



## RESEARCH ARTICLE

### PREVALENCE, BACTERIOLOGICAL PROFILE AND ANTIBIOGRAM OF URINARY TRACT INFECTIONS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT ZANANA HOSPITAL OF JHALAWAR MEDICAL COLLEGE, JHALAWAR, RAJASTHAN

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#### ABSTRACT

**Background and Objective:** Urinary tract infections (UTIs) during pregnancy pose significant risks to maternal and fetal health. This study aimed to estimate the prevalence, bacteriological profile, and antibiotic susceptibility patterns of both asymptomatic and symptomatic UTIs among pregnant women attending the antenatal clinic at Zanana Hospital, Jhalawar Medical College. **Method:** From September 2023 to August 2024, a prospective study was conducted involving 1119 pregnant women. Urine samples were collected and analyzed for bacteriuria. Cultures were performed on blood agar, MacConkey agar, and other selective media. Antimicrobial susceptibility was tested using the Kirby-Bauer disk diffusion method. **Results:** Of the 1119 women screened, 294 (26.27%) had bacteriuria. Symptomatic women had a higher prevalence (74.69%) compared to asymptomatic women (12.98%). Bacteriuria was more common in older age groups, multigravida women, and in the third trimester. The most common pathogen was *Escherichia coli* (41.5%), followed by *Staphylococcus aureus* and *Klebsiella pneumoniae*. Multidrug-resistant strains were found in 41.5% of cases, with significant resistance to cephalosporins. **Conclusion:** Routine screening for significant bacteriuria in pregnant women is essential, regardless of symptoms, due to the high prevalence and risk of severe complications. The predominance of multidrug-resistant *E. coli* underscores the need for localized antibiotic susceptibility testing to guide effective treatment and minimize resistance risks. Continued monitoring and tailored antibiotic use are crucial for improving maternal and fetal outcomes.

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## INTRODUCTION

Urinary Tract Infections (UTIs) represent a prevalent and significant health concern, particularly in pregnant women. Defined as the presence of  $\geq 100,000$  organisms/ml of urine in asymptomatic individuals or  $>100$  organisms/ml with pyuria in symptomatic patients.<sup>1</sup> UTIs can lead to serious complications if left untreated. These infections can impact any part of the urinary system—bladder, urethra, ureters, or kidneys and during pregnancy, they pose risks to both maternal and fetal health.<sup>2</sup> Pregnant women are particularly vulnerable due to physiological changes that increase UTI risk, including urethral dilation, increased bladder volume, decreased bladder tone, and altered urine concentration. Symptoms of UTIs include frequent urination, pain during urination, lower abdominal discomfort, fever, and urinary retention. Asymptomatic bacteriuria, while not always causing immediate symptoms, is a significant risk factor for developing symptomatic UTIs and can lead to severe complications like pyelonephritis, low birth weight, preterm birth, and maternal anaemia.<sup>3</sup>

The primary pathogen for UTIs is uro-pathogenic *Escherichia coli* (UPEC), though other bacteria such as *Klebsiella pneumoniae*, *Staphylococcus saprophyticus*, *Enterococcus faecalis*, and group B *Streptococcus* also contribute.<sup>3</sup> UTIs in pregnancy can be classified into asymptomatic bacteriuria, lower tract infections (e.g., cystitis, urethritis), and upper tract infections (e.g., pyelonephritis). They can be further categorized as uncomplicated or complicated based on the presence of urinary tract abnormalities.<sup>4</sup> Early diagnosis and treatment of UTIs are crucial to prevent complications and ensure positive outcomes. Antibiotic therapy must be carefully selected due to altered pharmacokinetics in pregnancy and increasing antibiotic resistance. Local resistance patterns should guide empirical treatment to balance effectiveness and safety.<sup>5</sup> Despite effective management strategies, the threat of antimicrobial resistance, driven by overuse and misuse of antibiotics, complicates UTI treatment. This underscores the need for ongoing research and prudent antibiotic use.<sup>5</sup>

The present study aims to evaluate the antimicrobial susceptibility of UTI pathogens in pregnant women at Jhalawar Medical College, Jhalawar, addressing the need for regional data to inform treatment decisions.

**Aim:** To estimate the Prevalence, Bacteriological Profile And Antibiotic susceptibility pattern of asymptomatic and symptomatic Urinary Tract Infections Among Pregnant Women Attending Antenatal Clinic At Zanana Hospital of Jhalawar Medical College Jhalawar, Rajasthan.

### Objectives

- To estimate the prevalence of UTI among the pregnant women.
- To isolate pathogenic bacteria causing UTI among the pregnant women.
- To study the antimicrobial susceptibility pattern of isolates obtained from pregnant women with UTI.

## MATERIAL AND METHOD

This prospective study was conducted at the microbiology laboratory of Jhalawar Medical College from September 2023 to August 2024, focusing on urinary tract infections (UTIs) in pregnant women. A total of 1119 urine samples were collected from antenatal women in various trimesters, with or without UTI symptoms, who were attending the Obstetric Outpatient and Indoor Departments at Zanana Hospital. Participants were selected based on their history of UTI and absence of recent antibiotic therapy, with the exclusion of those who did not consent, had recent antimicrobial use within 30 days, duplicate samples, or catheterization. Detailed patient histories were recorded, and midstream urine samples were collected in sterile containers, processed within 30 minutes or stored at 4°C if delayed. Samples were analysed for colour, turbidity, and deposits macroscopically, and underwent microscopy and culture to detect bacteria.

The urine was cultured on blood agar, MacConkey agar, and CLED (Cysteine Lactose Electrolyte Deficient) Agar using a standard calibrated 4mm wire loop (0.001ml), incubated at 37°C for 24hrs. On the next day, the bacterial culture was observed and colony count was done on blood agar and checked for significant bacteriuria (semi-quantitative count i.e. 100 colonies and more). Identification was based on biochemical tests, including catalase, oxidase, and various fermentation and hydrolysis tests.<sup>6,7,8</sup> Antimicrobial susceptibility was assessed using the Kirby-Bauer disk diffusion method on Mueller-Hinton and Blood agar plates.<sup>7,9</sup>

According to HiMedia the used disc concentration of antibiotics are Amikacin (30mcg), Amoxicillin+clavulanic acid (30mcg), Piperacillin+tazobactam (100/10mcg), Ceftazidime (30mcg), Cefotaxime (30mcg), Imipenem (10mcg), Nitrofurantoin (300mcg), Co-trimoxazole (25mcg), Vancomycin (30mcg), Norfloxacin (10mcg) statistical analysis was performed using IBM SPSS, with data analysed for mean, standard deviation, and chi-square tests. Ethical approval was obtained from the institutional ethical committee, ensuring compliance with ethical standards for patient participation and data handling.

## RESULTS

This descriptive study, conducted from September 2023 to August 2024 at Jhalawar Medical College and Hospital, analysed urine specimens from 1119 pregnant women to isolate and identify bacterial pathogens and assess their antibiotic susceptibility. The study included both asymptomatic and symptomatic women. Out of 1119 women screened, 294 (26.27%) were found to have bacteriuria. Among the 241 symptomatic women, 180 (74.69%) had significant bacteriuria, compared to 114 (12.98%) of the 878 asymptomatic women. The prevalence of bacteriuria was notably higher in symptomatic cases, and statistical analysis confirmed a significant association between symptoms and bacteriuria. Age-related analysis revealed the highest prevalence in women over 40 years (66.67%), followed by those aged 31-40 years (55.17%), 21-30 years (29.98%), and under 20 years (16.02%). Multigravida women had a higher incidence of bacteriuria (29.80%) compared to primigravida women (21.17%). Additionally, bacteriuria was more common in the third trimester (38.42%) compared to the second (28.03%) and first trimesters (13.61%). Turbidity in urine samples was significantly associated with bacteriuria, with 54.60% of turbid samples testing positive. Pyuria was significantly correlated with bacteriuria; 54.34% of samples with more than 5 pus cells per high power field showed significant bacteriuria. Microbiological analysis of 294 isolates revealed that 63.61% were Gram-negative bacilli and 36.39% were Gram-positive cocci. *Escherichia coli* was the predominant isolate (41.5%), followed by *Staphylococcus aureus* and *Klebsiella pneumoniae*. All Gram-negative bacilli were 100% sensitive to Imipenem, and Gram-positive cocci were 100% sensitive to Vancomycin. Sensitivity patterns varied among other antibiotics, with Nitrofurantoin showing significant efficacy against *E. coli* and *Klebsiella pneumoniae*. This study highlights significant associations between bacteriuria, symptoms, age, parity, trimester, urine turbidity, and pyuria, providing important insights for managing urinary tract infections in pregnant women.

**Table 1. Prevalence of bacteriuria among symptomatic and asymptomatic pregnant women screened**

	Bacteriuria present	Bacteriuria absent	Pregnant women
Symptomatic	180(74.69%)	61	241
Asymptomatic	114(12.98%)	764	878
Total	294	825	1119

**Table 2. correlation between microscopy and culture**

	2-5 pus cell/HPF	>5 pus cell/HPF	Total
Significant Bacteriuria	75	219	294
Negative culture	641	184	825
Screened	716	403	1119

**Table 3. Causative organism found in case of symptomatic and asymptomatic bacteriuria**

	Symptomatic	Percent	Asymptomatic	Percent
<i>E.coli</i>	71	39.44%	51	44.74%
<i>Klebsiella</i>	28	15.56%	19	16.67%
<i>Staphylococcus aureus</i>	38	18.78%	20	17.54%
<i>S.saprophyticus</i>	16	8.89%	12	10.53%
<i>E.fecalis</i>	14	7.78%	7	6.14%
<i>Pseudomonas</i>	8	4.44%	2	1.75%
<i>Proteus</i>	3	1.67%	1	0.88%
<i>Acinetobactor</i>	1	0.56%	1	0.88%
<i>Citrobactor</i>	1	0.56%	1	0.88%
Total	180	100%	114	100%

## DISCUSSION

This study was conducted at Jhalawar Medical College and Hospital from September 2023 to August 2024 providing valuable insights into the prevalence, patterns, and management of bacteriuria in pregnant women. Out of 1119 women screened, 294 (26.27%) had bacteriuria, which is consistent with previous research but varies across different studies. For example, findings by Rajni Dube et al.<sup>10</sup> (37.7%) and Asha Rani et al.<sup>1</sup> (31.78%) reported higher prevalence, whereas studies by Tazebew et al.<sup>11</sup> (9.5%) and Hamdan et al.<sup>12</sup> (14%) showed lower rates. In symptomatic cases, 74.69% showed significant bacteriuria, aligning with Mate Siakwa et al.<sup>13</sup> (76.4%) and ChidreYogirajVaijanathrao et al.<sup>14</sup> (59.7%). Conversely, Sabahat Saeed et al.<sup>15</sup> (33.3%) reported a lower rate. For asymptomatic cases, the prevalence of significant bacteriuria was 12.98%, consistent with studies by Aseefa et al.<sup>16</sup> (10.6%) and Tazebew et al.<sup>11</sup> (18.9%), but higher than findings from Kawser Parveen et al.<sup>17</sup> (26.1%). Our data revealed that bacteriuria prevalence increases with age and parity. The highest prevalence was observed in women over 40 years (66.67%) and those with higher parity, corroborating findings from Ansari et al. (33.33%) and Kawser Parveen et al.<sup>17</sup> (49.43%). Advancing age and multiple pregnancies contribute to increased UTI risk due to anatomical and physiological changes. The study also highlighted a peak in UTI prevalence during the third trimester (30.08%), consistent with Ansari et al.<sup>6</sup> (28.57%) and Asha Rani et al.<sup>1</sup> (31.78%). These findings suggest that the risk of UTIs increases as pregnancy progresses, possibly due to anatomical and hormonal changes that facilitate bacterial colonization. Analysis of urine turbidity showed that 54.60% of turbid samples had bacteriuria, whereas 12.89% of non-turbid samples did. Pyuria was significantly associated with bacteriuria, with 54.34% of cases having more than 5 pus cells, although pyuria alone is not a reliable indicator of bacteriuria.

Microbiological analysis identified Gram-negative bacilli (63.61%) as predominant, with *Escherichia coli* (41.5%) being the most common pathogen, followed by *Klebsiella pneumoniae* (15.99%). This aligns with other studies, reinforcing *E. coli*'s role as a primary pathogen in UTIs. Antibiotic sensitivity testing showed high susceptibility of *E. coli* to Piperacillin-tazobactam (90.16%), Nitrofurantoin (87.7%), and Cefotaxime (91.80%). However, there is notable resistance to some antibiotics, particularly cephalosporins, likely due to extended-spectrum beta-lactamases.<sup>10</sup>

In the recent National Guidelines on Empiric Antibiotic Treatment of UTIs in Pregnant Women by the Ministry of Health and Prevention, it is recommended that nitrofurantoin should be used as the first line of treatment and amoxicillin/clavulanic acid as an alternative. It is avoided in the third trimester due to concerns of its effect on fetal erythrocytes. Antibiotics like penicillins, erythromycin, and cephalosporins are safe in pregnancy [45]. Our study also shows the high sensitivity of organisms to both of them (mention the sensi). In addition, it also shows moderate sensitivity to cefuroxime (71%). Cefuroxime was the most common antibiotic used successfully as empirical therapy in culture-negative patients.<sup>10</sup> Although Carbapenems are not used in pregnant women, it was found to be the most sensitive to all the Gram Negative Bacilli with all of them being sensitive. Amongst others, high sensitivity in our study was found to be to Nitrofurantoin, and

Amikacin. For Gram positive Cocci, high sensitivity pattern was seen in Amoxycylav, Nitrofurantoin, Increasing resistance pattern were seen to Cephalosporins (cephlexine, cefotaxime, ceftazidime). Similar pattern was seen by other researchers with Nitrofurantoin being the most sensitive for Gram Negative Bacilli and Amoxycylav, Nitrofurantoin, Vancomycin for Gram Positive Cocci. This was similar to studies by Sabrina J Moyo et al., Gupta *et al.*, Arredondo-Garcia *et al.*, Arredondo-Garcia & Amabile-Cuevas<sup>20</sup>.

Antimicrobial susceptibility testing revealed the high resistance to penicillins (beta lactam group) by the urinary isolates and similar results were reported in earlier studies. This could be a result of extensive usage of these antibiotics and increased spreading of beta lactamase producing strains. This finding restricts the use of beta lactam group of antibiotics though they are considered as traditional drugs safe in pregnancy. Gentamycin which is known to be nephrotoxic, and should therefore be avoided. It was found that the resistance to amikacin were low which suggests that these drugs may be considered as first-line agents for the treatment of UTIs among pregnant women. Empirical use of antimicrobials may cause the development of more resistant bacteria which complicates the therapy in UTIs. The results revealed that uropathogens were more resistant to penicillins, macrolides and glycopeptides which restrict their use in treating UTIs.<sup>18</sup>

Antimicrobial sensitivities and resistance patterns vary from community to community and from hospital to hospital due to the development of resistant strains caused by mis-usage of antibiotics. Gram negative organism were sensitive to Cefotaxime (73.52%), Nitrofurantoin (61.76%), Cephalexin (32.35%). The Gram positive isolates were sensitive to Cefotaxime (64.28%), Nitrofurantoin (78.57%), Cephalexin (39.28%). This study also showed that there was significant resistance to Cephalexin. Cephalosporins is relatively safer in pregnancy than the administration of fluoroquinolone.<sup>19</sup> Overall, our findings emphasize the need for effective screening and management strategies for UTIs in pregnant women, considering the high prevalence of *E. coli* and the increasing antibiotic resistance. Continued local surveillance and tailored treatment approaches are essential to address the variability in microbial profiles and resistance patterns observed.

## CONCLUSION

Urinary tract infections (UTIs) are a prevalent issue during pregnancy, potentially leading to severe maternal and fetal complications if untreated. This study screened 1,119 pregnant women, revealing a notable increase in bacteriuria with advancing age, parity, and gestational age. Pyuria often indicates bacteriuria but is not a reliable sole indicator of its absence. Symptomatic bacteriuria is more readily diagnosed and treated compared to asymptomatic cases, which are more challenging to detect but are widespread among pregnant women. Thus, routine screening for bacteriuria, regardless of symptoms, should be integral to antenatal care. *Escherichia coli* was identified as the predominant pathogen in UTIs, with 41.5% of cases exhibiting multidrug resistance. Other significant pathogens included *Klebsiella* (15.99%), *Staphylococcus aureus* (19.73%), and *Pseudomonas aeruginosa* (3.4%). The rise in multidrug-resistant strains highlights the need for precise antibiotic susceptibility testing. Given these findings, comprehensive screening for significant bacteriuria and careful management of antibiotic use are essential to mitigate the risks associated with UTIs during

pregnancy. This approach will enhance treatment efficacy while addressing the challenges posed by antibiotic resistance, ensuring the safety of both mother and fetus.

**Conflict of interest:** No conflict of interest was seen during the study.

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