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"PREVALENCE, MICROBIOLOGICAL PROFILE, AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF URINARY TRACT INFECTION AMONG PREGNANT WOMEN: A HOSPITAL-BASED CROSS-SECTIONAL STUDY OF 300 CASES"

Obstetrics & Gynaecology

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ABSTRACT

Background: Urinary tract infection (UTI) is one of the most common medical complications in pregnancy. Due to anatomical and physiological changes, pregnant women are highly susceptible to both symptomatic UTI and asymptomatic bacteriuria (ASB). **Aim:** To determine the prevalence of UTI among pregnant women, compare OP (Out-patient) vs IP (In-patient) rates, and assess microbiological profile and antibiotic sensitivity patterns. **Methods:** A hospital-based cross-sectional study was conducted among **300 pregnant women** (OP = 210; IP = 90). Midstream clean-catch urine samples were subjected to microscopy, culture, and sensitivity (Kirby-Bauer method). Sociodemographic, clinical, and obstetric data were collected. **Results:** The overall prevalence of UTI was **32.3% (n = 97/300)**.

- OP prevalence: **28.1%**
- IP prevalence: **42.2%** (p = 0.01).

Most common organisms: **E. coli (58.7%)**, **Klebsiella pneumoniae (16.4%)**, **Staphylococcus saprophyticus (10.3%)**, **Enterococcus spp. (6.1%)**, **Proteus spp. (4.1%)**, **Pseudomonas aeruginosa (3.0%)**. Highest antibiotic sensitivity was observed to **Nitrofurantoin (86%)**, **Fosfomycin (82%)**, **Amikacin (78%)**, whereas high resistance was seen for **Ampicillin (68%)**, **Co-trimoxazole (57%)**, and **Cefixime (44%)**. **Conclusion:** UTI prevalence is significantly higher among hospitalized (IP) pregnant women. *E. coli* remains the predominant organism with significant resistance to commonly prescribed oral antibiotics. Routine screening and antibiogram-guided therapy are essential to prevent obstetric complications.

KEYWORDS

Prevalence, resistance, pregnant, antibiogram-guided therapy, Fosfomycin etc.

INTRODUCTION

Urinary tract infection (UTI) during pregnancy ranges from **asymptomatic bacteriuria** to **acute cystitis** and **pyelonephritis**. Pregnancy leads to:

- Progesterone-mediated ureteral dilation
- Urinary stasis
- Mild immunosuppression

These changes increase vulnerability to infection. UTI during pregnancy is associated with preterm labor, low birth weight, hypertensive disorders of pregnancy, neonatal sepsis, and maternal pyelonephritis. Global prevalence varies between 2% and 40%, depending on region, sample, screening strategies, and diagnostic criteria. This study provides detailed OP/IP comparison, microbial distribution, antibiotic susceptibility, and risk factor analysis in a sample of 300 pregnant women.

AIMS AND OBJECTIVE:

Aim of study to know Prevalence, Microbiological Profile, and Antimicrobial Susceptibility Pattern of Urinary Tract Infection Among Pregnant Women: A Hospital-Based Cross-Sectional Study of 300 Cases.

Objective Of Study:

To know Prevalence, Microbiological Profile, and Antimicrobial Susceptibility Pattern of Urinary Tract Infection Among Pregnant Women

MATERIALS AND METHODS

Study Design: Hospital-based cross-sectional study over **6 months**.

Sample Size n = 300 pregnant women

- OP (ANC clinic): **210**
- IP (ward): **90**

Inclusion Criteria

- Pregnant women aged 18–40 years
- Any trimester
- Not on antibiotics for previous **14 days**

Exclusion Criteria

- Known renal anomalies
- Chronic catheter use
- Recent UTI treatment

Data Collection

Sociodemographic Variables: we were followed sociodemographic data as per following criteria.

- Age
- Parity
- Trimester
- Socioeconomic status
- Previous UTI
- Diabetes status

OP/IP Segregation

Category	N
Out-Patient (OP)	210
In-Patient (IP)	90
Total	300

Microbiological Processing: 1. Sample Handling and Preparation

Collection: A clean-catch midstream urine sample is the preferred collection method to minimize contamination from external flora. For infants or specific clinical scenarios, alternative methods like catheterization or suprapubic aspiration may be used.

Transportation/Storage: Samples should be transported to the laboratory promptly, ideally within 2 hours of collection. If a delay is unavoidable, the sample should be refrigerated at 2-8°C for up to 24 hours or collected in a container with boric acid preservative to prevent bacterial overgrowth.

Urinalysis (Physical/Chemical Examination): Before culturing, a physical examination (color, clarity) and chemical analysis using a reagent strip (dipstick) are often performed to check for indicators of infection like nitrites, white blood cells, or blood.

Microscopic Examination: The urine is often centrifuged to

concentrate any solid components (sediment). This sediment is examined under a microscope for the presence and quantity of red blood cells, white blood cells, bacteria, yeast, crystals, and casts, providing early clues about an infection.

Culture And Identification

Inoculation: A calibrated loop is used to streak a specific, quantitative volume of the well-mixed urine (typically 1 µL or 10 µL) onto one or more types of agar media, such as blood agar (non-selective) and MacConkey agar (selective for Gram-negative bacteria).

Incubation: The inoculated plates are incubated aerobically at 35–37°C for 24 to 48 hours to allow microorganisms to grow into visible colonies.

Enumeration And Interpretation: After incubation, the colonies are counted to determine the bacterial load, measured in colony-forming units per milliliter (CFU/mL). A count of $\geq 10^5$ CFU/mL of a single species in a clean-catch sample typically indicates a UTI, though lower counts may be significant depending on the patient's symptoms and collection method.

Identification: If significant growth is observed, the specific type of bacteria or fungi is identified using techniques such as colony morphology, Gram staining, and various biochemical tests.

Antimicrobial Susceptibility Testing (AST)

Procedure: Once the pathogen is identified, an AST (or sensitivity test) is performed to determine which antibiotics are effective against it. This is commonly done using the Kirby-Bauer disc diffusion method, where antibiotic-impregnated discs are placed on an agar plate with the isolated organism. The lab reports whether the organism is **Sensitive** (inhibited by the antibiotic), **Intermediate** (partially inhibited), or **Resistant** (not inhibited).

Clinical Value: This information guides the healthcare provider in selecting the most effective antibiotic treatment for the patient, ensuring targeted therapy and helping combat antibiotic resistance.

Sample: Midstream clean-catch urine (MSU).

Tests Performed

Urine Routine Microscopy

- Pus cells (WBC/HPF)
- RBCs
- Epithelial cells
- Casts/crystals

Culture ($\geq 10^5$ CFU/ml considered significant)

- Inoculation on CLED, MacConkey, Blood agar
- Colony count
- Biochemical identification

Antibiotic Sensitivity Testing

- Kirby-Bauer disc diffusion
- CLSI guidelines

Antibiotics Tested: These following antibiotics were used for detection of antimicrobial resistance as per CLSI guidelines. Amoxicillin, Ampicillin, Nitrofurantoin, Ciprofloxacin, Cefixime, Cefuroxime, Amikacin, Gentamicin, Fosfomycin, Co-trimoxazole, Piperacillin-tazobactam and Meropenem (reserved).

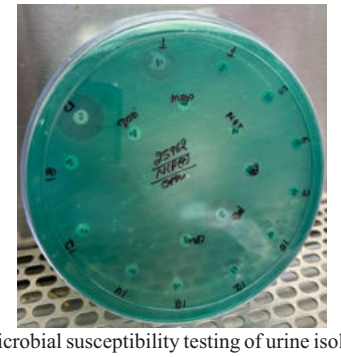


Figure: antimicrobial susceptibility testing of urine isolate on Mueller Hinton Agar (MHA).

RESULTS AND OBSERVATION:

This study were conducted in Ajmera hospital Bhilwara on 300 urine samples, out of these 300 samples we found following outcomes.

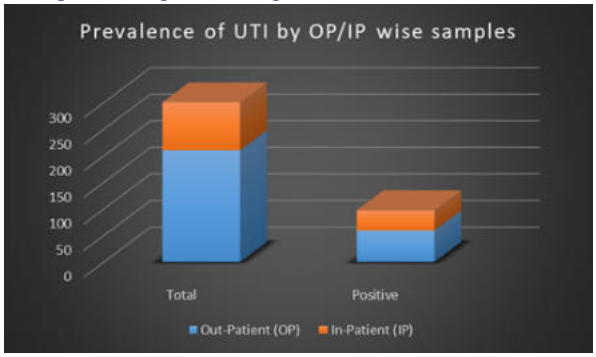
Prevalence of UTI: In this study we were found 97 were culture-positive (32.3%) out of 300 samples.

Prevalence of UTI by OP/IP wise samples

Table 5.1 Prevalence Of UTI By OP/IP Wise Samples.

Group	Total	Positive	Prevalence
Out-Patient (OP)	210	59	28.1%
In-Patient (IP)	90	38	42.2%
Total	300	97	32.3%

Chi-square = 6.4; p = 0.01 → significant.



Graph 5.1: Prevalence of UTI by OP/IP wise samples

Interpretation: IP pregnant women had significantly higher UTI rates.

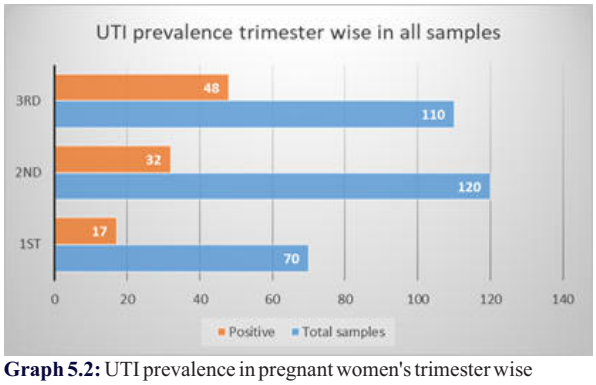
Demographic And Clinical Variables

UTI Prevalence Trimester Wise In All Samples

Table 5.2: UTI Prevalence In Pregnant Women Trimester Wise.

Trimester	Total samples	Positive	Prevalence
1st	70	17	24.3%
2nd	120	32	26.7%
3rd	110	48	43.6%

UTIs are most common in 3rd trimester.



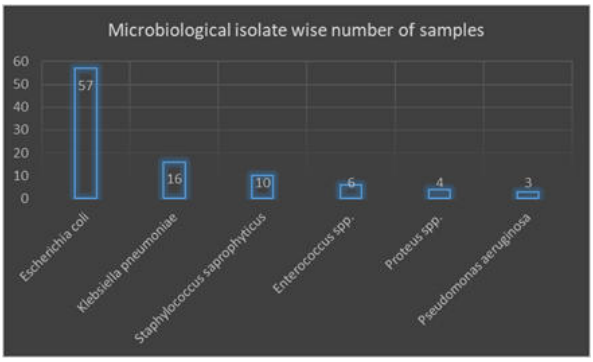
Graph 5.2: UTI prevalence in pregnant women's trimester wise

Microbiological Profile (n=97 isolates)

Microbiological Isolate Wise Number Of Samples In Our Study Were Found As Described Below.

Table 5.3: Microbiological Profile Of Various Isolates In Urinary Tract Infection In Pregnant Ladies.

Organism	No.	Percentage
Escherichia coli	57	58.7%
Klebsiella pneumoniae	16	16.4%
Staphylococcus saprophyticus	10	10.3%
Enterococcus spp.	6	6.1%
Proteus spp.	4	4.1%
Pseudomonas aeruginosa	3	3.0%
TOTAL	97	100%



Graph 5.3: Microbiological profile of various isolates in urinary tract infection in pregnant ladies.

Antibiotic Sensitivity Pattern: antimicrobial susceptibility pattern are as follows for gram negative which were isolated from urine samples. Gram negative bacteria which commonly inhabited in intestine and these commonly associated with urinary tract infection.

A. Gram-Negative Isolates (E. coli, Klebsiella, Proteus, Pseudomonas)

Table 5.4: Antimicrobial Susceptibility Pattern Of Gram-negative Bacteria In Urinary Tract Infection In Pregnant Ladies At Ajmera Hospital.

Antibiotic	Sensitive (%)	Resistant (%)
Nitrofurantoin	86%	14%
Fosfomycin	82%	18%
Amikacin	78%	22%
Cefuroxime	60%	40%
Cefixime	56%	44%
Ciprofloxacin	48%	52%
Co-trimoxazole	43%	57%
Ampicillin	32%	68%

B. Gram-Positive Isolates (Staph. saprophyticus, Enterococcus): Gram positive bacteria were less common but more pathogenic and cause urinary tract infection.

Table 5.5: Antimicrobial Susceptibility Pattern Of Gram-positive Bacteria In Urinary Tract Infection In Pregnant Ladies At Ajmera Hospital.

Antibiotic	Sensitive (%)
Nitrofurantoin	92%
Linezolid	88%
Vancomycin	86%
Amoxicillin-clavulanate	70%
Cephalexin	55%

Antibiogram Summary

Best Oral Agents:
- Nitrofurantoin
- Fosfomycin

Agents With Poor Efficacy:
- Ampicillin
- Co-trimoxazole
- Ciprofloxacin

Parenteral Agents (severe Cases):
- Amikacin
- Piperacillin-Tazobactam
- Meropenem (reserved)

Microscopy Findings

Table 5.6: Microscopic Findings In Urine Samples Of Urinary Tract Infections In Pregnant Ladies At Ajmera Hospital.

Parameter	Positive UTI (%)
Pus cells >10/HPF	84%
Bacteria +3	78%
Nitrites +	61%
Protein trace/+	52%
RBCs >5/HPF	22%

DISCUSSION

The study concluded that due to the high prevalence of UTI and significant antimicrobial resistance to common antibiotics, routine screening of all pregnant women for bacteriuria (both symptomatic and asymptomatic), along with culture and antimicrobial susceptibility testing, is crucial for effective treatment and prevention of adverse pregnancy outcomes. Empiric treatment without prior testing should be approached with caution due to high resistance levels.

Prevalence

The study found a UTI prevalence of **32.3%**, consistent with high rates reported in African and South Asian regions (20–40%). IP patients had significantly higher prevalence, probably due to:
- Complications
- Limited mobility
- Catheter use (even short-term)
- Comorbidities

Microbial Profile

E. coli remains the most common organism (58.7%), matching global trends due to:
- Perineal colonization
- Uropathogenic fimbriae
- Ability to ascend urinary tract

Antibiotic Sensitivity

High sensitivity to Nitrofurantoin and Fosfomycin supports their role as **first-line oral agents**. High resistance to ampicillin and co-trimoxazole is alarming and aligns with widespread AMR trends.

Maternal And Fetal Risks

Untreated UTI can lead to:
- Pyelonephritis
- Preterm labor
- Low birth weight
- Maternal anemia
- Sepsis

Thus, routine ANC screening is justified.

CONCLUSION

- UTI prevalence in pregnancy is **high (32.3%)**, especially among hospitalized women.
- Third-trimester women are at higher risk.
- *E. coli* is the leading pathogen.
- Nitrofurantoin and Fosfomycin are the most effective oral antibiotics.
- Routine urine culture screening and antibiogram-guided treatment should be integrated into antenatal care.

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