

## Study on the Bacteriological Causes of UTI in Pregnant Women and Their Current Resistance Pattern

Shivani Gour<sup>1</sup>, Vasundhara Sharma<sup>2</sup>, Imran Ahamad<sup>3</sup>, Umar Farooq<sup>4</sup>, Sudhir Singh<sup>5</sup>, Shweta R Sharma<sup>6</sup>

<sup>1</sup>MSc student, Department of Microbiology, TMMC & RC, Moradabad, Uttar Pradesh, India.

<sup>2</sup>Associate Professor, Department of Microbiology, TMMC & RC, Moradabad, Uttar Pradesh, India.

<sup>3</sup>Assistant Professor, Department of Microbiology, TMMC & RC, Moradabad, Uttar Pradesh, India.

<sup>4</sup>Professor & HOD, Department of Microbiology, TMMC & RC, Moradabad, Uttar Pradesh, India.

<sup>5</sup>Professor, Department of Microbiology, TMMC & RC, Moradabad, Uttar Pradesh, India.

<sup>6</sup>Associate Professor, Department of Microbiology, Moradabad, Uttar Pradesh, India.

### Abstract

**Background:** Urinary tract infection is one of the most prevalent medical problems of pregnancy. Infection of urinary system during pregnancy is linked to significant morbidity in mother and the foetus. Gram negative organisms cause urinary tract infection more frequently than gram positive organisms. E.coli (60-70%), Klebsiella (10%), Proteus (5-10%), Pseudomonas (2-5%) are the gram negative organism and gram positive organism includes Streptococcus species, Staphylococcus species and Enterococcus species. Aim: To isolate bacteria causing UTI in pregnant women and to study their current drug resistance pattern. **Material and Methods:** The study was carried out from January 2021 to November 2021 in tertiary care hospital Moradabad. The study was conducted in the department of Microbiology, Teerthanker Mahaveer Medical College & research centre Moradabad. The antibacterial resistance pattern was determined by automated method as per CLSI standards. **Results:** During the study period total 148 urine sample from ANC clinic were processed out of which 30 isolates were positive. Gram negative organism was predominant isolates. E.coli was major isolates. Highest resistance was seen against Ampicillin among both Gram negative organisms and gram positive organism. **Conclusion:** The current study compares the existing resistance pattern of treatment prescribed to pregnant women with bacterial UTI. Bacteria are the usual suspect for infections in expecting women. Sometime this could also lead to complication like cystitis, pyelonephritis, pre term birth, decreased mean gestational age, biofilm formation and many more.

**Keywords:** Urinary tract infection, pregnant women.

**Corresponding Author:** Vasundhara Sharma, Associate Professor, Department of Microbiology, TMMC & RC, Moradabad, Uttar Pradesh, India.

### Introduction

Urinary tract infection is one of the most prevalent medical problems of pregnancy.<sup>[1]</sup> This is, result of the physiological and morphological changes that occur in the genitourinary tract at the time of pregnancy.<sup>[2]</sup>

Infection of urinary system during pregnancy is linked to significant morbidity in mother and the foetus.<sup>[3]</sup> During pregnancy there are mechanical, hormonal and physiological changes.<sup>[4]</sup>

Urinary tract infection during pregnancy can cause pyelonephritis, hypertensive sickness, anemia, chronic renal failure and early delivery and low birth weight of fetus or death. Treatment of symptomatic and asymptomatic bacteriuria at any stage of pregnancy can

reduce the risk of this problems.<sup>[5]</sup> Due to adverse sequelae of UTI in pregnant women, maximum number of the hospital perform routine urinalysis of midstream urine specimen at some stage during their stay at antenatal health center.<sup>[6]</sup>

UTI can be asymptomatic or symptomatic. Asymptomatic bacteriuria is defined as the presence of microorganism in midstream urine sample that gives positive ( $>10^5$ cfu/ml) of the same uropathogen in a patient who does not have conventional UTI symptoms.<sup>[7]</sup>

Dysuria, urgency, cramps or pains in the lower abdomen, blood or mucus in the urine, pain during sexual intercourse are the signs and symptoms of UTI.<sup>[8,9]</sup>

Gram negative organisms cause urinary tract infection more frequently than gram positive organisms. E.coli (60-70%), Klebsiella (10%), Proteus (5-10%), Pseudomonas (2-5%) were the gram negative organism isolated and gram positive organism included Staphylococcus species, Streptococcus species and Enterococcus species.<sup>[10-12]</sup>

At present, antibiotic resistance can be observed around the world, especially in relation to E.coli which is the most common causative agent of UTI during pregnancy. Rising drug resistance as a result of empirical treatment of urinary tract infections requires regular monitoring of antibiotic susceptibility of uropathogen.<sup>[10]</sup>

To ensure effective medication and to have current information, it is necessary to identify the microorganisms that cause urinary tract infection in a certain region and as well as their susceptibility. In the majority of developing countries including India, prenatal screening for UTI is not given priority during prenatal care.<sup>[13,14]</sup>

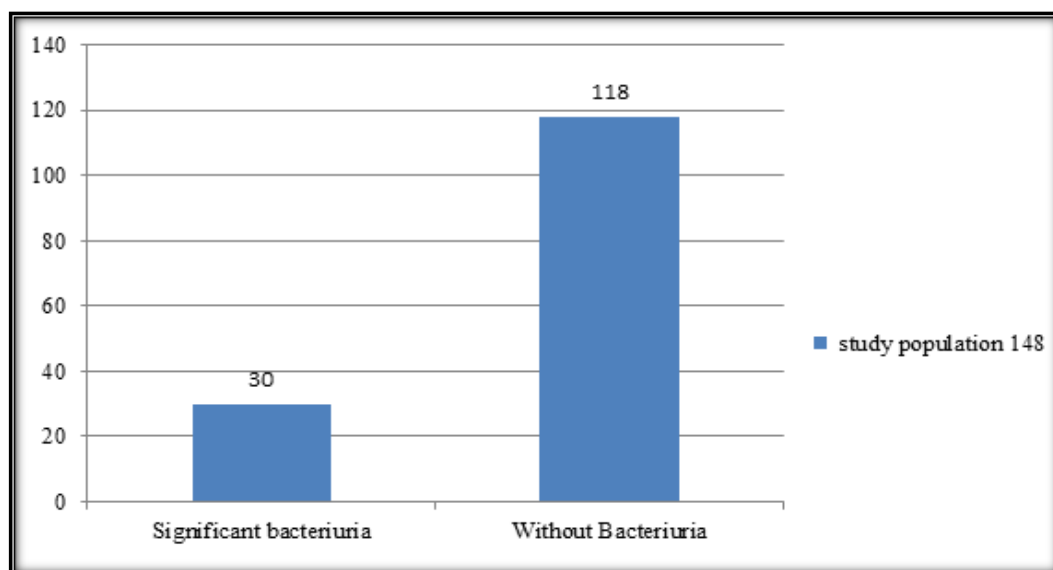
## Material and Methods

This Study was done in Teerthanker Mahaveer hospital, department of microbiology. 148 urine samples were taken from pregnant women who were visiting department of gynaecology Teerthanker Mahaveer hospital from January 2021 to November 2021 presenting with symptoms of UTI.

## Processing of Sample

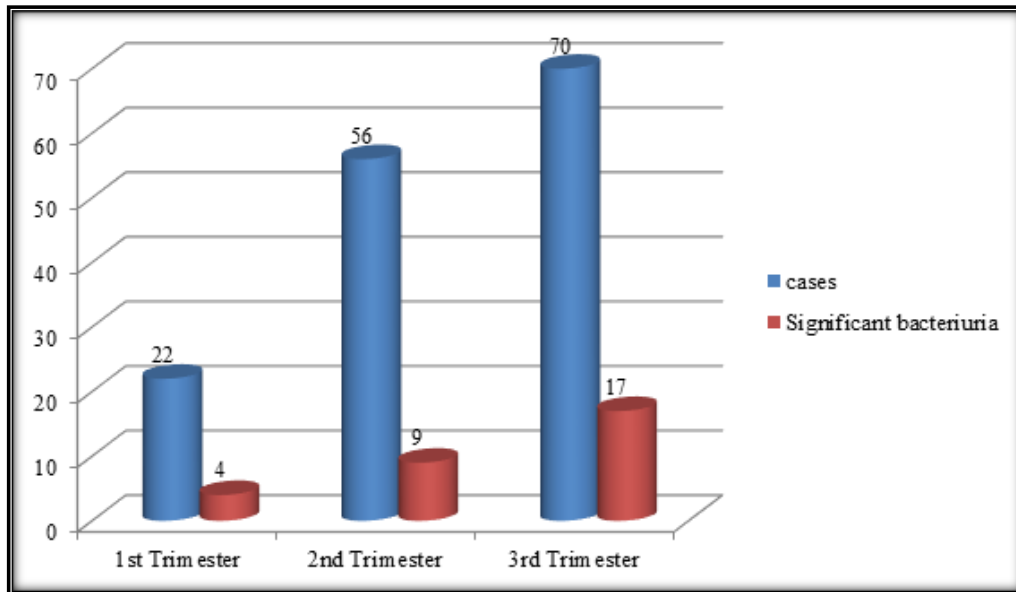
1. Microscopy (Wet mount microscopy was done to detect RBC, WBC and Epithelial cells in an uncentrifuged sample)
2. Culture on CLED agar (cysteine lactose electrolyte deficient agar)

## Results



**Figure 1: Graph showing patients having bacteriuria**

In our study out of 148 cases significant bacteriuria (20.27%), No significant bacteriuria (79.73%).



**Figure 2: Graph showing gestational distribution.**

According to gestational period, the highest percentage was seen in the third trimester (56.66%) followed by second trimester (30%) and in contrast to first trimester (13.34%).

**Table 1: Causative organism**

Organism	Number	Percentage (%)
GNB		
E.coli	16	53.33%
K.pneumoniae	4	13.33%
P.aeruginosa	1	3.34%
Acinetobacter	1	3.34%
GPC		
S.aureus	3	10%
S.saprophyticus	3	10%
Enterococcus spp.	2	6.66%
Total	30	100%

Out of the total isolates (30), the most common organism found was E.coli (53.33%) followed by Klebsiella pneumoniae (13.33%), S.aureus and S.saprophyticus (10%), Enterococcus spp. (6.66%), P.aeruginosa and Acinetobacter (3.34%).

**Table 2: Antibiotic resistance pattern of gram negative bacteria**

Organism	E.coli(16)	K.pneumoniae(4)	P.aeruginosa(1)	Acinetobacter(1)
AK	4(25%)	0(0%)	0(0%)	1(100%)
AMP	15(93.75%)	2(50%)	0(0%)	1(100%)
CIP	6(37.5%)	3(75%)	0(0%)	1(100%)
CXM	7(43.75%)	2(50%)	-	0(0%)
GEN	7(43.75%)	2(50%)	0%	1(100%)

NIT	4(25%)	2(50%)	1(100%)	0(0%)
NX	7(43.75%)	1(25%)	-	0(0%)
CPM	0(0%)	0(0%)	-	-
MRP	0(0%)	0(0%)	1(100%)	-
I	0(0%)	0(0%)	0(0%)	0(0%)

In above table the resistant pattern for gram negative bacteria the maximum resistant shown in Ampicillin (E.coli 93.75%, K.pneumoniae 50% Acinetobacter 100%) followed by Cefuroxime and Gentamicin.

**Table 3: Antibiotic resistance pattern of gram positive bacteria**

Organism	S.aureus (3)	S.saprophyticus(3)	Enterococcus spp.(2)
AMP	3(100%)	3(100%)	2(100%)
CD	0(0%)	-	-
CIP	1(33.33%)	0(0%)	2(100%)
E	2(66.66%)	-	2(100%)
VA	1(33.33%)	2(66.66%)	2(100%)
LZ	0(0%)	-	0(0%)
GEN	2(66.66%)	0(0%)	1(50%)
TE	2(66.66%)	-	2(100%)
P	2(66.66%)	-	2(100%)
NX	1(33.33%)	-	2(100%)

In gram positive bacteria the maximum resistant shown in Ampicillin 100%

## Discussion

The current study was done from January 2021 to Nov 2021. During this time period, a total of 148 urine samples were collected from pregnant women diagnosed as UTI cases. Further assessment of samples was done to identify the causative agents of UTI along with their current resistant pattern.

Our study was comparable to studies done by OM Rahiman F et al. Which reported symptomatic UTI in pregnant women (16.88%).<sup>[15,16]</sup> A study conducted in new Delhi by Kant S et al. concluded that the UTI in pregnant women 33.3% while it was, (37.84%) in the study done by Thakur S et al.<sup>[13,17]</sup> Rate of UTI in pregnant women (20.27%) in our research can be correlated with study by Rizvi M et al. they reported (25.2%) symptomatic bacteriuria. In our study the occurrence of UTI was (13.34%) throughout the first trimester, (30%) at second trimester and (56.66%) during third trimester. The highest incidences were found during the third trimester. This trend is similar with the study conducted by OM Rahiman F et al. In their study, they reported bacteriuria during first trimester, second trimester and third trimester as (13.95%), (14.28%) and (18.69%) respectively A study done by MPSrinathetal. reported that highest incidents were found during the (13.88%) third trimester followed by (11.9%) second trimester and (8.5%) first trimester.<sup>[15,18]</sup> This is due to the increased obstruction of ureters as a result of the enlarging uterus. However, in the study done by Sujatha R et al. they showed the high rate of infection was seen in first trimester.<sup>[19]</sup>

In our study, E.coli (53.33%) was predominantly isolated organism in pregnant women with urinary tract infection followed by Klebsiella (13.33%), S.aureus (10%), S.saprophyticus (10%), Enterococcus spp. (6.67%), Pseudomonas (3.34%) and Acinetobacter (3.34%). Similar studies conducted by Eshwarappa M et al. showed the highest percentage of isolated organism were E.coli(66.9%) followed by Klebsiella (15.5%), Enterobacter spp. (4%) and

*Pseudomonas* (10.2%). Moreover, MP Srinath et al. in their study concluded that percentage of incidence of *E. coli* (53.8%), *Klebsiella* (23.07%), *Pseudomonas* (3.84%) and *Enterococcus* species (7.69%).<sup>[18]</sup> Samaga PM et al. also conducted a research on UTI in pregnant women in which *E. coli* isolated was (42.2%), *Klebsiella* (11.1%) and *Acinetobacter* (6.7%).<sup>[20]</sup> similar study done by Rizvi M et al. isolated *E. coli* (41.9%), *Klebsiella* (21.7%), *Pseudomonas* (3.4%), *S. aureus* (5.9%) and *Staphylococcus saprophyticus* (6.4%).<sup>[21]</sup>

Our study also revealed about the resistance pattern in UTI in pregnant women. *Escherichia coli* were resistant to Ampicillin 15 (93.75%). Apart from these 15 *E. coli* isolate other gram negative bacteria was resistant to Ampicillin following Cefuroxime and Gentamicin. Among gram positive high resistant to Ampicillin (100%) was noted. High drug resistance was also noted in *Enterococcus* spp. A study done by Samaga PM et al. also had near about observation resistant pattern for Ampicillin (89.5%).<sup>[20]</sup>

In our study, Ampicillin (86.36%) showed the maximum resistance for gram negative bacteria followed by Cefuroxime (45.45%) and Gentamicin (45.45%) whereas gram positive bacteria showed complete resistance to Ampicillin (100%) and Vancomycin (50%). A similar study done by OM Rahiman F et al. reported high resistant pattern of gram negative bacteria to Ampicillin (95%), Cefuroxime (71.67%) and Gentamicin (25%). Gram positive bacterial isolate showed a complete resistance to Ampicillin (100%).<sup>[15]</sup>

## Conclusion

The current study compares the existing resistance pattern of treatment prescribed to pregnant women with bacterial UTI. Bacteria are the usual suspect for infections in expecting women. Sometime this could also lead to complication like cystitis, pyelonephritis, pre term birth, decreased mean gestational age, biofilm formation and many more.

Regular prenatal screening for symptomatic or asymptomatic bacteriuria should be performed and particular instructions for assessing antimicrobial susceptibility with safe medicines in pregnant women should be provided so that these can help in proper treatment.

Pregnant women should be tested for symptomatic bacteriuria at least once throughout each trimester because it has been associated to pregnancy problems. To avoid obstetric difficulties, all expectant women should have routine urine culture tests to detect the infection for appropriate antibiotic treatment.

The aim of the study was to identify bacterial causing urinary tract infection and their current resistance pattern. Our study will therefore be help for in better selection of antibiotic for pregnant women.

## References

1. Abdullah AA, Al-Moslih MI. Prevalence of asymptomatic bacteriuria in pregnant women in Sharjah, United Arab Emirates. *East Mediterr Health J.* 2005; 11(5-6):1045-52. PMID: 16761676.
2. Jayalakshmi J, Jayaram VS. Evaluation of various screening tests to detect asymptomatic bacteriuria in pregnant women. *Indian J Pathol Microbiol.* 2008; 51:379-81.
3. Sheiner E, Mazor-Drey E, Levy A. Asymptomatic bacteriuria during pregnancy. *J Matern Fetal Neonatal Med.* 2009; 22(5):423-7.
4. Bandyopadhyay S, Thakur JS, Ray P, Kumar R. High prevalence of bacteriuria in pregnancy and its screening methods in North India. *J Indian Med Assoc.* 2005; 103:259-62.
5. Schnarr J, Smaill F. Asymptomatic bacteriuria and symptomatic urinary tract infection in pregnancy. *Eur J Clin Invest.* 2008; 38(2):50-7.
6. Jeyabalan A, Lain KY. Anatomic and functional changes of the upper urinary tract during pregnancy. *Urol Clin North Am.* 2007; 34(1):1-6.

7. Najar MS, Saldanha CL, Banday KA. Approach to urinary tract infections in Srinagar. *J INDIAN*. 2009; 19(4):129-139.
8. Okonko IO, Ijandipe LA, Ilusanya OA, Donbraye-Emmanuel OB, Ejembi J, Udeze AO, et al. Incidence of urinary tract infection (UTI) among pregnant women in Ibadan, South-Western Nigeria. *African Journal of Biotechnology*. 2009; 8(23): 6650-7.
9. Franklin TL, Monif GR. *Trichomonas vaginalis* and bacterial vaginosis. Coexistence in vaginal wet mount preparations from pregnant women. *J Reprod Med*. 2000; 45(2):131-4.
10. Alemu A, Moges F, Shiferaw Y, Tafess K, Kassu A, Anagaw B et al. Bacterial profile and drug susceptibility pattern of urinary tract infection in pregnant women at University of Gondar Teaching Hospital, Northwest Ethiopia. *BMC Res Notes*. 2012 Apr 25; 5:197. doi: 10.1186/1756-0500-5-197. PMID: 22534117; PMCID: PMC3473254.
11. Gales AC, Jones RN, Gordon KA, Sader HS, Wilke WW, Beach ML. Activity and spectrum of 22 antimicrobial agents tested against urinary tract infection pathogens in hospitalised patients in Latin America; reports from the second year of the sentry antimicrobial surveillance program (1998). *J Antimicrob Chemother*. 2000; 45(3):295–303.
12. Khan R, Saif Q, Fatima K, Meher R, Shahzad HF, Anwar KS. Clinical bacteriological profile of UTI patients attending a north Indian tertiary care center. *J Integr Nephrol Androl*. 2015; 2(1):29-34.
13. Kant S, Lohiya A, kapil A, Gupta SK. Urinary tract infection among pregnant women at a secondary level hospital in Northern India. *Indian J Public Health*. 2017; 61(2):118-23.
14. Urinary Tract Infection. In: Baveja CP, editors, *Text Book of Microbiology*. 6th ed. New Delhi: Arya Pub; 2018.p.593.
15. RahimanFasalu OM, Balasubramanian T, Kumar P, Ashif CM, Shejina M. Prevalence of urinary tract infection and its etiological agent among pregnant women in Malabar region of kerala. *Int J Pharm Sci*. 2015; 34(2):202-09.
16. Khan R, Saif Q, Fatima K, Meher R, Shahzad HF, Anwar KS. Clinical and bacteriological profile of UTI patients attending a north Indian tertiary care center. *J Integr Nephrol Androl*. 2015; 2:29-34.
17. Thakur S, Nagpal KL. Urinary tract infection in pregnant women at Kathmandu, Nepal *JMCRR*. 2020; 3(9):454-58.
18. Srinath MP, Shajina M, RahimanFasalu OM. Etiology and prevalence of urinary tract infection among pregnant women in kerala. *Int J community Med p health*. 2018; 5(8):1-6.
19. Sujata R, Manju N. Prevalence of asymptomatic bacteriuria and its antibacterial susceptibility pattern among pregnant women attending the antenatal clinic at Kanpur city. *J clin*. 2014; 8(4):1-3.
20. Samaga P Mamatha. Bacteriological profile of urinary tract infection in pregnant women. *Ind J Microbiol*. 2016; 3(1):17-21.
21. Rizvi M, Khan F, Shukla I, Malik A, Shaheen. Rising prevalence of antimicrobial resistance in urinary tract infection during pregnancy: Necessity for exploring newer treatment option. *J of laboratory phy*. 2011; 3(2):1-6.