

Original article

Prevalence of Urinary Tract Infection and Uropathogen Profile Among Pregnant Women Attending Antenatal Care in Misurata, Libya

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Abstract

Urinary tract infection is common in pregnant women and associated with maternal, fetal, and obstetric complications. *Escherichia coli* is the most common etiologic agent in both symptomatic and asymptomatic infection, and culture is the gold standard for diagnosis. Treatment of both symptomatic and asymptomatic bacteriuria has been shown to reduce the rate of pyelonephritis in pregnancy and therefore screening for and treatment of urinary tract infection has become a standard of obstetrical care. Antibiotic treatment of bacteriuria significantly reduces the risk of maternal and fetal complications. This study aimed to determine the prevalence of urinary tract infections among pregnant women and identify the predominant uropathogens in Misurata, Libya. A prospective, cross-sectional design was employed. Urine specimens were obtained from 260 pregnant women between March and June 2026. The overall prevalence of culture-confirmed UTI was 31.2%, and *Escherichia coli* was the most frequently isolated uropathogen.

Keywords: Urinary tract infection, Pregnancy, Pre-eclampsia, Pyelonephritis, Bacteriuria.

Received: 30/07/26**Accepted:** 30/09/26**Published:** 08/10/26

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Introduction

Urinary Tract Infection (UTI) refers to an infection affecting any part of the urinary system, including the urethra, urinary bladder, and kidneys (1). European Association of Urology estimated that urinary tract infection affects more than 400 million people worldwide annually (2). The urinary tract undergoes significant physiologic and anatomic changes during pregnancy, with both hormonal and mechanical influences contributing to increased risk of urinary tract infections (UTIs) (3). Elevated progesterone levels mediate smooth muscle relaxation and lead to decreased ureteral tone and progressive dilation of the ureters, along with dilation of the renal calyces. Concurrently, mechanical compression from the enlarging gravid uterus reduces bladder capacity and alters normal urinary flow dynamics (3). Additional changes, including vesicoureteral reflux, increased post-void residual urine volume, and urinary stasis, further compromise effective urinary clearance. In addition, urine often becomes less acidic and contains higher levels of glucose and hormones, creating a favorable environment for some bacteria to multiply (4). Collectively, these alterations create an environment that facilitates bacterial growth and ascending infection.

Substantially, these will increase the risk of UTI development during pregnancy. Urinary tract infections represent the most common bacterial infection during pregnancy, affecting approximately 8% of pregnant individuals (5). Urinary tract infection requires immediate medical attention and it is the most common cause of admission in obstetrical wards (6). Untreated UTIs in pregnancy carry substantial risks for both maternal and fetal health (1,6,7). Maternal Complications include pyelonephritis and renal damage, sepsis, pre-eclampsia, adult acute respiratory distress syndrome, anaemia, blood clotting disorders and inflammatory pulmonary oedema (6). Fetal and Obstetric Complications include preterm birth, low birth weight, intrauterine growth restriction, premature rupture of membranes and subsequent chorioamnionitis, and neonatal sepsis (8,9).

The urinary tract infections in pregnancy could be asymptomatic bacteriuria, cystitis or pyelonephritis (1,5). Asymptomatic Bacteriuria defined as presence of a count of 100,000 or more colony-forming units per milliliter in the urine without any symptoms. This affects up to 10% of pregnancies and must be treated to prevent it from escalating (5). Cystitis in pregnancy is a bladder infection affecting 1% to 2% of pregnant women. Which manifested with dysuria, frequency, urgency and lower abdominal pain. Prompt treatment with safe antibiotics is essential to prevent the infection from spreading to the kidneys (6). Pyelonephritis is a kidney infection, and it is one of the most common non-obstetric indications for antepartum hospitalization. It can quickly lead to systemic illness, maternal sepsis, or preterm delivery (10).

There are some risk factors for the development of UTI during pregnancy; they include young maternal age, primiparity, diabetes, history of UTI, malnutrition, anatomical urinary tract abnormalities, and low socio-economic status (11).

Organisms that cause UTIs during pregnancy are the same as those found in non-pregnant patients. *Escherichia coli* accounts for 80-90% of cases. Other gram-negative bacilli are also common, such as *Klebsiella pneumoniae* and *Proteus mirabilis*. Gram-positive organisms such as group B streptococcus and *Staphylococcus saprophyticus*, and *Staphylococcus aureus* are less common uropathogens. Less common organisms causing UTIs include *Enterococci*, *Gardnerella vaginalis*, and *Ureaplasma ureolyticum*.

The American College of Obstetrics and Gynecology recommends that a urine culture be obtained at the first prenatal visit, and should be repeated during the third trimester, because the urine of treated patients may not remain sterile for the whole pregnancy period and risk of recurrence. The recommendation of the U.S. Preventive Services Task Force is to obtain a urine culture between 12 and 16 weeks of gestation.

By screening for and aggressively managing pregnant women with bacteriuria, the annual incidence of pyelonephritis during pregnancy significantly decreased. In randomized controlled trials, treatment of pregnant women with urinary tract infection shows a decrease in the incidence of preterm birth and low-birth-weight infants (5). The decision about how to screen pregnant women for bacteriuria is a balance between the cost of screening versus the sensitivity and specificity of each test. The gold standard for detection of bacteriuria is urine culture. However, this test is expensive and takes 24 to 48 hours to obtain results. The accuracy of faster screening methods such as leukocyte esterase dipstick, nitrite dipstick, urinalysis, and urine Gram staining has been evaluated (12).

A recent study shows One-in-three women had at least one positive finding on reagent strip testing. 10% of samples had a positive culture for a single organism, whereas 46.7% of samples were positive for multiple organisms (mixed culture). 43.7% of samples had a negative culture (12). In addition, comparing these screening methods with urine culture shows that while it was more cost-effective to screen for bacteriuria with the esterase dipstick for leukocytes, only 50% of the patients with urinary tract infection were identified compared with screening by urine culture. The high number of false negatives and the relatively poor predictive value of a positive test make the faster methods less useful; therefore, a urine culture should be routinely obtained in pregnant women to screen for bacteriuria at the first prenatal visit and during the third trimester (13). Furthermore, another study concluded that urine microscopy, dipstick analysis, and urinary symptoms were not useful in screening for UTI in pregnancy. UTI should be established by urine culture before starting antibiotic treatment (14).

Methods

A cross-sectional, prospective study design was used to conduct the study. The study was conducted in the antenatal care outpatient clinic in Misurata city, Libya. The urine sample collected from 260 pregnant ladies, over period March 2026- June 2026, regardless of age, parity and gestational age. Patients with vaginal bleeding, diabetes mellitus, renal pathology, and pregnant women who had established antimicrobial treatment were excluded. The participants were provided detailed instructions on how to collect a urine sample in a sterile urine container.

Urine samples collected after handwashing, midstream urine, were examined under a microscope and by dipstick, cultured on different media, blood agar and MacConkey agar, and incubated at 37°C for 48 hours. Gram staining and biochemical tests were performed to identify isolates.

Results

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), version 20 (IBM Corp., Armonk, NY, USA). A total of 260 pregnant women attending antenatal care clinics in Misurata, Libya, were enrolled. Urine culture confirmed urinary tract infection in 81 participants, giving an overall prevalence of 31.2% (Figure 1).

Gram-negative bacteria accounted for the primary cause of infection, led by *Escherichia coli* (23, 28.4%) and *Klebsiella pneumoniae* (17, 20.9%). Gram-positive isolates comprised a substantial proportion of infections, with *Staphylococcus aureus* (15, 18.5%) and *Staphylococcus saprophyticus* (14, 17.3%) being the most frequent. Less common pathogens included *Enterococcus faecalis*, *Streptococcus agalactiae* (Group B Streptococcus), *Pseudomonas aeruginosa*, and *Proteus mirabilis* Table 1, Figure 2.

Table 1: Distribution and frequency of uropathogens isolated from pregnant women (N=81)

Microbial Category	Uropathogen Species	Frequency (n)	Percentage (%)
Gram-Negative Bacteria	<i>Escherichia coli</i>	23	28.4%
	<i>Klebsiella pneumoniae</i> .	17	20.9%
	<i>Pseudomonas aeruginosa</i>	2	2.5%
	<i>Proteus mirabilis</i>	1	1.2%
Gram-Positive Bacteria	<i>Staphylococcus aureus</i>	15	18.5%
	<i>Staphylococcus saprophyticus</i>	14	17.3%

	Enterococcus faecalis	5	6.2%
	Streptococcus agalactiae	4	4.9%
Total		81	100.0%

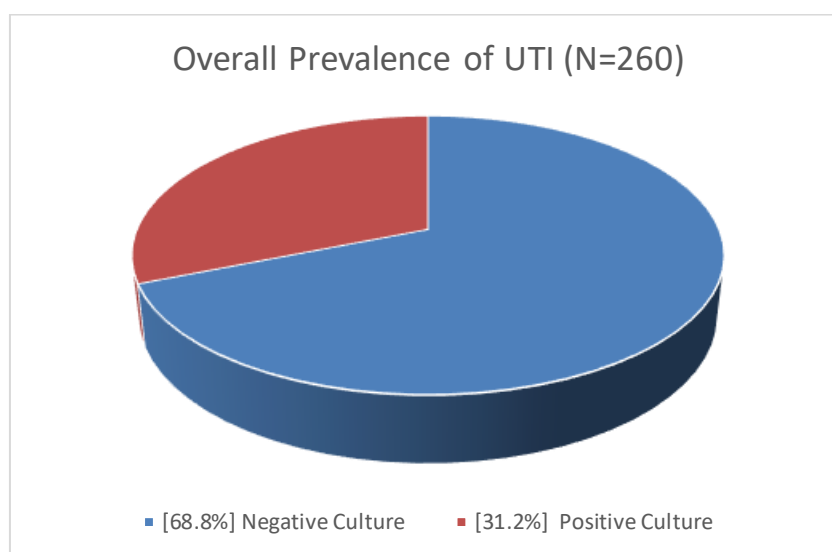


Figure 1 Prevalence of culture-confirmed urinary tract infections among pregnant women screened in Misurata, Libya (N=260).

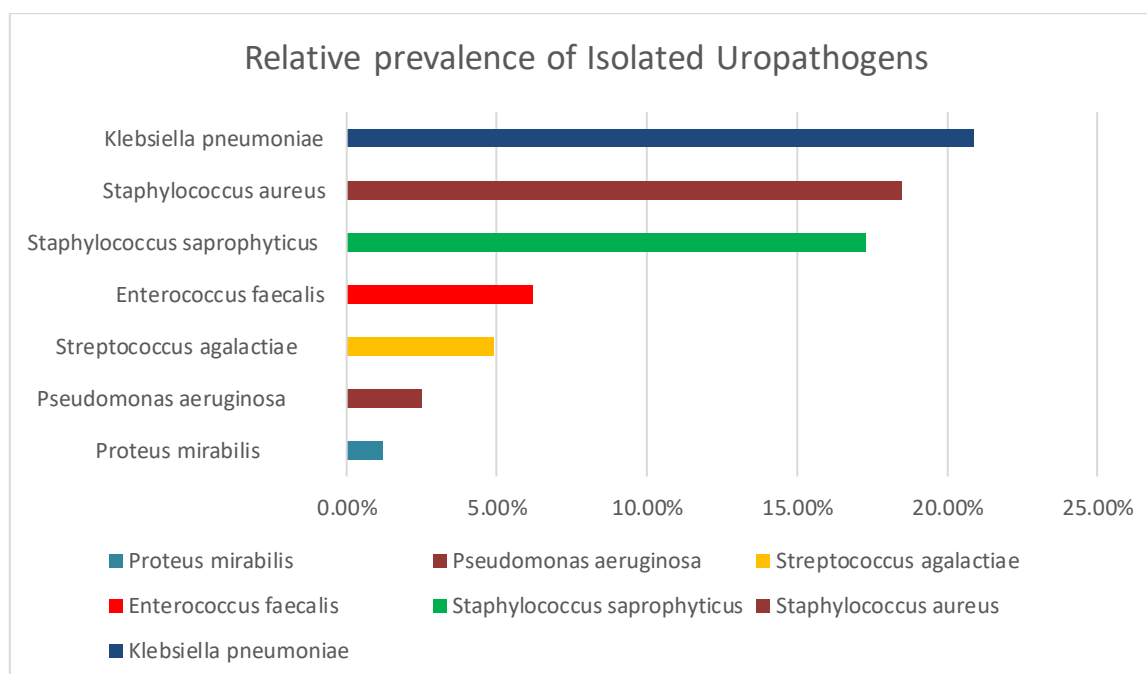


Figure 2 Frequency distribution of isolated bacterial pathogens among culture-positive cases (n=81). Gram-negative organisms accounted for 53.0% of total isolates, while Gram-positive organisms accounted for 47.0%.

Discussion

The global prevalence of urinary tract infections (UTIs) in pregnant women is approximately 13% to 27%, with broad systematic reviews placing the average worldwide at 23.9%. This study's findings showed that the prevalence of UTIs in pregnant women was higher than that reported globally. The higher rates of UTIs in this study may reflect regional differences in routine antenatal screening access, local health-seeking behaviors, and hygienic practices, which are known determinants of gestational UTI risk (15). Studies from neighboring Egypt report comparable or even higher UTI prevalence among pregnant women; for instance, a study at Sohag University Hospital documented a prevalence of 42.3% (16). In contrast, data from Sudan, an East African neighbor, indicate a notably lower prevalence of 14% (17).

In terms of the pathogen profile, most of the positive cultures in this investigation were Gram-negative bacilli, with *Escherichia coli* accounting for 28.4% and *Klebsiella pneumoniae* for 20.9%. The dominance of *E. coli* aligns with global pooled estimates and regional North African data, both of which identify it as the principal causative agent of urinary tract infections. This predominance likely reflects the capacity of *E. coli* to adhere to uroepithelial surfaces via fimbrial adhesins, together with the close anatomical relationship between the urogenital tract and the gastrointestinal reservoir (15). Notably, Gram-positive organisms accounted for a considerable share of isolates in our cohort, chiefly *Staphylococcus aureus* (18.5%) and *Staphylococcus saprophyticus* (17.3%). Whereas *E. coli* typically represents 60-80% of cases in high-income settings, reports from North and sub-Saharan Africa often describe a greater burden of Gram-positive cocci, including staphylococci and group B *Streptococcus*. This suggests a more heterogeneous uropathogen profile in our setting (15).

Conclusion

In this study, the prevalence of UTI was higher than pooled global estimates. Given the predominance of *E. coli* alongside other clinically relevant uropathogens, routine antenatal screening and antimicrobial susceptibility testing should be considered to evidence-based management. Untreated UTIs in pregnancy carry serious maternal and fetal risks, including pyelonephritis, pre-eclampsia, preterm labor, low birth weight, and neonatal sepsis, which makes early detection and treatment essential. Rapid screening tools such as urine dipsticks and urine nitrite tests have considerable false-negative rates, so urine culture remains the reference standard for antenatal screening.

The findings of this study support the integration of urine culture into standard first-trimester antenatal assessment across Libyan healthcare settings. Further large-scale, multicenter investigations incorporating comprehensive antimicrobial susceptibility testing are warranted to develop evidence-based, locally adapted guidelines for empirical therapy. In addition, research is needed to evaluate whether health education programs can alleviate symptoms and reduce the recurrence of UTIs during pregnancy.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

References

1. Ansaldi Y, Martinez De Tejada Weber B. Urinary tract infections in pregnancy. Clin Microbiol Infect. 2023 Oct;29(10):1249–53. doi:10.1016/j.cmi.2022.08.015
2. Turcu F, Vacaroiu I, Balcangiu-Stroescu A, Mitrea A, Miricescu D, Balan D, et al. Recurrent Urinary Tract Infections in Female Patients—A Clinical Review. J Mind Med Sci. 2025 Mar 5;12(1):5. doi:10.3390/jmms12010005
3. Hosien B, Belhaj H, Atia A. Characteristics of antibiotic-resistant bacteria in Libya based on different source of infections. Libyan International Medical University Journal. 2022 Jul;7(02):039–44.
4. Ngong IN, Fru-Cho J, Yung MA, Akoachere JFKT. Prevalence, antimicrobial susceptibility pattern and associated risk factors for urinary tract infections in pregnant women attending ANC in some integrated health centers in the Buea Health District. BMC Pregnancy Childbirth. 2021 Dec;21(1):673. doi:10.1186/s12884-021-04142-4
5. Urinary Tract Infections in Pregnant Individuals. Obstet Gynecol. 2023 Aug;142(2):435–45. doi:10.1097/AOG.0000000000005269
6. Matuszkiewicz-Rowińska J, Matyszko J, Wieliczko M. State of the art paper Urinary tract infections in pregnancy: old and new unresolved diagnostic and therapeutic problems. Arch Med Sci. 2015;1:67–77. doi:10.5114/aoms.2013.39202
7. McAteer S, Wartko P, Hajat A, Fuller S, Shortreed SM, Butler AM, et al. Racial and Ethnic Disparities in the Incidence and Treatment of Urinary Tract Infection During Pregnancy. J Womens Health. 2025 Aug;34(8):985–93. doi:10.1089/jwh.2024.0940
8. Daskalakis G, Psarris A, Koutras A, Fasoulakis Z, Prokopakis I, Varthaliti A, et al. Maternal Infection and Preterm Birth: From Molecular Basis to Clinical Implications. Children. 2023 May 22;10(5):907. doi:10.3390/children10050907
9. Radu VD, Vicoveanu P, Cărăuleanu A, Adam AM, Melinte-Popescu AS, Adam G, et al. Pregnancy Outcomes in Patients with Urosepsis and Uncomplicated Urinary Tract Infections—A Retrospective Study. Medicina (Mex). 2023 Dec 7;59(12):2129. doi:10.3390/medicina59122129
10. Cunningham HM, Knochenhauer HE, Federspiel JJ, Wein LE, Denoble AE, Heine RP, et al. Associations between Anemia and Outcomes of Pregnant Patients with Pyelonephritis. Am J Perinatol. 2024 May;41(S 01):e2403–9. doi:10.1055/a-2113-2892
11. Ansaldi Y, Martinez De Tejada Weber B. Urinary tract infections in pregnancy. Clin Microbiol Infect. 2023 Oct;29(10):1249–53. doi:10.1016/j.cmi.2022.08.015
12. O'Leary BD, Armstrong FM, Byrne S, Talento AF, O'Coigligh S. The prevalence of positive urine dipstick testing and urine culture in the asymptomatic pregnant woman: A cross-sectional study. Eur J Obstet Gynecol Reprod Biol. 2020 Oct;253:103–7. doi:10.1016/j.ejogrb.2020.08.004 PubMed PMID: 32862029.
13. Demilie T, Beyene G, Melaku S, Tsegaye W. Diagnostic accuracy of rapid urine dipstick test to predict urinary tract infection among pregnant women in Felege Hiwot Referral Hospital, Bahir Dar, North West Ethiopia. BMC Res Notes. 2014 Dec;7(1):481. doi:10.1186/1756-0500-7-481



14. Werter DE, Schneeberger C, Geerlings SE, De Groot CJM, Pajkrt E, Kazemier BM. Diagnostic Accuracy of Urine Dipsticks for Urinary Tract Infection Diagnosis during Pregnancy: A Retrospective Cohort Study. *Antibiotics*. 2024 Jun 19;13(6):567. doi:10.3390/antibiotics13060567
15. Salari N, Khoshbakht Y, Hemmati M, Khodayari Y, Khaleghi AA, Jafari F, et al. Global prevalence of urinary tract infection in pregnant mothers: a systematic review and meta-analysis. *Public Health*. 2023 Nov;224:58–65. doi:10.1016/j.puhe.2023.08.016
16. Mahmoud MonaAD, Kamel A, Ahmed S, El-Hamed AzzaAA. Prevalence of urinary tract infections among pregnant women at Sohag University Hospital. *Egypt Nurs J*. 2019;16(3):162. doi:10.4103/ENJ.ENJ_7_20
17. Hamdan HZ, Ziad AHM, Ali SK, Adam I. Epidemiology of urinary tract infections and antibiotics sensitivity among pregnant women at Khartoum North Hospital. *Ann Clin Microbiol Antimicrob*. 2011 Jan;10(1):2. doi:10.1186/1476-0711-10-2