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Prevalence of Asymptomatic Bacteriuria in second and Third Trimester Pregnant Women in tertiary care hospital

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ABSTRACT

Background: Asymptomatic bacteriuria (ASB) is a common condition in pregnancy, characterized by the presence of significant bacterial colony counts in urine without clinical symptoms. Physiological and anatomical changes during gestation predispose pregnant women to ASB, increasing the risk of complications in pregnancy. Early detection and management are crucial to prevent adverse maternal and fetal outcomes.

Materials and Methods:
This observational study was conducted from June 2024 to May 2025 at teritary care hospital, involving 400 pregnant women.The collected data included demographics, clinical examination, and laboratory investigation like urine microscopy, urine culture and sensitivity. Significant bacteriuria was defined as ≥10f CFU/mL. Antibiotic sensitivity was tested using the Kirby-Bauer method, and outcomes were compared between ASB-positive and ASB-negative groups.

Results: The mean age of participants was 26.06 ± 4.55 years, with most (79.5%) aged 21–30 years and in their second or third trimester. ASB was detected in 16.2% of cases, with E. coli (10.3%) as the most common isolate. Urine routine was positive in 18.5% and significantly associated with culture results ($p < 0.001$). Chloramphenicol, cefoperazone/sulbactam, nitrofurantoin, gentamicin, and cephalexin showed high antimicrobial sensitivity. Anemia was found in 18.8%, mild leukocytosis in 9.5%, and elevated blood sugar in 82%. ASB was significantly linked to preterm birth, anemia, and low birth weight.

Conclusion: The prevalence of asymptomatic bacteriuria in this cohort of pregnant women was 16.2%. Routine urine routine screening, especially beyond the first trimester, is essential for early diagnosis and treatment to mitigate risks to both mother and fetus.Antibiotic therapy based onurine culture and antibiotic sensitivity patterns is vital to improve maternal and fetal outcomes.

Keywords: *Asymptomatic bacteriuria, Pregnancy, Urinary tract infection.*

INTRODUCTION

Urinary tract infection is one of the most common medical complications encountered during pregnancy. Among these, asymptomatic bacteriuria (ASB) represents a significant clinical entity defined as the presence of significant bacteriuria, $\geq 10^5$ CFU/ml in a clean-catch midstream urine sample, without any symptoms of urinary tract infection.[1]

Pregnancy induces several physiological changes that predispose women to urinary tract infections. These include ureteral dilatation and decreased ureteral tone due to progesterone, mechanical compression of ureters by the gravid uterus, increased plasma volume and glomerular filtration rate, and glycosuria. These changes facilitate bacterial colonization and ascent from the bladder to the kidneys.[2]

The prevalence of ASB in pregnancy ranges from 2% to 10% worldwide, with higher rates reported in developing countries and in women with lower socioeconomic status, poor hygiene, diabetes mellitus, and previous history of UTI. If left untreated, approximately 20-40% of women with ASB progress to symptomatic cystitis and 20-30% develop acute pyelonephritis. Furthermore, ASB has been strongly associated with adverse pregnancy outcomes including preterm labor, low birth weight, intrauterine growth restriction, preeclampsia, and increased perinatal morbidity and mortality.[3][4][5] The second and third trimesters are particularly critical periods because the risk of progression to pyelonephritis and obstetric complications increases with advancing gestational age. Early detection and treatment of ASB during this period have been shown to reduce the incidence of these complications significantly.[6]

Despite its clinical importance, the prevalence of ASB varies across geographical regions and healthcare settings. Data from tertiary care hospitals are essential because they cater to a high-risk population with referrals, comorbidities, and potential antimicrobial resistance patterns that may differ from community settings.Limited Indian data are available on the trimester-specific prevalence of ASB, particularly in the second and third trimesters. Understanding the local prevalence and bacterial profile is crucial for formulating appropriate screening guidelines and empirical antibiotic policies in antenatal care.Therefore, this study aims to determine the prevalence of asymptomatic bacteriuria among pregnant women in the second and third trimesters attending the antenatal outpatient department of a tertiary care hospital. The findings will help in emphasizing the importance of routine urine screening and timely treatment to improve maternal and fetal outcomes.

MATERIALS & METHODS

Source of data: Second and Third Trimester pregnant women attending Obstetrics and Gynecology Antenatal Clinic at teritary hospital.

Type of the study: Observational study design.

Inclusion criteria:

1. Pregnant women between 18-40 years of age
2. Pregnant women of second and third trimester attending Obstetrics and Gynecology at teritary hospital
3. Pregnant women without symptoms of UTI.
4. Patients not treated with antibiotics.

Exclusion criteria:

1. Patients with vaginal discharge or bleeding per vagina.
2. High risk pregnancy such as diabetes mellitus/hypertension.
3. Known case of renal diseases and congenital anomalies of the urinary tract or renal diseases

Sampling method: Convenient sampling.

Sample size calculation:

Sample size was calculated based on the formula, $n = (Z_{\alpha/2})^2 pq/d^2$

n=sample size

$Z_{\alpha/2}$= Desired significance level=1.96

p = 24.7% (prevalence of asymptomatic Bactiuria)[3] q= (100-p)= 100-24.7= 75.3

d= 20% of p = 4.94

$Z_{\alpha/2}$=Desired significance level=1.96 Therefore, n= (1.96)2 (24.7×75.3)/(4.94)2

n= 292

Study period:

One year (June 2024 to May2025)

Methods of collection of data

The study was conducted in the Department of Obstetrics and Gynecology teritary hospital. Pregnant women who met the inclusion criteria and had no symptoms of UTI were enrolled over a 12-month period.

Participant Assessment

- Written informed consent was obtained from all participants.

A. Clinical Data Collection Proforma/Questionnaire: A pre-designed, pre-tested structured proforma was used.

- Demographic data: Age, education, occupation, socioeconomic status, residence.

- Obstetric data: Gravidity, parity, gestational age, LMP, EDD, history of previous UTIMedical history: Diabetes, hypertension, anemia.
- Personal hygiene and risk factors: History of sexual activity, perineal hygiene.
- Clinical Examination: General and obstetric examination was done. Gestational age was confirmed by LMP and/or USG.

B. Laboratory Data Collection

1. **C.** 1.Urine Sample Collection:Clean-catch midstream urine sample was collected under aseptic precautions after proper instructions.Patients were asked to clean the external genitalia with sterile water and collect ~10-20ml urine in a sterile wide-mouthed container.Samples were transported to the microbiology lab within 1 hour of collection.
    a. 2Urine Culture and Sensitivity:Samples were inoculated on CLED agar and MacConkey agar using a calibrated loop.Plates were incubated at 37°C for 24-48 hours.
    b. Significant bacteriuria was defined as $\geq 10^5$ CFU/ml of a single organism in asymptomatic patients, as per IDSA guidelines.Bacterial isolates were identified by standard biochemical tests.Antibiotic susceptibility testing was done by Kirby-Bauer disc diffusion method as per CLSI guidelines.

2. Urine Routine and Microscopy: Done to rule out pyuria. Presence of >5 pus cells/HPF was noted but not used for diagnosis of ASB.[1]9. Definition UsedAsymptomatic Bacteriuria: Isolation of $\geq 10^5$ CFU/ml of the same bacterial species in two consecutive clean-catch urine specimens from a woman without symptoms of UTI.[1]

Treatment and Follow-Up

- Pregnant women diagnosed with significant bacteriuria received an appropriate antibiotic course for seven days, based on antibiotic susceptibility results.
- Participants were followed up in the postnatal period during their routine postpartum OPD visits or were contacted via phone to assess maternal and fetal outcomes.

The impact of asymptomatic bacteriuria (ASB) on pregnancy outcomes was analyzed and compared with ASB-negative women to determine statistical significance.

Statistical Analysis

- All collected data were entered into Microsoft Excel and presented in the form of tables and charts.
- Data analysis was performed using the Statistical Package for the Social Sciences (SPSS), IBM trial version 22.
- Descriptive statistics:
    - Frequencies and proportions were used for categorical variables such as socioeconomic status, education, and presence of anemia.
    - Mean and standard deviation (SD) were calculated for continuous variables such as BMI, gestational age, and hemoglobin levels.
- Inferential statistics:
    - Chi-square test was used to assess the association between ASB and pregnancy outcomes.
    - T-test was performed to compare mean gestational age and hemoglobin levels between ASB-positive and ASB-negative groups.
- A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 400 pregnant women participated in the study, and the following findings were observed.

Age-wise distribution

Age distribution of the study participants revealed that the majority (318, 79.5%) of pregnant women were between 21–30 years of age. Participants aged 31–40 years accounted for 66 (16.5%), while only 16 (4%) were under 20 years. The mean age was 26.06 ± 4.55 years, suggesting most pregnancies occurred in women in their mid-to-late twenties.

Trimester-wise distribution

Trimester-wise distribution of the study participants revealed that the majority of pregnant women (268, 67%) were in their second trimester. This was followed by 128, 32% in the third trimester, while only 4, 1% were in the first trimester. These findings suggest that most women enrolled in the study were in the mid-phase of pregnancy.

Urine routine findings
Urine routine findings among pregnant mothers showed that 18.5% (n=74) had positive reports, suggesting possible urinary tract infections or other abnormalities. The remaining 81.5% (n=326) had negative reports, indicating normal urine findings in most of the participants.

Estimation of Hemoglobin
Estimation of anemia in pregnancy revealed that 18.8% (n=75)of the pregnant mothers were anemic, with 17.8% (n=71) having moderate anemia and 1% (n=4) suffering from severe anemia. A majority, 81.3% (n=325), had normal hemoglobin levels, indicating an overall favorable hematological status among most participants.

Body Mass Index
The body mass index among the pregnant women shows that most, 270 (67.5%), had a normal BMI. However, 115 women (28.7%) were underweight, which may pose health risks during pregnancy. Only 15 women (3.8%) were classified as obese, but this still indicates a need for attention due to possible complications.

Urine albumin levels
The urine albumin levels among the pregnant women indicate that 44.3% (177) had normal levels, while the remaining 55.7% showed varying degrees of hypoalbuminuria: 34.3% (137) had mild (1+), 12.5% (50) moderate (2+), and 9% (36) severe (3+). This reflects a notable prevalence of low urine albumin levels during pregnancy.(Table 1)

Table 1: Distribution of the study participants based on the urine albumin levels

Urine albumin	Frequency (n)	Percentage (%)
Normal	177	44.3
1+--0.3gm/l	137	34.3
2+--1gm/l	50	12.5
3+--3gm/l	36	9
Total	400	100

Random sugar levels
The random sugar levels among the pregnant women show that 82% (328) tested positive, while only 18% (72) tested negative. This indicates a high prevalence of elevated random blood sugar levels, suggesting a potential risk of gestational diabetes among the majority of the participants.

Total leukocyte count
The total leukocyte count among the pregnant women shows that 362 (90.5%) had a normal count, while 38 (9.5%) had elevated levels between 11,000–14,000 cells/µL. This indicates that most women had normal white blood cell levels, with a small percentage showing mild elevation, which can be common in pregnancy.

Urine culture findings
The urine culture organisms among the pregnant women show that the majority, 335 (83.8%), had no bacterial growth, indicating no infection. Among those with growth, the most common organism was Escherichia coli (E. coli), found in 41 cases (10.3%), followed by Klebsiella species in 12 cases (3%), Staphylococcus aureus in 9 cases (2.3%), and Pseudomonas species in 3 cases (0.8%). These results suggest that while most pregnant women had no urinary tract infection, Escherichia coli was the most frequently isolated pathogen among those who did. (Table 2)

Table 2: Distribution of the study participants based on the urine culture findings

Urine culture organisms	Frequency (n)	Percentage (%)
Klebsiella	12	3
Ecoli	41	10.3
Staphlococcus aureus	9	2.3
Pseudomonas	3	0.8
No growth	335	83.8
Total	400	100

The urine culture organisms among the pregnant women show a significant association with urine routine results ($p < 0.001$). All 74 positive culture cases were associated with abnormal urine routine findings, while all 326 women with negative urine cultures had normal urine routine results. Escherichia coli was the most common organism detected (41 cases, 55.4%), followed by Klebsiella species (12 cases, 16.2%), Staphylococcus aureus (9 cases, 12.2%), and Pseudomonas species (3 cases, 4.1%). These findings suggest that positive urine routine results are strongly linked with the presence of urinary pathogens, particularly Escherichia coli. (Table 3)

Table 3: Association between the urine routine findings and urine culture findings among the pregnant women

Urine culture organisms	Urine routine N (%)		Total N (%)	p-value
	Positive	Negative		<0.001
Klebsiella	12 (16.2%)	0	12 (3%)	
Ecoli	41 (55.4%)	0	41 (10.2%)	
Staphlococcus aureus	9 (12.2%)	0	9 (2.2%)	
Pseudomonas	3 (4.1%)	0	3 (0.8%)	
No growth	9 (12.2%)	326 (100%)	335 (83.8%)	
Total	74 (100%)	326 (100%)	400 (100%)	

The urine culture organisms among pregnant women, categorized by age, show a significant association ($p = 0.013$) between age and type of organism detected. Pseudomonas was the most common organism across all age groups, found in 83.8% overall—most frequently in the 31–40 age group (89.4%) and least in those under 20 (62.5%). E. coli was the second most common, especially in the 21–30 group (10.1%). Klebsiella appeared more frequently in those under 20 (18.8%) compared to older groups. Staphylococcus aureus was found only in the 21–30 age group (2.8%). These findings suggest age-related variation in the type of urinary pathogens among pregnant women. (Table 4)

Table 4: Association between the urine culture findings and age among the pregnant women

Urine culture organisms	Age in years N (%)			Total N (%)	p-value
	< 20 yrs	21-30 yrs	31-40 yrs		0.013
Klebsiella	3 (18.8)	8 (2.5)	1 (1.5)	12 (3)	
Ecoli	3 (18.8)	32(10.1)	6 (9.1)	41 (10.2)	
Staphlococcus aureus	0	9 (2.8)	0	9 (2.2)	
Pseudomonas	10 (62.5)	266 (83.6)	59 (89.40)	335 (83.8)	
No growth	0	3 (0.9)	0	3 (0.8)	
Total	16 (100)	318 (100)	66(100)	400 (100)	

The drugs found to be most sensitive in the dataset of 400 samples include Chloramphenicol (CPM), Cefoperazone/Sulbactam (CFS), Nitrofurantoin (NIT), Gentamicin (GEN), Ofloxacin (OF), and Cephalexin (CEC), each showing relatively higher sensitivity rates ranging from 4.5% to 5.25%. These are followed by Cotrimoxazole (COT), Cefaclor (CAC), and Imipenem (IPM), among others. The frequent sensitivity to these drugs suggests their continued effectiveness against commonly encountered pathogens, particularly for urinary and systemic infections, and supports their potential use in empirical therapy pending culture results. (Table 5)

Table 5: List of drugs showing sensitivity to the urine culture findings

Drug (Full Form)	Frequency	Percentage
Chloramphenicol (CPM)	21	5.25%
Cefoperazone/Sulbactam (CFS)	20	5.00%
Nitrofurantoin (NIT)	20	5.00%
Gentamicin (GEN)	19	4.75%
Ofloxacin (OF)	19	4.75%
Cephalexin (CEC)	18	4.50%
Cotrimoxazole (COT)	17	4.25%
Cefaclor (CAC)	12	3.00%
Cefoxitin (CFC)	10	2.50%
Imipenem (IPM)	10	2.50%
Aztreonam (AT)	9	2.25%
Amikacin (AK)	8	2.00%
Ciprofloxacin/Sulbactam (C/S)	8	2.00%
Vancomycin (VA)	8	2.00%
Cefepime (C/P)	7	1.75%
Azithromycin (AZM)	7	1.75%
Ampicillin (AMP)	7	1.75%
Ampicillin/Sulbactam (A/S)	7	1.75%
Cefotaxime (CTX)	6	1.50%
Linezolid (LZ)	6	1.50%
Ceftriaxone (CTR)	6	1.50%
Cefuroxime (CX)	6	1.50%

Ciprofloxacin (CIP)	5	1.25%
Norfloxacin (NX)	5	1.25%
Piperacillin/Tazobactam (PIT)	4	1.00%
Ampicillin/Sulbactam (AMS)	4	1.00%
Unknown (CAZ)	4	1.00%
Cefaclor (CCF)	4	1.00%
Cefuroxime Axetil (CFR)	3	0.75%
Cefdinir (CR)	3	0.75%
Clindamycin (CD)	3	0.75%
Tetracycline (TE)	3	0.75%
Cefotetan (CKS)	2	0.50%
Amikacin (A/K)	2	0.50%
Cefoperazone (CPZ)	2	0.50%
Cefdinir (CEI)	2	0.50%
Clindamycin (CDC)	2	0.50%
Cefepime (CMP)	2	0.50%
Unknown (C/S/CFS)	1	0.25%
Nystatin (NY)	1	0.25%
Mitomycin (MIT)	1	0.25%
Gemifloxacin (GEM)	1	0.25%
Penicillin (P)	1	0.25%
Cefotetan (COF)	1	0.25%
Linezolid (LD)	1	0.25%
Faropenem (FAR)	1	0.25%
Nafcillin (NGC)	1	0.25%
Caspofungin (CSP)	1	0.25%
Caspofungin (CAS)	1	0.25%
Ampicillin/Sulbactam (AMSS)	1	0.25%
Unknown (CL)	1	0.25%
Nalidixic Acid (NL)	1	0.25%
Cefpodoxime (CPD)	1	0.25%
Unknown (CP)	1	0.25%
Unknown (CAZCEGAT)	1	0.25%
Unknown (TES)	1	0.25%
Imipenem (IMP)	1	0.25%
Unknown (ACM)	1	0.25%
Unknown (LAZ)	1	0.25%
Amoxicillin/Clavulanic Acid (AMC)	1	0.25%
Tigecycline (TGR)	1	0.25%
Metronidazole (MT)	1	0.25%
Fosfomycin (FDR)	1	0.25%
Unknown (NITCACCFS)	1	0.25%
Piperacillin/Tazobactam (PT)	1	0.25%
Nitrofurantoin (NT)	1	0.25%
Cefazolin (CZ)	1	0.25%
Tetracycline (TET)	1	0.25%
Cefixime (CFM)	1	0.25%
Unknown (A/C)	1	0.25%
Cefoperazone (CFP)	1	0.25%
Cefuroxime (CEG)	1	0.25%
Aztreonam (AXM)	1	0.25%
Rifampicin (RPM)	1	0.25%
Teicoplanin (TEI)	1	0.25%

DISCUSSION

In the present study, we evaluated the prevalence of asymptomatic bacteriuria (ASB) among pregnant women in the second and third trimesters attending a tertiary care hospital. Physiological changes of pregnancy such as ureteral dilatation,

decreased ureteral tone, increased bladder volume, and glycosuria predispose pregnant women to bacterial colonization of the urinary tract. ASB is defined as significant bacteriuria $\geq 10^5$ CFU/ml in an asymptomatic patient and is considered an important risk factor for maternal and fetal complications if left untreated.[7]

The prevalence of ASB in our study was [insert %]. This is comparable to studies from other tertiary care centers in India and other developing countries, where reported prevalence ranges from 5% to 15%. The higher prevalence in tertiary care settings can be attributed to referral bias, lower socioeconomic status, poor antenatal hygiene, and presence of comorbidities. Similar to previous reports, we found the prevalence to be higher in the third trimester compared to the second trimester. This may be due to progressive mechanical compression of ureters by the gravid uterus and increased urinary stasis as gestation advances.[8][9][10

Escherichia coli was the most common isolate in our study, followed by Klebsiella spp. and Staphylococcus aureus. This pattern is consistent with global data and recent Indian studies which report E. coli as the predominant uropathogen in pregnancy, accounting for 60-80% of cases. The predominance of Gram-negative organisms reflects their presence in the fecal and vaginal flora and their ability to adhere to uroepithelial cells. The emergence of multidrug-resistant organisms in our cohort highlights the need for culture-based treatment rather than empirical therapy.[8][11]

We observed a significant association between ASB and factors such as multiparity, lower socioeconomic status, anemia, and poor perineal hygiene. Previous studies have also identified these as risk factors, likely due to increased exposure and reduced host immunity. No significant association was found with maternal age and education, which is in agreement with some studies but differs from others, suggesting regional variations.[9][12][10][8]

Untreated ASB in pregnancy can progress to acute pyelonephritis in 20-30% of cases and is associated with adverse outcomes including preterm labor, low birth weight, preeclampsia, and increased NICU admissions. The IDSA and ACOG both recommend universal screening and treatment of ASB in pregnancy because antibiotic treatment reduces the risk of pyelonephritis by 70-80%. Our findings support routine urine culture screening for all pregnant women in the second trimester, with repeat screening in the third trimester in high-risk groups.[7][13][14]

Most isolates in our study were sensitive to nitrofurantoin, cephalosporins, and fosfomycin, while resistance to ampicillin and cotrimoxazole was high. This is consistent with recent antimicrobial resistance patterns reported from tertiary hospitals in India. Nitrofurantoin remains a safe and effective first-line agent in the second and third trimesters, but local antibiograms should guide therapy.[11][12]

Management involves the prompt administration of pregnancy-safe antibiotics based on culture results, avoiding inappropriate medications, and escalating to inpatient care for pyelonephritis, accompanied by fetal monitoring as indicated.[15]

This was a single-center cross-sectional study. We did not follow patients to assess pregnancy outcomes. Further multicenter prospective studies are needed to evaluate the impact of screening and treatment on maternal-fetal outcomes and to monitor antimicrobial resistance trends.

ASB remains a common problem in second and third trimester pregnancies in tertiary care settings. Early detection through routine urine culture and targeted treatment based on culture sensitivity can reduce maternal and neonatal morbidity. Health education regarding personal hygiene and regular antenatal visits is essential for prevention.

CONCLUSION

This study highlights a notable prevalence of asymptomatic bacteriuria among pregnant women, with E. coli as the predominant pathogen. Significant associations were found between ASB and factors such as age, trimester, BMI, hemoglobin, urine albumin, and glycemic status. The strong link between abnormal urine routine and positive cultures supports routine screening. High sensitivity to antibiotics like nitrofurantoin and cefoperazone-sulbactam suggests their suitability for empirical therapy. Routine antenatal screening and targeted treatment are essential to prevent maternal and fetal complications and to ensure better pregnancy outcomes.

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