



URINARY TRACT INFECTION IN PREGNANCY: CLINICAL CHALLENGES AND MATERNAL-FETAL IMPLICATIONS

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ABSTRACT

Urinary tract infection (UTI) is one of the most prevalent and clinically significant complications during pregnancy, associated with adverse maternal and fetal outcomes such as preterm birth, low birth weight, and increased neonatal morbidity and mortality. The anatomical and physiological changes characteristic of the gestational period, combined with behavioral and social factors, favor bacterial proliferation and make pregnant women more susceptible to urinary tract infections. Given the clinical and epidemiological relevance of this condition, the present study aimed to gather and analyze the available scientific evidence on prevention, diagnosis, treatment, and educational strategies related to UTI in pregnant women. This is an Integrative Literature Review (ILR) conducted in the LILACS, SciELO, and PubMed databases, using controlled descriptors and free terms, based on the PICO strategy to formulate the guiding question. Studies published between 2017 and 2025, available in full text and written in Portuguese, English, or Spanish, were included. The findings showed that gestational UTI remains underdiagnosed in Primary Health Care, mainly due to limited access to laboratory tests, long waiting times for results, and the absence of standardized clinical protocols. Health education emerged as a central axis in preventive strategies, demonstrating effectiveness in reducing incidence rates and promoting self-care among pregnant women. The potential of educational technologies and complementary therapies as supportive tools for clinical practice and maternal-fetal health promotion was also observed. It is concluded that the management of UTI in pregnancy should integrate educational interventions, early diagnosis, and safe treatment, combining evidence-based practices with the principles of equity and comprehensive women's health care.

Keywords: Urinary tract infection; Pregnancy; Primary health care.



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1- INTRODUCTION

Urinary tract infection (UTI) is characterized by the colonization and multiplication of pathogenic microorganisms in the urine, resulting in inflammatory processes and lesions in the structures of the urinary system, such as the kidneys, bladder, epididymis, and urethra (Neto; Levy, 2019). The main etiological agent is *Escherichia coli*, responsible for approximately 70% to 85% of community-acquired cases, although other microorganisms such as *Staphylococcus saprophyticus*, species of the genera *Proteus* and *Klebsiella*, as well as *Enterococcus faecalis*, are also involved (Haddad; Fernandes, 2018; Brazilian Society of Nephrology, 2023). During pregnancy, this infection represents one of the most prevalent clinical complications, being associated with an increased risk of hospitalization during the prenatal period (Montenegro; Rezende Filho, 2011).

Pregnancy itself imposes anatomical and physiological changes that favor urinary stasis and vesicoureteral reflux, such as the relaxation of the smooth muscle of the urinary tract, uterine compression of the bladder, and the alteration of urinary pH toward more alkaline values, creating an environment conducive to bacterial proliferation (Carvalho *et al.*, 2023). These modifications increase pregnant women's vulnerability to the development of asymptomatic bacteriuria, cystitis, and pyelonephritis - conditions that, if left untreated, may progress to severe complications. Among the main clinical consequences are chorioamnionitis, endometritis, preterm labor, preeclampsia, low birth weight, and even neonatal death, emphasizing the importance of this issue within the maternal-fetal context (Hamdan *et al.*, 2011; Baumgarten *et al.*, 2011).

Since the 1960s, UTI in pregnancy has been recognized as a public health problem, with preventive actions recommended during prenatal care, including urine and urine culture tests, as well as educational guidance for pregnant women (Brazilian Ministry of Health, 2012; Getaneh *et al.*, 2021). Nevertheless, the literature indicates that the condition remains neglected within the Brazilian Unified Health System (SUS), with a scarcity of epidemiological research addressing educational and preventive interventions in this group (Hoffelder *et al.*, 2018). In light of this scenario, the present study aims to conduct an Integrative Literature Review (ILR) on urinary tract infection in pregnancy, focusing on prevention, diagnosis, treatment, and its impacts on maternal



and fetal health.

2- METHOD

This study is an Integrative Literature Review (ILR) grounded in Evidence-Based Practice, designed to gather and synthesize the available scientific knowledge on urinary tract infection (UTI) in pregnant women. This method allows for the inclusion of various types of studies - experimental, non-experimental, theoretical, and empirical - thus enabling a comprehensive and critical analysis of the scientific production on the subject (Lemes *et al.*, 2021). The review followed the six stages proposed by Souza, Silva, and Carvalho (2010), which include the definition of the guiding question, the establishment of criteria for literature search and selection, data collection, critical analysis and categorization of the studies according to levels of evidence, interpretation and discussion of the results, and presentation of the synthesized knowledge.

For the classification of evidence levels, the following hierarchy was adopted: Level I, meta-analyses and randomized controlled trials; Level II, experimental studies; Level III, quasi-experimental studies; Level IV, descriptive or qualitative studies; Level V, case reports or experiential studies; and Level VI, expert opinions. The formulation of the guiding question was based on the PICo strategy (Population, Interest, and Context), which is considered appropriate for qualitative reviews (Lockwood *et al.*, 2020). The population corresponded to pregnant women; the phenomenon of interest, to urinary tract infection; and the context, to knowledge regarding clinical manifestations, complications, and preventive strategies. Accordingly, the guiding question was defined as follows: “What scientific evidence is available on the prevention, diagnosis, and treatment of urinary tract infection in pregnant women, and how can this knowledge support educational strategies in primary health care?”

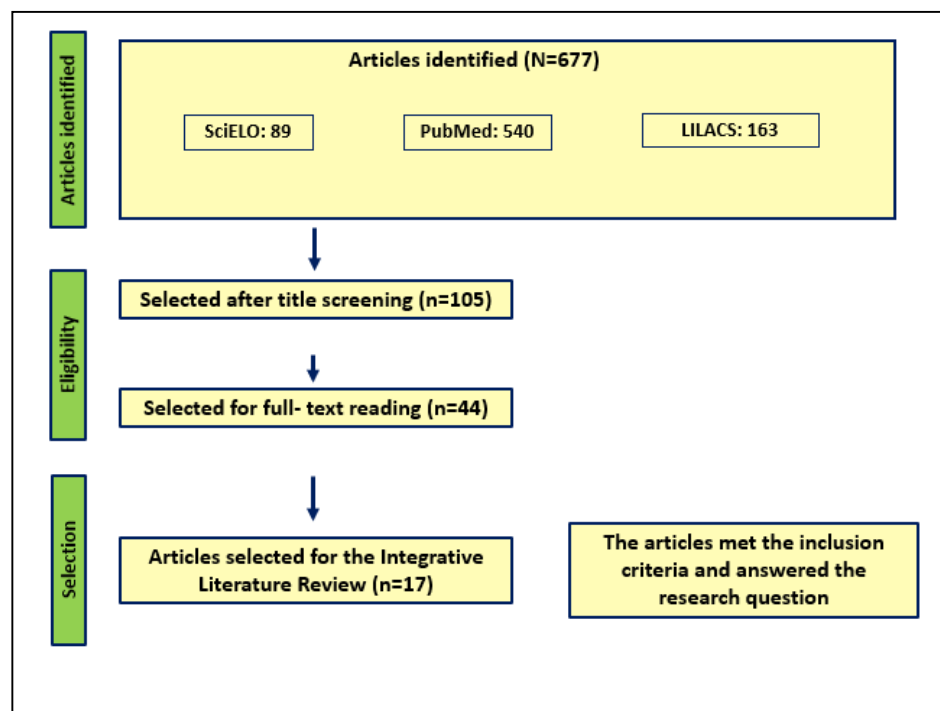
The search for studies was conducted using controlled descriptors from Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH), in addition to free-text terms. The search strategies included combinations such as “Infecção do trato urinário” AND “gestantes,” “ITU” AND “gestação,” “Infecção urinária” AND “gravidez,” “Educação em saúde” AND “gravidez” AND “infecção urinária,” “Pregnant” AND “Urinary Tract Infections,” and “Pregnancy” AND “Health Education.” The databases



consulted were the Latin American and Caribbean Health Sciences Literature (LILACS), the National Library of Medicine (PubMed), and the Scientific Electronic Library Online (SciELO).

Inclusion criteria comprised original studies available in full text, published between 2017 and 2025, written in Portuguese, English, or Spanish, and addressing the guiding question. Editorials, secondary reviews, dissertations, and theses were excluded. The initial search identified 677 articles, and after screening by pairs of reviewers through title, abstract, and full-text reading based on the predefined eligibility criteria, a total of 17 studies were included in the final sample. These studies composed the present review and are summarized in the methodological flowchart presented in Figure 1.

Figure 1: Methodological flowchart of the Integrative Review on Urinary Tract Infection in Pregnancy



Adapted from: Moher *et al.*, 2009

3- RESULTS

The selected studies addressed, from different methodological perspectives, the



clinical manifestations, risk factors, and preventive and therapeutic strategies related to urinary tract infection (UTI) in pregnant women. Overall, the publications converge in recognizing UTI as one of the most prevalent and clinically significant complications of the gestational–puerperal cycle, frequently associated with adverse outcomes such as preterm birth, low birth weight, and increased maternal - fetal morbidity and mortality. Most of the research was conducted in Latin American countries, particularly in Brazil, with an emphasis on primary health care and the nurse’s role during prenatal follow-up. The most frequent study designs were integrative reviews, cross-sectional studies, and descriptive qualitative research, which explored both clinical determinants and educational dimensions of care. To a lesser extent, clinical trials and institutional protocols focusing on pharmacological management and antimicrobial resistance prevention were identified, highlighting the rational use of antibiotics and the adoption of complementary, non-pharmacological measures.

The results also revealed a significant number of studies focusing on health education, emphasizing the development of educational technologies - such as videos, booklets, and discussion groups - as effective tools for promoting self-care and reducing the incidence of UTI during pregnancy. The reported interventions reinforced the importance of participatory strategies and the strengthening of bonds between health professionals and pregnant women, especially within Primary Health Care. International studies complemented this perspective by addressing the effectiveness of natural therapies and integrated prenatal care approaches, showing promising results for maternal - fetal safety.

Overall, the reviewed literature underscores the need for coordination between early diagnosis, appropriate clinical management, and ongoing educational actions, thereby establishing a comprehensive continuum of care for pregnant women. These findings are presented in detail in the following Summary Table, which consolidates the main methodological and thematic characteristics of the studies included in this review.

Table 1: Summary of studies included in the discussion of the integrative review

Article title / Main author	Journal / Year	Method / Level of evidence	Main findings
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Urinary Tract Infections in Pregnancy – Ansaldi et al.	Clinical Microbiology and Infection, 2023	Narrative review / Level V	High prevalence of UTI in pregnancy and maternal-fetal complications; highlights need for systematic screening and unified protocols.
Non-pharmacological interventions in prenatal care to prevent urinary infection – Hoffelder et al.	Brazilian Journal of Health Review, 2023	Integrative review / Level IV	Identifies effectiveness of educational and behavioral measures; reinforces the nursing role in prevention.
High-Risk Pregnancy: Technical Manual – Ministry of Health (Brazil)	MS – Brasília, 2022	Clinical guideline / Level VI	Recommends routine urine culture and safe antibiotic therapy; defines screening and follow-up flows.
Joint report... Clinical Management of Lower Urinary Tract Infections – De Rossi et al.	Brazilian Journal of Infectious Diseases, 2020	Interdisciplinary consensus / Level VI	Establishes safe therapeutic regimens (fosfomicin, nitrofurantoin); guides differential diagnosis and treatment.
Antibiotics for Asymptomatic Bacteriuria in Pregnancy – Smaill & Vazquez	Cochrane Database of Systematic Reviews, 2019	Systematic review / Level I	Confirms benefit of early treatment of asymptomatic bacteriuria to prevent pyelonephritis and preterm birth.
Maternal-Fetal Exposure to Antibiotics – Miao et al.	Environmental Science & Technology, 2024	Observational study / Level III	Demonstrates fetal risks of antibiotic exposure; reinforces rational use and laboratory monitoring.
Complementary Medicine for Treating Urinary Tract Infections – Hudson et al.	Frontiers in Pharmacology, 2022	Narrative review / Level V	Reports benefits of cranberry, probiotics, and vitamin C in preventing recurrent UTIs.
Nursing consultation in prenatal care: social representations of pregnant women – Melo et al.	Journal of Nursing UFSM, 2020	Qualitative research / Level IV	Shows that bonding and welcoming attitudes increase adherence to prenatal care and infection prevention.
Urinary Tract Infection in Pregnant Women: An Integrative Review – Silva et al.	Research, Society and Development, 2021	Integrative review / Level IV	Highlights the impact of educational actions and multiprofessional follow-up in reducing UTI incidence.
Educational Technology for the Prevention of Urinary Tract Infections – Fioravante & Queluci	Online Brazilian Journal of Nursing, 2017	Descriptive study / Level V	Demonstrates that leaflets and digital resources increase knowledge and self-care among pregnant women.
Prenatal care and reception from the perspective of pregnant women – Batista et al.	Revista Enfermagem Atual In Derme, 2021	Qualitative study / Level IV	Active listening and horizontal dialogue enhance adherence and



			early recognition of infection signs.
Effects of home pelvic-floor stabilization exercises on postpartum stress urinary incontinence – Khorasani et al.	International Urogynecology Journal, 2020	Randomized clinical trial / Level II	Indicates that health literacy and body education improve adherence and prevention of urinary dysfunctions.
Early diagnosis of asymptomatic urinary tract infections in pregnant women – Braga et al.	Brazilian Journal of Development, 2020	Cross-sectional study / Level III	Shows delays in laboratory results and their impact on maternal-fetal safety.
Manual of High-Risk Pregnancy – Brazilian Ministry of Health	Brazilian Ministry of Health, 2022	Technical guideline / Level VI	Updates maternal care pathways, including laboratory surveillance and safe management.
Factors associated with urinary tract infection in pregnant women – Fernandes et al.	Revista Brasileira de Medicina de Família e Comunidade, 2025	Observational study / Level III	Identifies correlation between geographic barriers, poor adherence, and higher UTI incidence.
Challenges in Implementing Surveillance Tools of High-Income Countries in LMICs – Jayatilleke	Current Treatment Options in Infectious Diseases, 2020	Narrative review / Level V	Discusses limitations of epidemiological surveillance and antimicrobial resistance in middle-income settings.
Pregnancy complications caused by urinary tract infection – Ribeiro et al.	Revista de Educação e Saúde, 2020	Integrative review / Level IV	Describes adverse maternal-fetal outcomes and weaknesses in reporting and monitoring complications.

Note: authors (2025), based on studies included in the Integrative Review “Urinary Tract Infection in Pregnancy: Clinical Challenges and Maternal - Fetal Implications

4- DISCUSSION

Urinary tract infection (UTI) during pregnancy remains a recurring challenge in obstetric practice and public health, given its high prevalence, maternal–fetal impact, and potential for recurrence. The anatomical and physiological changes that occur during pregnancy favor bacterial colonization and urinary stasis, increasing the risk of asymptomatic bacteriuria, cystitis, and pyelonephritis (Ansaldi *et al.*, 2023). Despite diagnostic and therapeutic advances, the literature indicates that UTI continues to be underdiagnosed and undertreated, especially in primary care settings with structural and logistical limitations (Hoffelder *et al.*, 2023). Based on the analysis of the included studies, this discussion was organized into three analytical categories: (1) prevention,



diagnosis, and treatment of UTI in pregnancy: evidence and clinical limitations; (2) health education and the pregnant woman's role in primary care; and (3) structural barriers and organizational challenges in the maternal-fetal care continuum.

4.1 Prevention, Diagnosis, and Treatment of UTI in Pregnancy: Evidence and Clinical Limitations

Preventing UTIs during pregnancy is essential for reducing maternal and fetal morbidity and mortality, with prenatal care serving as a key setting for early screening. National guidelines recommend performing urine cultures during the first and third trimesters, with particular attention to high-risk pregnant women, such as those with diabetes mellitus (Brazilian Ministry of Health, 2022). Nurses play a central role in this process, providing guidance on intimate hygiene, hydration, and the recognition of infection symptoms - practices that promote autonomy and self-care (De Rossi *et al.*, 2020). However, studies show that adherence to these measures remains inconsistent, particularly in regions with limited prenatal coverage and insufficient staff training.

Early diagnosis is hindered by the overlap between physiological symptoms of pregnancy and UTI manifestations. Although urine culture remains the gold standard, its unavailability in many primary health units leads to the use of less specific tests, such as routine urinalysis (Smaill; Vazquez, 2019). The lack of standardization in sample collection and transportation, combined with insufficient laboratory infrastructure, contributes to inconclusive results and therapeutic delays. This scenario reinforces the need for unified protocols and efficient laboratory workflows that ensure accurate and timely diagnosis.

Regarding treatment, the rational use of antimicrobials is indispensable, considering the fetal toxicity of certain drugs and the growing threat of bacterial resistance (Miao *et al.*, 2024). Brazilian guidelines recommend regimens including fosfomycin, nitrofurantoin, or cephalexin, depending on regional microbiological profiles (Brazilian Ministry of Health, 2022). Recent studies have also explored complementary therapies - such as *Vaccinium macrocarpon* (cranberry), probiotics, and vitamin C - with promising results in preventing recurrence and improving maternal well-being (Hudson *et al.*, 2022). The integration of these evidence-based approaches may



enhance therapeutic safety and support a more humanized model of care.

4.2 Health Education and the Pregnant Woman's Role in Primary Care

The literature highlights health education as one of the most effective strategies for preventing UTIs during pregnancy, particularly when linked to multidisciplinary follow-up and the strengthening of the bond between professionals and users of Brazil's Unified Health System (SUS) (Melo *et al.*, 2020). Health education fosters functional literacy and autonomy among pregnant women, enabling early recognition of symptoms and the adoption of simple preventive measures such as proper hydration and hygiene habits. Structured interventions, including group activities and discussion circles, have shown up to a 30% reduction in UTI incidence (Silva *et al.*, 2021), reinforcing primary care as the cornerstone of preventive actions.

The development of educational technologies - such as booklets, mobile applications, and videos - has proven to be an effective tool for broadening access to information. Studies indicate that didactic materials adapted to pregnant women's language improve understanding of infection risks and strengthen self-care behaviors (Fioravante; Queluci, 2017). Qualitative research from different regions of Brazil also reveals that active listening and horizontal dialogue between healthcare teams and patients foster adherence to preventive measures and improve awareness of early diagnosis (Batista *et al.*, 2021).

Moreover, international studies emphasize that health literacy is a key determinant in the adoption of preventive behaviors. Khorasani *et al.* (2020) demonstrated that women with higher levels of health literacy showed better adherence to preventive measures, regardless of income or formal education. Therefore, the promotion of continuous educational initiatives should be incorporated as a structural policy of prenatal care, aligned with the principles of comprehensiveness and equity that guide the SUS.

4.2 Structural Barriers and Organizational Challenges in the Maternal-Fetal Care Continuum

The third analytical category highlights the structural and organizational



limitations that compromise the comprehensive management of pregnant women with UTI within the SUS. Several studies report significant delays in laboratory testing: the average time between request and urine culture results can exceed 18 days - far above the recommended 72-hour limit (Braga, 2020). These delays stem from logistical inefficiencies, outsourcing of services, and workforce shortages, which negatively impact maternal - fetal safety (Brasil, 2022). In geographically isolated municipalities, such as those in the Amazon region, geographic and socioeconomic barriers further exacerbate inequalities, reducing prenatal adherence and hindering therapeutic follow-up (Fernandes *et al.*, 2025).

Beyond structural obstacles, there are notable weaknesses in care management and epidemiological surveillance. The lack of integrated workflows between primary and specialized care compromises treatment continuity and complication tracking. Limited availability of first-line medications such as fosfomycin and the growing problem of antimicrobial resistance pose additional challenges to implementing clinical protocols (Jayatilleke, 2020; Brazilian Ministry of Health, 2022). Simultaneously, the lack of consolidated data in national health information systems, such as SINASC and SISPRENATAL, restricts monitoring of obstetric complications related to UTI (Ribeiro *et al.*, 2020).

Strengthening surveillance and clinical governance is therefore crucial to ensuring faster and more equitable responses. Expanding access to laboratory tests, digitizing health records (e-SUS APS), and promoting continuous professional training are essential strategies for reducing regional disparities and guaranteeing comprehensive maternal care. Overcoming structural and organizational barriers represents an essential step toward translating scientific knowledge into effective clinical practices and improving maternal-infant health indicators in Brazil.

5- FINAL CONSIDERATIONS

Urinary tract infection (UTI) during pregnancy remains a significant clinical and public health challenge, particularly due to its impact on maternal - fetal morbidity and mortality. The evidence gathered in this review indicates that although screening and treatment protocols are well defined in both national and international guidelines, there



are still substantial gaps in their implementation across different levels of healthcare. Delayed diagnosis, limited laboratory capacity, and antimicrobial resistance continue to hinder effective management.

Prevention, coupled with health education, stands out as the most promising approach to reducing both the incidence and recurrence of gestational UTIs. Educational strategies grounded in active listening and the participation of pregnant women have proven effective in promoting self-care, enhancing prenatal adherence, and enabling early detection of infection signs. In this context, the role of nurses and multidisciplinary teams is central, encompassing both health education and mediation between pregnant women and health services, thereby reinforcing comprehensive care.

Conversely, overcoming structural and organizational barriers requires strengthening the maternal and child health network. Investments in diagnostic access, protocol standardization, and continuous workforce training - particularly in primary care - are indispensable. Integrating health information systems and implementing educational and surveillance technologies can optimize patient monitoring and reduce care fragmentation.

In conclusion, addressing UTI in pregnancy demands a multifactorial and interdisciplinary approach grounded in evidence-based practice and humanized care. By integrating prevention, early diagnosis, safe treatment, and health education, the Unified Health System can transform UTI management into a model of comprehensive and equitable care capable of ensuring better maternal and neonatal outcomes.

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