

Estrategias de enfermería para la prevención de infecciones del tracto urinario causadas por *Escherichia coli* en gestantes del Ecuador

*Nursing strategies for the prevention of urinary tract infections caused by *Escherichia coli* in pregnant women in Ecuador*

- ¹ Nhaylett Yoskyra Zurita Barrios  <https://orcid.org/0000-0002-1542-3351>
PhD in Educational Sciences, Ecotec Technological University, Samborondón, Ecuador.
nzuritab@ecotec.edu.ec
- ² Danny Joshua Cedeño Tomala  <https://orcid.org/0009-0002-6796-8182>
Student, Bachelor of Nursing, Ecotec Technological University, Samborondón, Ecuador.
dancedeno@est.ecotec.edu.ec
- ³ Luis Joel TO Alvarez Left  <https://orcid.org/0000-0001-7093-8342>
PhD in Health Sciences, Ecotec Technological University, Samborondón, Ecuador.
lalvarez@ecotec.edu.ec
- ⁴ Martha Rosario Baque Ortega  <https://orcid.org/0009-0001-5018-6208>
Student, Bachelor of Nursing, Ecotec Technological University, Samborondón, Ecuador.
martbaque@est.ecotec.edu.ec
- ⁵ Manuel Adolfo Gonzalez Correa  <https://orcid.org/0009-0000-0675-1954>
Student, Bachelor of Nursing, Ecotec Technological University, Samborondón, Ecuador.
mangonzalez@est.ecotec.edu.ec
- ⁶ Stephanie Pena Valdano  <https://orcid.org/0009-0006-7657-9743>
Student, Bachelor of Nursing, Ecotec Technological University, Samborondón, Ecuador.
estpena@est.ecotec.edu.ec



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Keywords:

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Resumen

Introducción. Las infecciones del tracto urinario (ITUs) ocurren ante la invasión de microorganismos que llegan a multiplicarse en las vías urinarias y órganos anexos causando procesos infecciosos que atentan contra la salud, en especial durante la gestación donde el pH vaginal y los cambios hormonales son factores que favorecen la llegada de gérmenes hacia el área genital desde otras zonas cercanas, como la Escherichia coli, microorganismo que emigra desde el recto hacia el tracto urinario femenino. **Objetivo.** El presente trabajo tiene la necesidad de describir estrategias aplicables por el profesional de enfermería para prevenir las infecciones urinarias desencadenadas por Escherichia coli en gestantes. **Metodología.** Se realizó varios análisis bibliográficos de las siguientes revistas: *Dialnet*, *Scielo*, *Scopus*, *Pubmed*, entre otras; y repositorios universitarios. Para identificar los estudios se emplearon operadores booleanos “AND” y “OR” combinados con términos claves Escherichia coli-pregnancy, infecciones urinarias-Ecuador. Se buscó artículos de textos completos, trabajos de pregrado y guías prácticas clínicas de años 2020-2024, con estimación de investigaciones publicadas en los años 2013, 2017-2019. **Resultados.** El Ecuador posee un protocolo deficiente para la prevención de ITUs en gestantes con medidas básicas que abarcan actividades de promoción de salud y protección específica, ejecutadas desde el primer nivel de atención. **Conclusión.** La reducción de prevalencia de las ITUs en Ecuador significa una constante actualización y compromiso del profesional, en brindar información sobre higiene y hábitos alimenticios, como cumplir con medidas de bioseguridad antes de la atención directa e impartir una profilaxis química a tiempo con antibióticos. **Área de estudio general:** Enfermería **Área de estudio específica:** Enfermería Gineco-obstétrica. **Tipo de Estudio:** Revisión bibliográfica.

Abstract

Introduction. Urinary tract infections (UTIs) occur due to the invasion of microorganisms that multiply in the urinary tract and adjoining organs, causing infectious processes that threaten health, especially during pregnancy where vaginal pH and

strategies and
Escherichia coli.

hormonal changes are factors that favor the arrival of germs to the genital area from other nearby areas, such as Escherichia coli, a microorganism that migrates from the rectum to the female urinary tract. objective. The present work has the need to describe strategies applicable by the nursing professional to prevent urinary tract infections triggered by Escherichia coli in pregnant women. Methodology. Several bibliographic analyzes of the following journals were conducted: Dialnet, SciELO, Scopus, PubMed, among others; and university repositories. To identify the studies, Boolean operators "AND" and "OR" were used combined with key terms Escherichia coli-pregnancy, urinary tract infections-Ecuador. We searched for full-text articles, undergraduate papers, and clinical practice guidelines from the years 2020-2024, with estimates of research published in the years 2013, 2017-2019. Results. Ecuador has a deficient protocol for the prevention of UTIs in pregnant women with basic measures that include health promotion and specific protection activities, conducted from the first level of care. Conclusion. The reduction in the prevalence of UTIs in Ecuador means constant updating and commitment of the professional to provide information on hygiene and eating habits, such as complying with biosecurity measures before direct care and providing timely chemical prophylaxis with antibiotics. General area of study: Nursing Specific area of study: Gynecological-obstetric nursing. Type of Study: Bibliographic review.

Introduction

UTIs are conceptualized as the existence of microbial flora within any of the aseptic pathways or organs of the urinary tract (1). For this reason, the functional degree of organs such as the bladder, urethra, ureters and the renal parenchyma itself is affected (2).

Urinary tract infections originate after the colonization of some bacteria, commonly of the gram-negative and gram-positive type (3). The most prevalent microorganisms are enterobacteria, a group made up of Klebsiella ssp, Enterobacter ssp, Proteus mirabilis, group B Streptococcus, coagulase-negative Staphylococcus, and Escherichia coli (E. coli); however, the least frequent bacteria causing UTIs are Gardnerella vaginalis and

Ureaplasma ureolyticum (4). Other pathogens cited are Klebsiella pneumoniae, Enterococcus spp and Pseudomonas spp (5).

According to the research carried out by Romero, Morales, Oviedo and Zapata during the year 2022, who analyzed 537 urine cultures from pregnant women, they showed that the microorganism most frequently isolated in the samples was E. coli with a frequency of 73.39% (6); being the etiological agent that favors the development of UTIs.

E. coli is a gram-negative pathogenic microorganism belonging to the Enterobacteriaceae family, where uropathogenic E. coli is the most predominant variation, since it is located among extraintestinal pathogenic E. coli (because they are located outside the natural microbial flora, that is, outside the intestines) (7); favoring the development of 80% of UTI cases in young women (5).

Worldwide, UTIs affect 150 million individuals annually, specifically women with a 3% prevalence of the population (1,8). They occur more frequently in women, since research has shown that around 40% of individuals of this sex contract some episode of UTI secondary to the anatomical location of the vagina and the short length of the urethra in these women. Pregnant women are the priority group for prevention and also vulnerable to the development of a UTI, those with a 5 to 10% incidence (3).

For this reason, urinary tract infections are generally caused by multiple functional and structural changes caused by pregnancy itself, such as: increased glomerular filtration mechanism and volume inside the ureters; hydronephrosis; increased urinary pH; decreased bladder and urethral tone; presence of glucosuria and hormones such as progesterone; these are predisposing factors for pregnant women to become susceptible to contracting a UTI (3, 8).

Thus, UTIs appear with greater prevalence during the second and third trimester, causing 10% of hospitalizations of pregnant women (9). It has been shown that approximately 30% to 50% of pregnant patients with this type of infection present a very characteristic clinical picture, with tenesmus, dysuria, suprapubic pain, urinary urgency, and fever (10), which may even transcend to develop future maternal-fetal complications.

Currently, it is known that a lower UTI if not treated in time can change and worsen into an upper urinary tract infection compromising the kidneys, developing pyelonephritis, acute renal failure, even a generalized infection (sepsis) (3); and in the case of pregnant women, they cause an early labor, whether eutocic or by cesarean section, causing premature rupture of the membranes, chorioamnionitis and low birth weight, additionally generating postpartum fever and even infections in newborns (11).

In Paraguay, UTIs have an incidence of 2% of the female population and occur in 81% of pregnant women, 43% of whom are generally in their third trimester and develop

obvious clinical signs; *E. coli* and *Staphylococcus saprophyticus* are the etiologic microorganisms, both with a prevalence of 40%. In addition, 63% of pregnant women have a secondary education level, which indicates a possible risk factor, since the lack of education accounts for the significant frequency of UTIs in this country (12).

In Ecuador, studies carried out at the Sangolquí Basic Hospital show that the prevalence of UTIs in pregnant women is 37.7%, with infection in the form of asymptomatic bacteriuria being predominant at 15.97% and the etiological agent being *E. coli* at 65.4% (13).

In the city of Libertad, in the province of Santa Elena, UTIs are present in 22.1% of 72.7% of women (14); however, the research carried out in the province of El Oro shows an 83% frequency of urinary tract infections in pregnant women, where 90.9% show clinical signs and symptoms during the third trimester of pregnancy, of which 97.5% are represented by pregnant women who attended at least 1 or 2 prenatal check-ups (3).

According to various studies, UTIs are the most common infectious diseases affecting humans regardless of sex, becoming a public health problem with a burden of morbidity and mortality, and above all a high rate of health costs if they develop (15). For this reason, the role of nursing staff during pregnancy should focus and be directed towards monitoring, attention to complications and primary characteristics of the disease, basing their care on the biological, psychosocial and physical needs of patients (3).

Given the lack of research and the increasing prevalence of UTIs in pregnant women living in Ecuador, the question arises: how can nursing reduce urinary tract infections? Thus, the objective of this article is to describe nursing strategies for the prevention of urinary tract infections caused by *Escherichia coli* in pregnant women in Ecuador; providing appropriate information to health professionals, especially nursing, and thus being able to reduce part of the prevalence of UTIs from primary health care.

Methodology

The methodology applied in this research work was developed with a documentary review, where books and scientific articles published during the last years from 2020-2024 were consulted, searching in research data results from high-impact scientific information databases, such as Latindex, Scopus, Scielo, Dialnet, Redalyc, Pubmed, ScienceDirect, Google Scholar, among others.

Certain research published during the years 2013, 2017, 2018 and 2019 were considered, due to the wide range of information related to the topic to be developed; undergraduate

works, protocols, guides and documents published by international health entities and the Ministry of Public Health of Ecuador (MSP) were also valued.

The search was carried out using key terms without any language restrictions, such as: “urinary tract infections OR Ecuador”, “Escherichia coli AND pregnancy”, “urinary tract infections AND complications”, “UTI”, “preventive strategies OR recommendations”, “treatment”, using and combining Boolean operators “AND” and “OR” that facilitated the search.

More than 50 bibliographies were consulted, all of them full texts written in Spanish and English; of which 24 bibliographical references were taken as inclusion criteria due to their relevance to the research topic, with the purpose of developing this article.

Results

UTIs are classified according to the place where they are acquired, the site of infection, signs and symptoms, and level of involvement or severity. Asymptomatic bacteriuria is the most prevalent, followed by lower UTI (cystitis), which if not resolved evolves into an upper urinary tract infection (pyelonephritis).

Nosocomial urinary tract infections are another cause of complications during pregnancy, due to the high antimicrobial resistance that *E. coli* has adopted in the hospital environment, leading to hospitalization processes in pregnant women who attend health units for their respective prenatal check-ups. The respective classification of these infections can be seen in Figure 1.

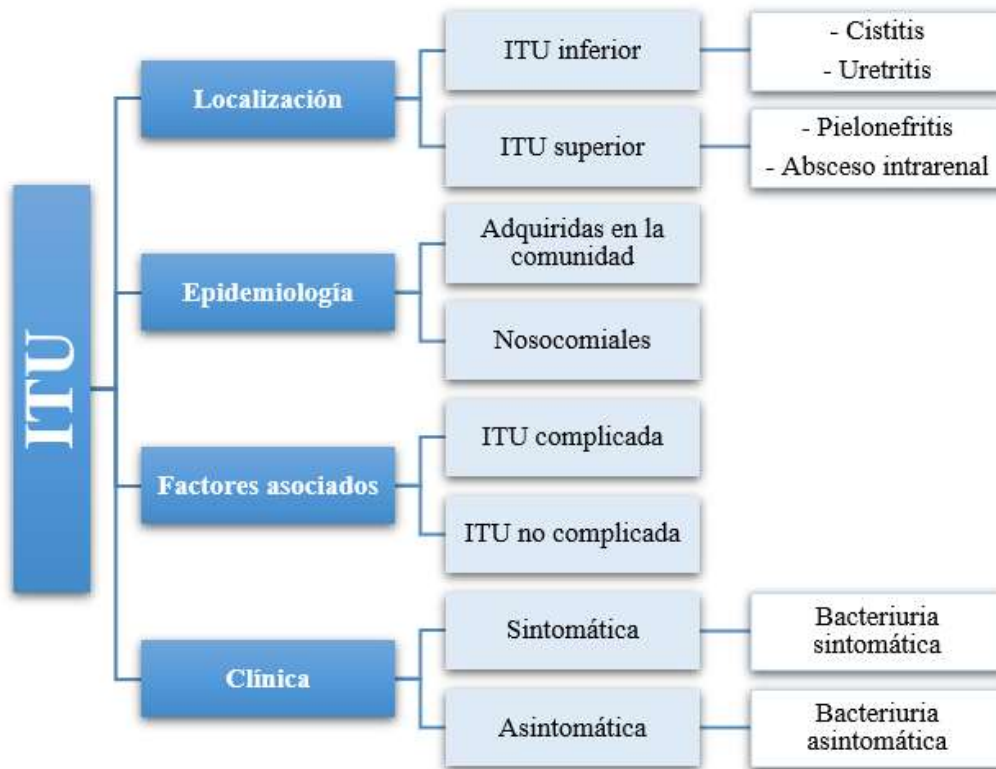


Figure 1. Typology and organization of ITUs.

Note: Prepared from Bejar et al. (3), Expósito et al. (16), Ministry of Public Health (17).

According to the statistical data presented in the previous section, there is a high prevalence of UTIs in the pregnant population of Ecuador, for this reason, it is essential that nursing staff develop a strategic plan of fundamental measures to prevent such infections; since the nursing professional must maintain and provide their care, as well as promote health in a holistic way to the community at risk and susceptibility (18), as is the case of pregnant women in order to avoid possible complications either in labor or in the product itself.

The strategies found through the exhaustive bibliographic review show the recommendations based on practical clinical evidence and scientific studies used to date by the MSP of Ecuador, detailed in Table 1.

Table 1. Basic recommendations for the prevention of UTIs in pregnant women applied in Ecuador

Document type; Title	Author (corporate)	Year	Country	Preventive measures
Clinical practice guideline (CPG); Urinary tract infection in pregnancy	Ministry of Public Health of Ecuador (MSP)	2013	Ecuador	<ul style="list-style-type: none"> ○ Oral hydration. ○ Bladder emptying. ○ Use of cotton underwear. ○ Treatment with antibiotics.

Note:* Taken from MSP (17)

There are some strategies proposed and implemented both internationally and nationally to reduce the frequency and incidence of UTIs in pregnant women (see Table 2).

Table 2. Hygienic strategies for pregnant women to prevent UTIs

Author(s) (ref.)	Country	Prevention strategies	Basis
Baroni & Añanca (19)	Peru	Do not use feminine protection frequently.	The material of these keeps the vaginal area moist.
		Wear underwear made of cotton.	It facilitates ventilation and prevents the generation of heat in the female genital area.
Martinez (20)	Spain	Perform bladder emptying.	Avoid holding back the urge to urinate, in order not to retain urine and therefore induce bacterial colonization.
Moran (21)	Peru	Induce postcoital bladder emptying.	Emptying the bladder after intercourse inhibits the movement of pathogens into the urinary tract.
Ramos & Roman (22)	Peru	Avoid vaginal douching (internal washing).	
		Perform vaginal hygiene with neutral soap and water (do not use strong soaps for genital cleaning).	The modification of vaginal pH is reduced, preventing the proliferation of infectious agents in the vulva and vagina.
		Change underwear more frequently during the day.	
		Use of aseptic toilets.	Dirty toilets contain colonies of uropathogens that, upon contact with the urothelium of the pregnant woman, enter and infect the vagina.

Table 2. Hygienic strategies for pregnant women to prevent UTIs (continued)

<i>Author(s) (ref.)</i>	<i>Country</i>	<i>Prevention strategies</i>	<i>Basis</i>
Suarez (23)	Ecuador	Perform post-defecation hygiene in an anteroposterior direction.	Female genital cleaning should be done from the vaginal area towards the anus, to avoid carrying microorganisms towards the urethra.

It was determined that the nursing professional must adapt to certain regulations and activities in order to achieve compliance with health promotion in the community and provide specific protection from primary care facilities (see table 3).

Table 3. Preventive measures and activities of healthcare personnel to reduce UTIs in pregnant women

<i>Nursing interventions</i>
<i>Type of intervention: Activities</i>
<ul style="list-style-type: none"> ○ Promote adequate oral hydration by drinking 2,000 to 3,000 ml (2 to 3 liters) of water (6 to 10 glasses) every day, to induce urine synthesis and excrete possible microbial colonies that lodge in the urinary tract from frequent urination (20, 21, 23). ○ Promote proper genital hygiene: teach the pregnant woman that after defecation, cleaning should be done in an anteroposterior direction (from the vulva to the anus), in order to avoid transporting fecal waste and microorganisms to the periurethral area (19–21, 23). ○ Provide guidance to patients about UTIs and the possible changes that these can have on their body (through education from health centers, health posts A, B and C, and through informative talks broadcast on radio and television) (22). ○ Prevent constipation (20).
<i>Type of intervention: Measures</i>
<ul style="list-style-type: none"> ○ The health professional must carry out the 5 moments of hand washing established by the World Health Organization (WHO), and thus ensure the reduction of risk of transmitting pathogens when providing direct care to patients (20). ○ Use of gloves as biosecurity material; health personnel must use gloves when faced with any risk agent (body fluids, appendages, injured skin and mucous membranes), the use of gloves reduces cross contamination between personnel and patient (20).

Another preventive measure is to reduce the consumption of alcoholic beverages, carbonated drinks and coffee, since they produce a bladder hypersensitivity reaction, exposing the pregnant woman to contracting a UTI (22).

The use of hyaluronic acid as a chemical prophylaxis has been determined, since, when introduced into the bladder using a pre-filled syringe, it acts by coating the bladder

epithelium, providing a glycosaminoglycan barrier that prevents certain pathogens such as *E. coli* from migrating from the rectum and adhering, penetrating, and proliferating in the urothelial cells of the genitourinary system (24).

Discussion

UTIs were among the infections with the highest recurrence and prevalence rates in medical consultations, with the pregnant population being the most affected, after infants and the elderly.

To this end, in the development of this bibliographic work to define nursing strategies for the prevention of UTIs, prevalence data of different microorganisms in different local regions of Ecuador were analyzed, as well as strategies implemented in both South American and European countries, recognizing symptoms and personal behavioral orientations; and on urinary tract infections in the aforementioned population.

Each result was analyzed, knowing, as stated by Fretes et al. (12), that in terms of age, educational level and marital status, the highest proportion of pregnant women in Paraguay, UTIs had an incidence of 2% of the female population and occurred in 81% of pregnant women, where 43% of them generally went through their third trimester and developed evident clinical signs; being *E. coli* and *Staphylococcus saprophyticus* the etiological microorganisms, both with a prevalence of 40%.

The above is consistent with that of Carriel et al. (14), who also found that in Ecuador in the city of La Libertad, mostly in the province of Santa Elena, UTIs occurred in 22.1% of 72.7% of women; however, a study conducted in the province of El Oro showed an 83% frequency of urinary tract infections in pregnant women, where 90.9% showed clinical signs and symptoms during the third trimester of pregnancy, and the prevalence was higher among women with basic primary education.

In relation to these results, other research, such as the study developed by Saquipay et al. (4), in 2021, in Cuenca (Ecuador), similarly showed a very high proportion of young pregnant women (20 to 39 years old) with 89.2%, added to the very low level of education and the lack of sexual education, revealing a serious problem that exists throughout the world due to misinformation, an important factor in the increase in social problems such as high interest rates.

All the above problems were related to the fact that in the countries where these studies were carried out, an increase in microbial prevalence was observed, but they also established their parameters and guidelines to follow based on manuals. Table 2 shows Hygienic strategies for pregnant women to prevent UTIs in both local and foreign populations, as well as the importance of the effectiveness of prevention.

From this information it was possible to speculate that pregnancy is a high-risk state for developing UTIs because it was found that the hormonal changes associated with pregnancy make women a favorable place for pathogens to grow. An example of the risk of urinary tract infections is a change in the pH of urine, which increases the risk of bacterial growth due to a high sugar content, evidenced by glucosuria during gestation.

It is of great importance that nursing staff know how to identify symptoms of a UTI, maintaining the strategy of prevention rather than cure by strengthening the knowledge of patients so that the intervention is not only in-hospital, but also outpatient. We can highlight that the use of sterile material is a primary measure for the prevention of UTIs before prophylaxis.

Regarding the use of hyaluronic acid, doubts arise about the effectiveness and possible adverse effects triggered by the use of this component in pregnant women; however, in the study by Hudson et al. (24), it indicates that in a case of a pregnant woman who was 27.2 weeks pregnant, she was treated with hyaluronic acid with the aim of managing interstitial cystitis, demonstrating a reduction of the symptoms and a total elimination after 6 months of the puerperium when the administration of the component was still maintained. Additionally, in this scientific article it was shown that in research where the urinary systems of pregnant and non-pregnant rats were analyzed, hyaluronic acid was found in high levels in the bladder and vagina of pregnant rodents without them presenting conditions; therefore, treatment with hyaluronic acid in pregnant women is fully supported and safe due to its protective and preventive qualities against UTIs.

This work will serve as a basis for future research, since there is not enough information about precautionary measures to reduce UTIs in the pregnant population, which is why new investigations are being carried out with the aim of strengthening the protocol for treating urinary tract infections that is applied in Ecuador.

Conclusions

- Nursing professionals must maintain a persistent modernization of knowledge to provide and highlight patient care by promoting real information, explaining the clinical features (main signs and symptoms) of UTIs, such as dysuria, frequency, hyperthermia, abdominal cramps and presence of bleeding. By educating patients, we prevent the frequency of urinary tract infections.
- In Ecuador, UTIs are mostly caused by poor personal hygiene and eating habits of users. Therefore, it is necessary to reinforce the training and updating of nursing graduates in the management of urinary tract infections, since prenatal check-ups are carried out by these professionals; therefore, there must be proper guidance, especially during the first two trimesters of pregnancy, based on the incorporation and implementation of new strategies proposed in this research, such as:

1. Avoid internal vaginal washing with solutions.
 2. Perform vaginal hygiene with neutral soap and water (do not use chemical-pharmaceutical products; these alter the physiological bacterial flora and can unbalance the vaginal pH).
 3. Reduced use of panty liners.
 4. Use clean toilets when performing biological defecation (it is recommended that toilet covers be used, since this prevents direct contact between the surface contaminated with uropathogens and the skin of the pregnant woman, reducing the risk of bacterial migration to the vulvar and vaginal area).
 5. Perform postcoital bladder emptying (urinate after having sexual relations).
 6. Prevent constipation, since fecal impaction is the main source of formation of *E. coli* colonies that can migrate to the periurethral area.
 7. Drink 300 ml (1 ¼ cup) of cranberry and raspberry juice per day during the first trimesters of pregnancy, without having any UTI.
 8. Eat a diet rich in fiber (fruits, vegetables, legumes, whole-grain pasta and dried grains).
 9. Drink probiotic-rich beverages (such as natural yogurt).
 10. Consider prophylaxis with intravesical hyaluronic acid.
- The prevention of urinary tract infections requires a comprehensive approach and nursing staff must be leaders and pioneers in the creation of educational programs that encourage correct eating habits, since most pregnant women in Ecuador do not have a high level of education due to sociodemographic factors, which increases the lack of knowledge about the proper cleaning of edible products and their cooking process, and even the treatment of vital liquid, in highly vulnerable sectors where they do not have access to potable water, which acts as a persistent center for *E. coli* colonization.
 - The strategies presented are intended to promote prevention and control the rates of UTIs and thus provide new measures that favor the updating of the clinical practice guide "Urinary tract infection in pregnancy" of the MSP of Ecuador, still in force since 2013; however, it is important to highlight that as nursing staff, we must also strengthen the issue of adequate and timely hand washing, complying with the protocol and technique of the same.
 - Taking into account the above mentioned regarding the management of handwashing techniques by healthcare personnel, it is currently necessary to reinforce it not only from a technical point of view, but also in the awareness of healthcare personnel, who claim not to comply for reasons that soap or solutions used for antisepsis cause certain dermatological problems, also due to lack of time

they lead this lack of knowledge to the increase in hospital stays by pregnant patients with UTIs, which can lead to maternal-fetal complications, increasing costs and, above all, antimicrobial resistance, becoming a national and global health problem.

Conflict of interest

The authors declare that they have no conflict of interest in writing this article.

Authors' contribution statement

Nhaylett Yoskyra Zurita Barrios. Conducted part of the bibliographic search, critically reviewed previous versions of the work, and wrote up the results.

Danny Josué Cedeño Tomalá. Analyzed the bibliographies taken as inclusion criteria, wrote the background of the article, the original manuscript, and designed a figure and tables.

Luis Joel Alvarez Izquierdo. Responsible for explaining the results found in the scientific research collected, he reviewed the later versions and made various contributions to support the discussion and the results.

Martha Rosario Baque Ortega. She contributed with the research of scientific papers and articles and the writing of the methodology.

Manuel Adolfo González Correa. He carried out the interpretation of results and the formulation of conclusions.

Estefanía Peña Valdano developed the main idea of the research and carried out the grammatical revision of the writing.

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