

URINARY TRACT INFECTION DURING PREGNANCY PREVALENCE -RISK  
FACTORS-MICROORGANISMS-TREATMENT

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## ABSTRACT

**Background:** Urinary tract infection (UTI) during pregnancy is often a silent disease, which carries serious complications for the pregnant woman and the fetus. Habits and lack of health awareness play an important role as a risk factors. The infection may develop into a stage of bacterial resistance, which poses a challenge and the risk of complications for the fetus and the mother. **Objective:** The study aimed to evaluate the prevalence of urinary tract infections in pregnant women, identify the most important risk factors, and search for the most effective antibiotics for treating urinary tract infections, with the goal of achieving a healthy pregnancy without complications. **Study design:** The study was conducted in a private clinic in obstetrics and gynecology, Lattakia, Syria. Follow-up of pregnant patients, and a comprehensive study of the data important for the research for all patients. **Results:** The study included 65 pregnant women, and the results showed that (33.84%) of them had positive pathogens in urine culture. There were several risk factors that are important indicators of UTI during pregnancy, and we found *Escherichia coli* (77.5%) to be the highest among the isolated pathogens. Cephalosporins and nitrofurantoin were the most commonly used antibiotics in treatment. **Conclusion:** It has been shown that there are many factors that contribute to the increased prevalence of urinary tract infections during pregnancy, so the importance of early and periodic health care during pregnancy is emphasized, to reduce complications and control bacterial resistance, and the importance of increasing health awareness on a large scale.

**KEYWORDS:** Pregnancy - Urinary tract infections - Risk factors - Antibiotics - Bacterial resistance.

## 1. INTRODUCTION

Urinary tract infection (UTI) is a disease in which microbes grow in the urinary tract (kidneys, ureters bladder, and urethra. causing inflammation.<sup>[1]</sup> it constitutes a major portion of obstetric complication, UTIs can occur in two forms: asymptomatic and symptomatic. Asymptomatic UTI refers to the persistent presence of bacteria within the female urinary tract without any symptoms.<sup>[2]</sup> Symptomatic UTIs are classified into lower and upper UTIs. Lower (urethritis, cystitis) Upper (pyelonephritis), it hits women more due to the short urethra. The prevalent rate is 20% among pregnant women.<sup>[1,2,3]</sup>

Several factors that increase susceptibility to infection, Physical and hormonal factors Responsible as a major factor which increasing the infection rate, as the enlarged uterus presses on the ureters, which leads to slowing down the urination process, and urinary incontinence leads to incomplete emptying of the bladder.<sup>[4]</sup>

During pregnancy, 70% of pregnant women have high levels of sugar in the urine, which increases the risk of infection.<sup>[5]</sup>

UTI diagnosed by studying the urine sample to detect pathogens. Midstream urine culture is recommended.<sup>[6]</sup> It diagnosed when Forming colonies of bacteria in a urine sample, when there is more than bacteriuria ( $\geq 10^5$ ).<sup>[7]</sup>

*Escherichia coli* bacteria are the main cause of urinary tract infections, accounting for 70-80% of cases.<sup>[8,9]</sup> Other common pathogens include *Klebsiella pneumoniae*, *Proteus*, *Acinetobacter*, *Staphylococcus aureus*, *Staphylococcus* group B, and *Pseudomonas aeruginosa*.<sup>[10,11,12]</sup>

Pregnancy itself is a stress factor, and urinary tract infection is a high-risk factor for major maternal and fetal complications.<sup>[13,14]</sup>

When treatment of UTIs fails, it may contribute to the development of complications, including low birth

weight, preterm birth, high blood pressure, preeclampsia, anemia, premature rupture of membranes, premature birth, infant death, bacteremia, and sepsis.<sup>[15,16]</sup>

With emphasis on maternal factors that increase the risk of UTI during pregnancy: advanced age, multiple births, smoking, diabetes, anemia, previous history of urinary catheterization, history of UTI, immunosuppression, and urinary tract abnormalities. Preeclampsia.<sup>[17,18]</sup>

Asymptomatic bacteriuria ( $\geq 10^5$  bacteria/ml urine)  
The absence of any symptoms is clearly associated with pyelonephritis, preterm birth, and hypertension. The association between preterm birth.<sup>[19]</sup>

This association between asymptomatic bacteriuria and birth weight at birth was first studied by Elder and Kass et al at Boston City Hospital between 1955 and 1960<sup>[20]</sup>, While Romero et al in 1989, reported the Meta-analyses have compared the prevalence of bacteriuria in women delivering at less than 36 weeks (33/404, 8.1%) compared with that of women delivering at 37 weeks or more (15/404, 3.7%; $P=.0036$ ).<sup>[21]</sup>

Eight randomized clinical trials of antibiotic therapy have shown a significant reduction in the frequent of LBW after antibiotic therapy.<sup>[22,23]</sup> Harris et al (1976) found that 35 of 70 women with asymptomatic bacteriuria ( $\geq 10^5$ ) had asymptomatic renal infection caused by antibody-coated bacteria (cfu/mL). Asymptomatic renal infection was associated with decreased creatinine clearance, intrauterine growth retardation, and maternal hypertension.<sup>[24,25,26]</sup>

Several studies have shown that socioeconomic and demographic variables are associated with differences in LBW among women with bacteriuria Asymptomatic and non-asymptomatic bacteriuria Asymptomatic bacteriuria may not be associated with LBW per se, but is a marker of low socioeconomic status that predicts LBW.<sup>[27]</sup>

Acute cystitis occurs in 1-4% of pregnancies, manifested by dysuria, frequent urination and hematuria. It is important to focus on the previous history of cystitis<sup>[28]</sup>, here the signs and symptoms of premature labor and threatened miscarriage in the second trimester of pregnancy should be emphasized, similar to those seen in acute cystitis. As the pressure of the enlarged uterus and the advancement of the fetal part, the urgency, frequency and suprapubic discomfort increase. It is necessary to perform a pelvic examination in the presence of signs and symptoms of urinary tract infection to rule out the threat of premature labor.

Acute pyelonephritis. 2% of pregnancies, especially during the second and third trimesters of pregnancy, and is the most serious complication.<sup>[28,29,30]</sup>

A previous history of urinary tract infection, history of urinary catheterization, urinary incontinence and diabetes should be emphasized.<sup>[28]</sup>

Clinical symptoms such as fever, abdominal pain, nausea/vomiting, and costovertebral angle pain. Ascending sepsis leads to nephritis, if left untreated it may progress to (pyonephritis) and then perirenal abscess. Less commonly Sepsis can develop and to a lesser extent septic shock, and is associated with the risk of preterm birth, premature rupture of membranes and low birth weight.<sup>[31,32]</sup> Therefore, early diagnoses and treatment are important. Note that E. coli (80% of cases). Focus should be on clinical diagnosis and blood test results. Urine culture, with blood culture when fever or signs of sepsis develop. Treatment during pregnancy Hospitalization with hydration and intravenous treatment with broad-spectrum antibiotics. Antibiotics should be adjusted with urine culture results according to treatment response. Serum creatinine and electrolytes should be checked frequently.<sup>[33]</sup>

Antibiotic therapy with a standard dose for 10 days. There is insufficient evidence to support the effectiveness of short-term regimens. Two weeks after completion of treatment, a re-culture of the urine should be performed to test for cure.<sup>[34,35]</sup>

## 2. METHODS

The study included 65 pregnant women, who were followed up during pregnancy in a private clinic for gynecology, pregnancy and obstetrics, of all gestational ages, ranging from 20 to 40 years, during the period from November 2023 to July 2024. A comprehensive analysis of the data relevant to the research was carried out for all patients. The diagnosis of urinary tract infection was made based on a positive urine culture. By collecting and analyzing the urine analysis report, urine culture and sensitivity, studying the details of the isolated urinary pathogens, studying the pattern of antibiotic sensitivity and patient details, we analyzed the collected data to study the associations using SPSS. Socio-demographic data (age and education) were collected, with research into factors associated with the urinary tract: urinary history (urinary tract infection during current pregnancy, urinary catheterization), medical history (genital infection, hypertension, diabetes) and habits (smoking, frequent bladder emptying, drinking adequate water). UTI was diagnosed during pregnancy, midstream urine sample, with positive culture results ( $\geq 10^5$  CFU/ml) in pregnant women with or without symptoms.

Outcome variables included prevalence of UTI, prevalence of asymptomatic and symptomatic UTI. Inclusion criteria: Pregnant women aged 20-40 years. Consent for follow-up, study of urine culture and sensitivity reports. Exclusion criteria: History of urological surgery, urogenital fistula, urolithiasis, congenital malformations of the urinary tract. Statistical analysis was performed using IBM SPSS stats10.

Variables were analyzed using the One-Way ANOVA test.  $P < 0.05$  was considered significant.

### 3. RESULTS

Our study showed that the prevalent rate of UTI (33.84%), asymptomatic UTI (24.69%) was higher than symptomatic UTI (9.15%). The study showed a significant association between UTI and demographic status, we found that age group 20-25 years was the important group that had the highest prevalence rate of infection (40.90%), as well as the highest prevalence rate in illiterate pregnant women (68.18%), the highest infection rate was in working women (63.63%).

In our study, the most common microorganisms responsible for UTS were *Escherichia coli* (77.57%),

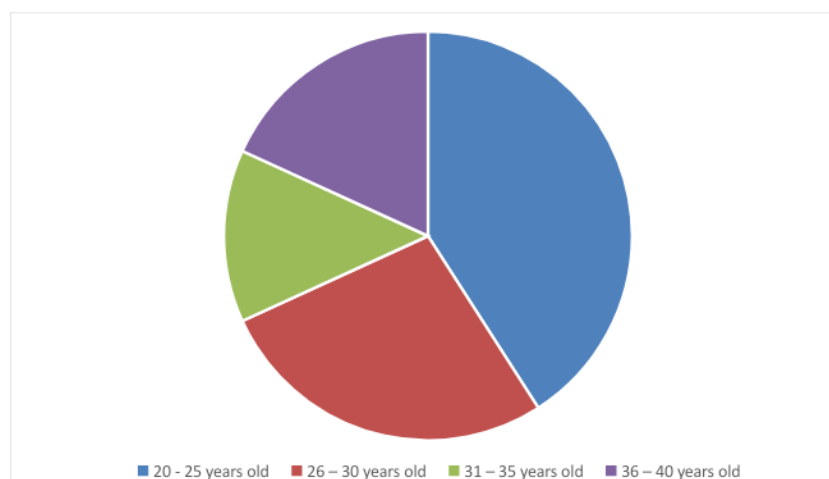
*Klebsiella pneumoniae* (10.33%), *Staphylococcus pyogenes* (2.30%). Most urinary pathogens showed high resistance to ampicillin and amoxicillin, while there was general sensitivity to cephalosporins and nitrofurantoin.

Pathogens showed high resistance to ampicillin and amoxicillin, while they showed general sensitivity to cephalosporins and nitrofurantoin.

Table 1: Relationship between sociodemographic characteristics of pregnant women and prevalence of UTI, shows that there is a statistically significant difference between women with negative and positive urine cultures, and the relationship with (age, occupation, education) regarding UTI during pregnancy, with a statistical value of  $P \leq 0.05$ .

**Table 1: Sociodemographic characteristics and prevalence of UTI in pregnant women (65) cases.**

Socio-demographic variables	pregnant women diagnosed UTI Clulture+ (n = 22)	pregnant women not diagnosed UTI Clulture- (n= 43)	P.value
<b>Age (year)</b>			
20 – 25	9 (40.90%)	9 (20.93%)	$p \leq 0.05$
26 – 30	6 (27.27%)	15 (34.88%)	
31 – 35	3 (13.63%)	10 (23.25%)	
36 – 40	4 (18.18%)	9 (20.93%)	
<b>Occupation</b>			
working	14 (63.63%)	31 (72.09%)	$p \leq 0.05$
Housewife	8 (36.36%)	12 (27.90%)	
<b>Education</b>			
Literate	7 (31.82%)	33 (76.74%)	$p \leq 0.05$
Illiterate	15 (68.18%)	10 (23.25%)	



**Figure 1: illustrates the percentages of patients with UTI based on age group.**

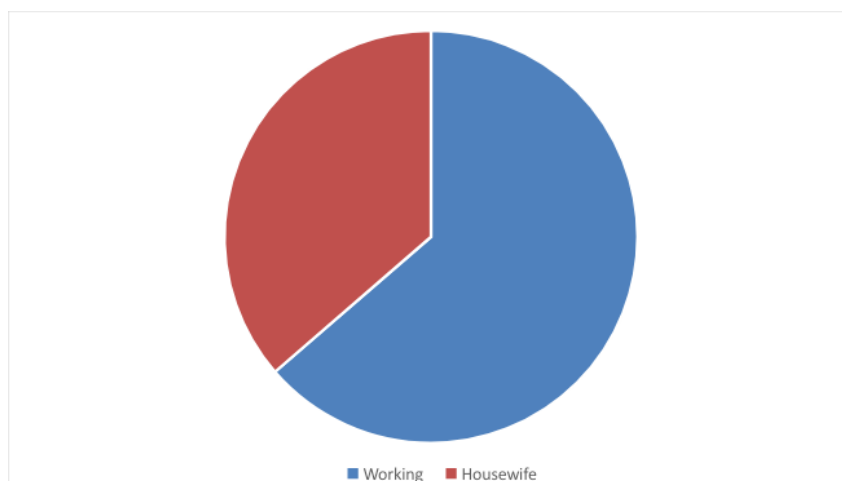


Figure 2: illustrates the percentages of patients with UTI based on occupation.

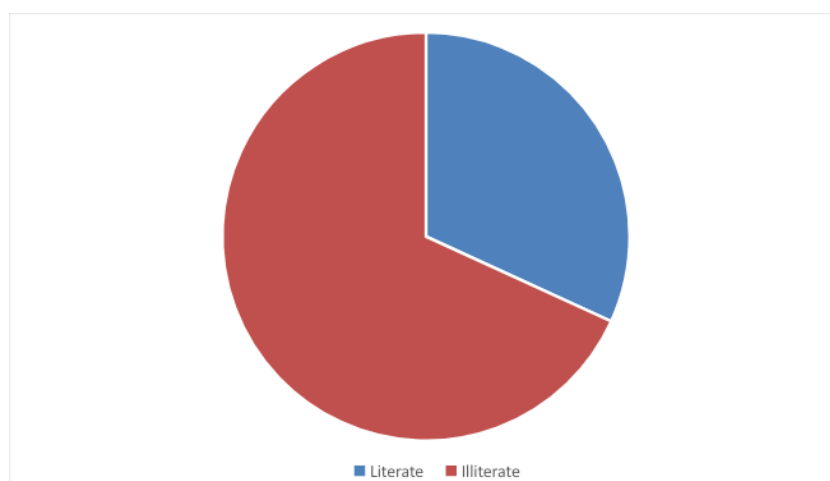


Figure 3: illustrates the percentages of patients with UTI based on education.

Table 2: Association between Predisposing factors and obstetric variables of pregnant women and prevalence of UTI.

Study the Predisposing factors: [Healthy habits, diseases and pregnancy history], The study of healthy habits (drinking enough water - emptying the bladder

regularly), diseases and history related to the urinary system (history of urinary tract infection, history of urinary catheterization) and obstetric variables showed statistically significant differences between pregnant women with negative and positive urine culture results with a P value  $\leq 0.05$ .

Table 2: The predisposing factors and obstetric variables of pregnant women and prevalence of UTI.

The predisposing factors	pregnant women diagnosed UTI Cluture+ (n = 22)	pregnant women not diagnosed UTI Cluture- (n= 43)	P.value
Drinking water	14 (63.63%)	34 (79.06%)	p $\leq$ 0. 05
Regular blabber emptying	12(54.54%)	36 (83.72%)	
blood pressure	13 (59.09%)	11(25.58%)	
Diabetes	8(36. 36%)	4 (9.30%)	
Genital tract infection	7(31.81%)	20 (46.51%)	
Smoking	13(59.09%)	28 (65.11%)	
History of UTI	14 (63.63%)	10(23.25%)	
history of urinary catheterization	12 (54.54%)	4(9.30%)	

Gestational Period trimester			p≤0. 05
First	4(18.18 %)	9 (20.93%)	
Second	8(36.36%)	14(32.55%)	
Third	10 (45.45%)	1%)	
Number of Deliveries			p≤0. 05
None	6 (27.27%)	13 (30.23%)	
1-2	5 (22.72%)	12 (27.90%)	
Multiple	11 (50%)	18(41.86%)	

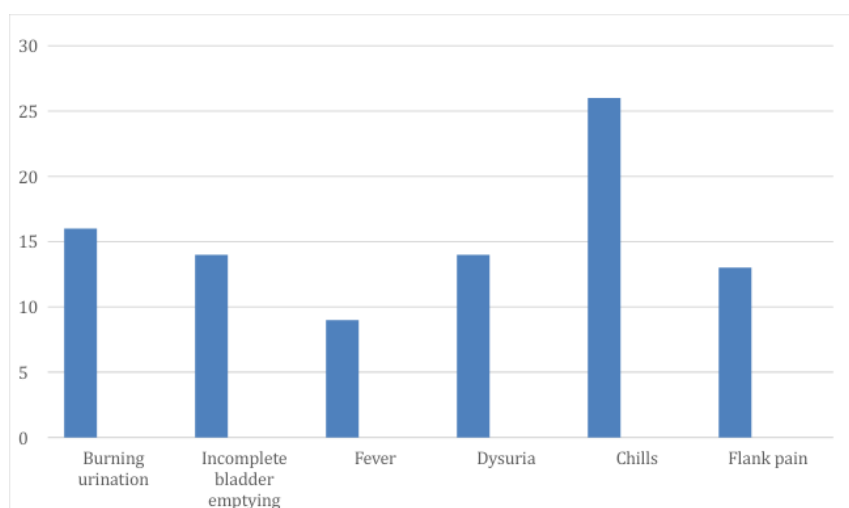
Values obtained showed significant statistical \*significant at P≤0. 05

Table (3): Study of the relationship between clinical manifestations in pregnant women and pathological

causes in urine culture showed significant statistical significance with a value of P ≤ 0. 05.

**Table 3: The relationship between clinical manifestations of the studied women (65cases).**

Clinical manifestation	pregnant women diagnosed UTI UTI Cluture+ (n= 22)	pregnant women not diagnosed UTI Cluture- (n= 43)	p. value
Burning urination	16 (72.72%)	16 (37.20%)	p≤0. 05
Incomplete bladder emptying	14(63. 63%)	10 (27.25%)	
Fever	9 (40.90%)	8 (18.60%)	
Dysuria	14 (63.63%)	10(23.25%)	
Chills	26 (21.31%)	57 (20.36%)	
Flank pain	13 (59.09%)	16 (37.20%)	



**Figure 4: illustrates the frequencies of symptoms experienced by patients with UTI.**

#### 4. DISCUSSION

Our study shows that the prevalence of urinary tract infections(UTI)in pregnant women (33.84%) is close to the results ofLeonardoetal. 2023 (37.7%), Innocentia et al. (31%), Ezekiel K. Vikar2023(39.8%).<sup>[36,37,38]</sup> Several studies have shown a higher incidence of UTI, Farjana et al. (30%)<sup>[39]</sup>, Ahmed M. A. et al (31.3%)<sup>[40]</sup>, and the results of Basu et al. also showed a similar higher prevalence of UTI (30.35%)<sup>[41]</sup>, N. Salari et al, 2023, showed that the incidence 23.9%.<sup>[8]</sup> While were higher compared to the results of Anne et al (8.9%)<sup>[42]</sup>, and higher than the results of Lekshmi et al, 2022 (8.9%)<sup>[43]</sup>,

Gore et al. (20.27%), Kant et al. (3.3%), and Thomas et al. (25%)<sup>[43,44,45]</sup>, Al-Kashif et found The higher prevalence of UTI was (53.5%), as well as Sebi J et al (46.6%), Razavi et al (51.2%), Sabharwal (63.3%)<sup>[4,47,48,49]</sup>, while the highest results were found in the study of Wori N, Eze, and Ebido L, (75%)<sup>[50,51]</sup>

Our study showed that the prevalence of asymptomatic UTI (24.69%) among pregnant women was higher than the prevalence of symptomatic UTI (9.15%) among pregnant women, similar to the results of Basu 2024<sup>[41]</sup>, prevalence of asymptomatic UTI (21.39%) among

pregnant women was higher than the prevalence of symptomatic UTI (8.96%), Innocentia et al. 2021, (31%) were positive for UTI, there were asymptomatic patients (28.7%) who were positive for UTI.<sup>[57]</sup>

While Anne's study (8.96%) among pregnant women<sup>[42]</sup>, Prevalence of asymptomatic urinary tract infection (4.5%) among pregnant women Prevalence of symptomatic urinary tract infection (4.4%), Lekshmi 2022.<sup>[43]</sup> The prevalence of symptomatic urinary tract infection (4.4%) compared to asymptomatic urinary tract infection (4.5%) is similar to the findings of Kant et al.<sup>[45]</sup>, which contradicts the results of our study. The higher prevalence of asymptomatic bacteriuria is considered a risk factor, because the danger of asymptomatic bacteriuria is that it may not be diagnosed early, and thus develop into acute pyelonephritis, then develop fetal-maternal complications, thus the need to focus on the importance of early and periodic screening.<sup>[41,43]</sup>

We found the prevalence rate according to age group, where the highest prevalence rate was in the age group 20-25 years with a rate of (40.90%), followed by the age group 26-30 years with a rate of (27.27%), we found a significant association between maternal age and UTI and it was statistically significant ( $P$  value  $\leq 0.05$ ) (Table 1). Similar to the results of Thomas et al., Ahmed et al., and Al-Azziyat et al.<sup>[46,53,54]</sup> While the study of Al-Kashef et al., Erickson, and Rahimin et al, were reported that UTI is common in women of all ages, but the incidence and prevalence rate increases with age.<sup>[4,55,56]</sup> Therefore, it should be emphasized that this important age group of 20-30 years is a high-risk group, which may be due to early marriage, lack of health awareness, and early childbearing.<sup>[52]</sup> which parallel the results of Nalini Y et al, and Al-Kashef et al.<sup>[57,4]</sup> While some other studies did not find a significant association between maternal age and the risk of UTI, such as the results of Temesgen. 2021.<sup>[58]</sup>

In our study, we found that working pregnant women had a higher infection rate of 63.63%, which may be attributed to the fact that working women may not be able to attend the health care clinic regularly due to work restrictions and commitment to working hours, as well as (drinking water-emptying the bladder)<sup>[44,57]</sup>, This is consistent with the results of Al-Kashef et al., who found that the highest rate was among working women (57.4%), This was contrary to the results of Basu et al. 2024. The highest infection rate was found among housewives pregnant women (55.74%), which is higher than the rate of working pregnant women.<sup>[4,41]</sup>

We focused on the role of education in the prevalence of UTI in pregnant women, We found that it was higher among illiterate women (68.18%) compared to educated women (31.82%) (Table 1) with a  $p$  value  $< 0.05$ , which is considered a very significant result, similar to most studies, Al-Kashef et al. Basu et al. Multani H,], the

valence rate among educated women (69.67%) compared to (30.33%) illiterate women.<sup>[4,41,59]</sup> This is justified by the lack of health awareness and health culture, as a result of the lack of regular visits to health care centers, which confirms the link between education and health awareness, and the need to focus on better awareness programs for all segments of society. In contrast, Temesgn2021 did not find that education had a statistically.<sup>[58]</sup>

Our study reported that multiparous pregnant women had a (50%) rate of UTI. Temesgen 2021 found that the rate increased in multiparous women by 1.5 times more than primiparous women<sup>[58]</sup>, also the results of Al-Kashef et al, Basu et al.<sup>[4, 41]</sup> also, the studies of Muhammad et al., Haider et al.<sup>[60,61]</sup> Since multiple births are an important risk factor, cervical dilation and urethral dilation increase the chances of ascending infection.<sup>[20]</sup>

We found that the highest rate of urinary tract infection was in the third trimester of pregnancy (45.45%), followed by the second trimester (36.36%) and then the first trimester (18.18%), respectively (Table 2). This indicates that gestational age is an important factor, and is confirmed by the results of Kant et al. Sibi G et al.<sup>[45,47]</sup>, the study of Basu et al (47.54%), followed by the second trimester and then the first trimester (20.49%), Gore et al. and Johnson et al.<sup>[41,44,62]</sup> The enlarged uterus in the third trimester, presses on the bladder, which increases the chances and rate of infection.<sup>[45]</sup> Therefore, the importance of periodic examination in the third trimester of pregnancy.

The results of the study showed that the difference between the presence of bacteria in urine culture and its relationship with predisposing factors and urination habits, regular bladder emptying, drinking enough water, which are important defensive factors against infection, drinking water, and not ignoring the urge to urinate, which agree Wori et al, Raheem an et al<sup>[50,56]</sup>, and the relationship with diabetes and previous urinary tract infections was statistically significant. It is important to focus on the previous history related to the urinary system (history of UTI, history of urinary catheterization), as it is considered one of the main factors that increase the risk of the formation of resistant strains. We found the rate of history of UTI (63.6%), (Table 2), which is consistent with the study of Al-Kashif (66.3%), Rohimin<sup>[4,56]</sup> and also consistent with the results of Haider J. et al., Okonkwo et al., and Lee s et al<sup>[61,63,64]</sup>, Temgen found a 3.12-fold higher incidence rate than previously healthy control.<sup>[58]</sup> We found the result of previous history of catheterization (54.5%), Temesgen found Pregnant women with a history of catheterization were 2.76 times more likely to develop a UTI<sup>[58]</sup>, This is consistent with the studies of Lee S et al, Onwuezobe et al.<sup>[64,65]</sup> Also, the difference between the rate of bacteria presence and positive urine culture and its association with clinical symptoms associated with urination (burning urination, incomplete bladder



emptying, fever, dysuria, chills, flank pain) (Table 3). The difference was statistically significant, consistent with the results of Lekshmi.<sup>[43]</sup>

In our study, the most common microorganisms responsible for UTI was *Escherichia coli* (77.57%), *Klebsiella pneumoniae* (10.33%), *Staphylococcus pyogenes* (2.3%). Innocentia et al 2021, *E. coli* was the most common (43.2%). Basu et al 2021, *E. coli* (68.03%), *Klebsiella pneumoniae* (18.85%), *Pseudomonas aeruginosa* (4.1%), Ezekiel K. *Escherichia coli* (27.8%) was the most common bacterial isolate followed by CoNS (13.5%) and *Proteus* species (12.6%).<sup>[37,41,38]</sup>

We found that most of the urinary tract pathogens are resistant to antibiotics, especially *E. coli*, which is highly resistant to amoxicillin and ampicillin (45–40%), while the most sensitive antibiotics were (cefazolin, cefaclor) second generation cephalosporins, (ceftriaxone, cefotaxime, ceftriaxone) third generation cephalosporins (65%), while the sensitivity to nitrofurantoin (57%). Which agrees with Leonardo et al. 2023, *E. coli* (65%). Antibiotic sensitivities were as follows: amoxicillin (41.3%), ampicillin (13%), cephalexin (30.4%), cefazolin (71.7%), cefuroxime (58.7%), nitrofurantoin (52.2%), ceftriaxone (58.7%)<sup>[36]</sup>. While Basu et al, found high overall resistance to ampicillin (86.88%), amoxicillin-clavulanic acid (88.52%) and cotrimoxazole (68.03%), and high sensitivity to imipenem (90.98%), meropenem (81.96%), Fosfomycin (81.97%) and cefepime (67.21%).<sup>[41]</sup>

Antibiotic resistance is found in all types of bacterial infections at a high rate, including the production of extended-spectrum beta-lactamases. The use of low-dose, long-term antibiotics may be effective for women with recurrent infections.<sup>[65]</sup>

## 5. CONCLUSION

The importance of following up on extensive studies, focusing on the most important common factors that predispose to urinary tract infections (UTI), which carry wide-ranging complications for the fetus and mother, to reach common treatment recommendations, in order to reduce the statistical infection rates.

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