthy pregnancy, are low-cost resources that can prevent gestational UTI and/or accelerate its diagnosis and treatment, mitigating the consequences for the fetus and the newborn.

The importance of following, developing and updating National Public Policies, manuals and ordinances for the continuous restructuring of the health care network for pregnant women, expanding care and providing follow-up to their rights, is highlighted. This includes the need for training and constant updating of the health team for comprehensive care for women's health, especially during pregnancy.

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