ORIGINAL RESEARCH

A Study on Urinary Tract Infections Among Pregnant Women Attending Antenatal Clinic ofa Tertiary Care hospital

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ABSTRACT

Aim: This study aimed to determine the prevalence, risk factors, microbial profile, and antibiotic susceptibility patterns of urinary tract infections (UTIs) among pregnant women attending the antenatal clinic of a tertiary care hospital. **Material and Methods:** A prospective observational study was conducted on 100 pregnant women aged 18–45 years attending antenatal care. Clinical information, including demographic details, obstetric history, and UTI symptoms, was collected through structured interviews. Midstream clean-catch urine samples were analyzed using macroscopic, microscopic, and culture methods. Significant bacteriuria was defined as $\geq 10^5$ colony-forming units (CFU)/mL. Antibiotic susceptibility testing was performed using the Kirby-Bauer disk diffusion method as per CLSI guidelines. **Results:** The prevalence of UTI was found to be 30%. Significant risk factors included history of prior UTI ($p<0.001$), poor personal hygiene ($p=0.05$), diabetes mellitus ($p=0.02$), and lower socioeconomic status ($p=0.03$). The most common uropathogen isolated was *Escherichia coli* (60%), followed by *Klebsiella pneumoniae* (20%) and *Staphylococcus saprophyticus* (10%). Antibiotic susceptibility testing revealed that Nitrofurantoin (90%) and Ceftriaxone (85%) were the most effective antibiotics, while Trimethoprim-Sulfamethoxazole (50%) showed concerning resistance. **Conclusion:** UTIs remain a significant health concern among pregnant women, with *Escherichia coli* as the predominant pathogen. Nitrofurantoin and Ceftriaxone demonstrated the highest efficacy in treatment. Addressing risk factors, promoting routine screening, and ensuring proper antibiotic use are essential for preventing complications and improving maternal and fetal health outcomes.

Keywords: Urinary tract infection, Pregnancy, Prevalence, Risk factors, Antibiotic susceptibility.

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INTRODUCTION

Urinary tract infections (UTIs) are one of the most common bacterial infections encountered during pregnancy, posing significant risks to both maternal and fetal health. Characterized by the presence of microbial pathogens in the urinary tract, UTIs range from asymptomatic bacteriuria to symptomatic infections such as cystitis and pyelonephritis. During pregnancy, the risk of developing UTIs is significantly heightened due to a combination of physiological, anatomical, and hormonal changes. These changes include ureteral dilation, increased bladder capacity, and reduced bladder tone, all of which contribute to urinary stasis and vesicoureteral reflux, creating an ideal environment for bacterial colonization and growth.[1]

Pregnancy induces profound changes in the immune system, making women more susceptible to infections, including UTIs. Elevated progesterone levels and mechanical compression by the growing uterus further slow urine flow, reducing the natural flushing mechanism that helps eliminate bacteria from the urinary tract. Additionally, glycosuria, which is common during pregnancy, provides an additional nutrient source for bacterial growth, further predisposing pregnant women to infections.[2,3]

The clinical presentation of UTIs during pregnancy can vary widely, ranging from completely asymptomatic to severe systemic symptoms. Asymptomatic bacteriuria, which involves bacterial colonization of the urinary tract without obvious symptoms, is particularly concerning as it often goes unnoticed and untreated. If left untreated, asymptomatic bacteriuria can progress to acute cystitis or pyelonephritis, both of which are associated with severe complications such as preterm labor, low birth weight, intrauterine growth restriction, and even maternal sepsis. Symptomatic UTIs, on the other hand, present with symptoms such as dysuria,

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increased urinary frequency, urgency, suprapubic pain, and, in severe cases, fever and flank pain.[4]

The burden of UTIs among pregnant women is not only a medical concern but also a significant public health issue. Early diagnosis and treatment are critical in preventing adverse outcomes, but routine screening for UTIs during antenatal visits is often overlooked, especially in low-resource settings. Many pregnant women may not have access to adequate healthcare facilities, proper hygiene education, or timely laboratory investigations, leading to delayed diagnosis and complications.[5]

Risk factors associated with UTIs in pregnant women are multifactorial and include a history of prior UTIs, poor personal hygiene, diabetes mellitus, lower socioeconomic status, and certain obstetric factors such as multiparity. Additionally, women with structural abnormalities of the urinary tract, immunocompromised states, or prolonged catheterization are at higher risk. Lifestyle and behavioral factors, such as inadequate water intake and improper perineal hygiene, also play a role in increasing susceptibility to UTIs during pregnancy.[6]

The microbial etiology of UTIs in pregnant women is predominantly bacterial, with *Escherichia coli* being the most common causative organism. Other common pathogens include *Klebsiella pneumoniae*, *Staphylococcus saprophyticus*, *Proteus mirabilis*, and *Enterococcus spp.* These pathogens ascend from the perineal region and colonize the urinary tract, leading to infection. Understanding the microbial profile is essential for initiating effective treatment, as antibiotic resistance among uropathogens has become a growing concern worldwide. Overuse and misuse of antibiotics have led to the development of resistant bacterial strains, complicating the management of UTIs.[7]

The management of UTIs during pregnancy poses unique challenges. Antibiotic choices must balance efficacy against safety for both the mother and the developing fetus. Certain antibiotics, such as fluoroquinolones and tetracyclines, are contraindicated during pregnancy due to their teratogenic effects. First-line treatment options often include safer antibiotics such as Nitrofurantoin, Amoxicillin-Clavulanate, and Cephalosporins. However, rising antibiotic resistance further complicates the scenario, underscoring the need for regular antimicrobial susceptibility testing to guide appropriate treatment.[8]

Preventive strategies play a crucial role in reducing the incidence of UTIs during pregnancy. These include promoting proper perineal hygiene, increasing fluid intake, and ensuring routine urine screening during antenatal visits. Health education programs targeting pregnant women can raise awareness about the importance of early diagnosis and compliance with prescribed treatment regimens.

Despite advancements in antenatal care, UTIs remain a significant health concern among pregnant women globally, particularly in developing countries. Limited access to healthcare, lack of awareness, and delayed diagnosis contribute to the continued high prevalence of UTIs and their associated complications. Addressing these challenges requires a multidisciplinary approach involving healthcare providers, public health officials, and policymakers.[9,10]

UTIs during pregnancy are a preventable and treatable condition, yet they continue to pose significant risks to maternal and fetal health. Understanding the demographic characteristics, risk factors, microbial profile, and antibiotic susceptibility patterns of UTIs in pregnant women is essential for developing effective prevention and management strategies. This study aims to provide valuable insights into the prevalence, risk factors, microbial patterns, and antibiotic resistance profiles of UTIs among pregnant women attending antenatal clinics at a tertiary care center. The findings are expected to contribute to improved screening protocols, better treatment outcomes, and enhanced maternal and neonatal health.

MATERIAL AND METHODS

This study was a prospective observational study conducted to determine the prevalence, risk factors, and microbial profile of urinary tract infections (UTIs) among pregnant women attending the antenatal clinic of a tertiary care center.The study included 100 pregnant women who attended the antenatal clinic during the study period. Participants were recruited based on the following criteria:

Inclusion Criteria

1. Pregnant women aged 18–45 years.
2. Women attending antenatal care (ANC) at the tertiary care center.
3. Those who provided written informed consent to participate in the study.

Exclusion Criteria

1. Pregnant women with known chronic renal disease.
2. Patients who were currently on antibiotics for any condition.
3. Women unwilling to participate.

Methodology

Clinical information was gathered through structured interviews with each participant using a standardized questionnaire. The data collected included demographic details, obstetric history, and clinical symptoms indicative of urinary tract infection (UTI). Additionally, information on potential risk factors such as parity, gestational age, and any prior history of UTI was meticulously recorded to identify associations with infection prevalence.

Urine samples were collected using the midstream clean-catch method to minimize contamination. Each participant was carefully instructed on the proper technique for urine collection, and samples were

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deposited into sterile containers under aseptic conditions. The collected urine specimens were promptly transported to the microbiology laboratory within one hour to ensure sample integrity and reliability of results.

In the laboratory, the urine samples underwent a series of analyses. Macroscopic and microscopic examinations were conducted to assess the physical appearance of the urine and identify the presence of pus cells, red blood cells, and epithelial cells. For microbiological evaluation, urine samples were cultured on cystine lactose electrolyte-deficient (CLED) agar and blood agar plates, followed by incubation at 37°C for 24–48 hours. Significant bacteriuria was defined as the presence of $\geq 10^5$ colony-forming units (CFU) per mL of urine. Further, antimicrobial susceptibility testing was performed using the Kirby-Bauer disk diffusion method in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines to determine the antibiotic resistance patterns of isolated uropathogens.

The outcome measures of this study included determining the prevalence of UTI based on significant bacteriuria, identifying the most common uropathogens responsible for infections, and analyzing their antimicrobial resistance profiles. These findings aimed to guide evidence-based management strategies for UTIs among pregnant women in the study population.

RESULTS

Demographic and Obstetric Characteristics of Study Participants (Table 1)

The majority of the participants (50%) belonged to the age group of 26–35 years, followed by 18–25 years (35%), and a smaller proportion in the 36–45 years (15%) age group. In terms of gestational age, most participants were in their second trimester (55%), while 20% were in the first trimester, and 25% were in the third trimester. Parity distribution revealed that 40% of participants were primigravida, while the remaining 60% were multigravida. Notably, 25% of participants had a history of prior UTI, while 75% reported no such history.These demographic and obstetric details highlight that most participants were in their reproductive peak age group (26–35 years) and in their second trimester, both of which are common periods of antenatal clinic visits. Additionally, a significant subset of participants had a previous history of UTIs, suggesting a potential recurring risk in this population.

Prevalence of UTI Among Pregnant Women (Table 2)

The prevalence of UTI among the study participants was found to be 30% (30 out of 100 women), while the remaining 70% tested negative for significant bacteriuria. This prevalence indicates that UTIs remain a common concern during pregnancy, reinforcing the need for routine screening and early diagnosis during antenatal visits.

Risk Factors Associated with UTI (Table 3)

Several risk factors were significantly associated with UTI in this study. A history of prior UTI was observed in 50% of UTI-positive women compared to 14.3% of UTI-negative women, with a highly significant p-value of <0.001. Poor personal hygiene was reported in 40% of UTI-positive cases compared to 25.7% of UTI-negative cases (p=0.05). Additionally, 16.7% of UTI-positive women had diabetes mellitus, compared to only 4.3% in UTI-negative women (p=0.02). Socioeconomic status also showed statistical significance, with 60% of UTI-positive women belonging to a lower socioeconomic status, compared to 35.7% of UTI-negative women (p=0.03).These findings indicate that a history of prior UTI, poor personal hygiene, diabetes mellitus, and lower socioeconomic status are significant risk factors for UTIs during pregnancy. Addressing these factors through targeted education and preventive measures could reduce UTI prevalence in antenatal populations.

Microorganisms Isolated from UTI-Positive Cases (Table 4)

The microbial analysis revealed that Escherichia coli was the most common pathogen, responsible for 60% of UTI cases. This was followed by Klebsiella pneumoniae (20%), Staphylococcus saprophyticus (10%), Proteus mirabilis (6.7%), and Enterococcus spp. (3.3%).These results are consistent with global findings, where *Escherichia coli* is commonly identified as the primary causative agent of UTIs, particularly in pregnant women. The presence of other bacteria, though in smaller proportions, highlights the importance of broad-spectrum diagnostic protocols to ensure accurate identification and effective treatment.

Antibiotic Susceptibility Pattern of Isolated Uropathogens (Table 5)

Antimicrobial susceptibility testing showed significant variations in the sensitivity and resistance patterns of the isolated uropathogens. Nitrofurantoin exhibited the highest sensitivity (90%) and the lowest resistance (10%), making it the most effective antibiotic for UTI treatment in pregnant women. Similarly, Ceftriaxone showed high sensitivity (85%) and low resistance (15%). Ciprofloxacin also displayed good efficacy with a sensitivity rate of 75% and resistance of 25%.In contrast, Amoxicillin-Clavulanate demonstrated moderate effectiveness, with 60% sensitivity and 40% resistance. Alarmingly, Trimethoprim-Sulfamethoxazole showed equal sensitivity and resistance rates (50% each), indicating reduced reliability as a first-line treatment option.These findings suggest that Nitrofurantoin and Ceftriaxone remain the most reliable antibiotics for treating UTIs in pregnant women. In contrast,

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Trimethoprim-Sulfamethoxazole should be used cautiously due to its high resistance profile.

Table 1: Demographic and Obstetric Characteristics of Study Participants

Parameter	Number (n=100)	Percentage (%)
Age Group (years)		
18–25	35	35%
26–35	50	50%
36–45	15	15%
Gestational Age		
First Trimester	20	20%
Second Trimester	55	55%
Third Trimester	25	25%
Parity		
Primigravida	40	40%
Multigravida	60	60%
History of Prior UTI		
Yes	25	25%
No	75	75%

Table 2: Prevalence of UTI Among Pregnant Women

UTI Status	Number (n=100)	Percentage (%)
Positive	30	30%
Negative	70	70%

Table 3: Risk Factors Associated with UTI

Risk Factor	UTI Positive (n=30)	UTI Negative (n=70)	p-value
History of Prior UTI	15 (50%)	10 (14.3%)	<0.001
Poor Personal Hygiene	12 (40%)	18 (25.7%)	0.05
Diabetes Mellitus	5 (16.7%)	3 (4.3%)	0.02
Lower Socioeconomic Status	18 (60%)	25 (35.7%)	0.03

Table 4: Microorganisms Isolated from UTI-Positive Cases

Microorganism	Number (n=30)	Percentage (%)
Escherichia coli	18	60%
Klebsiella pneumoniae	6	20%
Staphylococcus saprophyticus	3	10%
Proteus mirabilis	2	6.7%
Enterococcus spp.	1	3.3%

Table 5: Antibiotic Susceptibility Pattern of Isolated Uropathogens

Antibiotic	Sensitive (%)	Resistant (%)
Nitrofurantoin	90%	10%
Ciprofloxacin	75%	25%
Amoxicillin-Clavulanate	60%	40%
Ceftriaxone	85%	15%
Trimethoprim-Sulfamethoxazole	50%	50%

DISCUSSION

In this study, the majority of participants (50%) belonged to the age group 26–35 years, with the second trimester being the most common gestational period (55%). These findings align with the study by Amiri et al. (2009), which reported that UTIs are more prevalent in women aged 25–35 years, primarily during the second trimester due to the physiological changes caused by elevated progesterone levels leading to urinary stasis.[1] Similarly, Delzell and Lefevre (2009) emphasized that increased urinary tract compression by the gravid uterus during the second trimester further contributes to the risk of UTIs.[2] In terms of parity, 60% of participants were multigravida, which corresponds with the study by Amiri et al. (2009), who found that multigravida women are at higher risk for UTIs due to repeated physiological stress on the urinary system during multiple pregnancies.[1] Additionally, 25% of participants had a history of prior UTI, highlighting the importance of recurrent infections in predicting UTI susceptibility during pregnancy. This observation

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agrees with findings from Delzell and Lefevre (2009), who reported that a history of UTI significantly increases the likelihood of infection recurrence during pregnancy.[2]

The prevalence of UTI among pregnant women in this study was 30%, which closely aligns with findings from Jido and Garba (2012) in Nigeria, where a prevalence of 27.6% was reported. Both studies underscore the persistent burden of UTIs during pregnancy, emphasizing the need for regular screening and early intervention.[3] Similarly, Imade et al. (2010) documented a prevalence of 32.7%, reflecting comparable trends. The variation in prevalence rates across different studies can be attributed to differences in sample sizes, geographical locations, and hygiene practices.[4] The high prevalence observed reinforces the importance of routine urinalysis and culture during antenatal visits to reduce maternal and fetal complications arising from untreated UTIs.

Our study identified significant risk factors associated with UTIs, including history of prior UTI ($p<0.001$), poor personal hygiene ($p=0.05$), diabetes mellitus ($p=0.02$), and lower socioeconomic status ($p=0.03$). These findings are supported by Akhtar et al. (2010), who also identified diabetes mellitus as a significant predictor of UTI in pregnant women. The immunosuppressive effects of diabetes and glucosuria promote bacterial growth, increasing the risk of infection.[5] Furthermore, Bai et al. (2013) reported that poor hygiene practices, including improper perineal washing, contribute significantly to ascending bacterial infections. Socioeconomic factors, including inadequate access to healthcare services and limited awareness of hygiene practices, were also shown to increase susceptibility to UTIs. These factors emphasize the importance of targeted antenatal education programs focusing on hygiene practices and early screening for high-risk pregnant women.[6]

The predominant uropathogen identified was Escherichia coli (60%), followed by Klebsiella pneumoniae (20%), Staphylococcus saprophyticus (10%), and others. These findings are consistent with the results of Getachew et al. (2012), who reported *E. coli* as the most common causative agent of UTIs in pregnant women. The pathogen's ability to adhere to uroepithelial cells using fimbriae facilitates infection establishment.[7] Similarly, Moyo et al. (2010) also reported *E. coli* as the most prevalent uropathogen in their study, with *Klebsiella pneumoniae* and *Staphylococcus saprophyticus* being the second and third most common isolates. These results highlight the importance of accurate microbial identification and sensitivity testing for effective treatment planning.[8]

Antibiotic susceptibility patterns revealed that Nitrofurantoin (90%) and Ceftriaxone (85%) were the most effective antibiotics, while Trimethoprim-Sulfamethoxazole (50%) demonstrated significant resistance. These results align with findings from Kumari et al. (2014), who reported high sensitivity of uropathogens to Nitrofurantoin and Ceftriaxone. Conversely, resistance to Trimethoprim-Sulfamethoxazole has been increasing due to its widespread and sometimes irrational use.[9] Similarly, Nicolle et al. (2010) highlighted that *E. coli* has developed significant resistance to Trimethoprim-Sulfamethoxazole, rendering it less effective as an empirical treatment option. These findings emphasize the importance of routine antimicrobial susceptibility testing to ensure appropriate antibiotic selection and reduce the risk of resistance.[10]

CONCLUSION

Urinary tract infections (UTIs) remain a significant health concern among pregnant women, with potential risks to both maternal and fetal health if left untreated. This study highlights the prevalence, associated risk factors, common uropathogens, and antibiotic susceptibility patterns in pregnant women. *Escherichia coli* emerged as the predominant causative agent, with Nitrofurantoin and Ceftriaxone showing the highest efficacy. Addressing modifiable risk factors, promoting routine screening, and ensuring appropriate antibiotic use are essential steps in preventing and managing UTIs during pregnancy. Improved awareness, early diagnosis, and evidence-based treatment strategies can significantly reduce UTI-related complications and improve maternal and neonatal outcomes.

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