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# Bacterial Profile, Antimicrobial Susceptibility and Associated Factors of Asymptomatic Bacteriuria and Symptomatic Urinary Tract Infections Among Antenatal Women Attending Tertiary Care Hospital – A Prospective Study.

[1] Dr Lankalapalli Siva Rajeswari, [2] Dr Sunitha B, [3] Dr KV Chakradhar.
[1] Senior resident , Department of Microbiology, NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam.
[2] Associate Professor, Department of Microbiology, NRI Institute of Medical Sciences, Visakhapatnam.
[3] Professor, Department of Microbiology, NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam.

**Correspondence:**
***Dr Sunitha B.***
*Associate Professor, Department of Microbiology, NRI Institute of Medical Sciences, Visakhapatnam.*

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## Abstract

***Introduction:*** Urinary tract infections (UTIs) are prevalent among pregnant women, with asymptomatic bacteriuria (ASB) being a primary concern. If untreated, approximately 25% of cases progress to clinical infection. The unique physiological and anatomical changes during pregnancy predispose antenatal women to these infections, which can adversely impact maternal and foetal outcomes. Routine screening and timely treatment can significantly reduce morbidity. ***Methodology:*** This prospective cross-sectional study was conducted at the Department of Microbiology, NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam, from November 2022 to December 2023. A total of 226 antenatal women attending the OPD of Obstetrics and Gynaecology at Anil Neerukonda Hospital were enrolled. Mid-stream clean-catch urine samples were collected and processed by semi-quantitative culture on Blood agar and CLED agar. Antibiotic susceptibility testing was performed by disc diffusion (Kirby-Bauer) as per CLSI guidelines. Drug resistance mechanisms (ESBL, MBL) were detected by confirmatory phenotypic tests. Obstetric outcomes were followed until delivery. Statistical analysis was performed using SPSS v20 and Chi-square test ($p < 0.05$ considered significant). ***Results:*** Out of 226 urine samples, 56 (24.7%) were culture positive. Asymptomatic bacteriuria accounted for 16.3% and symptomatic UTI for 8.4% of the study population. The majority of culture positive subjects were aged 20–30 years (80.3%), of lower socio-economic status (64.2%), and multigravida (60.7%). The second trimester had the highest culture positivity (58.92%). Escherichia coli was the predominant isolate (55.35%), followed by Klebsiella pneumoniae (14.28%) and Staphylococcus aureus (10.71%). Gram-negative bacilli constituted 76.7% of isolates. ESBL producers were found in 19.6% and MBL producers in 1.7% of organisms. Nitrofurantoin (94.33%) and Imipenem (97.6%) showed the highest sensitivity. Anaemia (p=0.04) and preeclampsia (p=0.02) showed significant association with bacteriuria. Low birth weight was significantly associated with bacteriuria (p=0.05). ***Discussion:*** The bacteriuria prevalence of 24.7% is consistent with other Indian and global studies. E. coli dominance and high ESBL rates underscore the need for local antibiogram-guided therapy. Nitrofurantoin remains the drug of choice for uncomplicated UTI in pregnancy. Significant associations with anaemia and preeclampsia highlight the importance of early detection and management of bacteriuria in antenatal women.

**Keywords:** Asymptomatic bacteriuria, Antenatal women, Antimicrobial susceptibility, Escherichia coli, ESBL, Pregnancy outcomes, Urinary tract infections.



## INTRODUCTION

Urinary tract infections (UTIs) represent a prevalent medical concern, particularly among pregnant women. The unique physiological and anatomical changes that occur during pregnancy predispose expectant mothers to these infections [1,2]. Urinary tract infections pose a significant risk to pregnant women, with asymptomatic bacteriuria (ASB) being a primary concern. If left untreated during pregnancy, approximately 25% of ASB cases progress to clinical infection [1].

To mitigate this risk, screening for ASB is recommended for all pregnant women at their initial prenatal visit, typically through a clean-catch mid-stream urine culture, as timely treatment can reduce the rate of clinical infection to 3% to 4% [1]. In non-pregnant women, the prevalence of ASB ranges from 5% to 6%, which closely aligns with estimates for pregnant

women, ranging from 2% to 7%. ASB tends to be more frequent in parous women, individuals of low socioeconomic status, and carriers of sickle cell trait [1].
The pathogenesis of UTI in pregnancy is driven by physiological changes including hydroureter, reduced bladder tone, vesicoureteral reflux, and glucosuria, all of which facilitate bacterial ascension and growth [9,10,11]. The spectrum of organisms and their antibiotic susceptibility patterns are known to vary regionally and temporally, emphasising the need for institution-specific surveillance [12,13]. Emergence of ESBL and MBL producing organisms further complicates empirical therapy [14].

Our study therefore aims to assess the prevalence, clinical characteristics, microbiological profiles, patterns of antibiotic susceptibility, and impact on pregnancy outcomes of ASB and symptomatic UTIs in antenatal women attending a tertiary care hospital in Visakhapatnam.

**Objectives of the study:**

- To determine the prevalence of asymptomatic bacteriuria (ASB) and symptomatic UTI among antenatal women.
- To isolate and characterize bacterial pathogens responsible for ASB and symptomatic UTI.
- To determine antibiotic susceptibility patterns and detect drug resistance mechanisms (ESBL, MBL) among isolates.
- To analyze the impact of bacteriuria on maternal and foetal outcomes.

## METHODOLOGY

This prospective cross-sectional study was conducted in the Department of Microbiology, NRI Institute of Medical Sciences (NRIIMS), Sangivalasa, Visakhapatnam, from November 2022 to December 2023. About 226 antenatal women attending the outpatient department (OPD) of Obstetrics and Gynaecology of Anil Neerukonda Hospital (ANH), Sangivalasa, Visakhapatnam, belonging to any gestational age and parity, were enrolled after obtaining informed consent. The sample size of 226 was calculated using the formula $n=z^2pq/d^2$.

**Inclusion Criteria:**

- All antenatal women belonging to any gestational age and parity attending the Obstetrics and Gynaecology OPD.
- Subjects who provided written informed consent for enrolment in the study.

**Exclusion Criteria:**

- Antenatal women with prior antibiotic usage in the preceding month.
- Antenatal women who could not give consent.

**Sample Collection and Transportation:**

All antenatal women were instructed to collect 30 ml of mid-stream clean-catch urine sample in a wide-mouth sterile universal container after cleaning the periurethral area with soap and water and spreading the labia apart. Samples were transported immediately to the laboratory and processed within 1 hour of collection.

**Examination of Urine Specimen:**

**Macroscopic examination:**

Each urine sample was macroscopically inspected for colour, turbidity, and volume.

**Microscopic examination:**

Uncentrifuged urine wet mount was examined under the microscope for pus cells per high-power field (HPF); a count of more than 5 cells/HPF indicates UTI. **Urine dipstick test:** SIEMENS MULTISTIX® 10 SG Urinalysis strip was used to detect glucose, ketone bodies, specific gravity, blood, pH, protein, urobilinogen, nitrate, and leucocyte esterase.

**Urine Culture:**

Semi-quantitative urine cultures were performed on Blood agar and CLED agar (HIMEDIA Laboratories) using the standard loop method with a 4 mm (10 µL) nichrome wire loop holding 0.01 ml of urine. Cultures were incubated at 37°C for 18–24 hours. Colonies were counted using a colony counter and multiplied by 100 to obtain the number of colony forming units (CFU) per millilitre. Interpretation was done as per general guidelines for urine cultures (Table 1) [30].

**Table 1: General Interpretive Guidelines for Urine Cultures [30]**

| Result | Specimen / Clinical Condition | Work Up |
|---|---|---|
| $\geq 10^4$ CFU/ml of a single potential pathogen or for each of two potential pathogens | Clean catch mid-stream / pyelonephritis, acute cystitis, asymptomatic bacteriuria or catheterized urines | Identification of organism and appropriate antibiotic susceptibility testing |
| 2 or 3 organism types with predominant growth of 1 organism and $<10^4$ of other | Clean catch mid-stream urine sample | Identification and susceptibility testing for predominating organisms |
| $\geq 10^3$ CFU/ml of a single potential pathogen | Clean catch mid-stream urine / Catheterized / Acute cystitis | Identification of organism and appropriate antibiotic susceptibility testing |

**Identification of Organisms:**

Significant isolates were identified by standard microbiological techniques including Gram staining, colony morphology on CLED agar with Andrade indicator, and biochemical tests (catalase, coagulase, oxidase, indole, urease, citrate, triple sugar iron agar, MIU). Staphylococcus aureus was identified by tube and slide coagulase tests. Enterococcus species were identified by growth on Bile Esculin Agar (BEA).

**Antimicrobial Susceptibility Testing (AST):**

Antibiotic susceptibility testing was performed by disc diffusion method (Kirby-Bauer) on Mueller Hinton Agar (MHA) as per CLSI guidelines. The following antibiotics were tested: Nitrofurantoin (NIT), Cefotaxime (CTX), Ceftazidime (CAZ), Cefazolin (CZ), Piperacillin-Tazobactam (PIT), Ampicillin (AMP), Ciprofloxacin (CIP), Cotrimoxazole (COT), Gentamicin (GEN), Amoxicillin-Clavulanic acid (AMC), and Imipenem (IPM). Quality control was maintained using ATCC strains.

**Detection of ESBL and MBL:**

ESBL detection: Double Disc Synergy Test (DDST) was used. An increase of ≥ 5 mm in zone of inhibition around clavulanic acid combination discs confirms ESBL production as per CLSI guidelines. MBL detection: Disc diffusion test against Imipenem (10 µg) was used for screening. Imipenem-EDTA Combined Disc Test (CDT) was used as confirmatory test; augmentation of zone of inhibition ≥ 7 mm around the Imipenem-EDTA disc confirms MBL production.

**Follow-up:**

Women with bacteriuria were treated with appropriate antibiotics as per drug sensitivity patterns. Repeat cultures were obtained 2 weeks after completion of therapy. All antenatal women in both groups were followed until delivery for complications such as preeclampsia, IUGR, anaemia, and premature labour. Mode of birth, gestational age at delivery, and birth weight were recorded.

**Statistical Analysis:**

Data were entered in MS Excel and analysed using SPSS v20. Frequencies and percentages were used for categorical variables. Group comparisons were performed using Chi-square test. A p-value $< 0.05$ was considered statistically significant. All tests were two-tailed.

## RESULTS

### Maternal Age Distribution

In the distribution of maternal age, 7.1% of culture positive subjects were under 20 years, compared to 5.8% in culture negative subjects. The majority of both groups were aged 20–30 years (80.3% culture positive vs 80.5% culture negative). For those over 30 years, 12.5% were culture positive and 13.5% were culture negative (Table 2).

**Table 2: Maternal Age Distribution among Study Population**

| Age Group (years) | Culture Positive Subjects | Culture Negative Subjects |
|---|---|---|
| <20 | 4 (7.1%) | 10 (5.8%) |
| 20–30 | 45 (80.3%) | 137 (80.5%) |
| >30 | 7 (12.5%) | 23 (13.5%) |
| **Total** | **56 (100%)** | **170 (100%)** |

### Socio-economic Status

The study population was categorised by socio-economic status. Among culture positive subjects, 64.2% belonged to the lower socioeconomic class, 33.9% to the middle class, and 1.7% to the upper class. Corresponding figures for culture negative subjects were 62.9%, 34.7%, and 2.3% respectively (Table 3).

**Table 3: Distribution of Study Population Based on Socio-economic Status**

| Socio-economic Status | Culture Positive Subjects | Culture Negative Subjects |
|---|---|---|
| Lower class | 36 (64.2%) | 107 (62.9%) |
| Middle class | 19 (33.9%) | 59 (34.7%) |
| Upper class | 1 (1.7%) | 4 (2.3%) |
| **Total** | **56 (100%)** | **170 (100%)** |

**Culture Positivity and Prevalence**

Out of 226 urine samples, 56 (24.7%) were culture positive for bacteriuria. Among the study population, 16.3% had asymptomatic bacteriuria (ASB) while symptomatic UTI was present in 8.4% of subjects, accounting for 24.77% in total. The remaining 75.2% were culture negative (Table 4).

**Table 4: Distribution of Study Population Based on Culture Positivity (n=226)**

| Study Population | Total | Percentage |
|---|---|---|
| Culture positive subjects | 56 | 24.7% |
| Culture negative subjects | 170 | 75.2% |
| **Total** | **226** | **100%** |

**Distribution Based on ASB and Symptomatic UTI**

Among the 56 culture positive subjects, 37 (66.07%) had asymptomatic bacteriuria and 19 (33.9%) had symptomatic UTI. The highest culture positivity was observed in the second trimester (58.92%), followed by the third trimester (21.42%) and the first trimester (19.64%). Among culture positive subjects, 39.2% were primigravida and 60.7% were multigravida.

**Table 5: Distribution of Culture Positive Subjects Based on ASB and Symptomatic UTI (n=56)**

| Culture Positive Subjects | Total | Percentage |
|---|---|---|
| Asymptomatic Bacteriuria | 37 | 66.07% |
| Symptomatic UTI | 19 | 33.9% |
| **Total** | **56** | **100%** |

**Screening Tests for Bacteriuria**

Among culture positive subjects, 54 individuals had more than 5 pus cells per high-power field (HPF), whereas among culture negative subjects only 6 showed more than 5 pus cells/HPF. Nitrate reduction tests were positive in 34 culture positive cases and 3 culture negative cases. Urine albumin was positive in 18 culture positive and 22 culture negative subjects (Table 6).

**Table 6: Screening Tests for Bacteriuria among Study Population (n=226)**

| Study Population | Pus Cells >5/HPF | Pus Cells <5/HPF | Nitrate Reduction Positive | Nitrate Reduction Negative | Albumin Positive | Urine Sugar Positive |
|---|---|---|---|---|---|---|
| Culture positive subjects | 54 | 2 | 34 | 22 | 18 | 8 |
| Culture negative subjects | 6 | 164 | 3 | 167 | 22 | 3 |

**Distribution of Culture Isolates**

Escherichia coli was the highest isolated organism in our study, accounting for 55.35% of culture positive cases, followed by Klebsiella pneumoniae (14.28%), Staphylococcus aureus (10.71%), Enterococcus faecalis (7.14%), Coagulase Negative Staphylococcus – CONS (5.35%), Pseudomonas aeruginosa (3.57%), Enterobacter cloacae (1.78%), and Proteus mirabilis (1.78%). Gram-negative bacilli accounted for 76.7% of isolates, while Gram-positive cocci constituted 23.2% (Table 7).

**Table 7: Distribution of Culture Isolates (n=56)**

| Organism | Number | Percentage |
|---|---|---|
| **Gram-negative isolates** | | |
| Escherichia coli | 31 | 55.35% |
| Klebsiella pneumoniae | 8 | 14.28% |
| Pseudomonas aeruginosa | 2 | 3.57% |
| Enterobacter cloacae | 1 | 1.78% |
| Proteus mirabilis | 1 | 1.78% |
| **Gram-positive isolates** | | |
| Staphylococcus aureus | 6 | 10.71% |
| Enterococcus faecalis | 4 | 7.14% |
| CONS | 3 | 5.35% |
| **Total** | **56** | **100%** |

**Drug Resistance Mechanisms**

Among the total organisms (n=56), 19.6% were Extended-Spectrum Beta Lactamase (ESBL) producers and 1.7% were Metallo Beta Lactamase (MBL) producers.

**Antibiotic Susceptibility Pattern**

The antibiotic susceptibility pattern of all isolates is summarised in Table 8. Nitrofurantoin showed the highest sensitivity (94.33%), followed by Imipenem (97.6%) and Piperacillin-Tazobactam (79.06%). High resistance was observed to Ampicillin (57.7%) and Cefazolin (56.09%). Ciprofloxacin sensitivity was 66.07% and Cotrimoxazole sensitivity was 74%.

**Table 8: Antibiotic Susceptibility Pattern of Isolates**

| Antibiotic | Sensitive n (%) | Resistant n (%) | Total Tested |
|---|---|---|---|
| Nitrofurantoin (NIT) | 50 (94.33%) | 3 (5.66%) | 53 |
| Cefotaxime (CTX) | 22 (53.6%) | 19 (46.3%) | 41 |
| Ceftazidime (CAZ) | 1 (50%) | 1 (50%) | 2 |
| Cefazolin (CZ) | 18 (43.9%) | 23 (56.09%) | 41 |
| Piperacillin-Tazobactam (PIT) | 34 (79.06%) | 9 (20.93%) | 43 |
| Ampicillin (AMP) | 19 (42.2%) | 26 (57.7%) | 45 |
| Ciprofloxacin (CIP) | 37 (66.07%) | 19 (33.9%) | 56 |
| Cotrimoxazole (COT) | 37 (74%) | 13 (26%) | 50 |
| Gentamicin (GEN) | 43 (76.78%) | 13 (23.21%) | 56 |
| Amoxicillin-Clavulanic acid (AMC) | 37 (69.8%) | 16 (30.1%) | 53 |
| Imipenem (IPM) | 42 (97.6%) | 1 (2.3%) | 43 |

**Maternal Outcome – Anaemia**

Among culture positive subjects, 64.2% (36/56) were anaemic compared to 75.2% (128/170) of culture negative subjects. A Chi-square test of 37.6 with a p-value of 0.04 indicated a statistically significant association between bacteriuria and anaemia (Table 9).

**Table 9: Comparison of Anaemia among Culture Positive and Culture Negative Subjects**

| Haemoglobin (g/dl) | Culture Positive Subjects | Culture Negative Subjects |
|---|---|---|
| With Anaemia | 36 (64.2%) | 128 (75.2%) |
| Without Anaemia | 20 (35.7%) | 42 (24.7%) |
| **Total** | **56 (100%)** | **170 (100%)** |
| **Statistical test** | Chi-square: 37.6 | p-value: 0.04 |

**Maternal Outcome – Preeclampsia**

Among culture positive subjects, 3.57% (2/56) were diagnosed with preeclampsia compared to 2.35% (4/170) of culture negative subjects. Chi-square test yielded a statistic of 22.8 with p-value 0.02, indicating a statistically significant association between bacteriuria and preeclampsia (Table 10).

**Table 10: Comparison of Preeclampsia among Culture Positive and Culture Negative Subjects**

| Pre-eclampsia | Culture Positive Subjects | Culture Negative Subjects |
|---|---|---|
| With Pre-eclampsia | 2 (3.57%) | 4 (2.35%) |
| Without Pre-eclampsia | 54 (96.4%) | 166 (97.6%) |
| **Total** | **56 (100%)** | **170 (100%)** |
| **Statistical test** | Chi-square: 22.8 | p-value: 0.02 |

**Foetal Outcomes – IUGR, PROM, Pre-term Birth, and Low Birth Weight**

IUGR was found in 14.28% of culture positive subjects compared to 5.59% in culture negative subjects (Chi-square 11.5, p=0.08 – not significant). PROM was present in 8.16% of culture positive and 4.34% of culture negative subjects (Chi-square 15.9, p=0.09 – not significant). Pre-term births occurred in 10.20% of culture positive and 8.07% of culture negative subjects (Chi-square 13.6, p=0.21 – not significant). Low birth weight (<2.5 kg) was noted in 17.8% of culture positive subjects versus 12.9% of culture negative subjects, with a statistically significant association (Chi-square 34.2, p=0.05) (Table 11).

**Table 11: Comparison of Foetal Outcomes among Culture Positive and Negative Subjects**

| Outcome | Culture Positive n (%) | Culture Negative n (%) | Chi-square | p-value |
|---|---|---|---|---|
| IUGR | 7 (14.28%) | 9 (5.59%) | 11.5 | 0.08 |
| PROM | 4 (8.16%) | 7 (4.34%) | 15.9 | 0.09 |
| Pre-term birth | 5 (10.20%) | 13 (8.07%) | 13.6 | 0.21 |
| Low birth weight | 10 (17.8%) | 22 (12.9%) | 34.2 | 0.05* |

*Statistically significant ($p < 0.05$)

## DISCUSSION

The present study aimed to determine the prevalence, clinical, and microbial profile of asymptomatic bacteriuria and symptomatic urinary tract infections (UTIs) in antenatal women attending a tertiary care hospital, along with the impact of these infections on pregnancy and foetal outcomes. A total of 226 antenatal women were included in the study conducted from November 2022 to December 2023.

**Prevalence of Bacteriuria**

Out of 226 urine samples, 56 (24.7%) were culture positive for bacteriuria. Notably, in our study, 16.3% had asymptomatic bacteriuria and 8.4% exhibited symptomatic UTI. This prevalence aligns with previous studies; a study conducted in Dhaka by Parveen K et al [16] also showed a bacteriuria prevalence of 26%, while Ranjan et al [17] reported 35% in India, and Kant et al [18] noted 33.3%. Various studies show ASB among antenatal patients ranging from 11.33% to 19%, with Irum Shehzadi et al [19] reporting 14.2% in Abbottabad and Abha Gupta et al [20] reporting 13.8% (Table 12).

**Table 12: Comparison of Prevalence of ASB and Symptomatic UTI among Studies**

| Studies | Prevalence of ASB | Prevalence of Symptomatic UTI |
|---|---|---|
| Our study | 16.3% | 8.4% |
| Irum Shehzadi et al [19] | 14.2% | 7% |
| Abha Gupta et al [20] | 13.8% | 9.2% |
| Paresh Patel et al [21] | 13.8% | – |
| Kerure RD et al [29] | 14.8% | 8.1% |
| Parveen K et al [16] | 26% | – |

**Socio-economic Status and Gravida Distribution**

A higher proportion of culture positive subjects (64.2%) belonged to the lower socioeconomic status, consistent with several studies in literature that correlate lower socioeconomic status with higher incidence of bacteriuria [15,16,17], potentially due to limited access to healthcare and sanitation facilities. Among culture positive subjects, 60.7% were multigravida, indicating a higher prevalence of bacteriuria among multigravida women, possibly due to anatomical and physiological changes from previous pregnancies. Parveen K et al [16] reported that multiparity is associated with increased urinary tract infection in pregnancy, while Thakur A et al [22] reported higher bacteriuria among primigravida (58.5%).

**Period of Gestation**

In the study, the majority (63.7%) of participants were in their second trimester. Among culture positive subjects, 58.92% were in their second trimester. This distribution suggests the second trimester is the most important time for the development of bacteriuria, presumably as a result of structural changes in the urinary system during this period.

### Screening Tests

Screening tests showed that 54 culture positive subjects had more than 5 pus cells/HPF. Nitrate reduction tests were positive in 34 cases. Urine albumin was positive in 18 culture positive cases. Among culture negative subjects, most had fewer than 5 pus cells/HPF and nitrate reduction tests were largely negative. This emphasises the utility of simple screening tests like pus cell count and nitrate reduction in identifying bacteriuria. Studies have shown that the nitrate reduction test exhibits good sensitivity in detecting nitrate-reducing bacteria in urine samples [24,25].

### Distribution of Culture Organisms

Gram-negative bacilli accounted for 76.7% of isolates, while Gram-positive cocci made up 23.2% in our study population. Escherichia coli was the highest isolated organism (55.35%), consistent with numerous studies identifying E. coli as the predominant pathogen in urinary tract infections, primarily due to its ability to adhere to the uroepithelium and form biofilms enhancing its virulence. Paresh Patel et al [21] had contradicting results where Gram-positive isolates were more predominant, while Sabri M et al [26] reported higher incidence of Gram-negative bacilli consistent with our study. Gargi Mudey et al [28] concluded in their study that Gram-negative bacteria in pregnant women with significant bacteriuria showed highest susceptibility to amikacin, gentamicin, imipenem, and meropenem, while resistance was observed against ceftazidime, cotrimoxazole, and ciprofloxacin.

### Antibiotic Susceptibility

The antibiotic susceptibility pattern among bacteriuric pregnant women showed E. coli as the prevalent pathogen with highest susceptibility rates to Nitrofurantoin and Nalidixic Acid as reported by Ilusanya OA et al [23]. In our study, Nitrofurantoin (94.33%) and Imipenem (97.6%) showed the highest sensitivity. Significant resistance was observed to Ampicillin (57.7%), Cefazolin (56.09%), and Ceftazidime (50%). Another study concluded that Gram-negative bacteria were prevalent with 95% being multidrug-resistant [27]. The high prevalence of ESBL producers (19.6%) underscores the need for antibiotic stewardship and avoidance of empirical third-generation cephalosporins.

### Comparison Between Preeclampsia, IUGR, PROM, and Foetal Outcomes

The study further analysed the correlation between maternal infections and adverse pregnancy outcomes. Among the women with culture-positive UTIs, 3.57% developed preeclampsia, 14.28% had IUGR, and 8.16% experienced PROM. Statistical analysis showed that the presence of UTI significantly increased the risk of preeclampsia ($p < 0.05$). Pre-term births were higher among culture positive subjects (10.20%) compared to culture negative subjects (8.07%). Low birth weight (<2.5 kg) was significantly more common in culture positive subjects (17.8%) compared to culture negative subjects (12.9%), with statistical significance ($p=0.05$). Adverse maternal and foetal outcomes including low birth weight, premature membrane rupture, preterm labour, and increased risk of conditions like hypertension and preeclampsia have been associated with the presence of asymptomatic bacteriuria in pregnant women [19-21].

## CONCLUSION

This study highlights the significant prevalence of bacteriuria (24.7%) among antenatal women attending a tertiary care hospital in Visakhapatnam, with a higher incidence in those of lower socioeconomic status and multigravida. Asymptomatic bacteriuria was more common than symptomatic UTI, necessitating routine screening of all antenatal women. Escherichia coli was the predominant isolate, with high ESBL prevalence (19.6%) underscoring the need for antibiotic stewardship. Nitrofurantoin remains the most effective drug for UTI in pregnancy. Significant associations were found between bacteriuria and anaemia ($p=0.04$), preeclampsia ($p=0.02$), and low birth weight ($p=0.05$). Adverse pregnancy outcomes, including pre-term birth, low birth weight, and preeclampsia, emphasise the importance of early detection and treatment. Regular screening, effective management of anaemia, and appropriate antibiotic use are critical to improving maternal and foetal outcomes in antenatal women with bacteriuria.

## REFERENCES

1. Habak PJ, Griggs RP Jr. Urinary Tract Infection in Pregnancy. [Updated 2023 Jul 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
2. Nickel JC. Management of urinary tract infections: historical perspective and current strategies: Part 1–Before antibiotics. J Urol. 2005 Jan;173(1):21-6. PMID: 15592098.
3. Haider AAK, Al Hamad ARS, Mohsin RS, Khudhur AI. Clinico-pathological study of urinary tract infection during pregnancy. Int J Health Sci (Qassim). 2022;6(5):2652-2656.
4. Abdelaal R, Ibrahim GM, Baraka A, Mohammed II, Ali NH, Abdelrahman RY, et al. Evaluation of Diagnostic Methods for Asymptomatic Bacteriuria (ASB) During Pregnancy. Int J Life Sci Pharma Res. 2022;12(4):L123-L128.

5. Roopali, Gunjal D, Sakuntala Mundary, Kiran Kavatagi, S Sonawane. Comparative study of UTI in high-risk pregnant patients and patients attending to ANC clinics. Panacea Journal of Medical Sciences, (2022).
6. Artzberger B. Urinary Tract Infections. (2022). doi: 10.1016/b978-0-323-69578-7.00011-9.
7. Czajkowski K, Bros-Konopielko M, Teliga-Czajkowska J. Urinary tract infection in women. Przeglad Menopauzalny, (2021).
8. Spriha Smriti, Srivastava RK, Sahu NP. Asymptomatic bacteriuria in pregnancy and complications associated with asymptomatic bacteriuria. International Journal of Scientific Research, (2021).
9. Dafnis E, Sabatini S. The effect of pregnancy on renal function: physiology and pathophysiology. Am J Med Sci. 1992;303:184-205.
10. Fried AM. Hydronephrosis of pregnancy: ultrasonographic study and classification of asymptomatic women. Am J Obstet Gynecol. 1979;135:1066-70.
11. Jeyabalan A, Lain KY. Anatomic and functional changes of the upper urinary tract during pregnancy. Urol Clin North Am. 2007;34:16.
12. Begum F, Barua D. The Etiology of Urinary Tract Infections among Pregnant Women in a Tertiary Care Hospital – A Prospective Observational Study. Scholars International Journal of Obstetrics and Gynecology, (2023).
13. Bhoomika Ravi, Sumana K. Bacteria associated with urinary tract infection in pregnant women with overview of their antibiotic susceptibility tests. International Journal of Current Pharmaceutical Research, (2022).
14. Haider Ahmed Khalil Al Hamad Aziz, Rasha Salim Mohsin, Ahmed Imad Khudhur. Clinico-pathological study of urinary tract infection during pregnancy. International Journal of Health Sciences (IJHS), (2022):2652-2656.
15. Dubé R, Al-Zuheiri STS, Syed M, Harilal L, Zuhaira DAL, Kar SS. Prevalence, Clinico-Bacteriological Profile, and Antibiotic Resistance of Symptomatic Urinary Tract Infections in Pregnant Women. Antibiotics, (2022).
16. Parveen K, Momen A, Begum AA, Begum M. Prevalence of urinary tract infection during pregnancy. Journal of Dhaka National Medical College & Hospital. 2011;17(2):8-12.
17. Ranjan A, Sridhar ST, Matta N, Chokkakula S, Ansari RK. Prevalence of UTI among pregnant women and its complications in newborns. Indian Journal of Pharmacy Practice. 2017;10(1).
18. Kant S, Lohiya A, Kapil A, Gupta SK. Urinary tract infection among pregnant women at a secondary level hospital in Northern India. Indian Journal of Public Health. 2017;61(2):118-23.
19. Shehzadi I, Ayub S. Prevalence of asymptomatic bacteriuria and its antibacterial susceptibility pattern among pregnant women. International Journal of Health Sciences (IJHS), (2023). doi: 10.53730/ijhs.v7ns1.14329.
20. Gupta A. Prevalence of asymptomatic bacteriuria among pregnant women. Global Journal for Research Analysis, (2023). doi: 10.36106/gjra/6508183.
21. Patel P, Patel M, Desai K. Prevalence of Asymptomatic Bacteriuria Among Pregnant Women Attending a Tertiary Care Hospital in Western India. National Journal of Community Medicine, (2022). doi: 10.55489/njcm.131020222444.
22. Thakur A, Baral R, Basnet P, Rai R, Agrawal A, Regmi MC, Uprety DK. Asymptomatic bacteriuria in pregnant women. Journal of Nepal Medical Association. 2013;52(192).
23. Ilusanya OA, Adesetan TO, Egberongbe HO, Otubushin AT. Asymptomatic bacteriuria in antenatal patients attending state hospital, Ado-Ekiti, Ekiti State, Nigeria. Current Research Journal of Biological Sciences. 2012;4(3):261-4.
24. Srihari A, Beeregowda YC, Vishnu Vardhan Reddy T. A comparative study of Griess nitrate test and urinary culture in detection of asymptomatic bacteriuria in children. (2012).
25. Khattak AM, Khan HU, Akhtar W, Mahsud I, Ashiq B. Accuracy of Griess Test to Predict Asymptomatic Bacteriuria during Pregnancy. Gomal Journal of Medical Sciences, (2004).
26. Khelfaoui MS, Zeroug R, Yousfi M, Satha B. Prevalence and Antimicrobial Susceptibility Patterns of Gram-negative Uropathogens Isolated in Public Hospital Establishment, Skikda-Algeria. Journal of Pharmaceutical Research, (2020). doi: 10.9734/JPRI/2020/V32I3430960.
27. Metwally WS, Elnagar WM. Multidrug Resistant Uropathogens among Egyptian Pregnant Women. American Journal of Infectious Diseases, (2019). doi: 10.3844/AJIDSP.2019.115.122.
28. Mudey G, Devi AN, Sahu G, Mahajan S, Meshram S. Bacteriological profile and antibiogram of uropathogens isolated from obstetrics and gynaecology patients in a tertiary care hospital. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, (2023). doi: 10.18203/2320-1770.ijrcog20231522.
29. Kerure RD, Biradar AV, Lakshetty S, Biradhar S. A Study of Urinary tract infection in pregnancy and its effect on maternal and perinatal outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, (2024). doi: 10.18203/2320-1770.ijrcog20240031.
30. Tille PM, editor. Bailey and Scott's Diagnostic Microbiology. 13th ed. New Delhi: Elsevier; 2014:168-92. (Laboratory methods and Strategies for antimicrobial susceptibility testing)
31. CLSI. Performance Standards for Antimicrobial Susceptibility Testing. CLSI document M100S, 32nd edition. Wayne PA: Clinical and Laboratory Standards Institute; 2022.