

## Bacteriological Profile of Urinary Tract Infections in Pregnant Women

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### Abstract

**Background:** Urinary tract infections (UTI), which are caused by the presence and growth of microorganisms in the urinary tract, are perhaps the single commonest bacterial infections of mankind and in pregnancy, it may involve the lower urinary tract or the bladder. Urinary tract infection in pregnancy is associated with significant morbidity for both mother and baby.

**Aims and Objectives:** This study aimed to assess bacterial profile of urinary tract infection and their antimicrobial susceptibility pattern among pregnant women attending antenatal clinic at District hospital attached to Mandya Institute of Medical Sciences.

**Material and Methods:** This retrospective study was carried out in the Dept. of Microbiology, MIMS, Mandya. The urinary pathogens and their antibiotic susceptibility patterns from January - December 2014(One year) was studied from the records of Microbiology laboratory. Descriptive statistics was used and results were expressed as percentages.

**Results:** A total of 124 urine samples were received from pregnant women and processed in Microbiology laboratory from Jan to Dec 2014 .Among 124 samples, 45(36.2%) samples yielded significant bacterial growth. E.coli (19, 42.2 %) was isolated as predominant pathogen. 14 (73.7%) E. Coli and only 2(40%) Klebsiella were sensitive to nitrofurantoin which can be used in pregnancy. Only 2 (10.5%) E.coli were sensitive to Ampicillin with remaining 17(89.5%) being resistant.

**Conclusion:** This study showed that prevalence of UTI in pregnant women was 36.2%. It was also observed that E. coli (42.2%) was the most frequently isolated bacteria. All pregnant women should be screened for UTI with a urine culture and treated with antibiotics if the culture is positive.

**Key words:** E.coli, Pregnancy, Urinary tract infections, Uropathogens

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### Introduction

Urinary tract include organs that collect, store and release urine from the body which include: kidneys, ureters, bladder, urethra and accessory structures. Urine formed in the kidney is a sterile fluid that serves as a good culture medium for proliferation of bacteria.<sup>[1]</sup> Urinary tract infections (UTI), which are caused by the presence and growth of microorganisms in the urinary tract, are perhaps the single commonest bacterial infections of mankind<sup>[2]</sup> and in pregnancy, it may involve the lower urinary tract or the bladder<sup>[3]</sup>. UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards.<sup>[4]</sup>

Urinary tract infection in pregnancy is associated with significant morbidity for both mother and baby. The combination of mechanical, hormonal and physiologic changes during pregnancy contributes to significant changes in the urinary tract, which has a profound impact on the acquisition and natural history of bacteriuria during pregnancy<sup>[5]</sup>. At around 6th week of pregnancy, due to the physiological changes of pregnancy the ureters begin to dilate. This is also

known as "hydronephrosis of pregnancy", which peaks at 22-26 weeks and continues to persist until delivery. Both progesterone and estrogens levels increase during pregnancy and these will lead to decreased ureteral and bladder tone. Increased plasma volume during pregnancy leads to decrease urine concentration and increased bladder volume. The combination of all these factors lead to urinary stasis and uretero-vesical reflux<sup>[6]</sup>. Additionally, the apparent reduction in immunity of pregnant women appears to encourage the growth of both commensal and non-commensal microorganisms<sup>[7]</sup>. The physiological increase in plasma volume during pregnancy decreases urine concentration and up to 70% pregnant women develop glucosurea, which encourages bacterial growth in the urine.<sup>[8]</sup>

Among the pregnant women approximately 4% to 10% will have asymptomatic bacteriuria (ASB), and 1% to 4% will develop acute cystitis and 1% to 2% may develop severe acute pyelonephritis during the second half of pregnancy<sup>[9]</sup>.

The organisms causing UTIs during pregnancy are the same as those found in non-pregnant patients. E. coli accounts for 80% - 90% infections<sup>[10]</sup>, about 85% of community acquired UTIs, 50% of nosocomial UTIs and more than 80% of uncomplicated pyelonephritis<sup>[11]</sup>. These E. coli may be endogenous flora of the colon, first colonize the periurethral area and vaginal introitus, then ascend to the bladder and from the bladder to the renal pelvis by receptor mediated ascending process. The process involves both host and bacterial factors, namely tissue receptors and expression of bacterial attachment factors<sup>[12]</sup>.

Increase in concentration of amino acids and lactose during pregnancy also encourages the growth of *E. Coli* [13].

To ensure appropriate therapy, current knowledge of the organisms that cause UTIs and their antibiotic susceptibility pattern is essential. This study aimed to assess bacterial profile of urinary tract infection and their antimicrobial susceptibility pattern among pregnant women attending antenatal clinic at District hospital attached to Mandya Institute of Medical Sciences.

### Material and Methods

This retrospective study was carried out in the Dept. of Microbiology, MIMS, Mandya. Ethical approval was obtained from ethical clearance committee of College. The urinary pathogens and their antibiotic susceptibility patterns from January - December 2014 (One year) was studied from the records of Microbiology laboratory. Clean catch midstream urine sample collected in sterile container from pregnant women was received in the Microbiology laboratory. Microscopy was done and each sample was processed on blood agar and mac conkey agar. Culture positive result was given if the number of bacterial colony grown on culture media exceeded  $10^5$  colony forming units (CFU) per ml of urine in case of clean-catch midstream urine but based on type of urine

sample (straight catheterisation) submitted and clinical history (acute urethral syndrome, antibiotic therapy) of the patient, lower colony counts ( $10^3$  CFU/ml) were also considered significant in some cases. Bacterial identification was done by colony morphology, Gram staining and standard biochemical tests [14]. Antibiotic susceptibility testing was done by Kirby Bauer disk diffusion method as per CLSI guidelines [15]. Descriptive statistics was used to analyze the data and results expressed as percentages.

### Results

A total of 124 urine samples were received from pregnant women and processed in Microbiology laboratory from Jan to Dec 2014. Among 124 samples, 45(36.2%) samples yielded significant bacterial growth. *E.coli* (19, 42.2 %) was isolated as predominant pathogen followed by *Staphylococcus aureus* (8, 17.8 %), *CONS* (7, 15.5%), *Klebsiella* (5, 11.1%), *Enterococci* (3, 6.7%) and *Acinetobacter* (3, 6.7%) (Fig 1). Gram negative bacteria (27,60%) were predominantly isolated compared to Gram positive bacteria(18,40%). Only 29 (10.1%) isolates of *E.coli* were sensitive to ampicillin and 14 (73.7 %) were sensitive to nitrofurantoin. The antibiotic sensitivity patterns of the bacteria are shown in Table 2 and Table 3.

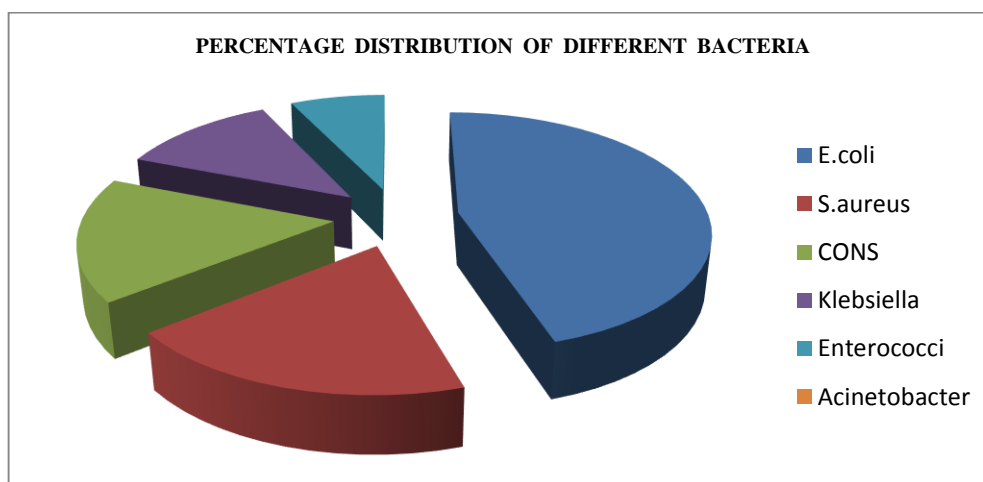


Fig. 1: Percentage Distribution Of Different Bacteria Isolated.

Table 1: Frequency of bacteria isolated from pregnant women with UTI.

Bacteria	Number (n)	Percentage (%)
<i>e.coli</i>	19	42.2
<i>Staphylococcus aureus</i>	8	17.8
<i>Cons</i>	7	15.5
<i>Klebsiella spp</i>	5	11.1
<i>Enterococci</i>	3	6.7
<i>Acinetobacter</i>	3	6.7

CONS-Coagulase negative *Staphylococci*

**Table 2: Antibiotic sensitivity pattern of Gram Negative bacteria**

	AMP	AMC	CTX	CTR	CIP	GEN	AK	NIT	T	NX	IPM
E. coli (19)	2 (10.1)	8 (42.1)	10 (52.6)	9 (47.3)	11 (57.9)	9 (47.3)	10 (52.6)	14 (73.7)	7 (36.8)	11 (57.9)	19 (100)
Kleb (5)	0	1 (20)	2 (40)	2 (40)	1 (20)	2 (40)	4 (80)	2 (40)	3 (60)	3 (60)	5 (100)
Acinetobacter (3)	0	1 (33.3)	1 (33.3)	2 (66.6)	2 (66.6)	2 (66.6)	2 (66.6)	1 (33.3)	1 (33.3)	2 (66.6)	3 (100)

AMP-Ampicillin, AMC-Amoxiclav, CTX-Cefotaxime, CTR-Ceftriaxone, CIP-Ciprofloxacin, GEN-Gentamicin, AK-Amikacin, NIT-Nitrofurantoin, T-Tetracycline, NX-Norfloxacin, IPM-Imipenem.

**Table 3: Antibiotic sensitivity pattern of Gram Positive bacteria**

	AMP	AMC	CTX	CTR	CIP	GEN	C	NX	COT	P	E	T	LZ
S. aureus (8)	2 (25)	4 (50)	4 (50)	5 (62.5)	6 (75)	3 (37.5)	4 (50)	5 (62.5)	6 (75)	2 (25)	3 (37.5)	4 (50)	8 (100)
CONS (7)	1 (14.3)	3 (42.9)	3 (42.9)	4 (57.1)	3 (42.9)	2 (28.6)	5 (71.4)	2 (28.6)	4 (57.1)	1 (14.3)	2 (28.6)	4 (57.1)	7 (100)
Enterococci (3)	0	0	0	0	1 (33.3)	1 (33.3)	0	0	2 (66.6)	0	0	0	3 (100)

AMP-Ampicillin, AMC-Amoxiclav, CTX-Cefotaxime, CTR-Ceftriaxone, CIP-Ciprofloxacin, GEN-Gentamicin, C- Chloramphenicol, NX-Norfloxacin, COT-cotrimoxazole, T-Tetracycline, LZ- linezolid. CONS-Coagulase negative staphylococcus

## Discussion

Bacteriuria, either symptomatic or asymptomatic, is common in pregnancy. If left untreated; 20% - 30% of asymptomatic bacteruria will lead to acute pyelonephritis. This may result in low birth weight of infants, premature delivery cases and occasionally, stillbirth, so it is a serious threat for the mother and foetus [16]. The overall prevalence of urinary tract infection in this study was 45/124 (36.2%). Akinloye et al,<sup>[17]</sup> reported a prevalence of 21.7% ,Onuh et al<sup>[18]</sup> reported 32.7% and Ajayi *et al*,<sup>[19]</sup> reported 40%, which is comparable to this study. However Onyemelukwe et al<sup>[20]</sup> reported a prevalence of 12.7% and Leigh<sup>[21]</sup>, Brook et al<sup>[22]</sup> reported a prevalence of 1-10%. This difference may be due to the inclusion of both symptomatic and asymptomatic pregnant woman in this study.

The bacterial pathogens isolated were predominantly *E. Coli* (42.2%), followed by *S. aureus* (17.8%), coagulase-negative staphylococci (15.5%), *Klebsiella* spp (11.1%) and *Enterococci* and *Acinetobacter* 6.7% each. *Escherichia coli* (42.2%) was the predominant isolate in this study. This finding is similar to other reports which indicate that Gram-negative bacteria, particularly *E. coli* is the most implicating pathogen isolated in patients with UTIs.<sup>[23,24]</sup> The major contributing factor for isolating higher rate of *E.coli* is due to urine stasis in pregnancy which favors for *E.coli* strain colonization.<sup>[25]</sup> Another reason could be due to poor genital hygienic practices by pregnant women who may find it difficult to clean their anus properly after defecating or clean their genital after passing urine during their pregnancy.<sup>[26]</sup>

All the Gram negative bacteria (100%) in our study were sensitive to Imipenem and all Gram positive bacteria (100%) were sensitive to Linezolid both of which are not safe drugs in pregnancy. 14 (73.7% ) *E. Coli* and only 2(40%) *Klebsiella* were sensitive to nitrofurantoin which can be used in pregnancy. Only 2 (10.5%) *E.coli* were sensitive to Ampicillin with remaining 17(89.5%) being resistant. Apart from these two *E.coli* isolates, no other Gram Negative bacteria was sensitive to Ampicillin. Even among Gram positives, high resistance to ampicillin was noted. 6 (75%) *Staph aureus* were sensitive to Ciprofloxacin and cotrimoxazole each. High drug resistance was also noted in *CONS* and *Enterococci*.

Antibiotic resistance has been recognized as the consequence of antibiotic use and abuse<sup>[27]</sup>. This might be due to inappropriate and incorrect administration of antimicrobial agents in empiric therapies and lack of appropriate infection control strategies, which can increase resistant organisms.

The limitation of this study was that we could not do a follow- up of these pregnant women.

## Conclusion

This study showed that prevalence of UTI in pregnant women was 36.2%. It was also observed that *E. coli* (42.2%) was the most frequently isolated bacteria. Due to rising antibiotic resistance among uropathogens, it is necessary to have local hospital based knowledge of the uropathogens and their antibiotic sensitivity patterns. All pregnant women should be screened for UTI with a urine culture and treated with antibiotics if the culture is positive. The early diagnosis and treatment of UTI during pregnancy can prevent complications to the mother and the fetus.

## Conflicts of Interested: Nil

## Source of Support: None

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