

# Bacteriological Study of Urinary Tract Infection in Ante-natal Patients in Teerthanker Mahaveer University, Moradabad

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## Abstract

**Introduction:** Urinary tract infection (UTIs) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract. UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards.

**Materials and Methods:** A mid-stream clean catch urine was collected from 150 antenatal patients carefully then transported to laboratory and culture and antibiotic susceptibility was performed.

**Results:** A total of 52 antenatal patients showed significant bacteriuria while 98 showed no significant bacteriuria from 150 patients. Bacterial agents were isolated from 52 pregnant women and were identified as: *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Enterobacter aerogenes*. *E. coli* (46%) was the commonest bacterial pathogen isolated. Other bacterial pathogens incriminated in this study were *S. aureus* (20%), *K. pneumoniae* (22%), *P. aeruginosa* (8%), *E. aerogenes* (8%).

**Discussion:** UTI in antenatal patients can lead to significant complications viz. fetal growth retardation and even still birth or abortion. In our study, UTI was seen in 34.66% antenatal women and *E. coli* (46%) was most common pathogen. Early diagnosis and treatment in UTI during antenatal period can prevent serious complications and lead to healthy outcomes for both mother and baby.

**Key words:** Antenatal care, Significant bacteriuria, Urine culture

## INTRODUCTION

Urinary tract infection (UTIs) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract. Urinary tract includes the organs that collect and store urine and release it from the body which include: Kidneys, ureters, bladder, and urethra. UTIs are among the most common bacterial infections in humans,

both in the community and hospital setting and have been reported in all age groups in both sexes.<sup>1-3</sup> It is a serious health problem affecting millions of people each year and is the leading cause of Gram-negative bacteremia. UTIs are also the leading cause of morbidity and health care expenditures in person of all ages.

UTI accounts for a significant part of the work load in clinical microbiology laboratories and enteric bacteria (in particular, *Escherichia coli*) remain the most frequent cause of UTI, followed by *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterobacter aerogenes*.<sup>4,5</sup>

UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards. UTI is defined as the presence of

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at least 100,000 organisms per milliliter of urine in an asymptomatic patient, or as more than 100 organisms/ml. of urine with accompanying pyuria (>5 white blood counts/HPF) in a symptomatic patient. Particularly in asymptomatic patients, a diagnosis of UTI should be supported by a positive culture for a uropathogen (Tamalli et al. 2013).<sup>6</sup>

Numerous reports have also suggested that UTI can occur in both male and females of any age, with bacterial counts as low 100 colony forming units (CFU) per millimeter in urine.<sup>2,4</sup> Female are however believed to be more affected than males except at the extremes of life.<sup>2,6</sup> Untreated upper UTI in pregnancy carries well documented risk of morbidity, and rarely, mortality to the pregnant women.<sup>5</sup> Sexually active young women are disproportionately affected. An estimated 40% of women reported having had a UTI at some point in their lives.<sup>7</sup>

Therefore, we conducted this study to evaluate the epidemiology of UTI in antenatal women attending own Teerthanker Mahaveer Medical College & Research Center in Moradabad.

## MATERIALS AND METHODS

### Study Area and Duration

This study was conducted from February 2014 to January 2015 in Department of Microbiology at Teerthanker Mahaveer Medical College.

### Study Population

Urine samples were collected from a total of 150 pregnant women between the aged ranges from 18 to 40 years. All these persons were out patients attending the Teerthanker Mahaveer College. The urine samples were obtained by informed consent of the pregnant women used for this study and the permission to that effect was obtained from the Ethical Committee of the hospital.

### Urine Specimen Collection

Early morning clean-catch midstream urine was collected from each pregnant woman into a wide-mouthed sterile screw capped container.

### Urine Culture and Antibiotic Susceptibility Test

With a calibrated micro-loop, 0.001 ml of urine was cultured on to a cystine lactose electrolyte deficient agar, blood agar, MacConkey agar and Muller Hinton Agar plates. After overnight incubation at 37°C for 24 h, colony counts yielding bacterial growth of  $\geq 10^5$ /ml was taken as being significant in both symptomatic and asymptomatic pregnant women. Antibiotic susceptibility of an isolated species namely, *E. coli*, *Klebsiella* spp., *Proteus* spp., and *P. aeruginosa*

and *E. aerogens* were tested for their susceptibility to some antibiotics (amikacin, ciprofloxacin, cefotaxime, ofloxacin, norfloxacin, nitrofurantoin, ampicillin and cotrimoxazole (Hi-Media Lab, India) by modified disc-agar diffusion technique (Kirby-Bauer method).<sup>8</sup>

## RESULTS

Table 1 show various bacteria isolated from the urine sample *E. coli* (44.20%), *K. pneumonia* (19.20%), *S. aureus* (21.10%), *P. aeruginosa* (7.60), *E. aerogens* (7.60). Table 2 show incidence of UTI by parity (no. of pregnancy), in 1<sup>st</sup> pregnancy (19.2%) positive, 2<sup>nd</sup> pregnancy (32.6%), 3<sup>rd</sup> pregnancy (48%). Table 3 show antibiotic sensitivity pattern of isolated organisms. In this table *E. coli* highly sensitive to nitrofurantoin, *K. pneumoniae* highly sensitive to ciprofloxacin, *E. aerogens* highly sensitive to ceftazidime, *P. aeruginosa* highly sensitive to ceftazidime, *S. aureus* highly sensitive to levofloxacin and nitrofurantoin. Figure 1 shows distribution of isolated organisms which causing urinary tract infection. The highest percentage of isolated organism is *E. coli* (44.20%). Figure 2 shows graph of incidence of urinary tract infection by parity. 19.2 % in Ist pregnancy, 32.66% in II<sup>nd</sup> pregnancy, 48% in III<sup>rd</sup> pregnancy. Figure 3 shows antibiotic sensitivity pattern with isolated organisms.

## DISCUSSION

During the period from February 2014 to January 2015, a total of 150 urine specimens were collected from pregnant women and processed. Significant bacteriuria  $>10^5$  CFU per ml was found in 52 patients among 150 patients examined.

**Table 1: Various bacteria isolated from the urine sample**

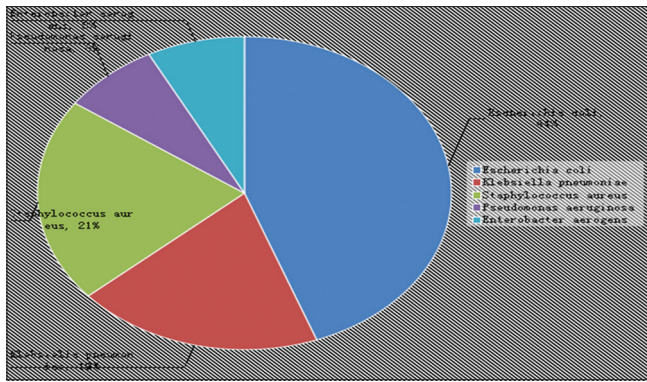
Isolated organisms	Number of positive sample (n=52) (%)
<i>E. coli</i>	23 (44.20)
<i>K. pneumoniae</i>	10 (19.20)
<i>S. aureus</i>	11 (21.10)
<i>P. aeruginosa</i>	4 (7.60)
<i>E. aerogens</i>	4 (7.60)

*E. aerogens*: *Enterobacter aerogens*, *P. aeruginosa*: *Pseudomonas aeruginosa*, *S. aureus*: *Staphylococcus aureus*, *K. pneumonia*: *Klebsiella pneumonia*, *E. coli*: *Escherichia coli*

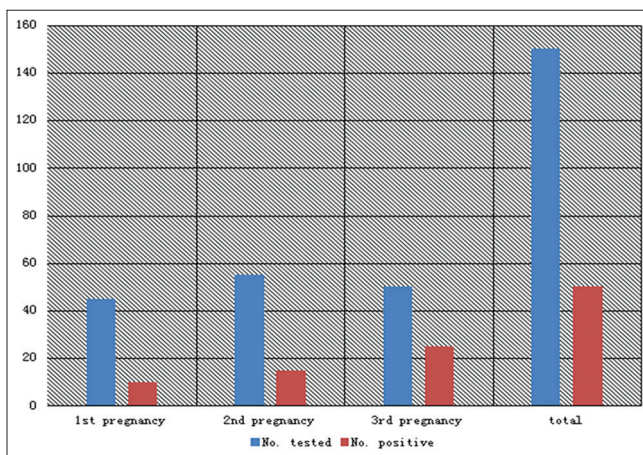
**Table 2: Incidence of UTI by parity (number of pregnancy)**

Parity	Number tested	Number positive (%)
1 <sup>st</sup> pregnancy	45	10 (19.2)
2 <sup>nd</sup> pregnancy	55	17 (32.6)
3 <sup>rd</sup> pregnancy	50	25 (48)
Total	150	52 (34.66)

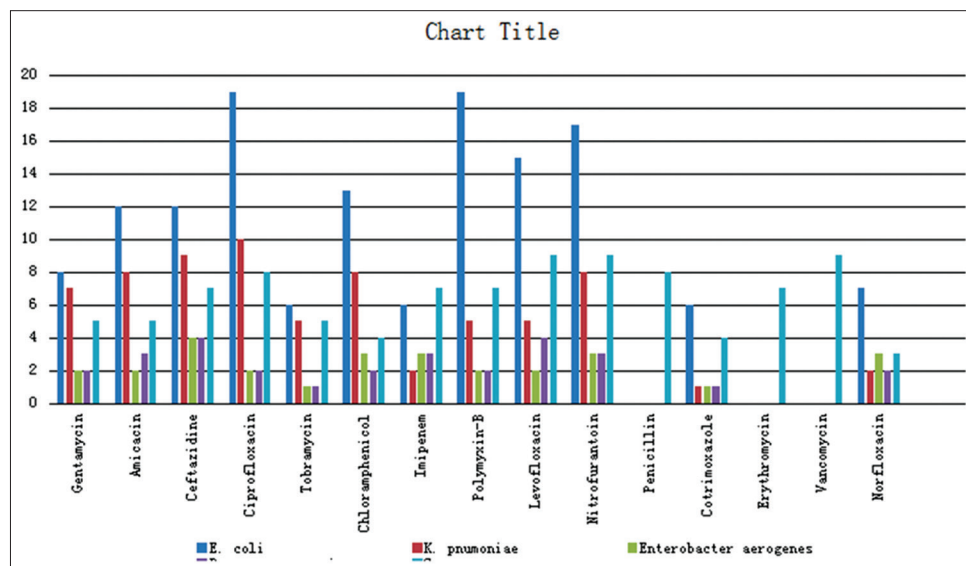
UTI: Urinary tract infection



**Figure 1: Distribution of bacteria causing urinary tract infection, in this chart *Escherichia coli* shows (44.20) the highest pathogenic organism which isolates in our study**



**Figure 2: This graph shows incidence of urinary tract infection (UTI) by parity, in this graph shows incidence of UTI by parity. 19.2 % in 1<sup>st</sup> pregnancy, 32.66% in 2<sup>nd</sup> pregnancy, 48% in 3<sup>rd</sup> pregnancy**



**Figure 3: This graph shows antibiotic sensitivity pattern of isolated organisms, in this graph shows antibiotic sensitivity pattern with isolated organisms**

The most commonly isolated bacteria were *E. coli* 23 (44.2%), *K. pneumoniae* 11 (21.1%), *S. aureus* 10 (19.2%), *P. aeruginosa* 4 (7.6%), *E. aerogens* 4 (7.6%).

In the present study, out of 52 positive urine sample from 150 cases, Gram-negative bacteria were more prevalent 41 (78%) than Gram-positive bacteria, which constituted 11 (22%) which was similar from previous study by Sabrina *et al.* who found that 38.1% of the total UTI were cause by Gram-negative bacteria. Similar findings have been reported by Blomberg *et al.*<sup>9-12</sup>

*E. coli* was major pathogen isolated from the urine cultures and accounted for one-third of the positive cultures with significant bacteriuria. *E. coli* is considered uropathogenic due to a number of virulence factors specific for colonization and invasion of the urinary epithelium, such as the P-fimbria and S-fimbria adhesions.<sup>13</sup> *K. pneumoniae* and *Staphylococci* were the second and third most common bacteria isolated. In our study, out of 52 positive samples, *E. coli* seen 23 (44.2%) so it was major uropathogen of UTI.

In the present study, women in their 2<sup>nd</sup> and 3<sup>rd</sup> trimester were found to have the higher incidence of UTI; 32.6% and 48%, respectively. A higher prevalence of UTI in antenatal women was found in an earlier study by Okonko *et al.* They observed that the prevalence of UTI was 41.4% in 2<sup>nd</sup> trimester and 55.1% in 3<sup>rd</sup> trimester.<sup>14</sup>

The most implicating organism causing UTIs among these pregnant women in this study was *E. coli* and it was responsible for (44.2%) of the cases of UTI. This



**Table 3: Antibiotics susceptibility pattern of isolated organisms**

Antibiotics	<i>E. coli</i>	<i>K. pneumoniae</i>	<i>E. aerogenes</i>	<i>P. aeruginosa</i>	<i>S. aureus</i>
Gentamycin	8	7	2	2	5
Amicacin	12	8	2	3	5
Ceftazidime	12	9	4	4	7
Ciprofloxacin	19	10	2	2	8
Tobramycin	6	5	1	1	5
Chloramphenicol	13	8	3	2	4
Imipenem	6	2	3	3	7
Polymyxin-B	19	5	2	2	7
Levofloxacin	15	5	2	4	9
Nitrofurantoin	17	8	3	3	9
Penicillin	-	-	-	-	8
Cotrimoxazole	6	1	1	1	4
Erythromycin	-	-	-	-	7
Vancomycin	-	-	-	-	9
Norfloxacin	7	2	3	2	3

*E. aerogenes*: *Enterobacter aerogenes*, *P. aeruginosa*: *Pseudomonas aeruginosa*, *S. aureus*: *Staphylococcus aureus*, *K. pneumoniae*: *Klebsiella pneumoniae*, *E. coli*: *Escherichia coli*

was followed by *S. aureus* (19.2%), *K. pneumoniae* (21.1%), *P. aeruginosa* (7.6%) and *E. aerogenes* (7.6%). This finding is similar to other reports which suggest that gram negative bacteria, particularly *E. coli* is the commonest pathogen isolated in patients with UTI.<sup>15-19</sup>

## CONCLUSION

UTI is one of the most common bacterial infections in the human population, and more frequent infection during pregnancy. With due consideration that most of UTIs during pregnancy are asymptomatic, they could lead to serious complications such as prematurity, low-birth weight, hypertension, and higher fetal mortality rates if untreated. This study was aimed to diagnose the asymptomatic or symptomatic bacteriuria, bacterial agents and their antibiotic sensitivity pattern in pregnant women attending from Jan 2014 to Feb 2015 in the Department of Microbiology at Teerthanker Mahaveer Medical College & Research Center, Moradabad.

In the present study, clean catch mid-stream urine samples were collected and cultured on Cystine Lactose Electrolyte Deficient agar by Standard loop method. Suspected colonies were identified, antibiotic susceptibility tests were done. Of 52 positive samples, 30 women suffered from asymptomatic bacteriuria while 22 women were suffering from symptomatic UTI.

The bacterial isolate were *E. coli* (44.2%), *S. aureus* (19.2%), *K. pneumoniae* (21.1%), *P. aeruginosa* (7.6%), *E. aerogenes* (7.6%).

Gram-negative bacteria were more prevalent 39 (78%) than Gram-positive bacteria which constituted 11 (22%). The most commonly isolated bacteria was *E. coli*, which is similar

to the findings of many other similar studies. Although antibiotic susceptibility of isolated bacteria in this study does not show significant differences with other studies.

Therefore, early diagnosis and treatment of UTI in antenatal women should be done to prevent complications and improve pregnancy outcomes for both the mother and the baby.

## REFERENCES

- Morgan MG, McKenzie H. Controversies in the laboratory diagnosis of community-acquired urinary tract infection. *Eur J Clin Microbiol Infect Dis* 1993;12:491-504.
- Ebie MY, Kandakai-Okukemi YT, Ayanbadejo J, Tanyigna KB. Urinary tract infection in military hospital. *Niger J Microbiol* 2001;15:31-7.
- Hooton TM, Winter C, Tiu F, Stamm WE. Randomized comparative trial and cost analysis of 3-day antimicrobial regimens for treatment of acute cystitis in women. *JAMA* 1995;273:41-5.
- American Academy of Family Physicians (AAFP). Urinary Tract Infections: A Common Problem for Some Women. Washington, DC: AAFP; 2004. [Reviewed/Updated: 08/04 Created: 03/01].
- National Institute of Health (NIH). What I Need to Know About Urinary Tract Infections. Bloomington, MN: NIH Publication; 2004. p. 04-4807.
- Tamalli M, Sangar B, Alghazal MA. Urinary tract infection during pregnancy at Al-khoms, Libya. *Int J Med Med Sci* 2013;3:455-9.
- Karen C, Deron CH, Donal HV, Clenn CR, Lesile TH, John MM. Laboratory evaluation of urinary tract infection in an ambulatory clinic. *Am J Clin Pathol* 1994;101:100-3.
- Collee JG, Fraser AG, Marmion BP, Simmons A. Mackie & McCartney Practical Medical Microbiology. 14<sup>th</sup> ed. Edinburgh, U.K: Churchill Livingstone.
- Gebre-Selassie S. Asymptomatic bacteriuria in pregnancy: Epidemiological, clinical and microbiological approach. *Ethiop Med J* 1998;36:185-92.
- Delzell JE Jr, Lefevre ML. Urinary tract infections during pregnancy. *Am Fam Physician* 2000;61:713-21.
- Nicolle LE. Epidemiology of urinary tract infection. *Infect Med* 2001;18:153-62.
- Schnarr J, Smaill F. Asymptomatic bacteriuria and symptomatic urinary tract infections in pregnancy. *Eur J Clin Invest* 2008;38:50-7.
- Sheffield JS, Cunningham FG. Urinary tract infection in women. *Obstet Gynecol* 2005;106:1085-92.
- Okonko IO, Ijandipe LA, Ilusanya OA, Donbraye-Emmanuel OB, Ejembi J,

- Udeze AO, *et al.* Incidence of urinary tract infection (UTI) among pregnant women. *J Biotechnol* 2008;8:6649-57.
15. Burbige KA, Retik AB, Colodny AH, Bauer SB, Lebowitz R. Urinary tract infection in boys. *J Urol* 1984;132:541-2.
  16. Okonofua EE, Okonofua BN. Incidence and pattern of asymptomatic bacteriuria of pregnancy in women. *Med Pract* 1989;17:354-8.
  17. Ebie MY, Kandakai-Olukemi YT, Ayanbadejo J, Tanyigna KB. Urinary tract infections in hospital. *Niger J Microbiol* 2001;15:31-7.
  18. Njoku CO, Ezissi NH, Amadi AN. Observations on bacterial infection of urinary tract patients. *Int J Environ Health Hum Dev* 2001;2:57-61.
  19. Akinyemi KO, Alabi SA, TaiwoMA, Omonigbehin EA. Antimicrobial susceptibility pattern and plasmid profiles of pathogenic bacteria isolated from subjects with urinary tract infections in Lagos, Nigeria. *Niger Q J Hosp Med* 1997;1:7-11.

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