



PREVALENCE OF ASYMPTOMATIC BACTERIURIA AMONG PREGNANT WOMEN AT A TERTIARY CARE HOSPITAL WITH ANTIBIOTIC SUSCEPTIBILITY PATTERNS.

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Abstract

Background: Asymptomatic bacteriuria (ASB) is a common condition during pregnancy that may lead to serious maternal and fetal complications if untreated. Early detection through routine screening is essential to prevent progression to symptomatic urinary tract infections.

Objective: To determine the prevalence of ASB among pregnant women attending a tertiary care hospital and to analyze the bacterial profile and antibiotic susceptibility patterns.

Methods: A hospital-based cross-sectional study was conducted on 200 pregnant women attending the Obstetrics and Gynaecology OPD at Dr. BSKIMS, Kanpur. Midstream urine samples were collected and processed using standard microbiological techniques. Significant bacteriuria was defined as $\geq 10^5$ CFU/mL. Bacterial isolates were identified, and antimicrobial susceptibility testing was performed according to CLSI guidelines.

Results: Of 200 urine samples, 24 (12%) showed significant bacteriuria, while 18 (9%) were contaminated. Gram-negative bacilli predominated (58.3%), with *Escherichia coli* as the most common isolate (50%), followed by *Staphylococcus saprophyticus* (21%) and *Staphylococcus aureus* (13%). ASB was most frequent in the third trimester (45.8%), in women aged 25–29 years (41.7%), and in multigravida women (62.5%). Antibiotic susceptibility revealed highest sensitivity to Imipenem, Nitrofurantoin, and Ceftriaxone, while Ampicillin and Cotrimoxazole showed high resistance.

Conclusion: The prevalence of ASB among pregnant women was 12%, with *Escherichia coli* as the leading pathogen. Routine antenatal screening and timely antibiotic therapy are essential to prevent maternal and fetal complications. Knowledge of local antibiotic susceptibility patterns can guide effective treatment.

Keywords: Asymptomatic bacteriuria, pregnancy, Escherichia coli, Gram-negative bacilli, antenatal screening, antibiotic susceptibility

Introduction:

Asymptomatic bacteriuria is common in women and increases in prevalence with age and/or sexual activity, due to short urethra, pregnancy, and easy contamination of urinary tract with fecal flora.¹ It may be of two types, symptomatic or asymptomatic. Asymptomatic bacteriuria (ASB) is defined as persistently & actively multiplying bacteria in significant numbers i.e., 10^5 bacteria per milliliter (ml) within the urinary tract without any obvious symptoms.²

ASB is common among women and occurs more frequently during pregnancy due to anatomical and physiological changes such as ureteral dilatation, urinary stasis, decreased bladder tone, and hormonal influences that facilitate bacterial colonization of the urinary tract.³ The prevalence of asymptomatic bacteriuria during pregnancy varies globally and has been reported to range between 2% and 15%, depending on geographical location, socioeconomic status, and study population characteristics.⁴ If left untreated, ASB may progress to symptomatic UTI, including acute cystitis and pyelonephritis, and is associated with adverse maternal outcomes such as anemia, preeclampsia, and septicemia.⁵ Moreover, untreated ASB has been linked to adverse fetal outcomes including preterm labor, low birth weight, intrauterine growth restriction, and increased perinatal morbidity and mortality. Early detection through routine urine culture screening during antenatal visits and appropriate antibiotic therapy significantly reduces the risk of maternal and fetal complications.⁶ Urine culture is the gold standard screening technique for ASB during pregnancy.⁷ The most common infecting organism is Escherichia Coli, which is responsible for 75-90% of bacteriuria during pregnancy. 25-30% of the asymptomatic bacteriuria cases develop into acute symptomatic UTI.⁸ Detection of ASB during pregnancy is important as women identified with ASB in early pregnancy have 20-30fold increased risk of developing pyelonephritis during pregnancy, compared with women without bacteriuria.⁹ The most common etiological agents causing asymptomatic bacteriuria in pregnancy are Gram-negative bacilli, particularly Escherichia coli, which accounts for the majority of cases. Other commonly isolated organisms include Klebsiella pneumoniae, Staphylococcus saprophyticus, Staphylococcus aureus, Enterococcus species, and Acinetobacter species.¹⁰

Material and Methods:

Study Design and Setting

This was a hospital-based cross-sectional study conducted in the Department of Microbiology in collaboration with the Department of Obstetrics and Gynaecology at Dr. BSKIMS, Kanpur, a tertiary care hospital, during a period of time January to December 2025.

Study Population

The study included 200 pregnant women attending the Obstetrics and Gynaecology Outpatient Department (OPD) during the study period.

Inclusion Criteria

- Pregnant women attending the Obstetrics and Gynaecology OPD.
- Pregnant women of any gestational age (first, second, or third trimester).
- Pregnant women without symptoms of urinary tract infection (i.e., asymptomatic).
- Women who provided written informed consent to participate in the study.

Exclusion Criteria

- Pregnant women presenting with symptoms suggestive of urinary tract infection such as: dysuria, increased frequency of micturition, urgency, fever, suprapubic pain.
- Pregnant women who had received antibiotic therapy within the preceding two weeks.

- Pregnant women with known renal disease or structural abnormalities of the urinary tract.
- Pregnant women with diagnosed diabetes mellitus or other significant chronic systemic illnesses.
- Women who did not provide consent for participation.

Sample Collection

After obtaining informed consent, participants were instructed regarding proper clean-catch midstream urine collection. Approximately 10–20 ml of midstream urine was collected in a sterile, wide-mouthed, leak-proof container under aseptic precautions. Samples were transported immediately to the microbiology laboratory and processed within one hour of collection.

Laboratory Processing

- Urine samples were mixed gently and cultured using a standard calibrated loop (0.001 ml) onto Cysteine Lactose Electrolyte Deficient (CLED) agar and Blood agar plates. The plates were incubated aerobically at 37°C for 18–24 hours.
- Significant bacteriuria was defined as the presence of $\geq 10^5$ colony-forming units (CFU) per milliliter of urine of a single bacterial species.

Antibiotic Susceptibility Testing

Antimicrobial susceptibility testing of the isolates was performed by the Kirby–Bauer disc diffusion method on Mueller-Hinton agar as per Clinical and Laboratory Standards Institute (CLSI) guidelines. The zone diameters were measured and interpreted as sensitive, intermediate, or resistant according to CLSI criteria.

Result:

Out of 200 urine samples collected from pregnant women attending the Obstetrics and Gynaecology OPD, Dr. BSKIMS, Kanpur a total of 18 samples were contaminated and excluded from analysis. Significant bacteriuria was detected in 24 cases.

Table 1: Culture Results of Urine Samples (n = 200)

Culture Result	Number (n)	Percentage (%)
Significant growth	24	12.0%
Contaminated samples	18	9.0%
No growth	158	79.0%
Total	200	100%

Out of 200 urine samples collected from pregnant women, significant bacteriuria was detected in 24 cases, giving a prevalence of 12%. Contamination occurred in 18 samples (9%), while the majority of samples (79%) showed no bacterial growth. This indicates that asymptomatic bacteriuria was present in a notable proportion of the study population, emphasizing the importance of routine screening during pregnancy.

Table 2: Distribution of Gram-positive and Gram-negative Isolates (n = 24)

Type of Isolate	Number (n)	Percentage (%)
Gram-negative bacilli	14	58.3%
Gram-positive cocci	10	41.7%
Total	24	100%

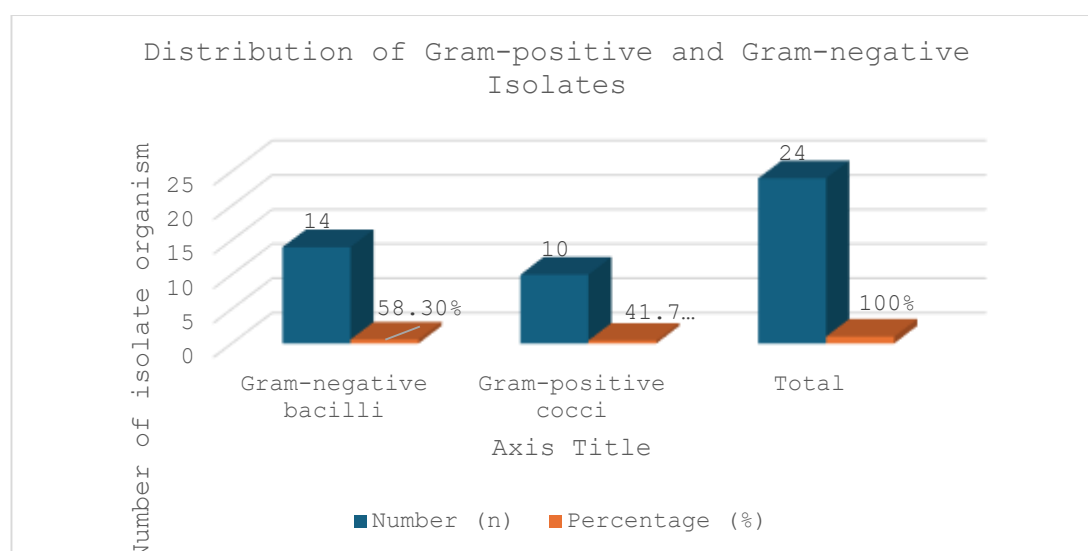


Figure 1: Graphical represents distribution of gram-positive and gram-negative isolates

Among the 24 culture-positive cases, Gram-negative bacilli were the predominant isolates, accounting for 58.3% of cases, while Gram-positive cocci constituted 41.7%. This indicates that Gram-negative organisms were the leading causative agents of asymptomatic bacteriuria in the study population.

Table 3: Distribution of Bacterial Isolates (n = 24)

Organism	Number (n)	Percentage (%)
Escherichia coli	12	50
Staphylococcus saprophyticus	5	21
Staphylococcus aureus	3	13
Enterococcus faecium	2	8
Acinetobacter baumannii	1	4
Klebsiella pneumoniae	1	4
Total	24	100%

Among the 24 bacterial isolates, *Escherichia coli* was the most predominant organism, accounting for 50% of cases. This was followed by *Staphylococcus saprophyticus* (21%) and *Staphylococcus aureus* (13%). *Enterococcus faecium* (8%), *Acinetobacter baumannii* (4%), and *Klebsiella pneumoniae* (4%) were isolated less frequently. The findings indicate that *Escherichia coli* is the leading causative agent of asymptomatic bacteriuria in the study population.

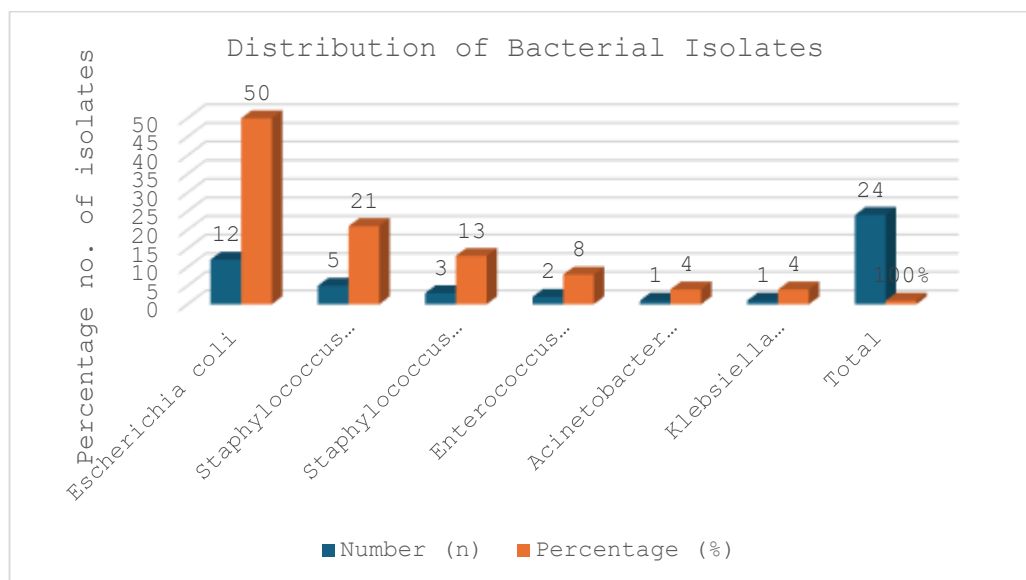


Figure 2: graphical represents distribution of bacterial isolates

Table: 4 Trimester-wise Distribution of Positive Cases (n = 24)

Trimester	Number (n)	Percentage (%)
First Trimester	6	25.0%
Second Trimester	7	29.2%
Third Trimester	11	45.8%
Total	24	100%

Among the 24 positive cases, the highest number of cases was observed in the third trimester (45.8%), followed by the second trimester (29.2%) and the first trimester (25.0%). This suggests that the prevalence of asymptomatic bacteriuria increased with advancing gestational age, being most common in the third trimester.

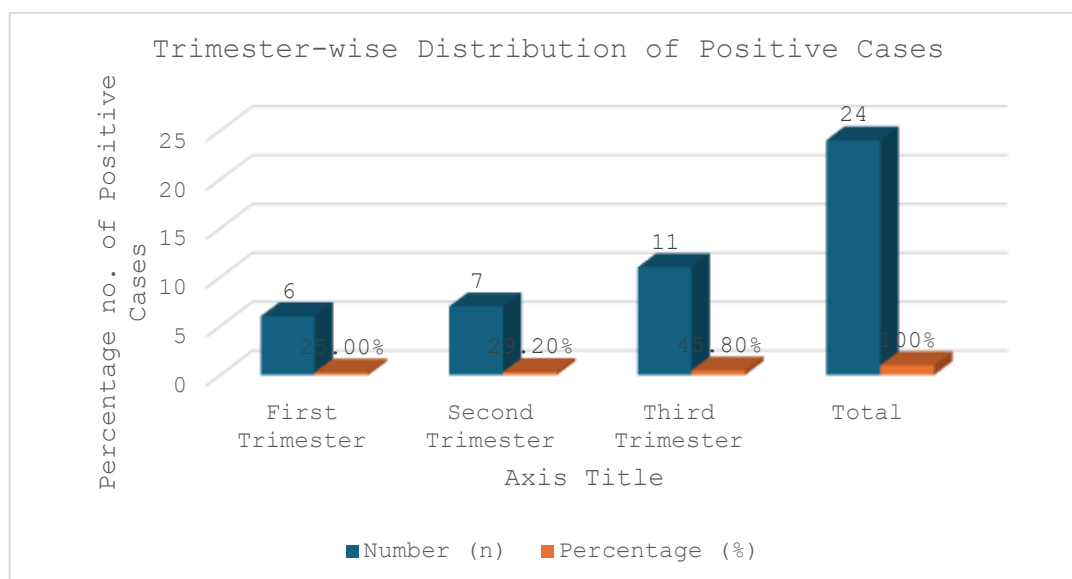


Figure 3: graphical represents Trimester-wise Distribution of Positive Cases.

Table 5: Age-wise Distribution of Positive Cases (n = 24)

Age Group (years)	Number (n)	Percentage (%)
18–24	6	25.0%
25–29	10	41.7%
30–35	8	33.3%
Total	24	100%

Among the 24 positive cases, the majority were in the 25–29 years age group (41.7%), followed by 30–35 years (33.3%) and 18–24 years (25.0%). This indicates that asymptomatic bacteriuria was most common in women aged 25–29 years in the study population.

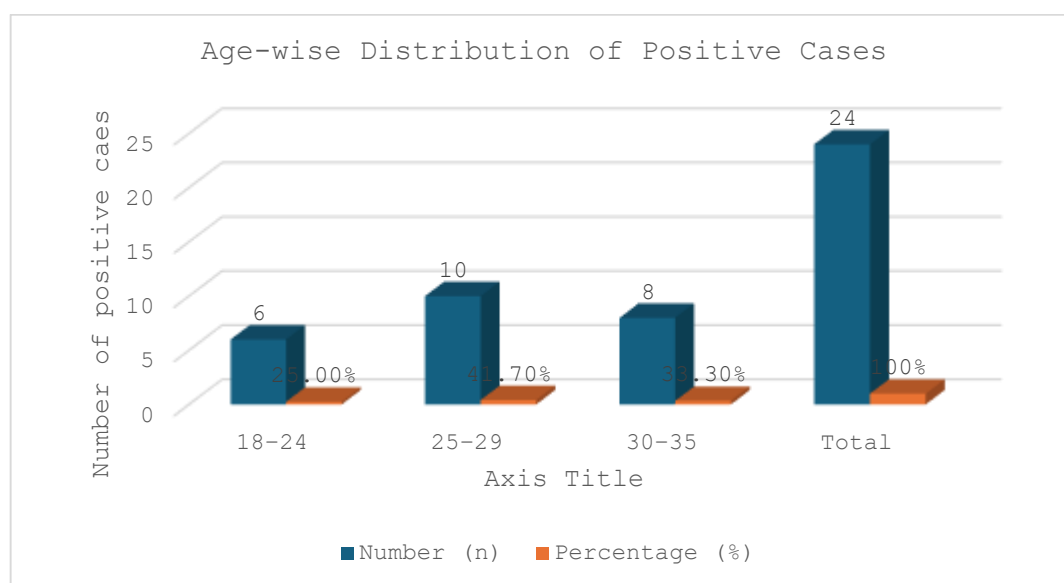


Figure 4: graphical represents age-wise distribution of positive cases.

Table 6: Gravidity-wise Distribution of Asymptomatic bacteriuria among pregnant women (n = 24)

Gravidity	Number (n)	Percentage (%)
Primigravida	9	37.5%
Multigravida	15	62.5%
Total	24	100%

Out of the 24 positive cases, 62.5% were multigravida and 37.5% were primigravida. This shows that women with previous pregnancies had a higher occurrence of asymptomatic bacteriuria compared to first-time pregnant women.

Table 7: Organism-wise antibiotic susceptibility pattern of isolates (n = 24)

A. Gram-Negative Bacilli (n=14)

Antibiotic	Sensitive N (%)	Intermediate N (%)	Resistant N (%)
Ampicillin	3 (21.4%)	2 (14.3%)	9 (64.3%)
Amoxicillin-Clavulanic acid	9 (64.3%)	1 (7.1%)	4 (28.6%)
Ceftriaxone	11 (78.6%)	1 (7.1%)	2 (14.3%)
Nitrofurantoin	12 (85.7%)	0 (0%)	2 (14.3%)
Ciprofloxacin	10 (71.4%)	1 (7.1%)	3 (21.5%)
Gentamicin	9 (64.3%)	2 (14.3%)	3 (21.4%)
Cotrimoxazole	5 (35.7%)	3 (21.4%)	6 (42.9%)
Imipenem	14 (100%)	0 (0%)	0 (0%)

The isolates showed highest sensitivity to Imipenem (100%), followed by Nitrofurantoin (85.7%) and Ceftriaxone (78.6%), indicating these antibiotics are most effective. Moderate sensitivity was observed with Ciprofloxacin and Gentamicin. High resistance was seen with Ampicillin (64.3%) and

Cotrimoxazole (42.9%), suggesting they are less suitable for empirical therapy, overall, Nitrofurantoin and Ceftriaxone appear to be appropriate first-line options for treatment.

B. Gram-Positive Cocci (n= 10)

Antibiotic	Sensitive N (%)	Intermediate N (%)	Resistant N (%)
Ampicillin	3 (30%)	1 (10%)	6 (60%)
Amoxicillin- Clavulanic acid	6 (60%)	1 (10%)	3 (30%)
Ceftriaxone	7 (70%)	1 (10%)	2 (20%)
Nitrofurantoin	8 (80%)	1 (10%)	1 (10%)
Ciprofloxacin	7 (70%)	1 (10%)	2 (20%)
Gentamicin	7 (70%)	1 (10%)	2 (20%)
Cotrimoxazole	5 (50%)	1 (10%)	4 (40%)
Vancomycin*	10 (100%)	0 (0%)	0 (0%)

Among Gram-positive isolates (n=10), Vancomycin (100%) showed complete sensitivity, followed by Nitrofurantoin (80%). Ceftriaxone, Ciprofloxacin, and Gentamicin each demonstrated 70% sensitivity. High resistance was observed with Ampicillin (60%) and Cotrimoxazole (40%).

These findings suggest that Nitrofurantoin and Vancomycin are the most effective agents against Gram-positive isolates, while Ampicillin shows limited efficacy.

Discussion: The study found a 12% prevalence of asymptomatic bacteriuria among pregnant women, consistent with previous reports. *Escherichia coli* was the most common isolate, followed by *Staphylococcus saprophyticus* and *Staphylococcus aureus*, with Gram-negative bacilli predominating. ASB was most frequent in the third trimester, in women aged 25-29 years, and in multigravida women, suggesting that gestational age, maternal age, and parity may influence susceptibility. Antibiotic susceptibility patterns showed that Nitrofurantoin, Ceftriaxone, and Vancomycin were most effective, while Ampicillin and Cotrimoxazole showed high resistance. These findings highlight the importance of routine antenatal urine screening and tailored antibiotic therapy to prevent maternal and fetal complications.

Conclusion: ASB was present in 12% of pregnant women, with *Escherichia coli* as the predominant pathogen. Gram-negative bacilli were more common, and risk was higher in the third trimester, women aged 25–29, and multigravida women. Routine screening and appropriate antibiotic treatment are essential to prevent adverse maternal and fetal outcomes.

Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this study.

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