



## An observational study to determine the prevalence and risk factors of asymptomatic bacteriuria and its antibacterial susceptibility among pregnant women

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### Abstract

**Introduction:** Urinary Tract Infections (UTIs) are commonly observed in pregnancy because of the physiological and structural alterations in the genitourinary system. During pregnancy, the urinary tract undergoes functional and anatomical modifications, coupled with immune adaptations, which predispose women to ASB.

**AIM:** To determine the prevalence and risk factors (gestational diabetes mellitus, low socioeconomic status, high parity) of asymptomatic bacteriuria and its antibacterial susceptibility in pregnant women attending the Antenatal clinic for their first visit in SMS medical collage Jaipur.

**Conclusion:** Overall, the findings emphasize the need for regular antenatal screening and timely, culture-based treatment to reduce the risk of complications and improve maternal and neonatal outcomes.

**Keywords:** Asymptomatic bacteriuria (Asb), pregnant women, prevalence and risk factors, antibacterial susceptibility, urinary tract infection (Uti)

### Introduction

Urinary Tract Infections (UTIs) are commonly observed in pregnancy because of the physiological and structural alterations in the genitourinary system. These infections may appear with symptoms or remain silent. Asymptomatic Bacteriuria (ASB) refers to the presence of actively multiplying bacteria in quantities greater than 10<sup>5</sup>/ml in urine from the urinary tract, excluding the distal urethra, without any clinical features of UTI.

Understanding the antimicrobial susceptibility patterns of these pathogens is essential to ensure appropriate treatment and to combat rising antibiotic resistance. Antibiotics like nitrofurantoin, cephalosporins, and ampicillin are frequently used in managing ASB during pregnancy. However, resistance to antibiotics, particularly ampicillin and trimethoprim-sulfamethoxazole, is becoming a growing concern. Therefore, performing urine culture and sensitivity testing is critical for tailoring effective antibiotic therapy and reducing the risk of resistance.

The high prevalence of asymptomatic bacteriuria (ASB) during pregnancy, along with its potential severe consequences for both mothers and their pregnancies, underscores the importance of screening and treatment. Effective intervention can prevent adverse outcomes, making it essential to identify and treat ASB during pregnancy. The frequency of pathogens responsible for UTIs and their 2 antimicrobial resistance profiles can vary across different regions, highlighting the need for localized surveillance and awareness regarding the most common causative organisms and their resistance patterns.

Screening for ASB during pregnancy is crucial, as there is strong evidence supporting the efficacy of treatment in improving outcomes. Universal screening for ASB in pregnancy is recommended in the United Kingdom (NICE 2008), the United States (Nicolle *et al.* 2005)<sup>11</sup>, and Canada (Nicolle 1994)<sup>12</sup>, due to the effectiveness of available treatments and the reduced risk of developing pyelonephritis. Prenatal testing through urine culture is

essential to reduce the likelihood of false negatives. Studies, such as those by Rouse *et al.* (1995)<sup>18</sup>, have demonstrated that screening for and treating ASB to prevent pyelonephritis during pregnancy is both cost-effective and beneficial when compared to a policy of no screening. The objective of the study is to determine the prevalence of ASB, identify risk factors associated with it, and evaluate the antibacterial susceptibility of pathogens among pregnant women.

### Aim & Objectives

#### AIM

To determine the prevalence and risk factors (gestational diabetes mellitus, low socioeconomic status, high parity) of asymptomatic bacteriuria and its antibacterial susceptibility in pregnant women attending the Antenatal clinic for their first visit in SMS medical collage Jaipur.

#### Objective

- To determine the prevalence of asymptomatic bacteriuria in pregnant women attending antenatal clinic in Department of Obstetrics and Gynecology of SMS Medical College, Jaipur.
- To identify the most common microorganism causing asymptomatic bacteriuria and its antibacterial susceptibility.
- To find out the risk factors of asymptomatic bacteriuria.

#### Inclusion Criteria

- All pregnant women who attended the antenatal clinic.
- Women who were willing to participate in the study and provided written, informed consent.
- Women who were not participating in any other study.

#### Exclusion Criteria

- Women with symptomatic urinary tract infection or pyrexia.

- Pregnant women who had taken antibacterial medication in the preceding two weeks.
- Pregnant women with known congenital renal anomalies or pre-existing renal disease.

**Observations and Results**

**Table 1:** Distribution of patients according to Urine Culture

Urine Culture	No. of Patients	Percentage
Sterile	179	80.27
E. Coli	20	8.97
Staphylococcus aureus	10	4.48
Enterococcus faecalis	6	2.69
Klebsiella pneumoniae	8	3.59
Total	223	100.00

Out of the 223 urine cultures performed, 179 samples (80.27%) were sterile. Among the positive cultures, Escherichia coli was the most common isolate, found in 20 patients (8.97%). Other organisms included Staphylococcus aureus in 10 patients (4.48%), Klebsiella pneumoniae in 8 patients (3.59%), and Enterococcus faecalis in 6 patients (2.69%).

**Table 2:** Antibiotic Sensitivity Pattern of Urinary Isolates

Personal History	E. Coli		Enterococcus faecalis		Klebsiella pneumoniae		Staphylococcus aureus	
	No. of Patients	Percentage	No. of Patients	Percentage	No. of Patients	Percentage	No. of Patients	Percentage
Cefixime	10	50	2	20	4	66.67	2	25
Amoxicillin	2	10	1	10	3	50.00	4	50
Ampicillin	5	25	1	10	1	16.67	8	100
Azithromycin	9	45	2	20	3	50.00	6	75
Cefepime	11	55	4	40	3	50.00	6	75
Ciprofloxacin	6	30	4	40	4	66.67	6	75
Clotrimazole	6	30	3	30	6	100.00	4	50
Nitrofurantoin	9	45	1	10	8	133.33	4	50

The association between personal history of antibiotic use and bacterial isolates revealed notable patterns. Among patients with E. coli infection, the highest occurrence was seen in those with a history of cefepime use (55%), followed by cefixime (50%), azithromycin and nitrofurantoin (45% each). Ciprofloxacin and clotrimazole were each reported in 30% of E. coli cases, while lower associations were noted with ampicillin (25%) and amoxicillin (10%). In cases of Enterococcus faecalis, cefepime and ciprofloxacin were most frequently reported (40% each), followed by clotrimazole and azithromycin (30% and 20%, respectively), while amoxicillin and ampicillin contributed to 10% each. Klebsiella pneumoniae showed the strongest association with clotrimazole (100%), followed by cefixime and ciprofloxacin (66.67% each), azithromycin, amoxicillin, and cefepime (50% each), and whereas ampicillin was least associated (16.67%). For Staphylococcus aureus, ampicillin use was reported in all cases (100%), while azithromycin, cefepime, ciprofloxacin (75% each), clotrimazole and amoxicillin (50% each), and cefixime (25%) also showed notable associations.

**Table 3:** Distribution of patients according to Gestational DM

Gestational DM	Total		Non-Significant Bacteriuria		Significant Bacteriuria		P-Value
	No. of Patients	Percentage	No. of Patients	Percentage	No. of Patients	Percentage	
Present	67	30.04	33	49.25	34	50.75	<0.001
Absent	156	69.96	146	93.59	10	6.41	
Total	223	100.00	179	80.27	44	19.73	

Out of 223 patients, 67 (30.04%) had gestational diabetes mellitus (GDM), with 33 (49.25%) showing non-significant bacteriuria and 34 (50.75%) significant bacteriuria. Among the 156 patients (69.96%) without GDM, 146 (93.59%) had non-significant bacteriuria and only 10 (6.41%) had significant bacteriuria. The presence of gestational diabetes was strongly associated with a higher prevalence of significant bacteriuria, and this association was statistically significant (P < 0.001).

**Discussion**

Asymptomatic bacteriuria (ASB) is a common condition during pregnancy and, if left undetected, can lead to adverse maternal and fetal outcomes such as pyelonephritis, preterm labor, and low birth weight. This study aimed to assess the prevalence, associated risk factors, and antibacterial susceptibility patterns among pregnant women. The findings suggest that while a significant proportion of women harbored bacteria in their urine without symptoms, certain groups were more vulnerable. Multiparity, rural residence, lower socio-economic status, and the presence of gestational diabetes mellitus were significantly associated with a higher risk of ASB. Although variations were observed with age, BMI, education, and occupation, these factors were not statistically conclusive.

The bacteriological profile was dominated by Escherichia coli, consistent with global trends, followed by Staphylococcus aureus, Klebsiella pneumoniae, and Enterococcus faecalis. Antibiotic sensitivity patterns varied, emphasizing the necessity of culture-specific therapy. These insights highlight the need for routine screening and personalized treatment during antenatal care to prevent complications. Early detection and management of ASB can reduce the risk of upper urinary tract infections and improve pregnancy outcomes.

**Urine Culture Distribution**

Out of 223 urine samples analysed, a majority—179 cases (80.27%)—yielded sterile results. Among the 44 culture-positive cases, Escherichia coli was the most frequently isolated organism, accounting for 8.97% (n=20), followed by Staphylococcus aureus in 10 cases (4.48%), Klebsiella pneumoniae in 8 (3.59%), and Enterococcus faecalis in 6 (2.69%). In a similar study, Imade P E *et al*69 reported a total of 664 isolates, where E. coli (27.1%) and S. aureus (24.4%) were the leading pathogens. Other organisms included Klebsiella (11.9%), Candida albicans (11.8%), Proteus (8.7%), Citrobacter (6.2%), Providencia (5.6%), and Pseudomonas aeruginosa (4.4%), with gram-negative organisms being predominant. Likewise, Jayachandran A L *et al*. 77 identified E. coli as the most frequent isolate (35.7%) among 14 asymptomatic bacteriuria cases, followed by S. aureus (28.5%), Citrobacter species (21.4%), and Klebsiella pneumoniae (14.28%), reaffirming the dominance of E. coli in such infections. Similarly, Patel P *et*

*al.* 70 reported *E. coli* as the most common uropathogen (4.4%), especially in the first trimester (10%). *CONS* (3.4%) and *Klebsiella* (1.6%) were linked to the third and first trimesters, respectively, while *S. aureus* (2.0%) was mainly seen in 61 the second trimester. In the present study among the patients with *E. coli* infection, the highest occurrence was seen in those with a history of cefepime use (55%), followed by cefixime (50%), azithromycin and nitrofurantoin (45% each). Ciprofloxacin and clotrimazole were each reported in 30% of *E. coli* cases, while lower associations were noted with ampicillin (25%) and amoxicillin (10%). In cases of *Enterococcus faecalis*, cefepime and ciprofloxacin were most frequently reported (40% each), followed by clotrimazole and azithromycin (30% and 20%, respectively), while amoxicillin and ampicillin contributed to 10% each. *Klebsiella pneumoniae* showed the strongest association with clotrimazole (100%), followed by cefixime and ciprofloxacin (66.67% each), azithromycin, amoxicillin, and cefepime (50% each), and whereas ampicillin was least associated (16.67%). For *Staphylococcus aureus*, ampicillin use was reported in all cases (100%), while azithromycin, cefepime, ciprofloxacin (75% each), clotrimazole and amoxicillin (50% each), and cefixime (25%) also showed notable associations. Similarly, Jayachandran A L *et al.* 77 found 100% sensitivity to Cotrimoxazole, Imipenem, and Piperacillin-tazobactam in all isolates, with high efficacy of Amikacin, Ciprofloxacin, and Nitrofurantoin. *S. aureus* also responded well to Vancomycin and Ceftazidime. Likewise, Neupane M S *et al.* 78 noted strong activity of Ciprofloxacin and Gentamicin (65–95%) and Nitrofurantoin against GBS and *Klebsiella*, while Ampicillin and Co-trimoxazole were less effective. Pragma *et al.* 71 reported 100% sensitivity to Imipenem, with *E. coli*, *S. aureus*, *E. faecalis*, and *K. pneumoniae* showing high sensitivity to multiple agents including Amikacin, Cefepime, and Gentamicin.

### Conclusion

This study highlights the need to screen pregnant women for asymptomatic bacteriuria, as several risk factors were found. Although factors like age, occupation, religion, education, BMI, pregnancy stage, and personal habits showed some differences, bacteriuria was significantly more common in women living in rural areas, those with low socio-economic status, those who had multiple pregnancies, and those with gestational diabetes. Notably, multiparous women and those with gestational diabetes had a markedly higher burden of infection, suggesting these groups require closer monitoring. Although most urine samples were sterile, *E. coli* was the predominant pathogen among culture-positive cases, followed by *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Enterococcus faecalis*. Antibiotic sensitivity patterns varied across organisms, with some showing high susceptibility to specific antibiotics, highlighting the importance of targeted therapy. Overall, the findings emphasize the need for regular antenatal screening and timely, culture-based treatment to reduce the risk of complications and improve maternal and neonatal outcomes.

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